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The Future of Applied Science

C. H. Mitchell, C.B., C.M.G., D.S.O., M.E.I.C.

A Survey of the Effect of the War on Engineering Training, the Qualities Desirable in an Engineer, and Proposed Changes in the Curriculum of Applied Science.

The future of Applied Science rests with all of us who are concerned with the development of this great country. This concern lies not only in the actual processes of development but equally as well in the education of our young men who are going to participate in its development.

It is not for me to point out on this occasion the greatness of this young Canada in its potentialities or to enlarge on the methods by which those potentialities will be developed in the next decade. But it is opportune for us to look about and to ascertain what the country expects —what it demands—of us, who, in a large measure are responsible for the leadership in those methods. It is opportune for us also to examine into our own capabilities and our own preparations so far as education is concerned, for undertaking that work of leadership and for influencing the younger generation in those directions in which the development of the country can be followed best.

It is not sufficient for us who are going to be responsible for the education of the young men who twenty years hence are to be the leaders in this country simply to "wait and see" or to accept the trend of events as they arrive in the inevitable development of the country. It is for us to anticipate the requirements and how those demands may be made, so that when they are put forward we are standing ready to meet them or, better still, can say that they are already met, the highly educated and trained men are already here or in the field ready to take their appointed places.

Herein, it seems to me, is the highest function of a great University leading the country in thought and action, anticipating its needs not by a few months but by years, so that the necessary influence has already gone out by which the reaction comes about in real results. And nowhere more than in Applied Science does this principle stand in need of adoption, of careful leading and of persistent pursuit.

It is now opportune for us to examine ourselves and our surroundings, to orient ourselves in this great year of Nineteen Hundred and Nineteen, on the one hand to the tragic years that are past and on the other to the hopeful years that are to come.

Who can say what this great war has been to us in influencing our lives and our ideals for the future? Those of us who through a Good Providence came through its fire, realize that the gallant men who have come back to us come back full of new ideas and new ideals, full of energy and the consciousness of the value of real hard work, full of hope in the reconstruction of the homeland that will

Inaugural address of Brigadier-General C. H. Mitchell C.B., C.M.G., D.S.O., as Dean of the Faculty of Applied Science and Engineering at the University of Toronto, 8th of October, 1919.

make and keep it the best place in the world in which to live and to work. And of those men in the war who engaged in the engineering and scientific achievements what can we say? We can never say enough and all will not be told for years to come. That great man of the Empire, Mr. Lloyd George, has said—and he recognized and said it early in the war—"It is an engineer's war"—and no one knew better than he, for among those who closely surrounded him were many of the greatest engineers and scientists of the Empire.

Technical Knowledge and the War

We are all aware that early in the struggle an Inventions Board was constituted through which all manner of new devices and suggestions were brought to notice— and very democratic, patient and sympathetic it was too. During the past months we have been reading with interest of the decisions of this now famous Board with respect to the apportionment of the credit (and remuneration) for the numberless devices, which have now become historic in the years of battle.

On the field of battle, evolving through the months and years from the early days, as many of us remember the stories of the failures and successes of individual offensive and defensive weapons, trench ordnance, wire cutting devices, defensive trench structures and emplacements, mining and tunnelling operations, the tremendous and rapid development of artillery of both light and heavy guns and, in the end, the remarkable evolution of the "tank" with its unique place in the battles of the latter months.

In the air, what can be said in a few words to indicate the effort, the triumphs and the disappointments of the engineer and the long months of anxieties and trials through which he has finally emerged with the aircraft of to-day? When we remember that as the war started, the mechanics and the principles of the science of the aeroplane as we now know it, were but in their very infancy, we realize how in the few short years, concerted, diligent, almost feverish effort in the application of science has brought us so far in the actuality of aerial navigation, a study by the way, in which I had myself become intensely interested as far back as 1894, twenty years before the war.

On and under the sea too there is yet to be told the story of the struggle and the patient careful months of work in the evolution of the mighty British fleet and in the effort to meet the insidious unseen menace of the enemy's submarine warfare.

Who can say when and how we may apply our knowledge gained of aerial navigation, aeroplane reconnaissances and aeroplane photographs; of wireless communication—even wireless interceptions—as well as of those elusive principles of the electric telephone and detector devices used so successfully in the front line; of the principles of acoustics and electricity so curiously developed in the methods of sound ranging practice and so successfully applied in co-operating with our artillery.

What of the application of rapidly constructed portable steel bridges; of the principles of building railways in impossible places and roadways over impassable marshes or of concrete emplacements and steel reinforced concrete dugouts to withstand the enormous impact of a bursting shell? And under the ground what more have our engineers learned of soft earth mining, of continuous contests with water and ventilation and of live saving apparatus? What have we learned of steam, electric and petrol motor traction and the principles above all of keeping the traffic going, despite everything that the frailties of man deprive it, the vagaries to which the elements subject it, and the fiendishness of a relentless enemy? How far are we on the way to ensure stability in the air or in the development of air propellers and engines? What have we learned that will be useful in the inevitable further development of our shipbuilding in Canada for the sea coasts and great lakes?

And in the great basic industries, in steel and the economic metals, in textiles, in ceramics, and even in the graphic arts, how much more do our soldiers and war workers know for their five years of diligent labour? In the fields of the manufacturing industries of electrical and mechanical character, the producers of the great volume of munitions and of the multitudinous articles of equipment and apparatus of warfare by their new devices and new applications and by their new methods of manufacture and organization of labour have brought about a new epoch in the whole of our industrial structure; what have we learned and what are we going to do about it?

And perhaps greater than all, in the value of chemical industry, do we look for the lead which the war has given. The initiative in this which was undoubtedly held by the enemy at the commencement of the war, went through a long period of trial and competition between the two great armies of scientific workers until, when the war ended even the enemy will agree that the domination of the scientific field lay with the Allies of the Entente. In the constituents of explosives, in fuels, in gases for offensive warfare—in the components of manufacture of that same numberless lot of articles used in warfare and in the normal (or should we say abnormal) commercial and industrial development arising from the seizure of the enemy's foreign trade denied them by their war, in all of these the applied sciences in the chemical industries contributed a share in the war which is even yet but little known to the public of the great nations for whom it has all been done.

And one should not forget another feature, a feature which stands apart, in which the soldier returning to his homeland from the great battle regions of France, Flanders, and Italy, but little realizes the influence. The subtle unconscious effect of a life however uncomfortable, unpleasant and lacking in the refinement of home, set amidst the great historic places of Europe and daily face to face with many of the architectural and artistic gems of the old world, could not but have an influence with will follow him through life. So with all his materialism, with the horrors of war, and with his daily life in contact with the varied applications of science to the great business of war, he had, withal, ever about him, the object lessons of the aesthetic whereby, by contract he must at least have somewhat learned to love the beautiful in nature and to be inspired by the charming things made by the great masters of the centuries.

Now with all this inventory of what has been brought back from the war and after this process of looking about us to find and orient ourselves, we quickly realize that even yet we are but standing on the threshold of the new era of reconstruction. There is a new world ahead in Applied Science and it is for us to apply and to reapply the principles and discoveries which have brought us thus far.

The War and Canadian Engineering Activities

Let us now turn to the field toward which we look and in which we are now called to work after this war period. Canada is quite as much what she was before the war but she has found herself in a manner that few of us could even have hoped. And she has found herself in no more definite way and in no more important way than in the realization of her great resources and her ability to apply them to her own life and the life of the Empire.

If we are to study for a few moments the trend of the great engineering activities of the country as they appeared firstly, before the war, compared with the period of the war; and secondly, during the war as compared with the future and its prospects of reconstruction activities, we find divergent differences. The activities have passed through various stages. It will be remembered that the prominent features of these activities before the war were connected mainly with the huge railway construction and extensions. Further activities included other features of transportation, of canals and terminals, then of hydro-electric power developments and a definite trend just previous to the war to comprehensive programmes of large building construction connected with the expansion of manufacturing and commerce. This period too claimed a lengthy activity in mining and its allied industries.

The war changed all that; through the same sudden transition by which we passed from peace to war we almost as suddenly passed from the stages just described to the stages consequent upon the national mobilization of all our resources, and with that came an entirely different character of engineering activity. It resolved itself into the transformation of most of our great manufactories into munition works or works solely engaged upon war material, whilst the remainder and many new ones had perforce to continue in the work of carrying on the normal industries for the life of the country carried on with redoubled energy. Thus all the great public works of state or municipality were either hurriedly completed or abandoned for the time being.

In the same manner the sudden termination of the war from its greatest intensity to an unexpected armistice, brought about a similar transition in the opposite direction. With the difference, however, that the great public works have not been resumed and if one may be bold to forecast, it is unlikely that they will be for some time to come in so far as railway construction is concerned.

But what does appear on the horizon, as the future of these great activities of the country indicates is a large resumption of manufacturing and industrial work through the return to peaceful pursuits and the consequent readjustment of all that pertains to the life of a newly developed manufacturing country in which, as always, the agricultural industry is, and will be, the mainstay. But there is more than that; all those smaller public works and those smaller private enterprises which were arrested or dislocated during the war and which are not yet ready to be prosecuted or financed are still to be revived and within a few years will doubtless absorb the attention and services of many engineers, as well as the interest of the financiers of the country. This is all without any reference to the entirely new enterprises consequent upon the normal growth and development of the country such as was steadily proceeding previous to the war. Already there are signs of the resumption of this growth and it remains still to be seen whether this will take on the same form as previously in national or municipal public works, in mining and metallurgical progress, and in all those scattered activities where the services of the applied scientist and the engineer are called into use.

Trend of Engineering Training

Translating these considerations into terms of the needful scientific education to meet the requirements, and analysing these requirements in view of the necessary leadership which, as has already been said, the University must exercise, it is reasonably certain that a reversal of the requirements has taken place and should be provided for. In short where before the war the various branches of Civil Engineering stood pre-eminently first in the requirements, its relative demand in Canada, for the immediate future at any rate, has apparently fallen to second or perhaps third place in the grouping. The Industrial group of engineering has come to the front and hence we find Electrical, Mechanical and Chemical Engineering high up in the group. In fact it is a curious feature that of the present first year in this Faculty numbering about four hundred in all of the eight departments, practically one quarter are proceeding in Chemical Engineering; this is undoubtedly a direct outcome and influence of the war. The Mining group, including metallurgy, appears likely to follow a normal expansion for some years to come although the actual increase in activity in mining not only in Ontario but throughout Canada has been somewhat arrested by the war, except in those directions actually influenced by munition production. In the more aesthetic side of Applied Science—that of Architecture, Town Planning, and the like—who can say what the future may bring? It is difficult to foretell and to foresee what course the educational requirements of the country may take, although after all much depends on the extent to which the University offers attractions in this much discussed branch of scientific and artistic education—in other words it is for the University to offer influence and make the demand for architectural education and thus indirectly have an influence on the architecture of the country.

Having thus examined the course of the various branches of engineering and analysed the tendencies and probabilites for the immediate future, it is necessary to see wherein the Applied Science and Engineering education, as it has been and is now constituted in this country, is designed to meet the requirements of the times.

History of Engineering Instruction

To appreciate properly the relation of the demand and supply of scientific education, if we may use such terms, it is necessary to first go back and consider the historic evolution of Applied Science and Engineering in this and some of the other older universities on this continent. In doing so it is curious to find how, within limits, the university or college education has endeavoured to meet the requirements of the particular period in the country's development. Forty years ago—and engineering in this University of Toronto under the Old School of Practical Science dates back to that period—it was wholly Civil Engineering and was designed to meet a demand mainly for those public works which were necessary to the growth of the country at that time. Thirty years ago, a critical period in the development, a departure had been made, increasing or varying the courses to include Mechanical and Electrical Engineering, Architecture and Chemistry—as an instance, when I myself graduated in Civil Engineering twenty-seven years ago, there were, out of a total class of nineteen, fourteen in Civil, three in Mechanical and Electrical, one in Architecture and one in Chemistry.

In the intervening years a steady increase of the departments other than Civil has taken place, and we now find that after various cycles of influences the industrial groups have come rapidly to the front and even dominate the whole Faculty. This is but a reflection of the normal development of the country, and is after all, what was to be expected. As for the phases through which the general process of the teaching of Applied Science has passed through these years, it is equally interesting to observe that the great principles which were laid down in those early days—those of the splendid founder of this great Faculty, the late Dean Galbraith—have been and still are adhered to—and let me now say that so far as I myself can influence them, will still be adhered to, modified only in so far as may be necessary to meet the changed situation of the times. These great principles are comprised in the teaching, first the necessary theoretical science, and then the methods of application, in other words the placing of mathematics, physics, chemistry, and descriptive geometry, with the inevitable drawing, before the work of the applied science itself.

In the cycles of change in the methods and in what may be termed the fashion, in Applied Science education, a curious period of transition is just now coming about, irrespective of the influence of the war. It is easily recognized that dating from say ten years ago, a wave of specialization swept over this continent and before and even during the war was running riot amongst the younger graduates of Engineering schools in an alarming fashion. It is obviously necessary to point out that a young gentleman scarcely out of his teens, however brilliant he may be, can hardly be said to be a subject for intensive specialization in such difficult branches of professional work as present themselves in these fields of learning and practice. Despite all efforts and contriving it seemed to have taken the fancy of the young generation so that they were the more drawn to those institutions where attractive special intensive courses were offered for their choice. I am glad to say, however, that this criticism is but slightly directed toward Canadian universities. That was all very well up to a certain point, but the process got somewhat out of hand, the pendulum swung—and has swung—too far, and now we are confronted with the inevitable readjustment by which a means is sought to counteract this tendency.

Requirements in Technical Education

Reverting to the great fundamental principles of Applied Science education it must be accepted that the first requisite is, without question, a sound general education as a foundation. This principle has already been put into practical application in this University by the establishment of more comprehensive and more stringent requirements at matriculation, whereby not only a very high standard is required in mathematics, (senior matriculation), but high standing is also necessary in English and languages. But that is only the start and does not by any means ensure all those fundamentals which form the foundation for the proper education of the applied scientist or engineer.

Following this further and considering the entire education of the young engineer, there seems only one conclusion as to the necessity of to-day in this young country at its critical stages of development. For now-a-days we require not only technologists in the form of applied scientists or engineers but we want men who are more, much more than that, we require to produce men who by their college education will be:

First—Broadly educated, cultured gentlemen.

Second—Good citizens of Canada and leaders of influence within the community in which they may be placed.

Third—Thoroughly educated technologists in whatever branch of applied science they may choose to enter.

How best to produce this type of rounded out graduate in the four short years in which he is under the influence of his professors and instructors is open to much discussion and time does not permit to follow it through. It is obvious, however, that if a University education does nothing else, it ought to produce a broadly educated, well informed citizen, capable of thinking for himself on all public questions and taking his part in leadership and genuine public service—all this apart entirely from the necessary special education and the application of it to his gaining a livelihood in the practice of his chosen profession. If then in coming up to the University to obtain his education, he must devote himself to his professional course in Applied Science, that course and that Faculty must provide him with his education in its entirety and must, therefore, not limit itself solely to the technological side of it.

At the other end of the scale of his education the young engineer of to-day who is not to be over specialized must learn to think in terms of subjects and educational values which may prove of the most use to him on going down from the University and entering his professional life. True, it has been said he must have been grounded in the fundamentals and in the practical application of these to the varied problems in the many sided phases of Applied Science as it is to-day known and practised. But there is a further distance he must go, especially in these days of materialism and of what is known in the workaday world as "practical results." He must learn to orient his technical education with the economics of the world into which he is about to enter, so that he may the more readily become the thinker, the leader, and the actor in the great effort of development and service in which he engages. Herein lies what, in a few years, will be found to be one of the governing factors in the more detailed and special education of the young engineer, his place in the economics of the community. It can easily be said that in the four years of a college course but little time can be given to this phase of education, that is agreed, but it is possible to instruct and to combine the types of work in such manner as to keep these principles of engineering economics clearly before the student in his later years.

The Returned Soldier and Applied Science

Just here it seems opportune to revert to the returned soldier and to try to look at Applied Science and its changed conditions through his eyes. He has seen as no one else has seen the truest application of science to the most practical of problems that have ever been put on in the world drama, and he has seen as no one else has seen the results of that application. He expects on coming back here to his University that we too have an appreciation of how better to apply these great principles of science to the world's problems not of war but of peace, and his eyes are on his University as never before.

Doubtless the type of student will be found to have changed during the past years in so far as the war has left its imprint. I speak of this because the returned soldier types and the normal types of recent years, were influenced by war conditions, are of a peculiarly high order, and in making this statement I am speaking from an experience which has included visits to many universities including those in Great Britain. As I stood before the first year in Applied Science a week ago to-day, over half of them returned soldiers, I could not help but be struck by the particularly strong features, the intelligent types and general appearance of men who can and will energetically accomplish things, an especially valuable characteristic in the engineer. Then I thought of that splendid tribute which I heard General Sir Arthur Currie pay to the Canadian soldier in his memorable speech to the Canada Club in London on the 20th of May last, in which he said "All Canadians are pioneers themselves or are immediate descendants of pioneers. Most of them have gained or inherited those indelible signs with which Nature graced the bodies and souls of those who have pitted their will, their strength, and their determination against elemental forces and have earned for themselves a portion of her riches."

The war itself produced new characteristics in those who remained in Canada and those who went abroad. The spirit of irresponsibility, so deplorably manifesting itself before the war, was arrested, and gave place to a greater sense of responsibility in all ranks in and out of the army. The logic here is that this new sense in the young generation has returned from the battle to our teaching to carry at least for the years of reconstruction. I shall always remember an inspiring address to staff officers which used to be made during the war by that good leader among staff officers, General Sir Charles Harington, in which he held up three words as a test: Trust, Training and Thoroughness. What more could we have wanted in leaders and followers alike?

Proposed Changes in Curriculum

All this leads up to the consideration of the curriculum and the manner and extent of instruction which is best suited for the country for the period in which we find ourselves and for the general type of student who comes to this University for his education. The curriculum throughout all engineering colleges, especially on this continent, is in the process of change for the reasons already referred to and a study of the tendencies in these changes reveals a degree of uniformity which in a measure applies to the particular requirements of this country and this University. During my visit the past spring to some of the leading universities in Great Britain where Applied Science is prominent, I was struck by the efforts that were being made to transform and reconstruct the curriculum in accordance with the newer demands, efforts which were due to the same causes and tendencies in the national life with which we ourselves are now confronted.

If the signs and the tendencies can be correctly interpreted—and this appears to be a universal opinion today among not only those engaged in engineering education but in practice as well—there are several radical changes in the curriculum which are now opportune, indeed are demanded. Amongst these are proposed: First—a rearrangement of subjects and economy of time by avoiding crowding the curriculum with less essential subjects and by judicious sequence to limit the number of subjects simultaneously studied to less than is now usual although not decreasing the number of student hours per week. Second—The introduction of broader humanistic subjects in the first two years which may be termed the general educational portion of the course, including, in addition to all the mathematics and science, a further study of English with special reference to Applied Science, and the introduction of studies in Economics, Sociology, and possibly Logic and Psychology in a form applicable to this work. This is without reference to the continuation of the study of modern languages which are so essential in the technical world of today. Third—The inclusion in the last two years of some of the higher forms of these broad subjects but with special application to the work and the relationship of the graduate after he enters his professional life; these subjects must be such as Finance, Engineering Law and Jurisprudence, Commercial Engineering, Industrial Management, and Engineering Economics, and it may be of interest to note here that some of this work in its simpler form has been included in the curriculum of this Faculty for some time past.

In addition to the foregoing there seem to be various other considerations. For instance, the student has great difficulty in his early years in orienting himself to the objects and processes of study in Applied Science, in discovering the relative value of the various subjects he is put to study and in realizing the application of these subjects to the real business of engineering practice.

Much stress is laid by British and American Universities on the inclusion of what they call practical engineering work side by side with the theoretical work in the earlier years. This was clearly recognized in this University in the early curriculum of the School of Practical Science and has been a feature ever since—for instance the laboratory work helps out the lectures in electricity and mechanics and surveying helps out the mathematics. In addition to this our curriculum here has always made it an essential that the student engage in some actual practical employment in the field and in engineering works during the summer holiday, lengthened specially for this purpose, and a new departure is now made by the establishment of a large rural camp or school about thirty miles north of Toronto for the purpose of carrying on instruction in surveying independent of that experience to be gained in the ordinary manner. The general tendency now, and one to be encouraged in connection with the education of the electrical, mechanical, or chemical engineer, is to participate in real industrial work, not only through the summer holiday period, but in some form of continuous co-operation with industries. Such work should be supervised to some extent by the College, and used as a source of problems and projects for scientific analysis and study and can be made mutually useful to the industry and the student. I appeal to the manufacturers of Toronto and the vicinity to meet the University in this regard, and I can assure them that in most cases whatever inconvenience they may be put to by such an arrangement will be reciprocated in some form to the advantage of their work in connection with study and research which may arise from it.

Expansion in Applied Science Education

While it is doubtless expected of me on assuming this post to indicate along what lines the course of expansion in Applied Science education will proceed, it is almost too early to go into further detail as to the curriculum than has already been outlined. As, however, a certain well defined policy is already in progress it may be sufficient to add to the foregoing that it is considered desirable amongst other things to reconstitute the Department of Civil Engineering to embrace general sections which will deal more specifically with those subjects of Municipal and Sanitary Engineering which are and will be more demanded by our municipalities whether civic or rural. In this department too it is thought that even in the face of changing tendencies already referred to, Transportation Engineering, (by Railway and Canal), as well as Highway Engineering should be further expanded in the senior years.

Irrigation and Reclamation Engineering too, so requisite in the development of our Western Provinces especially, should be given more attention, and even the work in Water Power, already highly developed in our curriculum, should be broadened.

The inclusion of a course of lectures and laboratory work in Ærodynamics so much in demand arising out of the war, is already provided for, and much assistance will be obtained by the elaborate air channel and other experimental apparatus which already has been installed in the Thermodynamics Building during the past year.

The subjects of Ship-building and Naval Architecture, which appear to be now in some demand especially with the revival of Canadian shipping on the Great Lakes and the development of the harbour works at Toronto and elsewhere, are being kept in view.

In Architecture very considerable extensions and changes are under way, and it is proposed to strengthen the Department by increased personnel including an additional associate professor; it is proposed too, to broaden and alter the character of the instruction materially by a closer co-operation with the architectural profession, whereby better opportunities may be secured for the student during his course.

Not the least of the additions to the programme is the inclusion of a course of lectures in Civic Town Planning by an eminent authority which will, it is hoped, broaden before long, in co-operation between the Engineering and the Architectural Departments, to a highly useful branch of instruction destined to become a real factor in the utilities and aesthetics of our municipal and industrial life.

In order to provide the student with a viewpoint somewhat in anticipation of his future career, the principle already established of arranging courses of lectures from prominent members of the profession will be further developed as this has been highly recomended by graduates and is recognized as of great value to the senior students.

In the programme particular reference must be made to engineering Research for which there is now separate provision to carry on, independently of the regular courses of instruction in the Faculty, by the employment of specially selected personnel under the heads of the various departments, utilizing the laboratory and other equipment at hand. Too much cannot be said of this work or of its inevitable effect on the industries and the application of science throughout the community. In electrical and chemical work much has already been accomplished and the full programme for the coming year in these and other branches is, it is hoped, only the commencement of a great work in the service of the country.

It may be said that such an extensive programme is beyond the compass of a four years college course. This is fully recognized but it is realized that a way must be found to introduce at least a portion of the fuller curriculum either by curtailing the present in the less essentials or by the introduction of a fifth year which is the alternative. This is for serious future consideration.

To summarize the foregoing considerations of the curriculum it will be observed that there are three main divisions all of which are common to the various courses and department of Civil, Mechanical, Electrical Mining and Chemical Engineering, and Architecture. First—the sciences, mathematics, physics, chemistry and mechanics; Second—the graphic and mechanical arts, drawing, design and practical field or shop work; Third—the humanities, English, economics, languages, and possibly philosophy.

Value of the Broad Curriculum

It is not radical to make these and their subsidiary subjects common to all departments for it is obvious that, for instance, the civil engineer must know something of electrical, steam, gas and other mechanical work; the electrical engineer of to-day must know something of hydraulics, masonry construction, railways, bridge building and even tunnelling, while the municipal and sanitary engineer must know considerable about electrical railways and pumps, steam engines and hydraulics in connection with the broad subjects of civics.

To pass further to these considerations and view them on a still broader horizon, the three main factors in the actual practice in which the graduate will engage may be resolved into scientific theory, the methods and practice in this application and the economic considerations. It has been said by some, with respect to the latter, that it is time enough when the graduate walks out into his professional life. Not so; if, when he is at the University, he has not been able to co-ordinate sicence and practice and obtain a sense of the economy of their application, he is going out into the world ill fitted to take his place alongside the men who are already there; much less to attain to be a leader amongst them. More than this, the complex industrial conditions of to-day are understandable only by long, careful study by thinking men living in close contact with industry; how much better it is to give the student while at college his first acquaintance with these complexities and his basic principles of industrial management. The philosophy of values and costs, the psychology of labour and industrial problems and skill in expression in writing and speech are all subjects worthy of attention whilst the student is still at college. The practical academic process by which these can all be combined into one course of study in senior years seems reasonable when one considers how for instance a complete project from its inception may be followed through to its conclusion by a series of problems for class discussion, outside study in operating concerns, broad reading and an ultimate report of a comprehensive character.

In considering the problems of values and costs, of labour and industrial conditions and their relation to production which is now paramount in this country, it must be born in mind that "the control of engineering lies in the hands of those who judge most accurately what enterprises men value sufficiently to be willing to assume the cost." Because engineering education has heretofore been confined mainly to technology the engineer has seldom been placed on executive governmental commissions or other public boards—boards and commissions that must decide on how public funds shall be extended on enterprises that are essentially engineering in character. Why has it happened too frequently in the past that the engineer has been called in to do the technical work of design and construction only after a board comprised of lawyers, bankers, doctors, clergymen, merchants or politicians had made a decision as to whether, from a standpoint of values and costs and other economic considerations the project under discussion shall in whole or in part go forward to construction." It is encouraging to know, however, that the idea is now developing that the public interest would be better served if the engineer had a greater voice in making such decisions.

Now to meet this new value which the public is beginning to place on the engineer what are we going to do about his education? This is a distinct demand if there ever was one, and the Universities should be the first to hasten to meet it. If the engineer and the applied scientist are to be prepared to take their proper places in the community they must be trained to appraise correctly what men consider to be worth while.

Qualities of the Engineer

And here let us consider for a moment what attributes and values the public will place on the engineer when he goes out into life. If he is going to be something more than a technologist what more must he be? This is a question which has been asked for some years in the searching that has been going on in the engineering profession on this continent not only with a view of training the young generation but in consideration of the whole relation of the engineer to the public. An inquiry was instituted two years ago by the Carnegie Foundation and in connection with that admirable study of the whole situation by Professor Mann, *A Study of Engineering Education*, the following question was put to the engineering profession at large from whom fifteen hundred replies were received, "What are the most important factors in determining probable success or failure in engineering?" It may not be a surprise to you to learn that for the first requisite, personal qualities were placed above everything, and these attributes were given seven times as frequently as were the knowledge of engineering science and the technique of practice. A second circular letter stating this result was then sent to the members of the great national engineering societies, each being asked to place in sequence of value six groups of those qualities head respectively, Character, Judgment, Efficiency, Understanding of Men, Knowledge and Technique. Over seven thousand replies were received and their votes placed Character at the head by 95 per cent., while Technique was voted to the bottom by an equally decisive majority.

Therefore, as Engineering and Applied Science expand into the new fields opening before them, the conception that character, judgment, efficiency, and understanding of men, are no less necessary than technical knowledge and skill will become more and more impelling, and it will become more and more essential that engineering colleges pay greater attention to the effect of their work on the development of the students."

An Instrument for Measurement of Rail Wear

Alexander D. Ferguson, A.M.E.I.C., Winnipeg, Man.

Many instruments and mechanical devices have been used from time to time in endeavours accurately to measure the "wear" on rails. Most of these have been of a "caliper" variety and have, I believe, not given great satisfaction for two reasons, viz.:—the uncertainty, firstly, that each measurement is taken in the same relative position with regard to the perpendicular axis of the rail and secondly, that, as usually only one measurement is taken at each point, such reading may not represent accurately the rail wear at that point. The instrument herein described does away with both of these primary objections and readily lends itself for use with any rail section with great speed and accuracy.

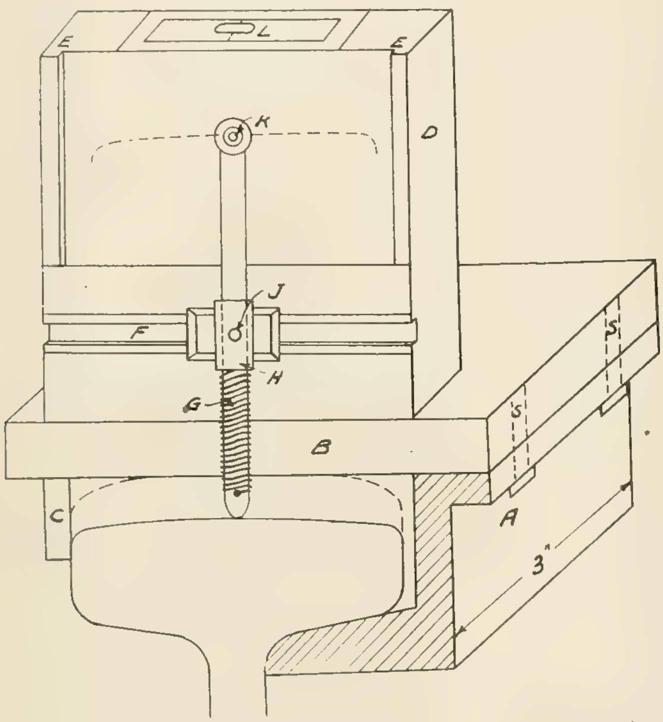


Fig. 1

The device consists essentially of :—(See Fig. 1.)

a. A casting of hard babbitt, cast against a new rail of the same section as the one to be measured, so as to give good contact with the under side of the rail head and also to fit tight into the curve where the rail head meets the web. As in the figure there is a little clearance between the side of the rail head and the edge of the casting to allow for a fit even if the rail head is battered over. A different casting is used for each different rail section. The castings are fastened to the recorder by screws S, S.

b. A mahogany plate about ⅜" thick with a clamp C, which moves in a slot and can be pushed hard against the outer edge of rail and screwed tight by a thumb screw, thus giving the instrument great stability when sitting on the rail. Behind is a single screw reaching down to the rail head which is used to level the instrument—using small level on the top as an indicator.

d. An upright mahogany plate with two slots E for the reception of cards, which are kept in position by a screw at the back of D.

f. A horizontal slot in which G has a free sliding movement.

g. Is of steel (hardened at the lower end but not sharpened to a point), G also has free vertical motion in sleeve H, which is fitted with a small screw J to clamp G when not in use. At the upper end of G there is K an attachment containing a pencil which by means of a spring can be kept pressed against a card inserted in E, E.

Method of Taking a Reading

The under side of the rail head is cleared of all debris. (When the setts are of wood this is easily accomplished, but when of stone it is necessary to cut these out with a stone chisel—the time taken in this operation is small as it is only necessary to cut out an opening 3" x ½" in to the web of the rail). The requisite casting is screwed on and is pushed under the flange side of the rail until good contact has been established; C is then pushed hard against the outer edge of the rail, screwed up tight and the instrument levelled up.

A card is inserted in E. E, and G is released so that the lower end rests on the rail head; K is then released so that the pencil presses hard against the card. G is then drawn across the face of the instrument and K makes an exact tracing of the rail head on the card, which is then taken out and the location, weight of section, etc., written on the back. By repeating this process at convenient intervals a graphic representation of the rail head over a certain route or routes is obtained.

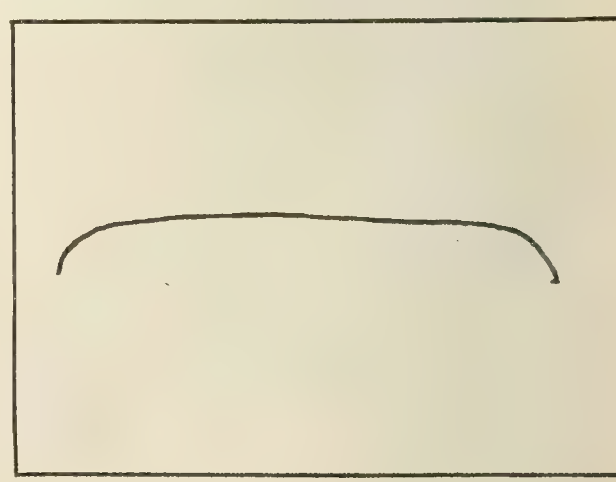


Fig. 2

Fig. II shows a representative set of cards. The instrument is set up on a new rail of the same section and the graph of this superimposed on the cards as in Fig. III.

This is the final card, and the shaded area represents accurately the portion of the rail head worn off at that point. By means of a planimeter this area is readily taken off; say, area is A.

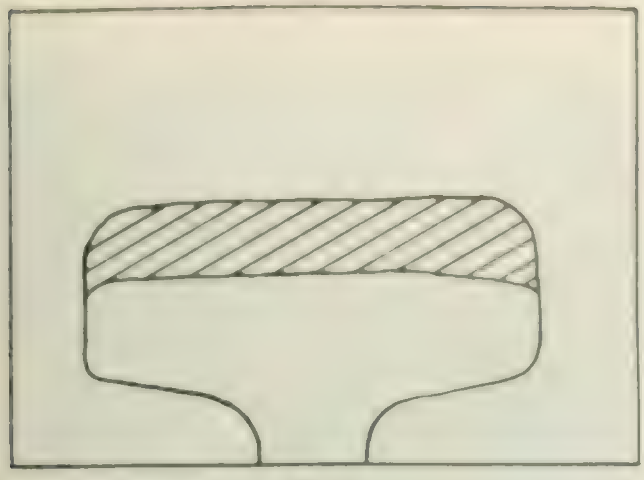


Fig. 3

If for any purpose it is desired to express the area worn off as a percentage of total allowable wear, the allowable wear must first be definitely ascertained. Suppose that when a rail has worn to a depth "w" on the central perpendicular axis it should be discarded, i.e., it has depreciated 100%. This distance is measured on a carefully drawn plan of the rail, the area of total allowable wear (B) deducted (by planimeter). Then A/B is the percentage of wear or represents the percentage of depreciation.

Below are some sketches of actual graphs of rail heads taken by the writer while conducting a series of measurements over the whole tracks of the Winnipeg Electric Railway during the Appraisal by the Manitoba Public Utilities Commission, (over 1200 readings were taken covering approximately 172 miles of track.)

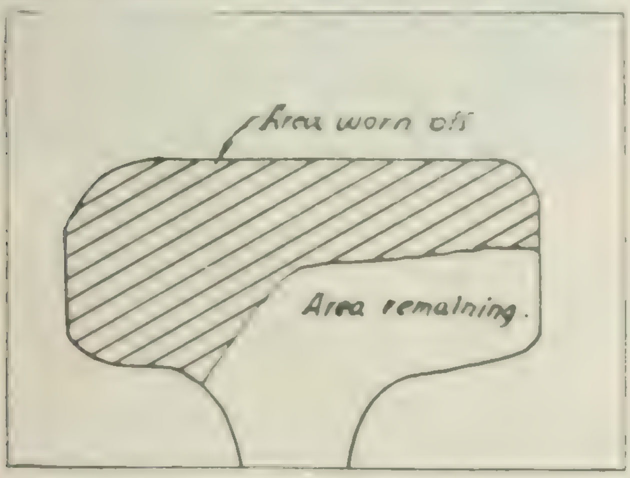


Fig. 4

Fig. IV.—70 lb. A.S.C.E. rail, more than 60% of the total head area of the rail was worn away.

Fig. 5

Fig. V.—60 lb. A.S.C.E. rail—an example of rolling or flow of metal.

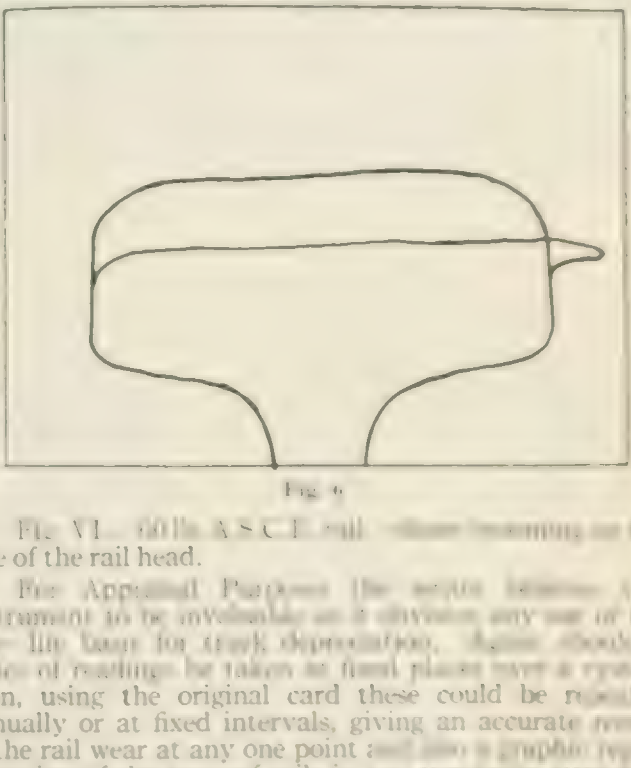


Fig. 6

Fig. VI.—60 lb. A.S.C.E. rail—shows becoming on the side of the rail head.

For Appraisal Purposes the writer believes this instrument to be invaluable as it obviates any use of the age-life basis for track depreciation. Again, should a series of readings be taken at fixed places over a system, then, using the original card these could be repeated annually or at fixed intervals, giving an accurate record of the rail wear at any one point and also a graphic representation of the state of rails in any particular stretch of track.

The writer is much indebted to Mr. Hypes of Winnipeg for his great interest and care in making the first instrument from very rough sketches, and for working out some important details.

To W. M. Scott, Esq., M.E.I.C., under whose direct supervision the Appraisal of the W. E. R. properties has been carried out, the writer's thanks are also due for his great interest and permission to develop and thoroughly test this new departure for the accurate measurement of wear of rail heads.

"Recent Experiments with Straw Gas"

By Professor A. R. Greig, A.M.E.I.C.

About three years ago, Mr. Harrison of Moose Jaw discovered that he could obtain a combustible gas from straw. He experimented with it for a time and took out some patents on the process.

The Agricultural Engineering Department of the University of Saskatchewan, through Doctor McLaurin, obtained Mr. Harrison's apparatus. It, however, had been through the fire at his foundry, and had to be completely rebuilt.

Experiments have been conducted for two winters, and in order that it may be known what has been done, the results, as far as we have gone, are set forth in what follows.

About 12 or 13 years ago, the city of Brandon experimented with straw in a gas plant, but it did not prove a success. The superintendent of the Winnipeg Gas Works at that time was of the opinion that it would not prove satisfactory.

The following is a description of Mr. Harrison's plant, and other apparatus used.

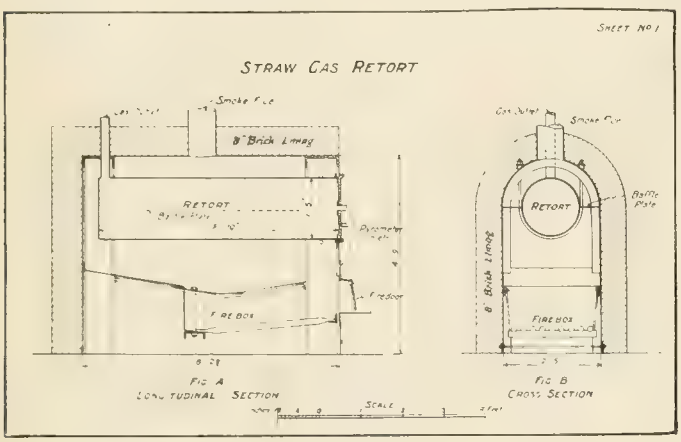


Fig. No. 1

Plate 2—Retort and Pyrometer Equipment

Plate No. 1 diagram A shows a vertical longitudinal section, and fig. B a vertical cross section through the retort and fire-box. This retort held a bale and a half of 100 lbs. of straw when compressed. The means taken for compressing the straw in the retort is shown on plate No. 3, fig. C. It consists of a large screw-press, the screw of which is 1½ inches in diameter and has four threads per inch. The plunger is of wood with an iron plate to take the thrust of the screw. The retort was filled with straw which was then compressed several times before 100 lbs. of baled straw could be put into it.

The removal of the char from the last days burning and the filling of the retort usually took 2½ hours of one man's time. The char when removed, on coming in contact with the air, often started to burn. It was practically all carbon and weighed 38 lbs. on the average. A great deal of the heat value of the straw is contained in this char.

The furnace was fired with straw and it took from 425 to 450 lbs. of good wheat-straw to distill one retort full of straw. The temperature in the fire box was kept at about 1500°F., which meant that the retort was a cherry red colour. A number of holes in it were burned in the retort, which were welded with the oxy-acetylene process. The last time a hole was burned it was found necessary to cut out a considerable portion of the bottom of the retort and weld in a new piece of steel.

Read before Saskatchewan Branch, September 11th, 1919.

The distillation usually took from 6 to 7 hours. Any attempt to shorten this time resulted in a higher temperature of the retort, and partial gas leaks and consequent burning of the retort.

Last winter pyrometers were kept, one in the fire box, one in the centre, and one three and one-half inches in from the side of the retort. Readings were taken at five minute intervals. It was found that the temperature in the fire box rose very quickly. The temperature as shown by the pyrometer three and one-half inches inside the retort would go up in a short time to slightly over 200° and stay there for nearly two hours.

The temperature would then rise once more at a nearly uniform rate of 200 to 225°F. per hour. The pyrometer in the centre would follow very slowly, until a final temperature of 1000 to 1100°F. was reached, after which the flow of gas ceased.

The gas was taken off through the gas outlet pipe shown on the top near the back end of the retort (Plate 1, fig. A). It started to move the meter about 30 minutes after operations were begun and came off at a nearly uniform rate of about 2 cubic feet per minute for from 2 to 3 hours, gradually diminishing after that period. An average of 500 cubic feet of gas was obtained from 100 lbs. of wheat straw. It is doubtful if the last 50 cubic feet were worth the extra fuel and firing.

Date 1919	Straw in Retort	Time Firing	Fuel Used	Gas Cu. ft.	Char Lbs.	Fluid Lbs.
April						
8	100 lbs.	7 hrs.		450		37
9	100 "	7-5	435	450	39	38
10	105 "	7	440	450		38
11	105 "	6-20	455	500		39
14	105 "	7-25	450	525	38	38
15	100 "	6	Wood	525		

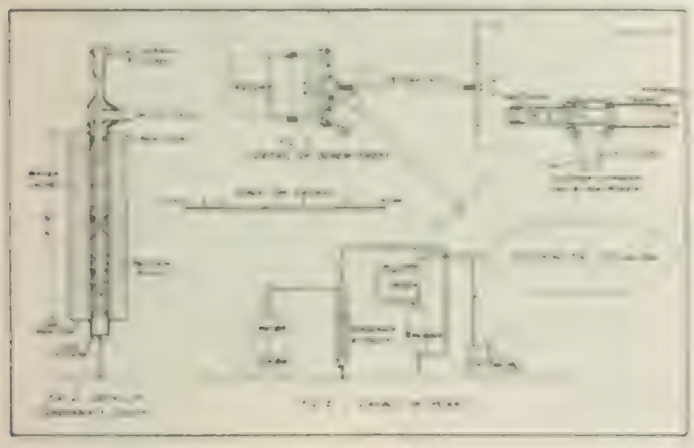


Fig. No. 5

D-45 McLaughlin car fitted for straw gas

The gas was taken from the retort to the cooler and condenser shown on Plate No. 2, Fig. D. Here the gas was taken down the centre pipe to near the bottom, returning up between the inner and outer pipes, the whole apparatus being enclosed in a jacket of running water. The inner pipe was fitted on the outside with a number of galvanized iron aprons filled with small holes to aid in the throwing down of the fluids condensed. About 38 lbs. of a heavy tarry liquid was obtained from the 100 lbs. of wheat straw, a considerable portion of which was evidently water.

The gas left the cooler at a temperature of 80 to 100°F. It was then piped to the scrubber shown on sheet No. 1, fig. E. This consisted of a steel tank, 15" dia. x 3/4" high filled with iron cuttings and charcoal, and having a spray of water on top. From the scrubber the gas was taken through the meter to the retaining bag or engine as desired.

This gas has a heat value of nearly 400 B.T.U. per cubic feet, while coal gas has a heat value of 650 B.T.U. per cu. ft.

Engine trials: It was found that the straw-gas was considerably different gas to deal with than gasoline vapor. After a good many trials we settled on a compression ratio of 5:2. Some fairly good brake horse power trials were obtained when a number of indicator cards were taken. These show an explosive pressure of 260 to 280 lbs.—much less than that obtained with gasoline. The trials were run on a 4 horse power International Harvester Co. engine. The bore of the cylinder is 4½", the stroke 7½", rated revolutions per minute 400. 5 brake horse power were obtained at 500 R.P.M. on a fuel consumption of 37.5 cubic feet per horse-power-hour. The 500 cubic feet ran the 5 horse power engine for 2 hours and 40 minutes.

Assuming the heat value as given above, this gave us practically the same thermal efficiency as was obtained on the same engine using gasoline. The mixing device is very simple. It is shown on Plate No. 2, fig. F. The gas inlet pipe is 1″ diam., the air inlet 1½″ diam., the tee 1½″ diam., reduced to take the one inch gas pipe as shown.Both air and gas pipes were throttled. It was found much easier to start on a gasoline priming than on the gas.

A D-45 McLaughlin car loaned by the Saskatoon branch of the McLaughlin Carriage Co., was fitted up with a 300 cu. ft. gas bag as shown in the photograph. The gas and air were mixed in the same way as for the small stationary engine, only the fittings were larger. The mixture was piped to the carburetor inlet so that by closing off the gas the car could be run on gasoline. The engine was started in this way, the gas valve was then opened, and the needle valve of the carburettor closed. The car was run only a short distance on straw gas before it stalled.

The 300 cu. ft. bag of gas has less heat value than one gallon of gasoline, so that it will readily be seen that it does not give promise of being a substitute for gasoline.

Summary:—By one man working 8 to 9 hours cleaning, filling the retort, and firing, 500 cubic feet of gas can be obtained from 100 lbs. straw and 450 lbs. of straw used as fuel, the total heat value of which is nearly 200,000 B.T.U., or an amount equal to what could be obtained from a scoop shovel full of good coal (16 to 18 lbs.)

To heat an ordinary 7 room house in Saskatchewan with straw gas, a gas holder of 4000 cu. ft. capacity would be necessary for 24 hours heating on the cold days. To fill this holder, 800 pounds of straw gas would have to be distilled and about 3600 pounds of straw would be used as fuel. Less fuel could be used if a battery of retorts were used.

Regulations of the Governor in Council as Required by Section Five of the Canada Highways Act.—A. W. Campbell, M.E.I.C., Highways Commission.

Sec. 5—The Governor in Council may make such regulations to be published in the "Canada Gazette" as are deemed advisable for giving effect to the objects and purposes of this Act.

Section 1—Work to be Aided

The highways to be aided under the Act shall comprise such main and market roads as have been designated by the Province as hereinafter provided with a view to encouraging production and stimulating trade and commerce, and as shall be approved by the Minister.

Section 2 Customary Highway Expenditure to be Supplemented

It is understood that the expenditures called for under the Canada Highways Act are intended to supplement the usual amounts granted and devoted to the construction and improvement of its highways by the Province itself.

Section 3—Method and Form of Making Application, Preliminary Procedure

Before an agreement is made with respect to any road or roads, there shall be furnished to the Minister by the Provincial Government a statement setting forth a programme for construction or improvement of a system of highways in the Provinces from which projects shall be selected. Such statement shall be accompanied by a general map of the proposed programme, bearing the approval of the Provincial Government and the endorsement of the Highways Department thereof. Each Provincial programme shall include, first, roads having greatest local agricultural and commercial importance, and second, roads having both local and general importance, and these programmes shall be so adjusted and arranged that the whole shall be correlated and form, as far as possible, a general system of Inter-provincial highways. This programme and amendments thereto shall be satisfactory to the Minister, and applications relating to the construction of specific portions thereof shall be made from time to time as provided for in the following section.

Section 4—Method and Form of Making Application, Project Statement, Plans, Specifications, Estimates, Etc.

Each application for aid shall be embodied in a project statement, on forms which may be had on application to the Commissioner of highways of the Department of Railways and Canals, which shall contain the following information and exhibits:—

(*a*) The purposes the undertaking will serve, and why it is in the public interest;

(*b*) The character and extent of traffic, present and prospective on the road;

(*c*) How the undertaking relates to the Provincial programme;

(*d*) A statement of the type of construction or improvement it is proposed to make, together with a report of the Engineer of the Provincial Highways Department endorsing the adoption of the proposed type and the design thereof as being the most economical and practicable in the public interest, his reasons therefore, and a full explanation of any special or unusual features thereof;

(*e*) The administrative control of and responsibility for the undertaking ;

(f) The source and method of procuring the necessary money for the undertaking and the extent to which interested municipalities contributed thereto;

(g) Plans in standard form to be prescribed by the Minister and in detail following accepted engineering practice, together with a sketch map showing the position of the proposed project on the general programme map of the Province;

(h) Specifications in standard form to be prescribed by the Minister setting forth the proposed type and method of construction, materials to be used, and other essentials, in such detail as to afford complete knowledge of all steps to be taken in carrying out the project;

(i) Copies of the form of contract to be used, together with all documents referred to therein or made a part thereof; and

(j) Estimated cost of the project, giving a schedule of quantities and the estimated cost of each item in detail.

All project statements, plans, specifications, estimates and other papers required in connection with any application of a Province for aid under the Act shall be forwarded to the Commissioner.

Section 5—The Agreement

When a project statement has been approved by the Minister an Agreement as provided for in the Act between the Province and the Minister shall be executed in triplicate by the Province on a form furnished by the Commissioner.

No payment under the Act shall be made until such agreement has been executed by the Minister nor shall payment be made for work done prior to such execution unless with the express approval of the Governor in Council which approval shall not be given in connection with work done prior to the coming into force of the Canada Highways Act or not done in accordance with these regulations.

Section 6—Tenders and Contracts

All expenditures shall be made pursuant to tender and contract, except as provided by the act, and shall be on the basis of unit prices. Tenders shall be called for at least three weeks before the work is to be let and notice of the calling for tenders shall appear in a contractors' or engineering journal as well as in such local newspapers as the Province deems necessary.

Section 7—Payments

In determining the actual necessary and reasonable cost of any highway for the purpose of fixing the amount to be paid under the Act, the cost of the following shall not be considered as a part thereof.

The cost of right of way and incidental damages, bridges, viaducts, subways, exceptional grade separations, provincial overhead and administrative expenses, the making of surveys, plans, specifications and estimates, or any engineering expenses incident to the project prior to the beginning of actual construction. The cost of culverts having a clear width of opening of not more than twenty (20) feet may be included.

Certified vouchers showing the amounts expended on each section of completed road, also showing the amounts, if any, expended on any uncompleted sections up to subgrade at the termination of each fiscal year during the five year period commencing April 1, 1919, shall be submitted to the Commissioner, and when he has certified that the terms and conditions of the agreement, in respect of the plans and specifications attached thereto, have been carried out as far as relates to such sections, forty (40) per cent of the cost thereof as defined by these regulations and expressly subject to section five thereof, will, upon authority of the Minister be paid to the Provincial Treasurer, or other person named in the agreement to receive the same.

Section 8—Records

Such records of the tenders submitted, of the cost of the work, of the inspections made, and tests of materials shall be kept by the province as shall enable the Commissioner at any time to determine the cost to the province and the status of the construction work done on any project. These accounts and records together with all supporting documents, shall be open at all times to the inspection of the Commissioner or his representatives, and certified copies thereof shall be furnished at his request.

Section 9—Inspection

The supervision of each project by the Provisional Highway Department shall include adequate inspection of work and material by competent engineers throughout the course of construction. To this end, any recommendation of the Minister to the Provincial Government with respect to the necessary technical qualifications and experience of the members of the highway organization will be enforced by such Government.

Section 10—Maintenance

Each Province shall agree that when the roads or highways constructed or improved with Federal aid shall have been accepted as completed, the Province shall maintain or cause the same to be maintained, with all necessary repairs and renewals, so as to preserve the standard of construction of each particular class of completed road or highway.

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOL. III. January 1920 No. 1

New Year Wishes

The Executive Committee of The Journal extends to all members of The Institute heartiest greetings of good will and best wishes for a happy and prosperous nineteen hundred and twenty.

Annual General and Professional Meeting

The Annual General Meeting of The Institute will be held at Headquarters on Tuesday, January the twenty-seventh at ten A.M.

Following the Annual Meeting will be a General Professional Meeting Wednesday and Thursday, January twenty-eighth and twenty-ninth, under the auspices of the Montreal Branch of The Institute. The Montreal Branch executive and membership has been engaged for several months past in arranging the programme and details of this meeting, which they have planned to make the greatest and most enjoyable gathering of engineers yet held in Canada.

A large attendance of ladies is anticipated, for whose entertainment special arrangements are being made, in addition to most of the regular functions at which they will be welcome.

Kindly keep these dates in mind, plan to be present and get the benefit of the inspiration that such a meeting presents with the added opportunity of a closer contact with your fellow engineers from all parts of Canada.

Town Planning in Canada

Of one Canadian city, interested in town planning, it was recently remarked that to bring a town planning scheme into effect two things were necessary—a topographical map and legislation. Granted that there exists an urge for a development that will be healthful, pleasing and yet economic and with due regard for commerce as the general *raison d'être* of large centres, then the degree of excellence of a topographical map and the scope of town planning legislation may be accepted as some measure of the success of town planning.

Judged by such standards, Canada is greatly handicapped by the fact that there exist no accurate topographical maps of a scale sufficient to exhibit in detail, features that must be considered in planning. We are indebted to various Federal Government Departments for topographical maps of various parts of Canada. The scale is generally one to sixty-three thousand, three hundred and sixty, or thereabouts, (one inch to one mile), and the maps which cover but a small part of the Dominion, are, therefore, as a rule, of value for regional planning only.

The need for accurate and detailed topographical maps and their usefulness for all engineering purposes have of course long been recognized. Of recent years, Major D. H. Nelles, M.E.I.C., has given particular thought and study to the matter as viewed in the light of experience in Europe and in the United States. He has specially urged the preparation of topographical maps for our Canadian cities. The scales he advises are 1 to 1,000 (one inch to eighty feet, approximately) for detailed city topography with reduction to one to ten thousand (one inch to eight

Members having copies of the October number of The Journal, which they do not wish to keep for reference, would confer a great favor by mailing them to the Secretary. About twenty copies are required.

hundred feet, approximately), where studies of the city as a whole are to be made, and also the latter scale for topographical maps for rural or regional areas. It is with difficulty that the average citizen can be made to grasp the necessity for a detailed topographical map when he knows there already exist compilations of subdivision plans. Such compilations are, of course, practically worthless for purposes of planning or development. Town planning schemes being carried out in Canada have had to contend with the handicap of poor maps.

In May, 1919, there was compiled by the South Australian Town Planning and Housing Association, information in regard to town planning legislation (existing and proposed), in various parts of the world. With but one or two amendments or additions this information is submitted as follows:—

Europe:

Italian Municipal Town Planning Act (since amended and extended), 1865.

Swedish Town Planning Law (1867).

Prussian Town Planning Act (1875), since extended and supplemented by other legislation applicable to all German States.

Town Planning legislation is also applied by councils and state Authorities in Holland, Belgium, France, Austria and other European Countries.

Britain:

Housing and Town Planning Act, 1909, amended by Housing and Town Planning Bill, 1919, assented to 31st July, 1919.

Canada:

Town Planning Acts have been passed in the following Provinces:—Prince Edward Island, 1918; Nova Scotia, 1912 and 1915; New Brunswick, 1912; Ontario, 1918; Manitoba, 1916; Saskatchewan, 1917; Alberta, 1913.

India:

Bombay Town Planning Act, 1916; Madras Town Planning Bill, 1918.

South Africa:

Transvaal Town Planning Bill (in draft).

Ceylon:

Housing and Town Improvement Ordinance, 1915.

Japan:

The Town Planning Committee of the Imperial Japanese Government is now at work.

United States:

City Planning Acts have existed for some time in the following States:—California, Massachusetts, New Jersey, Ohio and New York.

The following State Legislatures this year have passed or are about to pass similar Acts, namely:—Michigan, North Carolina, Texas, Utah and Indiana.

City Planning Commissions.—In the United States during 1918 there were 34 city or town planning Commissions at work, preparing for the planning and development of their cities and towns.

During 1917 the number of cities and towns with planning and development schemes of similar kinds in hand had increased to 230, many of which have considerably less population than Adelaide and suburbs (about 200,000).

Australia:

South Australia.—Town Planning and Development Bill, 1918, following Town Planning and Housing Bill, 1916.

New South Wales.—Town Planning Bill (in draft); Greater Sydney Bill (1918) (with town planning chapter), passed House of Assembly.

Queensland.—Greater Brisbane Bill (as above) in draft.

Western Australia and Tasmania.—Town Planning Bills (in draft).

Victoria.—Town Planning Bill promised since 1915.

New Zealand:

Town Planning Bill, 1918, introduced in Parliament and now under consideration in accordance with the recommendations of the New Zealand Town Planning Conference and Exhibition, 1919.

Canada's progress in legislation as compared with other countries can be gathered from the above. It might be of interest to returned men from France to know, as some of them probably do know, that in that country which affords such a splendid example in planning as Paris, town planning is now compulsory. Under the amended British Housing and Town Planning Act, 1919, town planning there is now also compulsory. By a certain date every town or area with a population of 20,000 must prepare a town planning scheme.

Similar in this respect to most countries, town planning legislation in Canada comes under provincial and not federal jurisdiction. The result is that in this Dominion some provinces have acts more advanced than those in other provinces, while two provinces have as yet passed no town planning legislation. The passing of advanced provincial legislation has been due largely to the efforts and with the advice of the Federal Commission of Conservation.

No town planning act can be fully effective if it fails to control building development as well as the mere planning of streets or parks. Town Planning in its broad sense includes "Housing" as a special form of building development. Effective housing, consequently, should be a part of or correlated to town planning. To avail themselves of the federal loan of $25,000,000 for the provision of homes for workingmen, and particularly returned soldiers, most of the Provinces have passed special housing legislation. In a number of instances the housing schemes have been, and in other cases are proposed to be, of such a size as to permit of town planning treatment, which is encouraged by most of the Housing Acts or regulations, and in one Province (Quebec) such is to be the only housing carried out.

To round out a trinity of requirements for effective town planning, to a topographical map and legislation, there can be added education. To a number engaged or interested in town planning in Canada this latter need became a pressing one. The immediate urge came from the Association of Dominion Land Surveyors and resulted in the formation of the Town Planning Institute of Canada. The first annual meeting of the Institute was held on the 31st May, 1919, and there are now some ninety members, architects, engineers, surveyors, associates, and up to the present one legal member. The membership of the American City Planning Institute, with whom a joint conference was held in October last, numbers, it is understood, only about sixty.

The objects of the Town Planning Institute of Canada are largely to promote university courses in town planning, and by local branch meetings to aid in the education of the members along the various architectural, engineering and surveying activities connected with town planning.

All the provinces in Canada suffer from the lack of real city topographical maps, some provinces from the lack of advanced town planning legislation, and some from the lack of taking full advantage of existing legislation. Endeavours are being made to have these deficiencies made good. And through education the spirit of town planning is spreading. The primary appeal of town planning is undoubtedly a moral or ethical one, and is to those who love their fellowmen. But its aim is economy, not only ultimate economy as regards human life but immediate economy in the carrying out of engineering projects. Possessed of a real desire for human betterment it opens up to the engineer unlimited possiblities for development in his profession.

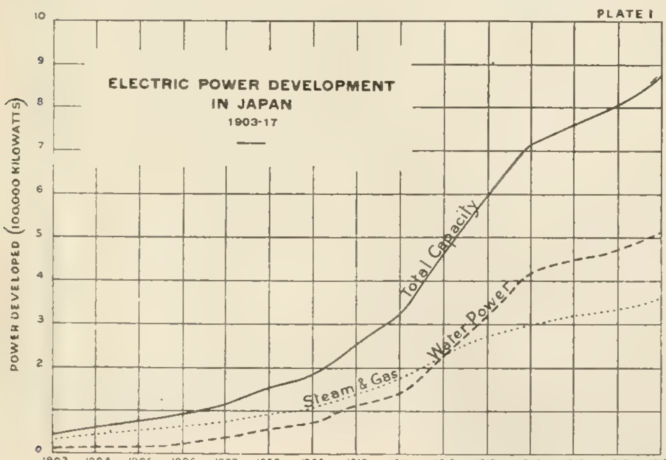
H. L. SEYMOUR, A.M.E.I.C.

Japanese Hydro-Electric Enterprise

For some years we have been aware that the electric industry in Japan was making remarkable progress, but anything like a complete record of the industry was not available.

In June last the Japanese Department of Communications issued a "Statistical Report of Electric Undertakings in Japan," from which the following information is compiled.

PLATE I



Attention is first called to Plate I which shews graphically the progress of electric power development in Japan from 1903 to 1917. The total kilowatt capacity (including reserves), increased from 44,252 k.w. in 1903 to 875,563, in 1917. During this period the capacity of electric plants using steam or gas as their primary source of power increased from 31,128 k.w. to 364,473 k.w. while water power made the enormous stride of from 13,124 k.w. to 511,090 k.w.

The most rapid progress was made during the five pre-war years (1910-1914), during which period the water power development nearly quadrupled while the steam or gas development only doubled.

PLATE 2

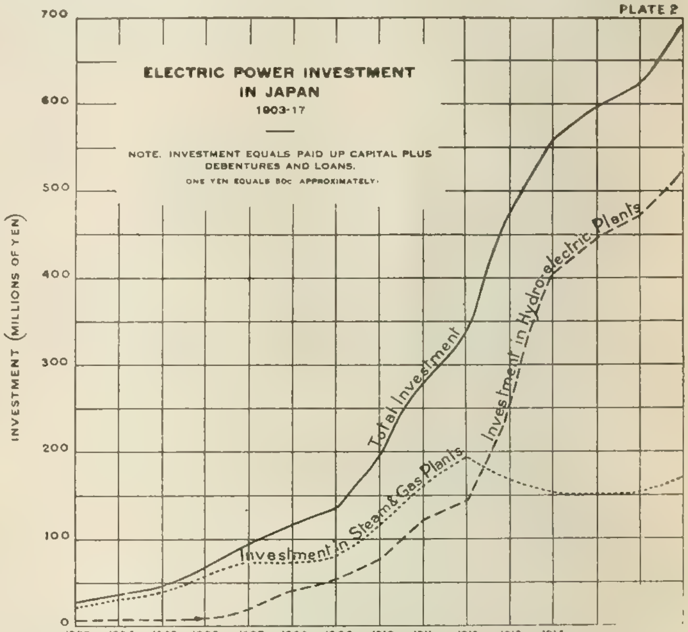


Plate II shows the growth of the actual capital invested (paid up capital plus loans or debentures), in electrical undertakings in Japan during the 1903-1917 period and indicates that since 1912 water power investment had nearly quadrupled whereas the investment in electrical undertakings using steam or gas has actually diminished. The total investment in electric power undertakings has grown in fifteen years from about 26 million yen to 693 million or roughly 13 million dollars to 346 million.

The foregoing shows in no uncertain manner that the central electric station industry is growing very rapidly in Japan and further that water power has overtaken other sources of power and is lengthening its lead steadily.

That water power would normally attain first place as the principal prime mover in Japan is evident, but the war-changed conditions demand that this source of power shall bear an immensely increased share of the burden, and both the government and private companies are taking active measures for further large scale water power developments.

A special committee of the Osaka Chamber of Commerce submitted a report to the government pointing out that coal—one of staple commodities of modern civilization—was both scarce and expensive, and that, therefore, it was vitally necessary to develope the hydro-electric industry to minimize coal consumption. This committee suggests that the government publish as far as possible the results of its hydro-electric investigations, that it afford every facility for private hydro-electric investigations, that it simplify proceedings and expedite development as far as possible.

Water Power activity in Japan is by no means confined to Chamber of Commerce resolutions. The Japanese Government has recently issued a bulletin outlining the extent and scope of the Water Power Survey. The intention is to expend 800,000 yen ($415,000 approximately) on the work between 1918 and 1922. Twenty-two survey parties will investigate 635 power sites on 200 rivers, establish 570 gauging stations and 116 new meteorological observatories. The approximate total power available is estimated at over two and one-half million continuous horse power or upwards of five million under average flow.

Yet another indication of Japanese enterprise in hydro-electric matters is the recent formation of the Japan Hydro-electric Company the capital stock of which is said to have been heavily over-subscribed. The increase of coal costs from 30 yen to 150 or 160 yen per ton, was seriously militating against Japanese industrial progress, consequently the several interests controlling the Electric Light Companies of Osaka and Kyoto, the Hokuroku Electro-Chemical Company supported by their friends in Tokyo, Osaka, and Kyoto, and elsewhere pooled their interests and organized the Japan Hydro Electric Company with a capital of fifty million yen ($25,000,000). This Company proposes to develope, within two years, 105,000 k.w., from the most convenient water powers, the rights of which are held by the above mentioned three companies.

The completion of these works will, according to estimates, enable the Japan Hydro-Electric Company, since it becomes possessed of the steam power stations of the Osaka and Kyoto companies (125,000 k.w. and 8,000 k.w. respectively), to dispose of 300,000 k.w. and further, by virtue of its amalgamation with the Hokuroku Electro-Chemical Company, to secure a large and profitable market for its surplus and off-peak power.

LIBRARY NOTES

Books Received

The following books have been received, and are to be found in the Library of *The Institute*.

British Engineering Standards Association Reports:—

No. 7, 1919	Dimensions of Insulated Annealed Copper Conductors for Electric Power and Light.
No. 47, 1919.	Specification and Sections of Steel Fishplates for Bull Head and Flat Bottom Railway Rails.
No. 81, 1919.	British Standard Specification for Instrument Transformers.
No. 86, 1919.	Report on Dimensions of Magnetos for Aircraft Purposes.
No. 89, 1919.	Specification for Indicating Ammeters, Voltmeters, Wattmeters, Frequency and Power Factor Meters.
No. 90, 1919.	Specification for Recording (Graphic) Ammeters, Voltmeters, and Wattmeters.
No. 100, 1919.	Specification for Falling Weight Testing Machines for Rails.
No. 101, 1919.	Sections of Light Flat-bottom Railway Rails and Fishplates.
No. C.L., 7270.	Interim Report on British Standard Whitworth Screw Thread and their Tolerances.
No. C.L., 7271.	Interim Report on British Association Screw Threads with Tolerances for Sizes Nos. 0 to 12 B.A.

CORRESPONDENCE

Editor, Journal: Jasper, Alta.

Dear Sir,

I send you herewith as a contribution to *The Journal of The Engineering Institute of Canada*, what I believe to be a new method of employing the prismoidal correction in calculating earthwork quantities.

During the war I have been somewhat out of touch with the proceedings of the various engineering societies, and it may be presumption on my part to say that the method is new. At any rate I cannot find any reference to it in the text books at my command, nor in the instructions to resident engineers on railways or highways. In this way this article may be of interest to members of *The Institute* engaged on works of this nature. I believe that one reason for many engineers labeling the prismoidal formula as an "unnecessary refinement" is the difficulty in applying it to all forms of earthwork prismoids.

Yours faithfully,

J. GRANT MACGREGOR, A.M.E.I.C.
Resident Engineer, Edith Cavell Highway

A New and Rapid Method of applying the Prismoidal Correction in Computing Earthwork Volumes

The usual method of computing earthwork is by taking the quantities from a table giving cubic yards for the sum of the end areas, and basing the correction for the prismoidal formula on the difference in width and depth of the two cross sections, representing the form of the prismoid. In order that the prismoidal correction can be applied in this manner, there must also be a similarity of form between the cross sections.

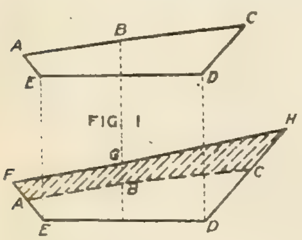
To compute earthwork accurately the cross sections must at least represent the average contour of the ground lying between them, and it is sometimes difficult to do this by what is known as a three or five level cross section in order that the prismoidal formula may apply.

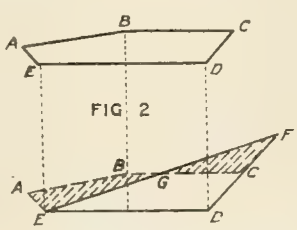
It may not have occurred to many engineers that the prismoidal correction may be based, not only on the general dimensions and form of the prismoids, but also on the ratio which the two end areas bear to one another. The assumption is that a prismoid of unequal end areas is composed of a number of small prismoids, the unit being a square foot at the base for the larger area, and terminating at the smaller end with an area proportional to the area of the smaller cross section. By dividing the larger area of one cross section by the smaller area of the other this ratio is obtained that is applied in the following table, giving the prismoidal correction for a prismoid 100 feet long and 100 square feet at the base.

TABLE

Ratio of End Areas	Prismoidal Correction Base 100 sq. ft.	.1	.2	.3	.4	.5	.6	.7	.8	.9
1–1	.00	0.05	0.21	0.47	0.55	1.33	1.91	2.61	4.26	4.31
1–2	5.33	0.06	0.23	0.53	0.90	1.49	2.14	2.92	3.81	4.82
1–3	11.29	0.04	0.16	0.37	0.66	1.03	1.49	2.03	2.65	3.36
1–4	15.44	0.03	0.13	0.30	0.54	0.85	1.23	1.68	2.19	2.78
1–5	18.87	0.02	0.11	0.25	0.44	0.69	1.00	1.37	1.78	2.26
1–6	21.66	0.02	0.08	0.18	0.33	0.51	0.73	1.00	1.31	1.66
1–7	23.73	0.02	0.08	0.20	0.34	0.53	0.77	1.05	1.37	1.74
1–8	25.88	0.01	0.06	0.15	0.27	0.42	0.60	0.82	1.08	1.38
1–9	27.57	0.01	0.05	0.11	0.20	0.31	0.45	0.62	0.81	1.03
1–10	28.84	....	....	....	....	....	....	....	....	....

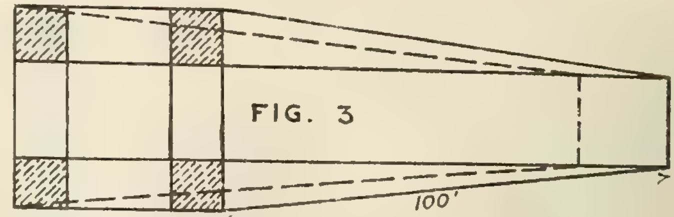
The same result is obtained by computing the volume of a prismoid of uniform cross section corresponding to the smaller cross section and adding to this the remaining wedge having an area at the base equal to the difference of the areas of the two cross sections.





The assumption in the case of a wedge is the same as for a prismoid, i.e., the mass would be composed of a number of small wedges having a base area of one square foot and vanishing at the upper perimeter of the smaller cross section. It is evident, therefore, that if the volume of the prismoid requires no correction, being uniform throughout, the remaining wedge is responsible for the entire correction to be made. In this way the table is made applicable to wedges as well as prismoids, the ratio for the correction in the case of a wedge, being the square root of the length of the thin edge for 100 square feet of base, or in the above case the square root of the width at the upper perimeter of the smaller cross section.

The foregoing appears to be true regardless of the dissimilarity of the cross sections and will apply in a case where the usual prismoid terminates in a triangle with a warped surface, providing that straight lines drawn from any point on the upper perimeter of one cross section to a corresponding point on the other will coincide with the warped surface of the prismoid. In the case of the prismoid terminating in a triangle as in Fig. 2, two wedges are formed, one being positive and the other negative. The vanishing point as before being at the upper perimeter of the cross section A. B. C. D. E.



Prismoidal Correction for End Areas

The same table of quantities for the sum of the end areas may also be used for the correction to be applied. It was found that if the smaller end area was computed throughout as a uniform prismoid requiring no correction the error was confined to the remaining wedge. It may also be shown in the following figure that the correction required may be confined to the four quarter pyramids at the corners of the prismoid. The remaining four wedges along with the uniform prismoid contained within the four wedges, are applicable to the table without any correction for the prismoidal formulas. The four quarter pyramids at the corners form a perfect pyramid, and in taking the quantity from the table of end areas corresponding to the base of the pyramid an error equal to one-third the true volume of the pyramid is made. This error is equal to the difference of the square roots of the end areas squared and divided by three, and is applied to the table as a negative quantity. The square roots of the end areas are readily obtainable from any table of squares and square roots and the operation is simpler and takes less time than by taking the correction from the table.

End Areas, a, a′ in sq. ft.

Prismoidal Correction

$$\frac{(\sqrt{a}-\sqrt{a_1})^2 \times 100}{81} = \text{Cu. Yds.}$$

REPORT OF COUNCIL MEETING

The regular monthly meeting of the Council was held at the rooms of *The Institute,* 176 Mansfield Street, on Tuesday, December 16th, at 8.15 P.M.

Montreal Branch Suggestions. The suggestions from the Executive of the Montreal Branch relating to improving the meeting hall, *Journal* and the meetings of the Branch, were noted. Mr. Francis agreed to report back to the Executive that the matters mentioned were under consideration.

Highway Development in Canada. The situation regarding highway development in Canada was discussed, it being resolved that *The Institute* favour the principle that this work be done under competent engineering supervision. The Secretary was instructed to write to the Provincial Divisions intimating that in view of the large road programme to be entered into by the

Provincial and Dominion Governments, and, inasmuch as this matter would be discussed at the Annual Meeting, it is desired to know from the Divisions or Branches what is the policy of the local Governments regarding this, so that representatives from the various provinces may reflect provincial opinion at the annual meeting.

Secretary's Visit to New York. The Secretary reported a satisfactory trip to New York, at which time he attended the Convention of the American Society of Mechanical Engineers and held conferences with the various engineering secretaries. He found the attitude was one of great friendliness towards *The Institute* and that the general feeling was towards closer unity and cooperation on the part of the entire engineering profession.

Legislation. Various correspondence relating to the legislation situation in Ontario was noted and the subject discussed at some length.

Approval of Branch By-Laws. Branch By-Laws were approved for Winnipeg; Saskatchewan; Niagara Peninsula; Hamilton; and, subject to slight modifications, St. John; Sault Ste. Marie; and Border Cities.

Changes in By-Laws. The report of the By-Laws Committee signed by Messrs. Ernest Brown and Walter J. Francis and approved by H. E. T. Haultain, was adopted as follows:

Montreal, December 15th, 1919.

The Council of

The Engineering Institute of Canada.

Gentlemen:—

We beg to submit herewith the report of the By-Laws Committee for the present year as follows:—

(1) That Section 57 be amended by the deletion of the words "except the Montreal Branch," after the twelfth word "Branch." The Section would then read:

Revenue

Section 57: The Secretary of the Institute shall each year remit to each Branch, twenty-five per cent. of the annual fees, current or arrears, received from the members of that Branch during that year, payments being made quarterly. A statement showing the individual amounts, and from whom collected, shall accompany each quarterly remittance.

For the purpose of this By-Law, the Branch Membership list shall be revised on the first day of January and the first day of July in each year, but the change shall not be retroactive, except in the case of new admissions to the Institute.

(2) That Section 61 be amended to provide for the election of a Vice-Chairman of a Provincial Division, by the addition of the words "a Vice-Chairman" after the tenth word "Chairman." The Section would then read:

Officers

Section 61: The Officers of a Provincial Division shall be a Chairman, a Vice-Chairman, and a Secretary-Treasurer, or a Secretary and a Treasurer, who shall be elected by the Executive Committee of the Division.

(3) That Section 65 be amended to provide for an additional District in Ontario. This proposal involves changes of boundaries and re-numbering of Districts. The Section as amended would then read:

Nomination and Election of Officers
Electoral Districts

Section 65: For the purpose of the nomination and election of officers the membership of the Institute shall be divided into Electoral Districts as follows:—

District No. 1, shall include all corporate members within twenty-five miles of the Headquarters of the Institute and all members residing outside of Canada.

District No. 2, all members outside of District No. 1 resident in the Province of Quebec.

District No. 3, all members resident in the Provinces of Nova Scotia, New Brunswick and Prince Edward Island.

District No. 4, all members resident in the Province of Ontario east of longitude 77° 30'.

District No. 5, all members resident in the Province of Ontario between longitude 77° 30' and a line starting at Lake Ontario and running as follows: along the [illegible] to longitude 80° 30', thence northerly to latitude 47° N, thence westerly to longitude 85° W, and thence northerly to the boundary of the Province.

District No. 6, all members resident in the Province of Ontario west of District No. 5.

District No. 7, all members resident in the Province of Manitoba.

District No. 8, all members resident in the Province of Saskatchewan.

District No. 9, all members resident in the Province of Alberta.

District No. 10, all members resident in the Province of British Columbia and in the Yukon Territory.

No other proposals for changes in the By-Laws have been considered.

We beg to remain,
Yours faithfully,
E. BROWN,
Chairman of Committee.
WALTER J. FRANCIS,
H. E. T. HAULTAIN, Members of Committee.

The Secretary was instructed to send the proposals of Council relating to the changes in the By-Laws to the entire membership at the earliest possible moment.

Ontario Provincial Division: The minutes of the Ontario Provincial Division Executive Committee meeting, held in Toronto on November 22nd, as forwarded by the Secretary, were noted.

The By-Laws of the Division were approved as submitted.

A request for an additional $25.00 for the Ontario Provincial Division was granted.

Calgary Branch Resolution: The resolution of the Calgary Branch regarding legislation was presented, and the Secretary instructed to write a letter outlining what Council was doing in this connection.

Peterborough Electrical Engineers: A copy of a petition forwarded by the electrical engineers of Peterborough, opposing a proposal to form a separate electrical engineering society in Canada, was noted. The Secretary was instructed to write expressing the appreciation of Council of their stand, illustrating their loyalty to the profession.

Ontario Professional Meeting: Hearty approval was given to the proposal to hold a General Professional Meeting of *The Institute* in Ontario either in June or September under the auspices of the Niagara Peninsula Branch, supported by the Ontario Provincial Division. Approval was also given to the proposal that this meeting be held in co-operation with a meeting of the American Institute of Chemical Engineers, provided satisfactory arrangements could be made regarding the date and programme.

Engineering Appointments: Letters from the Niagara Peninsula Branch and Ontario Provincial Division regarding certain engineering appointments were presented, and the proposal that such a position as Chairman of the Toronto and Northern Ontario Railway Board should be filled by an engineer was approved, also that a competent engineer should be on the proposed Administrative Board of the Government in connection with the Grand Trunk Railway. The Secretary was instructed to write to the Minister of Lands and Mines stating that *The Institute* supported the proposal that an engineer should be chairman of the T. & N.O. Railway Board.

Architects and Big Bridges: A report of the Montreal Branch on this subject was received and the suggestion of the Montreal Branch Executive that this be considered by the Legislation Committee of *The Institute* for report to the Council and the Montreal Branch was approved.

Registration of Civil Engineers: A circular sent by the Institution of Civil Engineers relating to the registration of Civil Engineers and showing the legislation situation in Great Britain was noted.

Municipal Standards: The memorandum submitted by R. A. Ross in response to a request for advice from the Secretary of the Canadian Engineering Standards Association, was approved, and the Secretary instructed to forward a copy to Captain Durley.

Ottawa Branch Classifications: A sub-committee consisting of G. Gordon Gale and the local members of the Council was appointed to examine the records of all the men whose names had been mentioned in the correspondence with the Ottawa Branch regarding classification, to report at a later meeting of the Council.

War Memorial: A proposed letter from the President to Lieut. Col. Doughty relating to a war memorial was approved.

Forms C and D: The Secretary requested advice regarding Forms C and D as a new supply was being ordered. It was resolved that the last paragraph of Form C be deleted and the words "and 'E' " be inserted after "Form D" in the third line of the second paragraph.

Quebec Bridge Transactions: On motion by Mr. Francis it was resolved that a letter of appreciation and thanks for their kindness in connection with assisting in the production of the Quebec Bridge Transactions be sent to the St. Lawrence Bridge Company, and also a similar letter to Messrs. Duggan and Johnson.

A letter from Dr. Craver, complimenting *The Institute* on the Quebec Bridge Transactions was noted and the Secretary instructed to forward copy of same with the above mentioned letters.

It was resolved that a charge of $10.00 be made for additional copies of these Transactions.

Announcement Annual Meeting: It was resolved that the announcement regarding the Annual Meeting be forwarded to the membership at the same time as the suggested changes in By-Laws. The Secretary was instructed to send cordial invitations to be present to the Presidents and Secretaries of the founder engineering societies, Canadian Mining Institute, His Grace the Duke of Devonshire and to the Presidents of the Canadian railways.

Reorganization of the Kingston Branch: It was noted that the Kingston Branch had re-organized with Col. Macphail as Chairman and W. H. Slinn as Secretary. The invitation to the Secretary to attend their postponed meeting on Tuesday, January 20th was considered, it being decided that owing to its nearness to the Annual Meeting it would be impossible for the Secretary to attend until a month later.

Journal: Consideration was given to the publication of papers in *The Journal* and elsewhere together with a request for a Montreal Branch paper, the entire matter being referred to the recently appointed Editorial Committee.

The late Stephen P. Brown : It was resolved that the Council record with sincere regret the death of Stephen P. Brown, a former member of Council. The Secretary was instructed to convey the sympathy of the Council to Mrs. Brown and family.

I.C.E. Transactions Available: A letter from Dr. Adams pointing out that a set of transactions of the Institution of Civil Engineers from the earliest volumes was available, was noted. The Secretary was instructed to thank Dr. Adams for his kindness in bringing this matter to the attention of Council.

Miscellaneous: A list of members whose dues had been unpaid for several years was presented. It was resolved that the various men whose names were mentioned be personally interviewed.

Personal: A number of applications were brought up for reconsideration, all of which were dealt with.

Owing to the lateness of the hour it was impossible to deal with the regular applications.

The following students were admitted.

L. H. Armstrong, G. H. Desbarats, R. N. Drummond, E. F. Emmons, W. A. Gale, A. R. Garrett, G. W. Hudson, H. L. Humes, E. S. Kelsey, L. S. McLennan, H. A. Pearse, W. S. Peck, I. Perzner, A. M. Reid, J. M. White, H. B. Wilder, W. H. Woods.

The meeting adjourned to Tuesday evening, December 30th.

BRANCH NEWS

Halifax Branch

F. R. Faulkner, M.E.I.C., Secretary-Treasurer

The regular monthly meeting of the Halifax Branch was held at the Green Lantern, Wednesday, Dec. 17th. Following the custom inaugurated last spring, this was a supper meeting. A pleasing feature was the presence of a number of guests which included a number of engineering students, the majority of whom have already filed applications for admission.

The Chairman first introduced new members or members who have just taken up their residence in Halifax. K. H. Smith, A.M.E.I.C., formerly Secretary-Treasurer of the branch, was then asked to come forward and the Chairman on behalf of the Branch presented Mr. Smith with a gold mounted fountain pen as a token of appreciation of his services in assisting to organize the branch and of his work as Secretary.

The Chairman explained why the paper to be presented at this meeting was not available, as the author was called to Montreal by the early train that morning. He then outlined the papers proposed for the January and February meetings, and strongly urged the members to work up papers for presentation before the branch.

Under the Branch By-Laws as originally adopted, the January meeting would be the annual meeting of the Branch. The attention of the members had been directed to the proposed Standard Branch By-Laws and on behalf of the Executive committee the Chairman submitted two resolutions:—one to the effect that the Branch adopt the proposed Standard Branch By-Laws and the other to the effect that the present executive remain in office until the proposed annual meeting in May. The Secretary was instructed to send out a letter ballot on these resolutions to be returned in time for the meeting in January.

The meeting was then thrown open for general discussion on subjects of Engineering interest. J. L. Allan brought up the question of the proposed bridge across the narrows to connect Halifax and Dartmouth and told of the work already done by various bodies in connection with this idea. The attention of the members was directed to the engineering features of the bridge and the discussion was along that line. A number took part in the discussion and as a result a committee composed of Messrs L. H. Wheaton, A. F. Dyer and H. W. L. Doane were appointed to submit a report at the January meeting.

After some further discussion on various subjects the meeting adjourned.

St. John Branch

A. R. Crookshank, M.E.I.C., Secretary

A joint meeting of the St. John Branch of *The Engineering Institute of Canada*, the Board of Trade Housing Committee, and the Commercial Club of St. John was held in the Board of Trade rooms on the evening of December 10th, with C. C. Kirby, A.M.E.I.C., in the chair. A report from Messrs. Ross & Macdonald, architects of Montreal, was read by the Chairman in which the abandonment of the old shell of the court house was advocated and the erection in its stead of a building, which, besides containing all the accommodation which might be required by the county and city authorities, would also serve as a civic centre. Attached to this report were sketches of two schemes, one taking in the whole block bounded by King, Carmarthen, Leinster and Sydney streets, and the other for the use of the present site. The first plan according to G. G. Hare, city engineer, would involve an expenditure of $1,400,000.00 and the second would necessitate an outlay of $600,000.00. These plans, which were submitted to the meeting only as an indication of what might be done, caused a lengthy discussion on the matter.

Various opinions were expressed regarding the two general areas, special features of the building, and the desirable features to be incorporated in design and construction. The matter was of such interest, however, that the subject was postponed for discussion until the following Thursday night, when other speakers would be invited, and an endeavour made to get the opinion of the public on the matter.

Montreal Branch

Frederick B. Brown, M.E.I.C., Secretary-Treasurer

On November 27th, W. E. L. Dyer presented a paper on "Railway Track Design and Manufacture," in which he referred to the recent practice in track construction for steam and electric railways. The author made special reference to the use of manganese and other alloy steels in heavy duty track work. The paper was followed by an interesting discussion in which a number of members and visitors took part. The Chair was occupied by Mr. Newell.

Following the lecture on "Engineering Features of a Sugar Refinery" given by J. J. York, A.E.I.C., on November 6th, the members of the Montreal Branch accepted the invitation of the St. Lawrence Sugar Refinery to visit their plant. About 75 members were present on Friday evening, November 28th, and about 60 on Saturday afternoon, November 29th. The parties were divided up into small groups, each being under the guidance of a member of Mr. York's staff, Mr. York taking charge of one of the groups. The visitors were taken through the plant in such a way that they could follow the whole process of sugar refining from the moment the raw sugar arrived at the receiving sheds to the packing of the finished product.

An interesting feature of the plant was the main boiler house and the pumping machinery, the latter having a capacity of two million gallons of water a day. The receiving sheds are modern steel and concrete structures, equipped with a number of travelling cranes and automatic weigh-bridges so that the sugar can be unloaded from ships lying at the wharf and delivered to any part of the receiving shed, which has a capacity of one-month's supply of raw sugar, equivalent to about forty million pounds. The raw sugar is taken from the shed to the top of the main building where preparatory to filtration it is passed through centrifugals, mixed with syrup and melted. Mr. York pointed out that the change from gravity to pressure filtration cost $20,000, but the daily saving amounted to $250, which soon made up for the capital spent.

The charcoal filtration formed an interesting part of the process. Liquid sugar having come through the first pressure filtration is passed through the charcoal filters, the filtrate at first being absolutely colorless. After a time it becomes darker and is developed to be used as lower grade syrups.

After filtration the syrups are ready for crystalization, which is obtained by boiling the syrup in large vacuum pans for periods depending on the quality of the syrup. The size and uniformity of the grain of the sugar is controlled by the degree of vacuum and the rate of feed of the syrup. The crystalized sugar is then passed through centrifugals where all the liquid is drained off and the crystalized sugar is passed through large drum dryers and is then ready for packing.

The thanks of the members of the Montreal Branch who visited the refinery are due to Mr. York, not only for his very thorough and interesting explanation of the various processes, but also for the arrangements which he made for the reception of the visitors.

On December 4th a very important address on the present Railway Situation in Canada was given by W. F. Tye, M.E.I.C. In dealing with the present railway mileage in Canada the author drew comparisons with other countries showing that Canada had a very much larger per capita mileage than any other country in the world, pointing out that in this country there are only 200 people to support each mile of railway. He referred to the earlier policies of the various Governments supporting first one road and then the other, and the fact that the rapid construction of trans-continental systems caused their ultimate bankruptcies. Mr. Tye was strongly opposed to Government ownership of the railways, and expressed his opinion that the only satisfactory solution of the present problem was to give an immediate decided increase in freight rates and for the Government to put the roads in such a condition that they will again become attractive to private owners.

A number of members entered into the discussion after the address, and the author replied to a number of questions. Mr. Hunter of the Papers and Meetings Committee occupied the Chair.

On December 11th, John Grieve, A.M.E.I.C., read his paper on "Paint for the Protection of Steel Work," Mr. Lefebvre acted as Chairman.

On December 18th, John T. Farmer, M.E.I.C., presented, on behalf of the Combusion Engineering Corporation, an illustrated lecture on "Mechanical Stokers," describing the advancement in this field and explaining the relative advantages of various types. Mr. Duchastel was Chairman for this meeting.

The Council having authorized the Montreal Branch to hold a Professional Meeting in conjunction with the Annual Meeting, the Executive Committee of the Branch has held a number of meetings for the purpose of drawing up a programme and making preliminary arrangements for this meeting. The subject was also discussed at the meeting of the Branch on December 18th. The Executive has appointed Messrs. Surveyer, H. G. Hunter, Thornton, Busfield and J. H. Hunter as Chairmen of the Programme, Entertainment, Publicity, Reception and Subscription Committees, respectively.

Ottawa Branch

J. M. Cochrane, A.M.E.I.C., Sec'y-Treas.

The Ottawa Branch of *The Engineering Institute of Canada* gave a luncheon on December 4th to Major-General Sir Edward Morrison, K.C.M.G., C.B., D.S.O., Deputy Inspector of Artillery for Canada. Over 175 were present and R. de B. Corriveau, M.E.I.C., presided. The theme of Sir Edward's address was, "The Invasion of Germany," with emphasis on the part played by engineers in connection with the war. Sir Edward paid a high tribute to the engineering profession, which he said had been closely allied to the artillery branch of the service; no profession had contributed more to ultimate victory in the war; he went on to say, jokingly, that he was one of that low class of people whose business was to kill rather than to save and mend life. In the engineering profession when the country was at war is found the men best able to do this. Sir Edward made a passing reference to universal training, which he considered of great importance. He then went on to go into more details of the engineers in war;—they supplied telephones, telephone service, railway engineering, railway service, tunnelling, bridging, making gun emplacements, etc., etc. In connection with building railways the Canadians stood pre-eminent.

Sir Edward described the various net-works, standard gauge lines, narrow gauge lines, and finally the 30-centimetre lines, the narrowest of all, used right at the front. At Vimy Ridge there was the finest system of this 30-centimeter railway that had ever existed in war, and this was due to the ability and perseverance of "a little red-headed engineer from Cobalt." There were sixty-five miles of these tiny roads at this point, which led to every heavy battery. When it was considered that some of the shells weighed two hundred pounds the saving in man power by those roads was enormous. Sir Edward described an experience of his own at Valcartier; the engineers built a bridge across the river, the first bridge of the kind that these engineers had built. After the bridge was built Sir Edward took his battery across, a few nights later a log boom burst up the river, and thousands of logs came tumbling down the high water, but the bridge stood; a few nights later 2000 horses broke loose and came tearing across the bridge—and the bridge stood. At Ypres it was a Canadian engineer who built a railway through and around houses and obstacles up to the front, and thereafter Canadians were in great demand for this work.

General Morrison told a story of a bridge that had been mined by the Germans; if this had been blown up it would have meant the lives of a thousand or more Canadians. Just as the Germans were blowing up the bridge a young Canadian officer darted forward, crossed the bridge, killed four of the Germans, took the fifth prisoner and stamped out the fuse. For this action he was awarded the Victoria Cross.

At the conclusion of the speech Mr. de Carteret thanked Major-General Morrison for his presence and for his very interesting speech. The gathering concluded with the singing of the National Anthem.

The second luncheon of the Ottawa Branch was held on December 19th, when Commander Ramsay, Flag Commander to Admiral of the Fleet Viscount Jellicoe, described the work of the Dover Patrol.

This address was of exceptional interest as Commander Ramsay was able to give an account of some of the methods used and operations proposed, which have not previously been made public. Commander Ramsay, who was for a considerable time in command of H.M.S. Broke, flotilla leader, which along with the Swift took part in the celebrated engagement with five German destroyers, was exceptionally well qualified to deal with his subject.

His Excellency the Governor-General, one of the Honorary Members of *The Institute*, was present at the luncheon, and tendered the thanks of *The Institute* to Commander Ramsay for his address, at the same time drawing attention to the importance of the present visit of Admiral Jellicoe and his staff. The officers of Lord Jellicoe's staff and the headquarters staff of the Canadian Naval Service were guests of the Branch at this luncheon, which was the most largely attended of any held this winter.

The programme of the second half of the winter session is now being arranged, and will contain several papers and addresses of unusual interest.

Ontario Provincial Division

Geo. Hogarth, M.E.I.C., Secretary-Treasurer

The following extract which gives a more detailed account of the result of this meeting than appeared in the December Journal is from the minutes of the meeting of the Ontario Provincial Division Executive held in Toronto, Saturday, November 22nd:—

"By request, Willis Chipman, M.E.I.C., of the Toronto Branch, explained the sequence of events which led up to the submission by Council to the Provincial Division of the general question of appropriate action, so far as the Province of Ontario is concerned, with reference to legislation to define the status of the engineer. Mr. Chipman further explained the action of the Special Committee of the Toronto Branch in further consideration of the draft bill prepared by the Special General Committee of *The Institute* which met in Montreal on April 5th, 1919.

The Chairman of the Toronto Branch, Mr. Harkness, then explained the action of his Branch in arranging for an informal gathering at the Engineers' Club at 6.30 on Monday evening, November 24th, for the purpose of explaining the point of view of *The Engineering Institute* in the matter of legislation, and further, to make it distinctly understood that *The Engineering Institute* so far as the Province of Ontario is concerned, proposed to co-operate with other professional engineering societies in taking any definite steps towards the introduction of legislation.

The meeting voiced its hearty approval of the constructive action of the Toronto Branch in considering the legislation proposals of the Special Committee of *The Institute* as explained by Mr. Chipman, and of the action of the Toronto Branch in convening an informal meeting, as explained by Mr. Harkness, of representatives of the Toronto organizations of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the Society of Chemical Industry, the Canadian Mining Institute and the Ontario Association of Architects."

It was unanimously resolved that the following organizations be invited to act with the Ontario Provincial Division of *The Engineering Institute* as an Advisory Conference Committee:

The Canadian Mining Institute.
The Canadian Society of Chemical Industry.
The American Society of Mechanical Engineers.
The American Institute of Electrical Engineers.
The Ontario Association of Architects.

Toronto Branch

H. S. Goldman, A.M.E.I.C., Acting Secretary.

An Open Meeting of the Branch was held at the Engineers' Club at 8 p.m. on Thursday, Dec. 4th, 1919.

Mr. Harkness, Presiding Chairman, announced the resignation of W. S. Harvey from the office of Secretary-Treasurer, and stated that if the present election should decide again in favor of Mr. Harvey new nominations will have to be called for and another election for the office of Secretary-Treasurer will have to take place. In the meantime he suggested that H. S. Goldman act as Secretary until one be properly elected.

The minutes of the previous meeting were then read and adopted.

The following members were then appointed as scrutineers to canvass the ballots for the election of officers for the coming year:—E. T. Wilkie, [illegible] and George Hogarth.

The scrutineers reported that the following members were elected to office :—

Chairman—R. O. Wynne-Roberts.

Secretary—W. S. Harvey.

Committee—Geo. T. Clark, C. R. Young and T. Taylor.

These Committee-men are elected for two years. As J. C. Krumm received the next highest number of votes, the Chairman declared him also elected in the place of W. A. Bucke whose resignation had been received recently. Mr. Krumm is only elected for one year, since by the end of that time the term of Mr. Bucke would have expired.

After the report of the scrutineers was received and confirmed, the Chairman called upon Professor J. Roy Cockburn who delivered an excellent lecture on the scientific application of locating guns by sound ranging.

The lecture was illustrated by numerous lantern slides and was much enjoyed by the members present.

The meeting adjourned at 11 p.m.

At a meeting of the Executive of the Toronto Branch held on Monday, December 15th, it was decided to refer the J. C. T. O. Report on "Status of Engineers" to the Provincial Division.

Niagara Peninsula Branch

R. P. Johnson, A.M.E.I.C., Secretary-Treasurer

A general business meeting of the Branch was held on November 25th at the Engineer's Club, Thorold.

The business on the agenda was as follows:—

1. Report of the Branch Salary Committee.
2. Report of the Branch representative at the first meeting of the Ontario Provincial Division Executive.
3. Report of committee on Branch By-laws.

Report of Salary Committee:

F. S. Lazier, Chairman of the Committee, read the report which was adopted by the Branch after a short discussion.

The report follows:—

Report of Salaries Committee

To the Chairman and Members,
Niagara Peninsula Branch,
Engineering Institute of Canada.

At a general meeting of the Branch held at Thorold on May 9th, you appointed us to study the question of engineering salaries, and instructed that we report at an early date our views as to what might be considered a fair schedule of salaries for the usual positions in all branches of the profession.

The ground to be covered by such a study and in compiling the required schedule is much greater than might be immediately apparent. It involves at the outset a professional classification, detailed and general enough to include all engineers who are employed in salaried positions.

Fortunately, we had at our disposal and available for study, a classification made by the American Association of Engineers, to which was also appended the salaries they considered to be the fair minimum and maximum for each position.

At an early date we learned that the Toronto Branch of *The Institute* had, in February, appointed a large and representative Committee to consider the salary question and that they had made considerable progress in a general classification of the profession.

The reclassification of the Civil Service of Canada, including the engineering positions therein, was also about ready for publication at the time your Salaries Committee was appointed.

With these several classifications of positions available, or to be ready in the near future, your Committee considered it would be an unwarranted duplication of effort to attempt the compiling of another, but thought that in view of the comprehensive personnel of, and the amount of this work already done by the Salaries Committee of the Toronto Branch their labors would probably produce a general engineering classification, which would, with such amendments as other Branches might suggest, be particularly applicable to the profession in Canada.

Your Committee held several meetings at which the general status of the profession was discussed, past and present salaries paid for engineering services reviewed, and possible means both of bettering the future status of the engineer and his financial position considered. The classification and salaries proposed by the American Association of Engineers, the Civil Service of Canada and the Toronto Branch of *The Institute* were studied and discussed and the whole matter given careful consideration.

From this study of the status of the engineering profession in Canada and the compensations accruing to the members thereof we beg to submit the following:—

1. We consider that in view of the increase in the cost of living and the training necessary to qualify for this work, the engineer, particularly in the junior positions of the profession is underpaid.

2. We feel that the adoption of a scale of minimum salaries and a standard classification of positions would be beneficial to the profession and to the general public.

3. We believe that the classification and scale of minimum salaries as compiled and adopted by the Toronto Branch, a copy of which is hereto attached, should be endorsed by the Niagara Peninsula Branch with the following exceptions:—

(*a*) In the case of engineers employed on Public Works, five instead of two years' practical experience should be required in place of graduation from a technical school of recognized standing.

(*b*) As the classification purports to deal with the profession of engineering, in which both education and training are necessary; and that inasmuch as the salaries mentioned for ... men, specifically described as having had no previous experience, appear to your Committee excessive, we would therefore recommend that the words "no previous experience necessary" be struck out wherever found and the clause "with fair education and previous experience" be substituted.

As there are no purely mining operations being carried on in the territory of this Branch it has not been considered advisable or necessary to attempt to formulate a schedule for this branch of the profession.

In conclusion your Committee desires to emphasize that the salaries set forth in the attached schedule are minimum salaries and that no attempt has been or should be made to fix the maximum which may be paid for any position in any of the various classes.

Respectfully submitted,

(Sgd.) F. S. Lazier,
S. R. Frost,
L. L. Gisborne.

The report of A. C. D. Blanchard, Chairman of the Branch and representative at the first meeting of the Ontario Provincial Division was next received. The following action was taken by the Branch on matters growing out of the report.

1. Representation on the Council from the Province of Ontario.

A motion was unanimously carried endorsing the decision of the Provincial Division to ask Council to permit the forming of another District in Ontario, the dividing line running approximately from Oakville to Owen Sound, the present line between districts No.'s 4 and 5 being moved so as to put Peterboro in the same district as Toronto, leaving Kingston in District No. 4.

2. General Professional Meeting in 1920.

In view of the fact that the Provincial Division Executive has decided upon holding a general professional meeting in 1920, a motion was unanimously passed setting forth that this Branch is desirous of holding this meeting at Niagara Falls under the auspices of the Niagara Peninsula Branch and that September would be the most preferable month. It was also decided to extend an invitation to the American Institute of Chemical Engineers to co-operate in holding a joint meeting. It was decided to appoint a nominating committee for the purpose of nominating sub-committees to arrange for the meeting. Those appointed follow:—F. W. Clark, S. R. Frost, the chairman and secretary of the Branch, A. W. L. Butler J. C. Moyer, H. M. Belfour, R. W. Powell and W. P. Near

The instructions given to the nominating committee are as follows:—

1. To apply through the Branch Secretary to the Ontario Provincial Division Executive for permission to hold a general professional meeting at Niagara Falls in 1920.

2. In the event of permission being granted to hold a professional meeting at Niagara Falls, to ascertain whether the American Institute of Chemical Engineers will co-operate in holding a joint meeting.

3. To fix upon a date for the meeting.

4. To determine the necessary sub-committees required to arrange plans for the meeting and to appoint these committees and give instructions to each.

5. To report on all the above matters to the next general business meeting of the Branch.

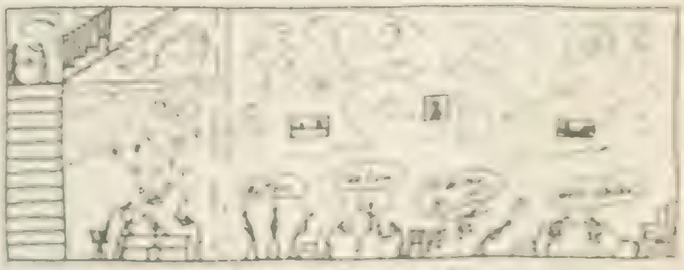
6. To remain in office till the professional meeting has been concluded and to see that each sub-committee is doing its work with proper dispatch.

Branch By-Laws.

The committee on Branch By-Laws made its report which was adopted by the meeting. The By-laws were framed along the lines of the proposed Standard Branch By-Laws recommended by Council. The Branch By-laws as adopted are subject to approval of Council.

Report of Salary Committee

Vote on the Salary Schedule



at close of Meeting

Niagara Peninsula Branch Meeting

Border Cities Branch

J. E. Porter, A.M.E.I.C., Secretary-Treasurer

At the adjourned annual meeting of the Border Cities Branch, held on December 1919, the discussion of Branch By-laws was continued from last meeting and these were revised in accordance with suggestions from the Council.

M. E. Brian then made a report in detail of the meeting of the Ontario Provincial Division, held at Toronto on November 22nd and considerable discussion ensued. The discussion was mainly on the proposed legislation and will be continued at our next meeting.

The reports for the closing year were received and the following officers for 1920 were elected.

Chairman	H. B. R. Craig, M.E.I.C.
Sec.-Treas	J. E. Porter, A.M.E.I.C.
Executive Committee	J. J. Newman, O.L.S., A.M.E.I.C.
	H. Thorne, M.E.I.C.
	M. E. Brian, O.L.S., A.M.E.I.C.

The meeting expressed its regret at the departure for Hamilton of our first Chairman, J. A. W. Brown, wishing him every success in his new work.

Peterborough Branch

R. L. Dobbin, M.E.I.C., Secretary

At a meeting of the Peterborough Branch held on Saturday, December 6th, 1919, the following were elected officers of the Branch:—

Hon. Chairman	R. B. Rogers,
Chairman	G. Reid Munro,
Vice-Chairman	R. H. Parsons,
Secretary	R. L. Dobbin,
Treasurer	D. L. McLaren,
Executive Committee	E. R. Shirley, A. L. Killaly, G. R. Langley, C. E. Sisson, P. L. Allison.

The officers were appointed a committee to draft the By-Laws for the Branch, and report at an early meeting.

G. Reid Munro and R. L. Dobbin were appointed representatives on the Executive Committee of the Ontario Provincial Division.

The Secretary was instructed to write and convey to Walter J. Francis of Montreal, the thanks of the Branch for the very artistic and clever manner in which he had written up the minutes of the inaugural meeting on November 6th.

A letter was received from the General Secretary at Montreal enclosing a cheque for $25.00 as an advance to the Branch. The Secretary was instructed to acknowledge this with thanks.

The paper of the evening was read by G. B. Smith, of Belleville, on the Central Ontario System of the Hydro-Electric Power Commission of Ontario of which Mr. Smith is Superintendent. Maps and diagrams were used to illustrate Mr. Smith's remarks, and at the conclusion of the paper, as an added attraction a large number of slides were shown of the Chippewa Development of the Commission.

Walter R. Blackwell, the architect of the new Memorial School, gave a short talk on the plans of the building.

The meeting was held in the Empress Hotel, and about fifty sat down to supper. The membership of the Branch is as follows:—11 Members, 17 Associate Members, 5 Juniors, 33 Affiliates.

Kingston Branch

W. H. Slinn, Jr. E.I.C., Sec'y.-Treas.

At a reorganization meeting of the Kingston Branch, Alexander Macphail, M.E.I.C., was appointed chairman, and W. H. Slinn, Jr.E.I.C., Secretary-Treasurer. It was agreed that the next meeting be held on December 16th at which J. M. Campbell, M.E.I.C., would read a paper on "The Electrical Power Plant at Kingston Mills, Ont." and the Secretary was instructed to extend an invitation to the General Secretary of *The Engineering Institute* to be present at the meeting and give a talk on the aims and organization, etc., of *The Institute.*

Winnipeg Branch

Geo. L. Guy, M.E.I.C., Sec'y.-Treas.

On Thursday, December 4th, a paper was presented to the Branch by C. D. How, on the "Economics of Elevator Construction and Operation." Mr. How, who is Engineer for the Dominion Grain Commission, gave an interesting address which was listened to with appreciation by a large attendance.

On December 9th, at the Fort Garry Hotel, a complimentary banquet, was given by the Branch to returned members, during which banquet Capt. C. N. Mitchell, V.C., M.C., A.M.E.I.C., was presented with an illuminated address as a mark of esteem and appreciation from his fellow members. An Associate Membership Badge was also presented on behalf of the Council of *The Institute.* The presentation of the Address was made by General H. N. Ruttan, and *The Institute* Badge by J. G. Sullivan. The address presented to Capt. Mitchell is as follows:—

"Your fellow-members of the Manitoba branch of *The Engineering Institute of Canada,* desire to express in some tangible form their great appreciation of the distinguished services you have rendered to the empire during the recent war, and especially for the courageous deeds by which you won the Victoria Cross and the Military Cross.

"The call of the empire came to you, and inspired by the precepts and example of your loyal father, you at once responded and placed your services at the disposal of the military authorities of Canada.

"We remember that you asked no preferment, but were content to go forth as a humble private, asking no favors and making no conditions; that by dint of unfailing devotion to duty and efficient service, you rose step by step until you attained the rank of captain in the Canadian Engineers.

"Your record at Messines, Menin Road, Amiens, Arras and Cambrai, and in the final advance on Mons, will ever be a source of pride to your professional brethren. We rejoice in the honor you have brought to yourself, your family and your profession by your gallant conduct in the field.

"We trust that you may live long to wear the decorations conferred upon you by his gracious majesty King George the Fifth, and that every blessing may attend your return to civil life."

The Chairman, W. P. Brereton, read many letters from other branches, "Wishing the returned men success, and that they may live long and enjoy the benefits of peace, for which they fought so nobly." Many prominent citizens were present, among them being Mayor C. F. Gray; Hon. G. Grierson, Minister of Public Works; and Isaac Campbell, K.C., all of whom addressed the meeting.

On December 17th, F. H. Martin gave a very interesting address on "Niagara Hydro-Electric Power Developments." Mr. Martin's address was of unusual interest, as he traced the history of the Falls from the time it was first discovered; and by means of a large number o. Lantern Slides showed the conditions existing previous to present developments. Mr. Martin dealt with the engineering problems which had to be overcome by the pioneer developers, and by means of lantern slides explained the more prominent engineering features of the work, which has been done during the last fifteen or twenty years.

Local Notes

J. G. Sullivan, M.E.I.C., member of the executive, Manitoba Branch, was elected Alderman to the City of Winnipeg Council in the recent election.

Mr. Sullivan's election is looked upon by all to be a compliment to the local branch and it is felt by many that his expert engineering knowledge and experience will be of incalculable benefit to the city in the forthcoming year, when many problems, which require engineering knowledge, will be brought before the council. He is assured of the best wishes of his associates in the profession with the assurance of their hearty co-operation during his term of office.

A. G. Dalzell, Secretary of the Vancouver Branch of *The Engineering Institute of Canada*, was recently in Winnipeg and attended the December 4th meeting of the Manitoba Branch, where he received a hearty welcome.

Calgary Branch

[illegible], *M.E.I.C.*, Secretary-Treasurer

The Annual General Meeting was held in the Board of Trade rooms on Saturday, Dec. [illegible]

The meeting was preceded by a luncheon, at which about [illegible] members and guests were present.

The meeting came to order at 2.30 P.M., and the retiring Chairman, Mr. Craig made a short address on the [illegible] members present and welcomed those who had recently returned from service overseas with the Allied forces. He gave a brief outline of the work that had been done during that time and drew attention to the many important matters to come up during the coming year, which would require their co-operation and support.

Ballots for Officers for the year [illegible] were called in, and Messrs. Chapman and [illegible] were asked to act as scrutineers and report the result of the Election.

The Secretary then read the minutes of the last annual meeting and of all subsequent meetings.

Arising out of the minutes, Mr. Craig stated that he had acted as delegate to the Municipalities Convention at Medicine Hat and had written a reply to the paper presented by a Mr. Godfrey criticising the Engineering profession. This reply had been published as part of the minutes and given full publicity, so that the members of the profession would not suffer from this unjust criticism, especially as the author had not seen fit to defend his action.

Mr. Pearce gave a brief account of the work done by the Provincial Natural Resources Committee to which he had been appointed a member through the efforts of the Branch.

Upon the motion of Mr. Peters seconded by J. I. Fish, the minutes of the previous meetings were adopted as read.

The Secretary read his report of the work of the Branch and a financial statement which had been audited, both of which are appended as part of these minutes.

Mr. Peters gave a brief account of the work done in an endeavour to secure legislation for the Engineering profession and answered questions of Messrs. [illegible] and [illegible] upon the subject. He felt that the Council of The Institute had not pushed this matter as they should have done in view of the mandate given it at the Annual Meeting in Ottawa last winter.

He therefore, submitted the following resolution for the consideration of the meeting:

> "That the attention of Council be strongly directed to the fact that in accordance with the last paragraph of the resolution concerning legislation passed at the last annual meeting held at Ottawa, they are required immediately to take the necessary measures in co-operation with the branches to have

legislation enacted. And, further, that it is the opinion of the Calgary Branch that it is the duty of the Council to take the initiative in this matter."

"That a copy of this resolution be sent to all the Branches."

The last paragraph of the resolution passed at Ottawa is as follows:—

"That the Council of *The Institute* shall report the result of the ballot to the branches, and if the vote is favorable to legislation the Council of *The Institute* shall immediately take the necessary measures, in co-operation with the Branches, to have legislation enacted."

The resolution was put to the meeting after being seconded by Mr. Pearce and carried unanimously.

Mr. Pearce moved that the Secretary be instructed to urge a speedy reply by the Council of *The Institute* to the resolution forwarded to them regarding Legislation, and that as soon as this reply was received the Secretary circularize the members, leaving it to the Chairman to call a special meeting if thought necessary. Seconded by P. J. Jennings, and Carried.

The scrutineers reported the result of the ballot for Officers to the Chairman, who declared the following elected, to act during the year 1920.

Chairman	P. Turner Bone.
Secretary-Treasurer	C. M. Arnold.
Executive Committee	H. B. Muckleston.
	F. W. Alexander.
	G. N. Houston.
Members of Executive without election	Wm. Pearce.
	G. W. Craig.
Auditors	F. K. Beach.
	W. J. Gale.

Mr. Craig expressed his appreciation of the assistance given him while Chairman of the Branch and said he felt it a great honor to have acted in that capacity.

Mr. Turner Bone was invited to take the Chair and met with a hearty reception.

He thanked the members for electing him to such an important office and stated that he was eager to do anything in his power to forward the work of the branch.

The meeting adjourned at 4.45 P.M.

Saskatchewan Branch

J. N. deStein, M.E.I.C., Sec'y.-Treasurer

The winter activities of the Branch began with the October meeting, at which H. G. Phillips, A.M.E.I.C., read a valuable paper on "Drainage Assessments." We had the pleasure at that meeting of having H. W. B. Swabey, A.M.E.I.C., of the Ottawa Branch with us.

The November meeting took the form of a "Welcome to the Returned Members," a detailed report of which appeared in the December number of *The Journal.*

At the December meeting (December 11th). A. J. McPherson, A.M.E.I.C., gave a very interesting resume of the preliminary work done in connection with the "Saskatchewan River Water supply." This is one of the most important questions, with which the engineers in Saskatchewan will have to deal in the next few years. The cities of Moose Jaw and Regina will have to look for an additional water supply and the whole district from the Elbow (on the Saskatchewan River) to Regina and some piece south of it, will have to depend on this future supply.

Mr. McPherson mentioned, that as early as 1894, already J. S. Dennis looked upon the Saskatchewan River as a supply for Irrigation purposes. After some preliminary surveys the Irrigation Department appropriated 200 cubic ft./second from the Saskatchewan River for the use of the District, which water, however, has never yet been utilized. There were a number of projects made, which Mr. McPherson enumerated in detail, but the difficulty seems to be to find out the minimum quantity of water necessary at present, and to build up a system, which is capable of future extensions. The amount of water necessary at present will hardly pay the cost of construction.

A further paper on this subject will be given before the Branch at an early date by G. D. Mackie, M.E.I.C., City Commissioner, Moose Jaw.

A number of Branch Committees have also begun their activities. The Paper and Library Committee (Chairman: D. A. R. McCannell, A.M.E.I.C.) has drawn up a program for the season's meetings, which are held every second Thursday of the month at the Kitchener Hotel, Regina, in conjunction with a dinner. The Concrete Committee (Chairman: H. McIver Weir, M.E.I.C., Saskatoon) has done some very valuable work in the investigation of the influence of Alkali upon concrete. The University of Saskatchewan appropriated considerable money for the purpose of research work in this connection and is proceeding in conjunction with the Branch. Professor C. J. Mackenzie, A.M.E.I.C., will read a paper at the Annual Meeting of the Branch, January 8th, giving a résumé of the work done by the Committee.

The Committee to assist the Canadian Engineering Standard Association (Chairman: A. P. Linton, A.M.E.I.C.) has invited contributions and suggestions from all members of the Branch.

The Branch as such is gaining rapidly in membership and there are very few engineers in Saskatchewan, who have not joined our ranks. We are also carrying on an active campaign to increase the number of Affiliates of the Branch and bespeak the assistance of all members.

The Secretary was favored with a visit from A. G. Dalzell, M.E.I.C., from Vancouver, who made a very short stop-over on his way from Ottawa, to his home.

C. P. Richards, A.M.E.I.C., the energetic Chairman of the Legislation Committee of the Branch had to go to British Columbia for the winter on account of his health.

Messrs. R. C. F. Chown, A.M.E.I.C., and J. M. Mackay, A.M.E.I.C., who spent several months in England and Scotland respectively, returned and resumed their respective duties.

O. W. Smith, M.E.I.C., has again gone to Victoria for the winter.

R. N. Coke, A.M.E.I.C., returned to his home in Jamaica.

Vancouver Branch

J. N. Anderson, A.M.E.I.C., Secretary

A general meeting of the Branch was held in the Board of Trade Auditorium on Monday, December 1st. The Branch Chairman, F. G. Matheson, presided over an attendance of thirty members, while the invitation extended to the members of the British Columbia Technical Association to attend our meetings was largely accepted. The subject of proposed legislation was fully discussed, and amongst those taking part were Messrs. Hill, Kennedy, Brakenridge, L. L. Brown, Powell, Mills, Philip and Parlan, also Messrs. Foreman and Bigwood, from the Victoria Branch. Professor Turnbull, member of the Mining Institute of Canada also spoke in favor of the proposal. Mr. Matheson vacated the chair to bring forward motion to pledge the Branch to favor the proposed bill to be presented to the British Columbia Legislature at the coming session, and also to further it by giving the Joint Committee all the financial help necessary to ensure its becoming an Act of Parliament. This was carried unanimously. The following Finance Committee was appointed to obtain funds for the furtherance of the desired legislation:—L. L. Brown, Chairman, R. Snodgrass, Secretary; J. H. Anderson, Treasurer; W. T. Johnston, F. O. Mills, and P. Philip.

A. E. Foreman, B.Sc., M.E.I.C., Public Works Engineer for the Province of British Columbia delivered a lecture on the "Organization and work of the Provincial Public Works Department." This proved to be most interesting and instructive and many valuable statistics were presented showing Departmental methods and the large savings in expenditures resulting from the methods now being adopted. Standard plans for all classes of road work were shown, and their application to this large and mountainous province explained. The Chairman presented the thanks of the meeting to Mr. Foreman for his excellent address.

Proposed Legislation for Engineers

A Legislative Committee of Engineers representing *The Engineering Institute of Canada*, the Mining Institute of Canada, the B. C. Technical Association, and other Societies, is now undertaking the work of drafting a Bill to incorporate Engineers on the lines of the draft Bill published by *The Engineering Institute of Canada* and the Canadian Mining Institute.

Joint Mainland Committee

F. G. Matheson, B.A.Sc., M.E.I.C., Chairman.
W. Anderson, M.E.I.C.
C. Brakenridge, M.E.I.C.
W. B. [illegible], M.E.I.C.
A. G. Dalzell, M.E.I.C.
N. J. Ker, M.E.I.C.
A. E. [illegible], M.C.I.
J. Muirhead, B.Sc., A.M.E.I.C.
W. H. Powell, B.Sc., D.L.S., M.E.I.C.
H. L. Robertson.
R. Snodgrass, A.M.E.I.C., Secretary.
J. M. Turnbull, B.A.Sc.
W. F. Anderson, B.Sc., A.M.E.I.C., M.L.A.
J. N. Anderson, A.M.E.I.C., Treasurer

Joint Island Committee

A. E. Foreman, B.Sc., M.E.I.C., Chairman.
H. C. Bailey.
P. W. W. Bell, M.E.I.C.
H. S. Browne.
W. M. Brewer.
E. C. Hayward.
E. N. Horsey, A.M.E.I.C.
J. B. Lambert.
D. O. Lewis, M.E.I.C.
T. K. Loach.
G. P. Napier, M.E.I.C.
W. Sleet Robertson.
S. N. Preston, A.M.E.I.C.
R. H. Woods.

The following has been sent to all engineers in the Province:—

Advertising of this Bill must be commenced by December 12th, and it is estimated that about $2000 will be required to get the Bill through the House at the next session of the B.C. Legislature.

A sum sufficient to cover the advertising and immediate expenses is required in the next few days by this Committee, in order that action may be initiated. The action of the Committee will depend on the support immediately received. Five dollars per head by 400 engineers is required, and as some will probably not come through, it is advisable to subscribe a larger sum if possible. Excess over sum required will be returned to subscriber pro rata. In order to be effective your subscription should be sent in immediately on receipt of this notice.

At the time of writing the Joint Committee has drafted a Bill which will be ready for [illegible] by the middle of December. Lt.-Col. H. S. Tobin, of the firm of Pattullo & Tobin, Barristers & Solicitors has been retained by the Committee to act as solicitor and to see the Bill presented to the House. The necessary advertisements are now appearing in the press of the Province and the progress of the Bill will be keenly watched by all members of the profession in Canada.

Copy of advertisement:—

NOTICE

Notice is hereby given that an application will be made to the Legislative Assembly of the Province of British Columbia at the next session, on behalf of the Association of Professional Engineers of British Columbia, for a Private Bill to incorporate the said Association, the said Bill to be known as THE BRITISH COLUMBIA ENGINEERING PROFESSION ACT, for the purposes of governing and regulating the practice of Civil, Mining, Metallurgical, Mechanical, Electrical and Chemical Engineering in the Province of British Columbia, and the qualification, examination and registration of intending practitioners, the discipline of its members, and for the acquiring of real and personal property and the disposal of the same, and for the general management of the Association.

Dated at the City of Vancouver, B. C., this 5th day of December, A. D. 1919.

H. S. TOBIN,
of the firm of Pattullo & Tobin,
Solicitors for the Applicants.

As soon as received a copy of the Bill will be forwarded to Headquarters and all Branches. The Finance Committee appointed by *The Engineering Institute of Canada* is acting for the Joint Committee on legislation.

Victoria Branch

Horace M. Bigwood, A.M.E.I.C., Secretary

The branch held the first of a series of informal receptions on the 24th of Nov. last, which was attended by about 65 members and friends.

The Chairman, Capt. W. M. Everall with Mrs. Everall, received the guests and fulfilled their duties in a very pleasing manner.

Dancing formed the basis for a very enjoyable evening, and several songs rendered by members and ladies, between dances, were much appreciated.

The committee are so satisfied with the result of their efforts that they feel sure that the succeeding events of a similar nature, which are to be held monthly on the fourth Monday, will be equally successful.

It is hoped by such means to bring the members into closer touch and to interest those of the profession who do not belong, and be the means of inducing them to join.

The Annual Meeting of the branch will be held on Dec. 17th, when officers for the ensuing year will be elected.

Algonquin Park

A good place to spend a winter vacation is Algonquin Park where winter sports usch as skating, tobogganing, ski-ing and snow-shoeing may be enjoyed to the full. Situated about 200 miles north of Toronto, and 170 miles east of Ottawa, Algonquin Park is easily accessible. The "Highland Inn," the largest of the Park hotels is open throughout the year so that visitors may be sure of first class hotel accommodation at any time. A copy of the new publication, "Enjoy winter in Ontario Highlands" may be obtained on request from Grand Trunk agents.

Presented to the Peterborough Branch E.I.C. by Ottawa Branch.

OBITUARIES

J. Eustache Sirois, A.M.E.I.C.

The death of Joseph Eustache Sirois, A.M.E.I.C., occurred on October 10th, 1919, at Ste. Anne de la Pocatière, P.Q.

Mr. Sirois was born on September 19th, 1858, at Ste. Anne de la Pocatière, P.Q., and was educated at the St. Anne's College, St. Anne de la Pocatière. He was admitted to practice as a Quebec Land Surveyor in April 1882, and as a Dominion Land Surveyor in December 1882. In 1883 and 1884, he surveyed different lands in the west of Canada for the Government of the Dominion. From 1884 till the time of his death he was doing engineering work in different capacities, being with the Riviere Ouelle Pulp & Lumber Company; Brown Corporation; Transcontinental Railway and the Great Northern Railway. Mr. Sirois was a member of the Board of Directors, of the Quebec Land Surveyors since 1886, and was appointed President of this corporation in 1912, which charge he occupied until the time of his death. He was an Associate Member of *The Institute*.

Flight Lieut. J. R. Middleton, Jr.E.I.C.

The Institute has learned with deep regret of the death of Flight Lieut. J. R. Middleton, Jr.E.I.C.

Flight Lieut. Middleton was the eldest son of the late Mr. G. H. Middleton and Mrs. Middleton, 38 Iverleith Place, Edinburgh, Scotland, was born at Toronto in 1888, and educated in Natal and at Edinburgh Academy and University.

In 1906 he joined the Canadian Pacific Railway engineering staff, and at the outbreak of the war was engaged on bridge work in British Columbia. He at once joined Lord Strathcona's Horse and served in France with that regiment, later being attached to the 7th Cameron Highlanders. In 1916 he served as a pilot with the Royal Flying Corps, and on March 24th when his squadron was heavily attacked, his machine was forced down in the German lines. As a wounded prisoner Lt. Middleton was sent to Mulbum Rubr Hospital, where he died on June 21, 1917.

A younger brother, Lieut. A. S. Middleton, who was on the Canadian Northern Railway Engineering Staff, died in France of wounds received at the battle of Lens. Another brother, Lt. G. H. Middleton, [illegible], was killed in North Russia.

Stephen Pearson Brown, M.E.I.C.

Stephen Pearson Brown, M.E.I.C.

It is with great regret that *The Institute* has learned of the sad fatality which occurred at [illegible] Lake, Me., on Dec. 7th, when S. P. Brown, M.E.I.C., was drowned. Mr. Brown was dragging his son on a sled when the ice gave way beneath him, and he was drowned before assistance arrived. Mr. Brown was born at Dover, Me., in 1877, was educated at the Massachusetts Institute of Technology, Boston, Mass., and graduated with the degree of S. B., in 1900. From 1900 to 1901, he was a junior partner of the firm of Collier & Brown, Consulting Engineers, Atlanta, Ga. In 1902-05, he was successively consulting engineer with the [illegible] Company, New York, engineer on construction, New York, New Haven & Hartford R.R., Bridgeport, Conn., and designer in reinforced concrete with the [illegible] Fireproofing Co., New York. From 1905 to 19[illegible] Mr. Brown was principal assistant engineer, United Engineering & Contracting Co., New York. During this period Mr. Brown was engaged on the following important undertakings:—depression of track of New York Central Ry. on Port Morris Branch, New York, the design of plant structures, concrete work and general construction on

Penn. R.R. cross-town tunnels in New York; with general superintendence of all work west of Fifth Avenue in 1908.

Mr. Brown came to Montreal in 1912 as engineer in charge of the construction of the Mount Royal Tunnel. He superintended the drawing up of the plans of the tunnel and took charge of this work from start to finish, and was chiefly responsible for its successful accomplishment. This was a remarkable achievement, since the construction of the tunnel under Mount Royal established a world's record in the matter of time and the successful working out of the details.

The tunnel proper was completed before Mr. Brown left Montreal. Immediately after the United States declared war in 1917, he left for the United States and offered his services to the Government in any capacity. He was not accepted for active service overseas, but was retained in the engineering department of the war service at home. At the conclusion of hostilities Mr. Brown became Vice-President and General Manager of Ford, Bacon & Davis, a large contracting firm of New York, which post he held until his death. He was an American citizen and came to Montreal almost a complete stranger. He resided here for about five years during which period he made himself almost a home citizen of Montreal and took a prominent part in much of the war work here. He brought his family to Montreal with him and they lived for a time on University Street, just above Burnside Place, and during the summer lived in Westmount on the Heights. Mr. Brown was active in supporting the Patriotic Fund, and numerous other enterprises of a similar nature for the benefit of Canadian soldiers and families in which work he was joined by Mrs. Brown. He was elected a member of the Council of *The Engineering Institute of Canada* in which he took an active part, addressing *The Institute* several times on the work of constructing the Mount Royal Tunnel. He was also a member of the Rotary Club, and the University Club. He was exceedingly popular in McGill circles, lecturing several times to the students on his work, and conducting parties of professors and students through the tunnel whenever they wished. Mr. Brown kept in touch with the Montreal engineers after his return to the United States, especially in matters connected with the tunnel.

During his stay in Montreal Mr. Brown won the respect and admiration of the members of the engineering profession not only by his high abilities, but by his excellent qualities as a citizen, and his death will be deeply regretted by every member of *The Institute*.

Mr. Brown is survived by his wife, who was Miss Edith Luce, of Boston, and two sons, his mother and two sisters, Mrs. J. Arnold Norcross, of New Haven, Conn., and Mrs. Clarence F. Doore, of Melrose, Mass.

The funeral was held in the Congregational Church, on the afternoon of December 8th, under the direction of Francis C. Peaks, and there was a large attendance. Beautiful flowers had been sent by the relatives and friends. The burial was in the family lot in Foxcroft cemetery.

PERSONALS

Frank Lee, M.E.I.C., has been appointed Engineer, Maintenance of Way, Eastern Lines, C.P.R., Winnipeg, Man.

*

William Smail, B.A.Sc., M.E.I.C., has been appointed chief engineer of the Northern Construction Co., in Vancouver, B.C.

*

C. B. Kingston, M.E.I.C., formerly of Pearce, Kingston & Brown, London, England, has moved to Johannesburg where he is with the African & European Investment Co.

*

C. H. Attwood, A.M.E.I.C., has been transferred from Ottawa to the Manitoba Hydrometric Survey of the Dominion Water Power Branch, Dept. of the Interior, Winnipeg.

*

Wimund Huber, A.M.E.I.C., has recently severed his connection with the Ontario Department of Public Highways and is now engaged in business as a contractor in Toronto.

*

S. J. Fisher, M.E.I.C., has been appointed superintendent of the James Smart plant of the Canada Foundry and Forgings Company at Brockville. Mr. Fisher took over the responsibilities of this position on December 1st.

*

Wm. P. Parker, M.E.I.C., formerly with the Keystone State Construction Co., has accepted a position with Ballinger & Perrot, architects, engineers and constructors, Philadelphia, in the capacity of production engineer.

*

J. E. Milne, Jr.E.I.C., has been appointed municipal engineer of Saanich, B.C. Lieut. Milne resigned the position of municipal engineer of Burnaby to accept the position at Saanich.

*

James McGregor, M.E.I.C., Superintending Engineer, Halifax Ocean Terminals, Canadian National Railways, has left Canada for a visit to Scotland and expects to be absent from this country for some time.

*

H. A. Paquette, A.M.E.I.C., of Levis, P.Q., formerly general manager of the Lauzon Engineering Works has resigned his position and has organized the Levis File Company at Levis, P.Q., of which he will be the directing head.

C. Brakenridge, M.E.I.C., is leaving for England, and his temporary address will be, c/o D. Brakenridge, 12 Selwyn View, Whitehaven, England. Mr. Brakenridge has been Acting Secretary of the Vancouver Branch and did much good work in this connection.

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W. G. Milne, A.M.E.I.C., has been appointed mechanical superintendent for Dominion Foundries & Steel Co., of Hamilton, Ont., the appointment having taken place on September 1st, 1919. Mr. Milne was formerly with the Hamilton Bridge Works Co., of Hamilton, Ont., where he occupied the position of Plant Engineer.

•

G. C. Williams, M.E.I.C., has accepted the position of contracting engineer, with the Whitehead and Kales Iron Works, Detroit, Mich. Mr. Williams was with the Canadian Bridge Company, Walkerville, Ont., for fifteen years, starting with them as a draftsman in 1904. At the time of his resignation he was sales engineer in charge of local structural sales.

•

Baron Gustave de Coriolis, A.M.E.I.C., has returned to Canada after being absent from this country for twelve years in France. His present address is 170 de l'Epee Ave., Outremont. Baron de Coriolis was in Paris during the later stages of the war and is interested in the reconstruction problem now facing France, particularly the development of hydro-electric power.

•

Lieut. B. A. Johnston, Jr.E.I.C., enlisted in Jan. 1916, with the 46th Battalion, going to England in November 1916. He went to France in December 1916, and in May 1917 was wounded in the left forearm. He spent ten months in the hospital in England. Lieut. Johnston returned to Canada in 1918, and spent fourteen months in the Tuxedo Military Hospital, Winnipeg before final discharge.

•

J. M. Begg, A.M.E.I.C., enlisted in October 1914, with the Highland Field Company, Royal Engineers, attached to the 51st Highland Division and served with that division in France from May 1915, till September 1916. From September 1916, till the Armistice was signed he was Staff Sergeant, foreman of works on construction of ammunition depots and aeroplanes in France. He returned to Canada in 1919 and is now residing at 256 MacKay St., Montreal.

•

J. J. McArthur, M.E.I.C., H.B.M. Boundary Commissioner and the Commission Engineers, Messrs. Craig and Fawcett, have been in conference during the past month at Ottawa with E. C. Barnard, U. S. Boundary Commissioner and R. N. Ashmun, of the Washington staff, and have dealt with a number of questions relating to the International Boundary.

The two Washington engineers were guests at the Ottawa Branch luncheon held in honour of Major-General Sir Edward Morrison.

Albert S. Miller, B.A.Sc., S.E.I.C., enlisted in Toronto in June 1917, with the Canadian Forestry & Railway Construction Depot. He went overseas immediately, was with the Canadian Railway Troops Depot in England, and was sent with reinforcements to the 1st Battalion, Canadian Railway Troops engaged in the construction of standard-gauge railways and bridges in Belgium and France. He returned to Canada in April 1919, and is now in charge of the Engineering Depot., of the Factories in Eastern Division, Dominion Canners, Ltd., Brighton, Ont.

•

Lieut. Thos. C. Main, A.M.E.I.C., enlisted in Winnipeg as a sapper in December 1914. He went overseas with the 44th Battalion, serving in all ranks up to Sergeant. In April 1916 he was transferred back to the Canadian Engineers and was wounded in June 1916 at Sanctuary Woods. In October 1916 he was sent to Salonika where he served with the 139th Army Troop Company; he was then sent to Italy with the 4th Heavy Bridging Train. Lieut. Main was awarded the Italian Croix de Guerre in connection with pontoon work on the River Piave in October 1918. He returned to Canada on June 13th, 1919.

•

Capt. E. R. B. Pike, A.M.E.I.C., enlisted as Lieut. O.C. Machine Gun Section, 2nd Australian Light Horse in August 1914, served in Gallipoli, was promoted to Captain, and returned to Australia owing to illness in August 1916. He was discharged as unfit for service, and was employed on camp work until December 1916, when he was appointed to A.I.F. transport service, and sent to England. Capt. Pike returned to Australia in July 1917, when his appointment in the A.I.F. terminated, and he was then employed on recruiting work. In October 1917 he was appointed Secretary, State Recruiting Committee in Queensland, which position he occupied until the close of hostilities.

•

Herbert P. Heywood, Jr.E.I.C., enlisted on July 4th, 1916, and left for England in December 1916. He was quarantined for some time at Bramshott and Purfleet Camps, leaving for France in March 1917 with the 3rd Canadian Railway Troops on railway construction, light railways, battery positions, etc., and later on the construction of fifteen miles of light railway from St. Aubain to Lestrem. Towards the close of the war the 3rd C.R.T. were sent to the Lens front to build a railway over No-Man's Land and later to Donai on standard gauge line to Valenciennes. Mr. Heywood was demobilized in Canada in October 1919 and is at present representing the Lock Joint Pipe Co., in Eastern Canada, with headquarters at 259 Davenport Road, Toronto, Ont.

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Lt.-Col. R. B. Harkness, D.S.O., Croix de Guerre, M.E.I.C., enlisted with the Canadian Engineers in January 1915, going overseas the same month with that unit. He accepted a commission with the 19th Battalion Welsh Regiment, 38th Imperial Division, going to France in November 1915 with this Division, and serving with them until the signing of the Armistice. He was wounded in March 1918, was awarded the D.S.O., (which was presented to him by H.R.H. the Prince of Wales on the occasion of his recent visit to Montreal), the Croix de Guerre, and was three times mentioned in despatches. He returned to Canada and was demobilized in March 1919. Lt.-Col. Harkness is now District Vocational Officer in the Soldiers' Civil Re-Establishment, St. Catharines, Ont.

*

Captain L. W. Gill, M.E.I.C., formerly, Professor of Electrical Engineering at the Kingston School of Mining, has been appointed Director of Technical Education for Canada, and has come to Ottawa to take up his new position.

Captain Gill will have charge of the administration of technical education throughout the Dominion, as provided for in the Technical Education Act passed at the last regular session of Parliament.

An expenditure of $700,000.00 in the various provinces is proposed, and it is expected that Captain Gill will at once confer with representatives of the various provinces in regard to the detail of the organization work.

Captain Gill is well known to members of *The Institute* in connection with his brilliant services overseas as officer of the 46th Field Battery, C.E.F.

*

W. S. Harvey, A.M.E.I.C., has resigned his position with the Toronto Harbor Commission to take up work in association with Mr. Alexander Potter, M.E.I.C., Consulting Engineer, New York; he expects to be for some time at Warren, Ohio, on investigation of sources of water supply in preparation of design and plans. Mr. Harvey received his early engineering training in Wales, was later associated with the British Insulated & Helsby Cables, Ltd., in charge of track work and street paving for the Chesterfield Electric Tramways, and was also in charge of contract work at Weston-super-Mare and Hull. Mr. Harvey came to Canada in 1910, and with the exception of six months at Lethbridge, has been associated with the city of Toronto in design of drainage systems, etc. Mr. Harvey has been a very energetic Secretary-Treasurer of the Toronto Branch and his loss will be felt by all the members of the Branch.

*

Hugh A. Lumsden, A.M.E.I.C., Assistant District Vocational Officer at Orillia, Ont., enlisted in April 1915, with the 35th Battalion, as Lieutenant; was transferred to the 19th, went overseas in May 1915, and in England he was transferred to the Overseas Railway Construction Corps, went to France in March 1916, joining the C.O.R.C.C. on railway construction work. The Corps consisted almost entirely of Canadian railway men, and out of a total strength of five hundred and ten men over one hundred commissions were eventually obtained. In October 1916, Colonel C. W. P. Ramsey, M.E.I.C., was appointed Railway Construction Engineer for the Fifth Army, and Lieut. Lumsden was appointed Adjutant under him. He was given command of "C" Company, in the Canadian Railway Troops, under Lieut.-Col. (now Brig.-General) Hervey, M.E.I.C., and was promoted to the rank of Major. A bad attack of influenza put a sudden end to active work and Major Lumsden was in hospital for four months. Since returning to Canada in April 1919, Major Lumsden has been with the Dept. of Soldiers' Civil Re-establishment, and expects to return to engineering work early next year. In July 1919, Major Lumsden was elected an Associate Member of the Institute of Civil Engineers in Great Britain.

*

Paul Emile Mercier, consulting engineer to the Administrative Commission of the city of Montreal, who was recently appointed as a professor on the staff of L'Ecole Polytechnique, Montreal, and who will hereafter devote a considerable portion of his time to educational work, was born March 15, 1877, at St. Hyacinthe, P.Q. He was educated at St. Mary's College, Montreal, and received his technical training at L'Ecole Polytechnique. He became chainman of the Montreal on the Montreal Park & Island Railway in 1895. Entering the service of the C.P.R., in 1896, as a rodman on the Quebec Division, he became a leveller in 1897. In 1898, he joined the staff of the Public Works Dept. of Canada as an assistant engineer and from 1899 to 1904 was a district engineer in that department. In 1905 his services were requested by the National Transcontinental Railway and for the following two years he was engineer in charge of that project. In 1908, Mr. Mercier engaged in private practice in Montreal, under the firm name of Baulne & Mercier, which connection was retained until 1914, when he was appointed deputy chief engineer of the city of Montreal. When George Janin, chief engineer of the city, was given leave of absence to go overseas in December 1914, Mr. Mercier became acting chief engineer, and upon Mr. Janin's death, in 1915, Mr. Mercier was appointed chief engineer. In May 1918, he became the City's Director of Public Works, from which position he retired in November 1918, to act as consulting engineer to the newly-appointed Administrative Commission. Mr. Mercier is a member of *The Engineering Institute of Canada,* the American Society of Civil Engineers and the Society of Civil Engineers in France.

*

Colonel Francis F. Longley, D.S.M., O.B.E., graduated ln 1902 from the United States Military Academy at West Point, and was commissioned in the Corps of Engineers, United States Army. He resigned his commission soon thereafter to engage in the practice of Civil and Sanitary Engineering and took a special course in the Massachusetts Institute of Technology in Sanitary Engineering Lines, his work being largely in the United States, but he has also done work in Canada and New Foundland. During the past seven years he has been a member of the firm of Hazen, Whipple and Fuller, Consulting Engineers of New York City, whose acquaintance with and experience in various phases of Sanitary Engineering work is world-wide.

In August 1917, Colonel Longley was commissioned as Major of Engineers, United States Army and sent to France to organize a service of water supply for the American Expeditionary forces. In November 1917 he was promoted to Lieutenant-Colonel and assigned to the 26th Engineers, the army water supply regiment. In October 1918 he was promoted to Colonel, 26th Engineers. During the first few months of American activities abroad, the water supply work was confined mainly to the line of communications. He also spent much time during the fall of 1917 with the British and French armies, studying their methods of handling water supply and other closely related problems. In the spring of 1918 he was engaged in the organization of the water supply service of the army, and for this work he was awarded the Distinguished Service Medal for his participation in this work. After the Armistice Colonel Langley was sent to England in charge of the army educational program in the United Kingdom, under which some two thousand officers and soldiers of the American Army attended British Universities for a period of about four months in the spring of 1919. On November 22nd, 1919, on board H.M.S. "Renown" Colonel Langley was invested by H.R.H. The Prince of Wales as Honorary Commander of the Order of the British Empire. He is a member of the American Society of Civil Engineers, *The Engineering Institute of Canada*, The American Public Health Association, The American Water Works Association, and the New England Water Works Association.

Norman M. Campbell, A.M.E.I.C., has resigned his position as General Sales Manager of Canadian Ingersoll Rand Co. Limited, and as a director of that company, having been appointed Managing Director of General Combustion Co. of Canada, Limited, with headquarters in New Birks Building, Montreal. He will assume his new duties on the first day of January 1920.

Norman M. Campbell, B.Sc., A.M.E.I.C.

Mr. Campbell was born in Montreal in 1878, the son of Rev. Dr. Robert Campbell of that City. He was educated at Montreal High School, Abingdon School and McGill University, from which he graduated in 1899 with the degree of Bachelor of Science.

On graduation he was appointed assistant engineer in the Waterworks Department of the Dominion Iron and Steel Co. at Sydney, during the construction of that company's plant.

He joined the staff of the Canadian Ingersoll Rand Co. Ltd., in [illegible], as manager of their Toronto branch and moved to Montreal to take a similar position there three years later.

In 1910 he was appointed general sales manager of the company, and during his tenure of that position he has had the satisfaction of seeing the company grow from a very modest concern to its present status as one of the largest manufacturing plants in the iron and steel industry of Canada.

The General Combustion Company was recently formed to exploit in Canada and Great Britain, industrial furnaces for annealing, forging, heat treating, etc., under the [illegible] patents with the trade name of "[illegible]" furnaces.

In connection with the retirement of Mr. Campbell from the Canadian Ingersoll Rand Co., a dinner was given in his honor in the Blue Room of the Windsor Hotel, Montreal, on Thursday, December 11th, at which a large number of the engineering and sales staff of the company was present. The following speech was read by E. W. Gilman, General Manager of the Company:—

Norman Campbell, B.Sc.: This gathering and these few expressions and this little remembrance that we give you from our hearts, evidence, in a simple way, the great good-will which your friends and co-workers in the Canadian Ingersoll-Rand Co., Limited, entertain for you. In retiring from this Company which you have served so faithfully for so many years, the sentiment is general that we are losing a capable, conscientious and faithful officer of the Company.

The desire to show recognition of the signal services you have performed in the upbuilding of the Company does not constitute the only motive for admiration and respect. Consistency of character, and a uniform regard for the welfare of your fellow workers, coupled ever with evidence of fairness, courtesy and high minded principles, have commanded a confidence and esteem which promoted the pleasantest relations and insures for you always the kindliest recollections.

In the success of all engagements and the achievement of every ambition, you have the earnest and cordial following of a host of well-wishers, who appreciate you as an executive, admire you as a citizen and honor you as a man.

EMPLOYMENT BUREAU

Situations Vacant

Electrical Draftsmen

Two electrical draftsmen experienced in transmission line and switchboard detail desired. Apply Box No. 71.

Junior Draughtsman

Junior draughtsman for designing small structures such as dams, etc., mapping and general draughting work, a graduate in applied science desired. Salary $100 to $110. per month. Apply Box No. 70.

Railway Draftsmen

Two good railway draftsmen wanted for an Ontario Public Utility. Box 69.

Two Steamship Inspectors for Vancouver and Quebec, Department of Marine. Salaries $2,700 per Annum.

Two Steamship Inspectors, one for the port of Vancouver and the other for the port of Quebec, to act in the dual capacity of inspector of boilers and machinery and of hulls and equipment, at an initial salary of $2,700 per annum, which will be increased on recommendation for efficient service at the rate of $180 per annum until a maximum of $3,240 has been reached.

Candidates must have education equivalent to graduation in engineering from a technical school of recognized standing; at least twelve years of experience in the design, construction, maintenance or operation of ships, marine engines and boilers; thorough knowledge of the theory and the practice of marine engineering and ship construction; ability to make clear and concise reports on inspections and to make working drawings, specifications, and estimates for proposed work; tact and good judgment.

The successful candidate will be required to perform the following duties: To inspect the boilers and machinery and hulls and equipment of steamships during construction, and, as required by law, to determine whether they are sufficient for the service intended and in good condition; to examine plans of ships and their equipment, marine machinery and boilers submitted for the purpose of determining by calculations of the strength of the various parts whether they can receive approval; to advise builders, owners, and others concerned in the matter of construction of ships and their machinery and the repairs required to keep the same in efficient condition; when satisfied as regards the sufficiency of ships, their boilers and machinery, and that the law as regards certificated officers, etc., has been complied with, to issue a statutory certificate of inspection, to examine candidates for marine engineer certificates; to act as a member of a Board of Steamship Inspection occasionally as required; to investigate and report on accidents and breakdowns happening to ships, their boilers and machinery; to supervise and report on repairs to Government ships, their boilers and machinery, and to perform other related work as required. Candidates should be not more than 40 years of age.

An examination will be held in connection with the filling of the position, and candidates will be notified later of the date and place of examination. *Preference will be given to residents in the provinces of British Columbia and Quebec respectively.*

The position of Steamship Inspector at Vancouver was advertised September 4 and is now readvertised.

Situations Wanted

Plant Engineer

Plant Engineer.—Engineer at present in charge of design and construction, of tools, fixtures, dies, etc., and all mechanical equipment of manufacturing plant, employed at present in New England wishes to return to Canada is fully qualified for the position of factory executive or plant engineer. Apply Box 12-P.

Oregon Provides for the Registration of all Professional Engineers

Act Recently Passed Affects Municipal and County Engineers as Well as Those in Consulting Practice

The Oregon State Legislature has provided in Chapter 381 of the General Laws of 1919 for the registration of all professional engineers, including civil, mechanical, electrical, chemical and mining. After January 1, 1920, no engineer can practice his profession in Oregon without being registered by the State Board of Examiners. This means that after the date given no county or municipal engineer can perform the duties of his office without being registered, as every map or official plan must be prepared or approved by a duly registered professional engineer.

Up to January 1, 1920, any engineer who files an application or registration and can show under oath that he had had at least six years' experience in professional engineering can be registered without examination. After that date, however, an engineer can be registered and receive a certificate only after passing an examination prepared by the Board.

The effect of this act will be to raise the standard of the engineering profession by safeguarding the public from the practice of incompetent and untrustworthy engineers. It will undoubtedly raise the standard of municipal and county engineers, particularly in the smaller places, and its results will probably be similar to those of the act recently passed by the state of California regarding the competence of county engineers; it will limit the practice of the profession of engineering to men duly qualified by experience and training or both. More than 400 engineers have already applied for registration, so that it is anticipated that all who are able to qualify will have registered before January 1, 1920.
"American City," November, 1919.

Preliminary Notice

of Applications for Admission and for Transfer

[illegible] December, [illegible]

The By-laws [illegible]

It [illegible]

In order that the [illegible]

[illegible] reputation of [illegible]

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications [illegible] January, [illegible]

Fraser S. Keith, Secretary.

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* The professional [illegible] as follows:—

Every candidate for election as MEMBER [illegible]

[illegible]

Every candidate for election as [illegible] (Books I.-IV. and VI.), [illegible]

Every candidate for election as [illegible] the advancement of professional [illegible]

The fact that [illegible]

ALDRICH—[illegible] Washington, D.C. [illegible]

References: J. R. W. [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

CROMBIE—REGINALD HOWARD, of Montreal. Born at Montreal, May 13th, 1885. Educ., Ridly Coll.; 1902-03, McGill Univ. 1903-06, asst. engr., P. Hume C.E., constrn., St. Raymond Pulp & Paper Mill; 1906-07, charge machine shop, Automobile Import Co., Montreal; 1907-08, charge dredging operations, Nicolet, P.Q., M. Connelly, contractor; 1908-09, asst. engr., P. Hume, salving and rebuilding dredge at Harbor Comm'rs Pier, Montreal; July-Dec. 1909, charge dredging operations, Louisville, P.Q., also excavating for Govt. Wharf constrn. at Sorel; 1910-15, building under own name, constrn. 18 residences, also eng. work constrn. new water supply, Quebec city, etc.; 1915-16, mech'l supt., Quebec Ammunition Co., Montreal; Jan.-Nov. 1917, shop engr., fuse dept., Williams Mfg. Co.; May-Nov. 1917, asst'g. mgr., Norcross Bros., Montreal, during constrn. of C.N.R. station and American Can Co. bldgs.; 1918-Mar. 1919, member of firm Hein, Crombie & Co.; Mar. 1919, to date, member of firm Crombie & Co., engrs., Montreal.

References: M. D. Barclay, O. J. Hein, G. M. Hudson, F. S. Keith, F. P. Shearwood.

DAVISON—HAROLD DORAN, of Welland, Ont. Born at Bridgewater, N.S., Aug. 15th, 1890. Educ., B.A.Sc., Toronto Univ., 1913. 1911-12, mechanic in shops of Jenckes Machine Co., St. Catharines; 1913-17, in charge of concrete constrn., Sec. No. 1, Welland Ship Canal; 1917, to date, mech. engr., British American Shipbuilding Co. Ltd.

References: H. M. Belfour, G. M. Hamilton, C. L. Hays, R. W. Leonard, F. E. Sterns, W. H. Sullivan.

DONKIN—CHARLES HAROLD FOSTER, of Amherst, N.S. Born at Acadia Mines, N.S., Oct. 26th, 1888. Educ. Private tuition. 1905-07, rodman, leveller on T.C.Ry.; 1907-10, inst'man on T.C.Ry. constrn.; May 1910, inst'man on Melville-Regina branch, G.T.P.; June-July, 1910, transitman on G.T.R., in Sask.; Aug.-Nov. 1910, res. engr. on constrn., N.W. of Moose Jaw, G.T.P.; 1911 (2 mos.), in office, Dist. F., T.C.Ry.; Mar.-Aug. 1911, transitman, C.N.R., on revision for double track; 1911-13, asst. engr. on C.N.R. in charge of location of line; 1913-14, transitman on D.L.S.; 3 yrs., 3 mos., military service, 2 yrs. in France and Belgium; at present in charge of constrn. of spur line to St. John drydock, and transitman on maintenance of way and structure, C.N.Ry.

References: G. R. Balloch, A. R. Crookshank, G. C. Dunn, C. O. Foss, F. G. Haven, H. Longley, C. M. Mackenzie, H. MacNeil, S. Troop.

DUFFY—DAVID AURIEL, of St. John, N.B. Born at St. John, May 26th, 1888. Educ., St. John High School. 1904-09, articled pupil to late Hurd Peters, city engr., St. John; 1909-12, draftsman and inst'man, city of St. John; 1912, to date, asst. to road engr., St. John, on pavements, retaining walls, etc.

References: A. R. Crookshank, R. H. Cushing, G. G. Hare, G. N. Hatfield, G. G. Murdoch.

FRASER—ISAAC MATHESON, of Montreal. Born at Pictou, N.S., Nov. 1st, 1890. Educ., B.Sc. (mech. eng.), McGill Univ., 1919. 3 mos., millwright, N.S. Stee & Coal Co. Ltd., New Glasgow; 1 yr. draftsman; 3 mos., iron worker, Dom. Iron & Steel Co., Sydney, N.S.; at present, demonstrator, mech'l dept., McGill Univ.

References: E. Brown, W. G. Matheson, C. M. McKergow, D. Lewis, R. B. Stewart.

GODDARD—GEORGE ANSON, of Outremont, P.Q. Born at Osage, Iowa, Sept. 20th, 1893. Educ., B.Sc. (mech. eng.), McGill Univ., 1915. 1909-11, Diamond Flint Glass Co.; Apr.-Sept. 1911, C.P.R. irrigation survey; summers 1912-13-14, in eng. dept., General Fire Extinguisher Co.; 1915-16, shops and eng. dept., Armstrong-Whitworth Co. of Canada, Longueuil works; 1916-17, asst. inspector of shells, Imperial Ministry of Munitions; 1917-18, mgr., Modern Tool Mfg. Co., shell plant; May-Sept. 1918, plant engr., Terrebonne Elec. Power & Steel Co.; at present, organizing Crescent Motors Limited, with a view to eventually mfr. automobiles in Canada.

References: D. Bremner, E. Brown, J. L. Busfield, M. J. Butler, C. M. McKergow; A. R. Roberts, C. W. Stokes.

HARRAGIN—HUGH CLYDE, of Montreal. Born at Trinidad, B.W.I., Mar. 4th, 1888. Educ., Queen's Royal Coll., Trinidad. 1904-06, apprentice, Trinidad Govt. Eng'g. Shops; 1906-09, apprentice machinist, C.P.R., Angus shops; 1909-10, locomotive constrn.; 1910-12, asst. air brake instructor, C.P.R., Eastern lines; 1912-13. air brake inspector, C.P.R.; Jan-Mar. 1913, test dept., C.P.R., to test all steel coaches built in Canada; 1913-14, travelling engr., Canada Grip Nut Co. Ltd.; 1914-16, factory manager, same firm; Mar. 1916-June 1919, on active service with Can. Field Artillery; at present, factory manager, Canada Grip Nut Co.

References: G. H. Duggan, J. M. R. Fairbairn, H. Holgate, J. H. Trimingham, H. H. Vaughan, W. H. Winterrowd.

JOHNSTON—WILLIAM JAMES, of St. John, N.B. Born at South Devon, N.B., Jan. 1st, 1891. Educ., B.Sc. (E.E.), Univ. of N.B., 1913. 1906 (2 mos.), timekeeper on ballasting, Bangor & Aroostook Ry.; 1909-10 (8 mos.), contractor's timekeeper on constrn., N.T.C.Ry.; 1912 (4 mos.), cost and timekeeper, Fredericton & Grand Lake Coal & Ry. Co.; 1913-17, asst. engr., P.W.D., Fredericton and St. John, N.B.; 1917-19, overseas, gunner, Canadian Garrison Artillery; at present, asst. engr., P.W.D., St. John.

References: W. C. Ewing, F. G. Goodspeed, J. K. Scammell, F. S. Small, J. A. Stiles, A. G. Tapley.

JONSSON—JUNIUS, of Saskatoon, Sask. Born in Iceland, June 5th, 1884, Educ., private tuition. 1901-08, with H. B. Proudfoot, D.L.S., Toronto, as picket. 2nd asst., then 1st asst., in full charge of parties carrying out surveys; 1908, supervisor of constrn. in sewer and water dept., city of Saskatoon under Willis Chipman; Sept. 1908, to date, asst. city engr., Saskatoon; was acting city engr. for 4 and 3 mos. respectively.

References: T. W. Brown, A. R. Greig, C. J. Mackenzie, E. H. Phillips, W. M. Stewart, J. E. Underwood, H. McI. Weir, C. J. Yorath.

LATIMER—VICTOR NELSON, of Winnipeg, Man. Born at Holland, Man., Apr. 20th, 1891. Educ., matric. 1910-11, leveller, location, C.N.R.; 1912-13, res. engr., constrn., C.N.R.; Apr.-Aug. 1914, inst'man, highway constrn., D.P.W., Manitoba Govt.; Jan. 1915-June 1918, military service, 1st C.M.R., France; May-Sept. 1918, inst'man and senior inspector on aqueduct constrn., Greater Wpg. Water Dist.; 1918-19, inst'man, revision, G.T.P., in charge of residency; July 1919, to date, transitman, C.N.Ry.

References: G. C. Dunn, W. S. Fetherstonhaugh, W. D. Mackenzie, L. E. Silcox, A. Wimbles.

LEWIS—HUGH MILES, of Port Arthur, Ont. Born at Neath, S. Wales, July 26th, 1887. Educ., matric., Jarvis St. Coll. Inst., Toronto. 1908-10, rodman, etc., C.N.R. survey in B.C.; 1910-11, levelman, G.T.Ry., Toronto; 1911-13, inst'man and asst. res. engr., C.N.P., constrn., B.C.; 1913-14, draftsman and asst. chief draftsman, C.N.P., Vancouver; 1914-19, military service, Infantry and Engineers, 1916-17, Intelligence Dept.; mapping and air photography; instructor in mil. eng., etc.; Apr.-Sept. 1919, asst. engr., and Sept. 1919, to date, engr. in charge, Port Arthur Pulp & Paper Co.

References: C. F. Alston, H. J. Lamb, T. R. H. Murphy, S. H. Sykes, T. H. White.

LLOYD—HAROLD, of Winnipeg, Man. Born at London, Eng., Sept. 26th, 1880. Educ., Rochester Athenium & Mechanics Inst., architectural drawing; evening classes in bridge eng. at Columbia Univ.; I.C.S. Detailing and checking steel work as follows:—1901-02, American Bridge Co.; May-Aug. 1902, Rochester Bridge & Constrn. Co.; 1902-03, Lackawanna Steel Co.; 1903-04, Baldwin Locomotive Works; 1904-05, Lackawanna Steel Co.; 1905-07, Milliken Bros., New York City; in charge steel details; Apr.-Sept. 1907, American Bridge Co.; 1907-11, designing railroad bridges, engr. of structures office of N.Y.C. & H.R.R.; 1911-12, asst. engr. in charge of structural work, architect's of N.Y.C. & H.R.R.; 1912-13, asst. engr., designing and estimating steel work, Lackawanna Bridge Co., New York City; 1913-14, in charge steel details, also designing and estimating steel work, Dom. Bridge Co., Winnipeg; 1914-15, designing structural steel work, Winnipeg River Power Co.; 1915-18, asst. bridge engr., Good Roads Board, Manitoba Gov't.; Nov. 1918, to date, bridge engr., of same.

References: P. Burke-Gaffney, S. A. Button, W. E. Hobbs, W. H. Hunt, E. W. M. James, M. A. Lyons, F. A. W. MacLean, A. McGillivray.

LOCKHART—WILLIAM STANLEY, of Montreal. Born at Moncton, N.B., May 19th, 1892. Educ., B.Sc. (E.E.), McGill Univ., 1914; 2 yrs. eng. course, Mt. Allison Univ. Summers, 1912, Allis Chalmers; 1913, constrn., Shaw. Water & Power Co.; 1914-17, New England Power Co. & Power Constrn. Co. of Worcester, Mass.; June 1917, enlisted, obtained commission in Royal Flying Corps as Lieut., on active service until June 1919; at present, elec. eng., Engineering Co. of Canada.

References: E. G. Burr, C. V. Christie, L. A. Herdt, C. M. McKergow, C. W. Stokes.

MEADD—HOWARD ELLIOTT, of Kingston, Ont. Born in Township of McGillvry, Ont., May 11th, 1892. Educ., 2nd class professional certificate for prov. of Ont.; at present, in 3rd year, Queen's Univ. Summer 1914, mining, Victoria Mine, Mond, Ont.; 13 mos. in France on rly. work with 48th Coy., Can. Forestry Corps; summers 1917, on rly. and hydraulic work with Hydro Elec. Power Comm.; 1919, leveller and topog'r, Nipigon River development, H.E.P.C.; at present, attending Queen's Univ.

References: G. F. Hanning, J. N. Stanley.

MITCHELL—WILLIAM GORDON, of Montreal. Born at Port Hope, Ont., July 25th, 1888. Educ., B.Sc., 1913; M.Sc., 1914, McGill Univ. Summer vacations: 1910, operating mech. plant on rly. constrn., N.T.R. in northern Quebec, Macdonald & O'Brien, contractors; 1911, constrn. supt. on highway and highway bridge in Ontario; 1912, constrn. supt. on rly. masonry constrn., C.P.R.; 1913-14, tech. investigations for Mt. Royal Tunnel & Terminal Co.; 1914-16, in charge of div. of wood preservation, Forest Products Laboratories; 1916, mining engr. with R. Martens & Co. Ltd., London, Eng., on investigation of timber and mining industries in Scandinavia, Finland, European Russia, Siberia and Manchuria; May-Oct. 1919, independent eng. work in Canada and United States; Oct. 1919 to date, with Canada Export Paper Co. Ltd. to investigate conditions of pulp and paper industry in Norway, Sweden, Finland, Russia, Poland and Germany.

References: J. S. Bates, E. Brown, F. B. Brown, H. M. MacKay, J. B. Porter, R. S. L. Wilson.

MUIRHEAD—JAMES, of Vancouver, B.C. Born at Glasgow, Scotland, Jan. 26th, 1880. Educ., B.Sc. (C.E. and E.E.), Glasgow Univ. 1902; A.M.I.E.E.; A.M.I.C.E. 1897-90, apprentice in eng. works; 1902-03, in charge of substation, Glasgow Corp'n tramways dept.; 1903-08, with British Thomson-Houston Co. Ltd., Rugby, Eng.; elec. mfrs., as designer of elec. mach'y; 1908-09, elec. designer and works mgr., Krumos Ltd., Bath, Eng., mfrs. of elec. specialties; 1909-11, estimating engr., Bruce Peebles & Co. Ltd., elec. mfrs., Edinburgh; 1912-14, in distribution and transmission line dept., B.C. Elec. Ry. Co., Vancouver, 1 yr. in charge of design and supervision during constrn. of transmission line, etc.; 1914-19, asst. elec. inspector, and at present chief elec. inspector, Govt. of B.C.

References: J. N. Anderson, W. R. Bonnycastle, A. E. Foreman, J. E. Griffith, E. G. Matheson.

ORD—LEWIS CRAVEN, Major, of Montreal. Born at Toronto, Ont., Mar. 3rd, 1881. Educ., matric. exam., Upper Canada Coll.; West Toronto Coll. Inst. 4 yrs., machinist apprentice; 3 yrs. machinist; 1 yr. loco. fireman; 2 yrs. loco. engr.; 1 yr. car repairer; 2 yrs. air brake inspector; 2 yrs. instructor; 1906-09, loco. foreman and acting master mechanic, C.N.O.Ry., Parry Sound; 1908-09, master mechanic, The New Canadian Car Co., Port Daniel, P.Q.; 1910-13, shop engr., Angus car shops, and gen. car inspector on lines east of Fort William, C.P.R.; 1913-Mar. 1919, asst. master car builder, east of Fort William; 1914, asst. works mgr., Angus shops, C.P.R.; June 1916-May 1919, military service, lieut., captain and major; June 1919, to date, asst. works mgr., Angus shops, C.P.R.

References:—J. M. R. Fairbairn, H. Holgate, W. McNab, J. H. Trimingham, H. H. Vaughan, W. H. Winterrowd.

PORTER—ARTHUR STUART, of Hamilton, Ont. Born at Toronto, Apr. 2nd, 1891. Educ., public and high school; commercial law, etc. Govt. township work; at present, manager, Hamilton office, Can. Gen. Elec. Co., Toronto.

References: W. A. Bucke, E. H. Darling.

POSTE—HENRY CLIFFORD FREDERICK, of Cornwall, Ont. Born at Brighton, Ont., Jan. 9th, 1875. Educ., Coll. Inst.; 2½ yrs. student in Can. Gen. Elec. Co. factory, 1 yr. in charge of power dept., 1½ yrs. in test dept.; 2 yrs. operating supt. of Atlanta Water & Power Co., Atlanta, Ga.; 5 yrs., elec. supt., Aluminum Co. of America, Massena, N.Y.; 3½ yrs., gen. supt., Canadian Light & Power Co., Montreal; 3½ yrs. (to date), manager St. Lawrence Power Co. Ltd., and manager, Cedars Rapids Transmission Co.

References: W. J. Francis, R. S. Kelsch, A. B. Lambe, J. Murphy, R. M. Wilson.

CHILD—CYRIL GEORGE, Major, O.M.F.C., of Banff, Alta. Born at Calgary, Alta., Sept. 10th, 1889. Educ., B.Sc. (C.E.) McGill Univ. 1911; Western Canada Coll. 1911-12, asst. to city engr., Calgary; 1912-13, town engr., Edson, Alta., designed water and sewerage systems; 1913, private practice in civil eng. and land surveying in Calgary, with S. K. Pearce; 1914, asst. res. engr., Rocky Mountains Park of Canada; Aug. 1914, left Canada as Lieut., Apr. 1915, promoted to captain, July 1916, major, 1918 Sub Section Director of Mechanical Warfare (Tanks) Dept., in London, later chief Disposal Officer for this dept., returned Sept. 1919; Oct. 1919, resumed as asst. res. engr., Rocky Mts. Park of Canada.

References: J. T. Child, H. M. MacKay, C. H. Mitchell, H. B. Muckleston, W. Pearce.

McGIVERIN—FREDERICK ARTHUR, of Montreal. Born at Hamilton, Ont., July 30th, 1884. Educ., Ridley Coll., St. Catharines; Faculty of Science, Univ. of Toronto, 1906. Summers, 1903, with Tyrell & MacKay; 1904, with J. W. Tyrell on western Canada survey; 1905, on constrn., Kaministiquia Power Co., Fort William; 1907, asst. engr. on constrn., same firm; 1908-11, asst. engr., Dominion D.P.W., Toronto; on harbor and drydock constrn.; 1911-14, dist. sales agent, Can. Car & Foundry Co. and Can. Steel Foundries Ltd., Toronto; 1914-Feb. 1919, with 10th Field Coy., Can. Engrs., O.M.F.C., France & Belgium; at present, with Can. Steel Foundries, in charge of track work.

References: W. F. Angus, K. W. Blackwell, E. G. Hewson, L. W. Klingner, R. W. Leonard, J. G. Sing, W. P. Wilgar.

SMITH—DAVID RUDOLPH (Lieut.) of River Glade, N.B. Born at St. Martins, N.B., Aug. 24th, 1886. Educ., B.A., 1906; B.Sc., 1910, Univ. of N.B.; Deputy Land Surveyor, Prov. of N.B. 1908-09, in charge of forestry survey, Pejepscot Paper Co.: 1909 (6 mos.) levelman, C.P.R. right of way survey; 1910 (6 mos.) in charge of survey party, International Comm., River St. John; 1911-13, asst. to G. G. Murdoch, in charge of surveys, sewer constr., etc.; 1913-15, private practice as civil engr.; 1916-19, overseas, in charge of rly. constrn. parties, reconnaissance and location surveys; transferred to Reserve of Officers, Mar. 1919; 1919 (6 mos.) in charge of highway constrn. and street rly. maintenance; at present, bldg. supt., D.S.C.R., St. John, N.B.

References: A. R. Crookshank, H. G. Dimsdale, F. G. Goodspeed, G. G. Murdoch, A. R. Sprenger, C. McN. Steeves, A. G. Tapley, S. C. Wilcox.

SWIFT—CYRIL JAMES (Major) of St. Catharines, Ont. Born at Kingston, Ont., Mar. 24th, 1886. Educ., diploma of graduation, R.M.C. 1908. 1908-09, draftsman on constrn., N.T.C. Ry.; June-Dec. 1909, water power survey of Iroquois Falls, northern Ont. and on maintenance of way; 1910-11, inst'man, constrn., N.T.C.; 1911-14, res. engr., N.T.C. Ry.; 4½ yrs. overseas; at present, asst. res. engr., Sec. No. 1, Welland Ship Canal.

References: T. S. Armstrong, A. J. Grant, E. P. Johnson, G. L. Mattice, W. H. Sullivan, W. P. Wilgar.

WATSON—JOHN PRINGLE, Lieut., of Montreal. Born at London, Ont., Sept. 28th, 1884. Educ., B.A.Sc., Toronto Univ. 1906. 1906-12, with C.P.R., gen. draftsman on locomotives, snow plows, etc., and conducting tests; 1912-15, with St. Lawrence Bridge Co., Montreal, designing mech'l equipment for Quebec Bridge erection and supervising constrn. of same in shops; 1915-17, with Dom. Bridge Co., Lachine, designing and detailing extensions and equipment for munitions work; 1918, on active service, lieut., Can. Engrs.; Apr.-Sept. 1919, Dom. Bridge Co., Lachine, designing shop equipment; at present, eng. dept., Imperial Tobacco Co. Ltd., Montreal.

References: N. C. Cameron, H. S. Grove, A. L. Harkness, G. F. Porter, C. H. Timm, L. R. Wilson.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

BATES—HAROLD CAREY, of Toronto, Ont. Born at Toronto, Feb. 3rd, 1892. Educ., B.S., Queens Univ. 1917. Summers 1913-16, Toronto Harbor Comm., inst'man, etc.; 1917-19, inst'man, maintenance of way, G. T. R., Barrie div.; May-June 1919, asst. engr., Toronto Harbor Improvements; at present, inst'man, Toronto to Niagara Falls location, ry. dept., Hydro Elec. Power Comm.

References: E. T. Agate, T. U. Fairlie, F. P. Goedike, G. F. Hanning, E. G. Hewson, G. Hogarth, I. F. Willsie, N. D. Wilson.

HANEY—REUBEN JOHN, of Regina, Sask. Born at Rochester, Minn., Nov. 14th, 1890. Educ., B.Sc. (C.E.) Sask. Univ. 1916. 1913, LaColle Falls Hydro Elec. Works, Prince Albert, Sask.; 1916, asst. to E. W. Murray, D. & S.L.S.; 1916-17, asst. in checking plans of survey branch, Dept. of Highways; 1917 to date, with C. S. Cameron, C.E., and land surveyor, asst. in charge of municipal eng. work.

References: C. S. Cameron, H. S. Carpenter, C. C. Cronk, C. J. Mackenzie, H. R. MacKenzie, D. A. R. McCannel, E. W. Murray.

HUGLI—EDWING EZRA HERMAN, of Toronto, Ont. Born at Golden Lake, Ont., Apr. 10th, 1890. Educ., B.A.Sc., Toronto Univ. 1914. 6 mos., drafting in office of Wm. Fingland, architect, Winnipeg; 6 mos. drafting, Roman Stone Co., Weston, Ont.; 2 summers in charge of a survey party on maintenance of way, Ont. div. C.P.R.; 2 mos. laying out with instrument, Can. Kodak plant at Mt. Dennis, Ont., under C. E. Deakin Ltd., Montreal; 2½ yrs. detailing and checking structural steel drawings in office of Lewis Hall Iron Works, Detroit, Mich.; 8 mos., structural drafting, Mond Nickel Co., Coniston, Ont.; enlisted Dec. 1917, discharged Mar. 1919; at present, structural engr. in office of Thos. W. Lamb, Toronto.

References: J. L. Brower, C. V. Corless, P. Gillespie, H. E. T. Haultain, T. R. Loudon, J. F. Robertson, C. R. Young.

MILLER—WARREN CRON, of St. Thomas, Ont. Born at Point Edward, Ont., Feb. 12th, 1894. B.Sc. (hons. in civil eng.) Queens Univ. 1917; Coll. Inst., etc. Summers: 1913, D.L.S. resurveying with C. F. Aylesworth; 1914-15, leveller, Dept. Railways & Canals, Servern dist., Trent Canal; Aug.-Sept. 1915, inst'man, O.L.S. resurvey, Fitton & Chase, Orillia; June 1916, enlisted, overseas July 1918-July 1919; July-Nov. 1919, asst. to city engr., and at present city engr., St. Thomas, Ont., including work of St. Thomas Board of Water Comm'rs.

References: F. A. Bell, J. A. Bell, W. F. M. Bryce, R. J. McClelland, T. S. Scott.

ROCHE—IVOR FRANCIS REES, of Westmount, P.Q. Born at Fredericton, N.B., Nov. 1st, 1891. Educ., B.Sc., McGill Univ. 1913. Timekeeper on grain conveyors, Montreal Harbor; rodman, draftsman, etc. on railroad constrn., C.P.R.; concrete pile inspector, Northern Elec. Mfg. Co.; transitman on location party and constrn., C.P.R., Trenton, Ont.; 2 yrs. office engr. and asst. to supt., John S. Metcalf Co., Trenton, on constrn.; res. engr. on constrn. work, Can. Light & Power Co., St. Timothée, P.Q., installing water turbines and generators, etc.; at present, with Lignite Board of Canada, as asst. engr., designing industrial bldgs. and drawing up plans for same.

References: C. E. Fraser, R. DeL. French, H. R. Rolph, K. B. Thornton,

ROSE—JOHN THOBURN, of Winnipeg, Man. Born at Toronto, Ont., Sept. 4th, 1894. Educ., B.A.Sc., Toronto Univ., 1915. Oxford School of Mil. Aeronautics, 1917. 1913 (5 mos. 1914 (2 mos.) inspector, roads and pavements, Toronto; 1914 (4 mos. storage investigation, Water Power Branch, Ottawa; 1915, asst. on water power reconnaissance survey; 3 yrs. overseas with C.F.A. and R.A.F., pilot, R.A.F. (Lieut.); at present, junior power development engr., Hydrometric Survey of Manitoba.

References: C. H. Attwood, P. Gillespie, M. C. Hendry, J. T. Johnston, M. A. Stewart.

TILLSON—LAURENCE BYRON, Lieut., M.C., of Windsor, Ont. Born at Gravenhurst, Ont., June 22nd, 1892. Educ., B.A.Sc., Toronto Univ. 1915. Summers: 1912, asst. hydrographer hydrographic surveys; 1913, topog'r, Old Man River, irrigation survey; 1914, topog'r, irrigation survey, Saskatchewan, Dept. of the Interior; Feb. 1915-Apr. 1919, military service, bombardier, corporal and lieut., Sept. 1919 to date, with Can. Steel Corp., Ojibway, as inst'man on eng. staff.

References: H. R. Carscallen, A. E. Eastman, J. E. Porter, A. A. Richardson F. S. Rutherford, H. Thorne.

WALLACE—GEORGE ARTHUR, of Montreal. Born at Milton East, P.Q., May 18th, 1892. Educ., B.Sc., McGill Univ. 1919. 2 mos. in shops of Can. Westinghouse Co.; 1 yr. on submarine detection work, British Admiralty (2nd lieut. Royal Marines); June 1919 to date, lecturer in elec. eng., McGill Univ.

References: E. Brown, E. G. Burr, C. V. Christie, L. A. Herdt, H. M. MacKay.

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

Published Monthly at 176 Mansfield Street, Montreal

— By —

THE ENGINEERING INSTITUTE OF CANADA

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THE CANADIAN SOCIETY OF CIVIL ENGINEERS

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Volume III MONTREAL, FEBRUARY 1920 Number 2

Report of Council for the Year Nineteen Hundred and Nineteen

Service to the individual member, to the Branches and to the Engineering Profession, has been the constant aim of the Council during the past year. This spirit of service has been one of evolution spreading over a number of years until it is now fully recognized and firmly established as a basic principle underlining the policy of *The Engineering Institute of Canada*. It has been exemplified in many ways in connection with the work of *The Institute* during 1919, which as far as real progress in co-ordinating the engineering profession and developing a professional spirit is concerned, is believed to be one of the most progressive in the history of the profession in this country. A material result of this spirit is evidenced by the unprecedented number of applications for admission by engineers of a high standing. The stimulation to personal effort which the new policy has evolved on the part of the individual member, and the growing feeling in the minds of non-member engineers that the influence of *The Institute* warrants their becoming part and parcel of its fabric, is undoubtedly having its effect.

While the financial statement dealt with in the Report of the Finance Committee shows that operating expenses have exceeded the revenue, *The Institute* has profited materially in the matter of good will and interest of the individual members, and this represents a capital investment.

In carrying out the policy of the Council, a considerable part of the Secretary's time has been spent in visits to the Branches and personal consideration on behalf of the individual members.

During the year new Branches were established at Sault Ste. Marie, Niagara Peninsula, Border Cities and Peterborough, and the Kingston Branch has renewed its activities. Every one of the eighteen Branches of *The Institute* is in a flourishing condition so that the great strength of the national organization to day is its local societies or branches, each one of which is becoming more and more a force and a factor in the community in which it is located.

In connection with the Branches, the rebates have been increased. Standard stationery has been adopted, and is supplied without charge from headquarters. There has also developed a strengthening of the bonds between the various Branches, resulting in a considerable interchange of branch ideas and courtesies.

The new membership certificate of *The Institute* has been produced and issued to several hundred of the new members, and it is confidently hoped that the balance of those delayed will be sent out without undue delay. The new certificate, together with the new badge, which is already worn by a large number of the members, have met with general approval and much complimentary comment.

The Journal of *The Institute* has grown in favour from month to month, and it is strongly urged that every member give it his personal support, because of its value to the profession and because it has done much to strengthen the bond of union between the members.

The past year has seen the return of our men from the Front. After the wonderful record which they made they are gladly welcomed back. Every effort was made to assist the returned men to secure suitable positions and with considerable success, in spite of the fact that engineering during the past year has been far below normal with a consequent lessened demand for engineering services.

In addition to *The Journal*, two outstanding publications have been issued: "The Manufacture of Munitions in Canada," by Past President H. H. Vaughan, the most complete record of the production of munitions in this country that has been published. "The Quebec Bridge" Transactions which have been described as the outstanding engineering publication of the year in America reflect great credit on the authors, and the thanks of *The Institute* are due the St. Lawrence Bridge Company and Past Presidents Johnson and Duggan for their unstinted interest and assistance in their production.

Beginning with a discussion at the Professional Meeting in Saskatoon during the summer of 1918, the question of legislation has occupied a prominent place in the activities of *The Institute* during the past twelve months. A special Committee representing every Branch formed in accordance with a resolution of the last Annual Meeting, has drawn up a Proposed Act, the principle of which has been approved by Council, and which at the present moment is under active consideration in every Province. In some instances, application for the registration of engineers has already been presented to the local Legislatures, while in other Provinces Acts are in the course of preparation. *The Institute*, although initiating the movement, has made no attempt to make this an Institute proceeding, but has left the matter in the hands of the engineers in each province.

Engineering classification and remuneration have been sponsored by *The Institute* during the past year, and a movement was taken up by *The Institute* on behalf of the individual engineer. These efforts, although falling somewhat short of the results hoped for, have paved the way for a greater recognition of the value of engineering services.

Generally speaking the past year has been a notable one for the profession, the results of which, if the present policy be continued, will have a far-reaching effect on the profession in the years to come.

R. W. LEONARD,
President.

FRASER S. KEITH,
Secretary.

ROLL OF THE INSTITUTE

Elections during the year resulted in the following additions to the Roll:—fifty-two Members; two hundred and fifty-one Associate Members; fifty-eight Juniors; one hundred and thirty-seven Students, and five Associates.

The following transfers were made:—sixty-five associate Members to the class of Member; seventy-seven Juniors and thirty-two Students to the class of Associate Member; thirty Students to the class of Junior, and one Junior to the class of Associate.

There have been removed from the rolls by resignation or on account of non-payment of dues:—four Members; eleven Associate Members; one Junior; three Students and one Associate. A detailed list of resignations accepted is as follows:—

Members............... Binnie, A. T.
Owens, R. B.
Roehm, G. E.

Associate Members...... Boyce, C. F.
Brandeis, C.
Clark, F.
Kennedy, J.
Kennedy, W. A.
Moodie, W. H.
Sedziack, F.

Junior.................. Vallee, J. I.

Students............... Begras, A.
Jodoin, T.
Panneton, F.

The following deaths, thirty-eight in number, have been reported, of which number thirteen were killed in action:

Members.............. Brown, Stephen P.
Browne, William L.
Campbell, Duncan McD.
Garden, G. H.
Hillman, Thomas E.
Marceau, Ernest
Newman, R. L.
O'Donnell, John P.
Thornton, N. M.
Vallee, Louis A.

Associate Members...... Baird, George H.
Doyle, David
Fraser, Alan T.
Sirois, J. Eustache
Smith, Harry G.
Tourigny, Honore B.

Juniors................. Goodstone, Arthur S.
Grenier, Hector
Mortimer, Frank R.
Price, Charles B.
Ross, George W.

Students............... Gooderham, G. A.
McRostie, George M.

Associate............... Weddell, Robert

Killed in Action or Died while on Active Service

Member	Brunlees, H.
Associate Members	Lawledge, F. M., Lieut. Mullon, J. M. L. G. Stirling, Robert A.
Juniors	Ewart, D. M., Lieut., M.C. Munkman, G. H. N., Lieut. Tingley, Frank H.
Students	Binns, P. V. Lennox, Victor S. Marchbank, O. J., Lieut. Perry, C. V. Scott, Wm. Douglas. Wallace, Hugh.

At present the membership stands as follows:

Honorary Members	10
Members	836
Associate Members	1,825
Juniors	334
Students	518
Associates	32
	3,555
Elected—acceptances pending	102
	3,657

ELECTIONS AND TRANSFERS

The following is a detailed statement of elections and transfers which have taken place during the year. These are not included in the official membership roll until acceptances have been received.

January 21st, 1919

Members:

Barnes, A. J. — Misener, J. S.
MacNab, I. P.

Associate Members:

Griffith, J. — MacKay, W. B.
Harris, R. C. — Nixon, R. L.
Houghton, J. W. — Scott, W. K.
Jones, W. G. — Stephens, G. L.
Macdonald, A. T.

Transferred from the Class of Associate Member to that of Member:

Crysdale, C. R. — Darling, E. H.

Transferred from the Class of Junior to that of Associate Member:

Hobbs, W. E. — Whittaker, D.

February 25th, 1919

Members:

Campbell, T. B. — Marrs, C. H.
Gaby, F. A. — Reid, F. B.
Glassco, J. G.

Associate Members:

Battershill, J. W. H. — Perkins, H. W.
Brunskill, H. C. D. — Peters, J. D.
Cameron, C. F. — Preston, J. E.
Orton, C. J. S. — Ryan, E. A.
Patterson, E. B. — Schachere, B.

Associate:

Pinder-Moss, J. F. S.

Transferred from the Class of Associate Member to that of Member:

Burbidge, G. H. — Duff, W. Alex.
Cagnat, G. H. — Rogers, C. H.

Transferred from the Class of Junior to that of Associate Member:

Eardley-Wilmot, T. — Morrissette, J. N. E. H.
Manning, J. M.

Transferred from the Class of Student to that of Associate Member:

Rocher, B.

Transferred from the Class of Student to that of Junior:

Cresser, J. A. — Way, W. R.

March 25th, 1919

Members:

Denis, L. G. — Palmer, R. K.
Gaines, E. C. — Reid, J. A.
Hobson, R. — Tobey, W. M.
Hungerford, S. J. — Wardwell, W. H.
Larson, C. H. — Weekes, M. B.

Associate Members:

Bellows, W. S. — Morley, J. H.
Brown, G. J. — Munroe, St. J.
Buchanan, C. A. — Neville, E. A.
Duperron, A. — Robinson, R. C.
Eager, A. H. — Sandover-Sly, R. J.
Howarth, C. — Sedgwick, A.
Hubbard, F. W. — Smail, F. H.
Huether, A. D. — Timm, C. H.
MacPherson, A. R. — Vaughan, F. P.
Milne, W. G. — Viens, E.
Mills, G. A.

Junior:

MacTavish, W. I. — Owens, J. E.
Nesham, L. C.

Transferred from the Class of Associate Member to that of Member:

Armstrong, J. — Leamy, J. M.
Bond, F. L. C.

April 24th, 1919

Member:

Newman, W.

Associate Members:

Balls, M. — Newman, J. J.
Bene, M. E. — Templeman, G. E.
Boese, G. P. F.

Junior:

Childerhose, E. A.

Transferred from the Class of Associate Member to that of Member:

Cole, F. T. — McFarlane, J. A.
Derrom, D. L. — McKenzie, B. S.
Emra, F. H. — Montgomery, E. G. W.
McArthur, F. — Swabey, H. W. B.

Transferred from the Class of Junior to that of Associate Member :

Askwith, F. C. Porter, J. E.
Calvert, D. G. Rutledge, M. J.
Dixon, A. Stairs, G. S.
Hunt, W. H. Valiquette, J. H.
McCully, R. C. Watson, M. B.

Transferred from the Class of Student to that of Associate Member:

Dalton, G. F. Hornsby, L. H.

Transferred from the Class of Student to that of Junior:

Hadley, W. F. Hunt, W. G.

June 3rd, 1919

Members:

Baldwin, R. A. Phillips, H.
Haycock, R. L. Smith, W. N.
Morris, W. R. C. Tyrell, J. W.

Associate Members:

Barnes, H. E. R. MacDonald, P. J.
Claxton, G. Mylrea, T. D.
Cuthbert, A. D. W. Nichol, F. T.
Davidson, J. M. Porter, J. H.
Joslyn, C. E. Randleson, H. G.
Kearney, T. Ricketts, S. F.
Kirby, T. H. Tait, E. L.
Landry, J. H. Venney, L. T.
MacDermot, S. G. Wheatley, J. H.

Juniors:

Creighton, C. S. Patterson, H. W.
James, A.

Transferred from the Class of Associate Member to that of Member:

Craig, J. D. Moore, E. V.
Dobbin, R. L. Wallberg, E. A.
Drysdale, W. F.

Transferred from the Class of Junior to that of Associate Member:

Dalziel, W. Milne, J. E.
Devereux, L. J. Oliver, S. E.
MacIsaac, D. F. Strachan, J., Jr.
McLaren, W. C. Turner, S. R.

Transferred from the Class of Student to that of Associate Member:

Boisseau, L. J. G. Thorn, G. O.

Transferred from the Class of Student to that of Junior:

Boulton, C. A. Scott, E. H.
Leclair, W. J. Williams, J. N.
McCrudden, H. E.

June 24th, 1919

Members:

Bishop, W. L. Fawcett, T.

Associate Members:

Arcand, C. L. Richards, E. G.
Campbell, J. G. Shaw, J. W., Jr.
Fraser, D. J. Sherrin, P.
Macleod, J. W. Wilson, B.
Purser, R. C.

Associate:

Christie, G. M.

Juniors:

Freeman, H. J. Walcot, J. B.
Freeman, P. W.

Transferred from the Class of Associate Member to that of Member:

Loudon, T. R. Thomson, L. R.
McCubbin, G. A. Thorne, H.

Transferred from the Class of Junior to that of Associate Member:

Cimon, J. M. H. Inness, R. D.

July 22nd, 1919

Members:

Buck, H. W. Cole, G. P.
Chambers, A. R. White, F. O.

Associate Members:

Black, J. R. McFaul, W. L.
Charles, J. L. Pickings, H. B.
Clark, F. W. Richardson, F. L.
Colhoun, G. A. Ross, K. G.
Dean, C. D. Skolfield, H. N.
Jacobs, L. L. Stidwill, F.
Loudon, A. C. Stokes, C. W.
Macaulay, H. D. Tripp, G. M.
Marchand, J. A. H. Walcott, W. D.
Martindale, E. S. Whitney, C. S.
McClymont, H. R. Wickwire, D. S.
McColl, C. R.

Juniors:

Buckley, P. B. Simpson, B. N.
McCort, C. R. Vogan, G. O.
Richardson, W. H. S. Whitman, C. O.
Roberts, S. O.

Transferred from the Class of Associate Member to that of Member:

Caddy, A. E. Johnson, S. B.
Decew, J. A. McLean, N. B.
Elliot, L. B. Murdoch, G. G.
Hill, B. M. Redmond, A. V.

Transferred from the Class of Junior to that of Associate Member:

Dupuis, L. C. McLerie, A. G.
Keefer, J. A. Stinson, J. N.
Kirkpatrick, A. M. Wynne-Roberts, L. W.

Transferred from the Class of Student to that of Associate Member:

Avery, C. R. Lindsay, C. C.
Drolet, J. H. A. E. Ratz, J. E.
Heroux, J. E. Stephens, W. E.
Johnson, R. P. Wright, A. C.
Kirkpatrick, P. C.

Transferred from the Class of Student to that of Junior:

Galbraith, R. D. Redman, W. B.

August 19th, 1919

Members:

Locke, T. J. Svenningson, S.
Reid, F. C.

Associate Members:

Anderson, J. N. Lowry, G. H.
Archibald, C. L. MacKenzie, W. J.
Beresford, G. W. MacLaurin, J. G.
Bigwood, H. M. Malloch, E. S.
Buckley, R. E. Malloch, N.
Burbank, M. A. McAndrew, J. B.
Campbell, W. R. McCoy, L.
Crombie, W. B. Mills, T. S.

Dawson, F. M. | Montgomery, W. G.
Ellison, C. H. | Morgan, R. C.
Elliott, C. C. | Petrie, J. B.
Fraser, J. L. | Ponton, G. M.
Freeman, R. F. | Ross, O. W.
Frost, S. R. | Silcox, H. R.
Gisborne, L. L. | Troop, S.
Harland, W. | Trowsdale, R. S.
Hughson, T. L. | Way, L. O.
Jansen, W. A.

Associate:
Block, J. F.

Juniors:
Bradley, C. | McDonald, N. G.
Crawford, A. W. | Pennock, W. B.
Gardner, D. B. | Ryan, J. H.
MacLean, C. S. | Young, F. B.

Transferred from the Class of Associate Member to that of Member:
Cockburn, J. R. | McDougall, G. K.
Ferguson, G. H. | McLay, D. B.
Greene, J. F. | Nevitt, I. H.
Holmes, A. R. | Sprenger, A. R.
Miles, H. R.

Transferred from the Class of Junior to that of Associate Member:
Blue, W. E. | MacGillivray, J. A.
Ford, J. W. | MacLachlan, R. C.
French, M. H. | Morrow, H. M.
Goodman, F. I. C. | Nehin, F. O'B.
Gregory, A. W. | Norris, J. H.
Harkness, R. B. | Shaw, J. B.
Hay, W. W. | Stewart, J. C.
Hogarth, B. B. | Wilson, N.
Lye, R. G.

Transferred from the Class of Student to that of Associate Member:
Barcelo, J. R. | Marien, E. R.

Transferred from the Class of Student to that of Junior:
Dery, T. | Ward, R. C.

September 23rd, 1919

Members:
Boyd, W. H. | Kyle, D.
Cornwall, C. A. K.

Associate Members:
Ault, H. W. | McDougall, J. C.
Balfour, H. E. | O'Connor, J. F.
Beauchemin, J. A. | Parker, S. R.
Chesnut, V. S. | Perry, F. M.
Frith, H. W. | Polet, M.
Fuller, H. P. | Pozer, C. H.
Habben, L. E. | Racey, H. W.
Hodsdon, D. W. | Runciman, A. S.
Jamieson, D. W. | Sherman, H. B.
Macdonald, W. C. | Wang, S.
MacLachlan, J. G. | Whitman, K. E.
McCarthy, T. V. | Young, W. I.

Juniors:
Bishop, A. L. | Plummer, W. E.

Transferred from the Class of Associate Member to that of Member:
Archer, A. R. | Hodgson, J. P.
Farmer, J. T.

Transferred from the Class of Junior to that of Associate Member:
Caron, J. C. | Kidd, G. H.

Transferred from the Class of Student to that of Associate Member:
Bengo, R. C. | Lammers, C. F.
Hay, A. K. | Taylor-Bailey, F. W.

Transferred from the Class of Student to that of Junior:
Allingham, F. | Little, E. C.
Chalmers, G. H. | Pringle, J. E.
Fuller, C. H. R.

Transferred from the Class of Junior to that of Associate:
Norrish, W. H.

October 28th, 1919

Members:
Butler, F. L. | Peek, R. L.
Ketchen, W. L. | White, A. H.

Associate Members:
Ball, A. N. | Johnston, S. W.
Barnes, F. M. | Keith, G.
Barnjum, H. F. G. | Macdonald, R. F.
Beck, E. H. | Mather, R. H.
Bowen, S. | McKiel, H. W.
Brown, L. L. | McLellan, J. W.
Butler, A. W. L. | Mutch, D. A. S.
Campbell, N. | Oldham, W. F.
Courtice, E. D. W. | Pease, E. R.
Cram, H. R. | Taylor, W. C.
Danks, F. A. | Whitelaw, A. R.
Doane, H. W. L. | Stuart, W. H.
Dryden, J. G. | Tawse, H. S.
Fairbanks, R. L. | Wood, J. R.
Fellowes, K. C. | Wynn, E. M.
Graham, A. G. | Young, A. G.
Hallock, B.

Juniors:
Chapman, E. W. G. | McDonald, W. S.
Cookson, L. H. | Poole, J. M.
Dawson, K. L. | Timbrell, E. G.

Transferred from the Class of Associate Member to that of Member:
Brakenridge, C. | Holden, J. C.
Brown, P. P. | Magwood, W. H.
Craig, J. C. | Mathieson, D. M.
Grim, W. A. E. | Saunders, R. G.

Transferred from the Class of Junior to that of Associate Member:
Bothwell, R. S. C. | Macrae, L. P.
DesRosiers, A. | Murray, W. P.
Fisken, A. D. | Saint-Laurent, J. B. O.
Gordon, J. M. | Spencer, R. A.
Hogarth, C. E. | Wilson, C. St. J.
Knight, F. C.

Transferred from the Class of Student to that of Associate Member:
Calvin, R. M. | Hepinstall, R. R.
Duncan, W. E. P. | Richardson, A. A.

Transferred from the Class of Student to that of Junior:
Alberga, G. F. | Johnston, G. W. F.
Brett, J. F. | Layne, G. F.
Gardner, W. M. | Mawhinney, W. G.
Johnston, B. A. | McPherson, D. E.

November 25th, 1919

Members:

Allison, P. L.	Roberts, P. B.
Dill, C. W.	Shirley, E. R.
Langley, G. R.	Sisson, C. E.
Macdonald, W. B.	Tarr, C. W.
Marble, W. O.	Westbye, P. P.
Morrison, J. W.	

Associate Members:

Anderson, G. B.	Jones, T. M.
Barns, B. L.	Kennedy, S. S.
Blanchard, C. H.	Lauzon, S. A.
Blanchard, G.	Martineau, J. O.
Bookhout, A. F.	McLaren, D. L.
Brisbane, J. S.	Melling, H. T.
Corbett, C. F.	Palmer, F. H.
Coutlee, W. F.	Perks, W. G.
Craig, J.	Pickrell, W. J.
Crashley, J. W.	Pope, S. D. H.
Croly, J. B.	Reid, G. C.
de Carteret, S. L.	Robertson, C.
Earnshaw, P.	Roblin, H. L.
Fletcher, W. J.	Seaton, N. D.
Forbes, J. H.	Stout, C. V.
Fowler, C. A. D.	Sutherland, A. L.
Gates, A. B.	Tripp, H. H.
Gilchrist, T. E.	Waring, J. A.
Gray, A. J.	Weekes, A. S.
Hall, E. K.	Bate, C. B.
Hervey, P. C. B.	

Juniors:

Cossette, M.	Reid, J. H.
Evans, C. T.	Roy, L. deB.
Hinton, R. E.	Scholfield, S.
Holmgren, E. L.	Shaw, C. B.
Lynch, H. A.	Stavert, R. E.
Lyon, J. E.	Thexton, R. D.
McKenzie, R. D.	Wills, D. C.
Patterson, J. F.	

Associate:

McAvity, G. C.

Transferred from the Class of Associate Member to Member:

Finlayson, J. N.	Hughes, G. B.
Fisher, S. J.	Swan, W. G.
Creig, A. R.	Tapley, F. B.
Herriot, G. H.	

Transferred from the Class of Junior to that of Associate Member:

Aggiman, J. N.	Nares, B. L.
Amoss, F. X.	Peden, E.
Ellis, D. S.	Spicer, P. O.
Gibson, J. M.	Taylor, G. R.
Hibbard, F. H.	Wells, E. E.
Hudson, G. M.	Youngman, W.
McColl, S. E.	

Transferred from the Class of Student to that of Associate Member:

Bruce, C.	McNeice, L. G.
Cavanagh, A. L.	Muntz, E. P.
Gage, E. V.	Smyth, E. S.

Transferred from the Class of Student to that of Junior:

Black, A. P.	Vance, J. A.
Loignon, H. H. B.	

December 30th, 1919

Member:

Winckler, G. W.

Associate Members:

Ames, F. T.	Morgan, N. L.
Anderson, J. M.	Morton, J. M.
Buchan, P. H.	Nourse, H. C. B.
Drummond, R.	Pratt, F. M.
Gleeson, L.	Ross, A. M.
James, H. C.	Roy, J. E.
Jones, F. S.	Smith, J. W.
Lionais, J. E.	Waddell, N. M.
Lumsden, J. F.	Whyte, G. H.
Maxwell, M. W.	Young, W. B.
McDougal, C. H.	Yuill, A. C. R.
Moore, R. C.	

Juniors:

Campbell, H. M.	Molesworth, John B. (Lord Congleton)
Lamb, J. M. M.	Perry, L. A.
Lancaster, H. P.	Watson, J. M.
Maxwell, R. J.	Wilkins, H. O. D.
Merry, F. S.	Wilson, J. S.

Associate:

Fraser, R. H.

Transferred from the Class of Associate Member to that of Member:

Dickenson, J. G.	Hill, E. M. M.
Hertzberg, H. F. H.	Munro, G. Reid.

Transferred from the Class of Junior to that of Associate Member:

Forsyth, J.	Shackell, S. W.
Gallaher, O. G.	

Transferred from the Class of Student to that of Associate Member:

Humphrey, A. E.	Macdonald, C. B. R.

Transferred from the Class of Student to that of Junior:

Weeks, R. E.

Report of Finance Committee

The Finance Committee submits a similar table to those prepared during the past few years, showing the receipts and expenditures for the last ten years, on which they comment as follows:—

1. In 1918 the receipts from *The Journal* are shown in Miscellaneous Earnings and the Expenses of *The Journal* in Printing and Stationery.

In 1919 the sum of $2,003.00, received as voluntary subscriptions to *The Journal* are shown in Miscellaneous Earnings, and the difference of $3,019.00 between the amount received from advertising and the expense of publishing *The Journal* is shown as a charge against Printing and Stationery.

2. For both years the difference between the cost of Printing and Stationery and the receipts from Miscellaneous Earnings is approximately the same so that these amounts may be ignored in making a comparison.

3. Excluding miscellaneous earnings, in 1919, there is an increase of approximately $[illegible] in the gross receipts. Both subscriptions and entrance fees show a large increase due to the extension that has taken place in the activities of *The Institute*. This increase is most satisfactory and, although most of our men have returned from the front, the subscriptions this year have not benefited to the full extent from their re-entry into civil life.

4. Excluding printing and stationery, in 1919, there is an increase of $12,278.00 in the expenses. This increase is accounted for as follows:—

Salaries and Wages	$6,265 00
General Expenses	1,848 00
Branch Operations	2,287 00
Legislation Committee	1,727 00
Other Amounts	151 00

The increase in Salary and Wages account is partly chargeable to *The Journal*, which would account for about $4,000.00 of the increase, partly to the large increase of work on account of the expansion in the membership and activities of *The Institute*, and partly due to the increases it has been necessary to make in the salaries of the Staff. The increase in general expense is not unreasonable and that in the expenses of Branches is caused by the increased number of Branches and the expense of the professional meetings.

5. A portion of the increased expenditure might be considered as extraordinary, but these extraordinary expenses will recur from time to time and your Committee feels that steps must be taken to obtain sufficient revenue to wipe out our present deficit. The publication of *The Journal* has cost *The Institute* approximately $[illegible] during the past year. This is largely caused by the inclusion in it of the Engineering Index, but this Index is of great service to our membership and *The Institute* may certainly feel greatly favoured by the generous arrangement by which this information is furnished us by the American Society of Mechanical Engineers. Your Committee considers it would be a great mistake to discontinue this publication, but that, in view of the benefit the membership receive from *The Journal*, a reasonable subscription for it is justified.

6. Your Committee, therefore, recommend that the by-laws be amended to restore the subscription fees to *The Institute* to the amount at which they stood before the subscription was deducted from them and that the present by-law charging $[illegible] per annum for a subscription to *The Journal* be retained. This would increase the revenue of *The Institute* about $[illegible] per annum and, with the larger receipts we may confidently expect from the current fees, should place it in a sound financial condition. In view of the length of time necessary to make a change in the by-law, your Committee would suggest that the Annual Meeting recommend the Council to request our membership to voluntarily agree to this proposition for the ensuing year.

ALEX. BERTRAM,
Treasurer.

MONTREAL, JANUARY [illegible], 1920.

RECEIPTS AND EXPENDITURES—THE ENGINEERING INSTITUTE OF CANADA

RECEIPTS.

		1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
(1)	Arrears Collected	$4,031	$2,092	$2,887	$1,994	$3,298	$6,703	$6,612	$[illegible]	$3,243	$3,703
(2)	Current Fees	9,491	11,893	13,897	15,037	15,616	12,438	13,176	15,359	15,538	19,118
(3)	Advance Fees	134	288	158	186	270	139	153	220	165	818
(4)	Entrance Fees	2,124	2,779	4,077	4,169	2,895	2,233	2,485	3,235	3,047	6,532
(5)	TOTAL	$15,780	$17,052	$21,019	$21,386	$22,079	$21,543	$22,426	$[illegible]	$21,993	$30,171
(6)	Interest Received	252	187	1,393	894	315	450	429	556	[illegible]	[illegible]
(7)	Miscellaneous Receipts	79	174	341	225	172	87	972	113	[illegible]	[illegible]
(8)	TOTAL	$16,111	$17,413	$22,753	$22,505	$22,566	$22,080	$23,727	$[illegible]	$[illegible]	$[illegible]

EXPENDITURES.

		1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
(9)	Interest Paid	—	—	$854	$1,695	$1,201	$1,200	$1,200	$1,200	$[illegible]	$1,301
(10)	Printing and Stationery	$6,268	$3,757	6,865	6,416	10,551	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(11)	Salaries and Wages	3,846	4,714	5,195	4,906	5,652	[illegible]	[illegible]	[illegible]	8,519	14,784
(12)	Taxes and Water	244	247	848	1,466	1,448	1,280	1,300	1,025	1,406	1,521
(13)	General Expense	2,670	4,198	4,307	5,257	4,812	4,151	3,260	4,612	[illegible]	7,113
(14)	Branch Societies	648	1,118	2,810	2,121	2,296	2,266	2,454	3,693	[illegible]	[illegible]
(15)	Legislation	—	—	—	—	—	—	—	—	—	1,727
(16)	TOTAL	$13,675	$14,034	$20,879	$21,861	$25,960	$19,776	$20,085	[illegible]	[illegible]	[illegible]
(17)	Excess Receipts	2,436	3,378	1,874	646	—	2,304	3,642	[illegible]	[illegible]	[illegible]
(18)	Excess Expenditures	—	—	—	—	3,394	—	—	[illegible]	[illegible]	[illegible]

STATEMENT OF ASSETS AND LIABILITIES AS AT 31st DECEMBER, 1919

Assets.

PROPERTY ACCOUNT			$89,041.64
FURNITURE:			
Balance as at 31st Dec., 1918	$2,254.15		
Added during year	1,293.65		
		$3,547.80	
Less 10% written off for depreciation		354.78	
			3,193.02
LIBRARY:			
Estimated Value of Books			6,330.00
INVESTMENTS, including Special Fund:			
Canada Permanent Mortgage Corporation Stock, 18 Shares Par Value, $10.00 each		$ 180.00	
Montreal Light, Heat & Power Co. Stock, 6 Shares Par Value, $100.00 each		120.50	
Dominion of Canada Victory Loan Bonds, 1927, $500.00 Par Value		500.00	
Dominion of Canada Victory Loan Bonds, 1934, $1,500.00 Par Value		1,500.00	
			2,300.50
ARREARS OF FEES—Estimated			5,000.00
ACCOUNTS RECEIVABLE:			
Advertising in Journal		$3,395.34	
Advances to Branches		350.00	
			3,745.34
GOLD MEDAL			45.00
CASH:			
Savings Bank Account		$ 529.83	
Current Bank Account		2,527.10	
Petty Cash on Hand		68.28	
			3,125.21
			$112,780.71

Liabilities.

SPECIAL FUNDS:		
Prize Fund Account	$468.77	
Leonard Medal	527.50	
Plummer Medal	500.00	
Fund in Aid of Members and Families	1,470,86	
		2,967.13
MORTGAGE ON PROPERTY:		
Royal Institute for the Advancement of Learning.		
Mortgage on Mansfield St. Property at 6%	$20,000.00	
Interest accrued thereon to date	216.67	
		20,216.67
ACCOUNTS PAYABLE		6,724.01
CANADIAN BANK OF COMMERCE LOAN		5,000.00
SUNDRY REBATES DUE TO BRANCHES		483.16
SURPLUS ACCOUNT:		
Balance as at 31st Dec., 1918	$84,184.09	
Less:		
Deficit for year to 31st Dec., 1919	6,439.57	
	$77,744.52	
Depreciation written off Furniture	354.78	
		77,389.74
		$112,780.71

Montreal, 14th January, 1920.

Verified: RIDDELL, STEAD, GRAHAM & HUTCHISON, C.A., Auditors.

STATEMENT OF REVENUE AND EXPENDITURE FOR THE YEAR ENDING 31st DECEMBER, 1919

Revenue

Subscriptions		
Arrears of Fees	$ 3,[illegible]	
Current Fees	19,[illegible]	
Advance Fees	[illegible]	
Entrance Fees	[illegible]	
		$30,1[illegible]
Interest		
Savings Bank Account	$ 57 04	
On Overdue Fees	217 44	
		274 48
Dividends		
Canada Permanent Mortgage Corporation Stock	$ 18 00	
Montreal Light, Heat & Power Co. Stock	27 00	
		45 00
Journal Subscriptions		2,003 00
Rent of Hall		49 00
Expenses of Committee, Rebate		33 66
		$32,567 26
Balance being excess of Expenditure over Revenue for the year ending 31st December, 1919		6,439 57
		$39,006 83

Expenditure

Interest on Mortgage		[illegible]
Office Supplies and Stationery		[illegible] 82
Books, Magazines and Library Expenses		[illegible]
Postage and Telegrams		[illegible]
Postage on Transactions		[illegible]
Salaries of Secretary and Office Staff		[illegible]
Caretaker's Wages and Service		[illegible]
Taxes		[illegible]
Water Rates		[illegible]
Repairs and House Supplies		[illegible]
Auditors' Fees		[illegible]
Students' Prize		[illegible]
Expenses—Annual Meeting		[illegible]
Expenses—Montreal Branch Meetings		[illegible] 12
Expenses—St. John Professional Meeting		[illegible]
Expenses—Western Professional Meeting		[illegible]
Insurance		[illegible]
Electric Light, Power and Gas		[illegible]
Fuel		[illegible]
Telephone		141 [illegible]
Bank Exchange		[illegible]
Miscellaneous Expenses		[illegible]
Legal Expenses		[illegible]
Gzowski Medal		[illegible] 97
Printing and Binding		[illegible]
Travelling Expense		[illegible]
Journal Expense		[illegible]
Certificates		[illegible]
Year Book Advertising		[illegible]
Branch Stationery and Supplies		115 [illegible]
Badges		[illegible]
Legislation Committee		[illegible]
Ontario Provincial Division		[illegible]
Quebec Provincial Division		[illegible]
Alberta Provincial Division		[illegible]
Donation		[illegible]
Transactions 1918, Balance Written Off		[illegible]
Examination Fees Overpaid		[illegible]
Rebates of Fees to Branch Societies		
Toronto	[illegible]	
Quebec	143 25	
Winnipeg	[illegible]	
Ottawa	[illegible]	
Vancouver	[illegible]	
Victoria	121 40	
Edmonton	[illegible]	
Calgary	[illegible]	
Saskatchewan	[illegible]	
Peterborough	[illegible]	
St. John	[illegible]	
Hamilton	[illegible]	
Halifax	[illegible]	
Sault Ste. Marie	[illegible]	
Niagara	[illegible]	
Border Cities	[illegible]	
		[illegible]
		$39,006 [illegible]

Montreal, 14th January, 1920.

Verified, Riddell, Stead, Graham & Hutchison, C.A.,
Auditors.

Report of the Library & House Committee

During the past year your Committee has investigated conditions in connection with the Library and has come to the conclusion that the Library can be made much more useful than it is at present. It was understood that money was not available for the Library during the past year and consequently no specific recommendations were made. We would point out, however, that in order to keep a technical library up to date, there must be added each year a reasonable percentage of new books on a number of subjects which are not at present properly covered. We recommend therefore, that an appropriation be set aside for the Library and that the incoming Library Committee be authorized to make a judicious selection of needed technical books. As a further means of making the Library more useful particularly to outside members, we would recommend the preparation of a Library Catalogue to be placed in the hands of all members of *The Institute.*

The staff quarters of the building are not sufficient for the headquarters' staff and a re-allocation should be made.

The Council has approved of the suggestion of the Library and House Committee that the expensive ventilating equipment in the basement of the building be sold. The amount realized from this should provide a reasonable fund for books for 1920.

Your Committee recommends that in future two separate committees be appointed, one to deal with the Library, the other the House.

Publications Received

The following publications were presented to *The Institute* during the current year:—

By Geo. A. Mountain, M.E.I.C.—Report of Board of Railway Commissioners of Canada, 1916.

By F. A. Combe, A.M.E.I.C.—Principles of Combustion in the Steam Boiler Furnace, by Arthur D. Pratt.

By W. Bell Dawson, M.E.I.C.—Reports of Tidal and Current Survey, 1894-1918.

By R. De L. French, M.E.I.C.—Handbook of Street Railroad Location, by John P. Brooks, Surveying Manual, by Pense & Ketchum, Manual of Field Engineering, by Ives & Hilts, The Building Law of the City of Boston, Acts of 1907-Chapter 550. Rural Sanitation in the Tropics, by Malcolm Watson, The Railroad Spiral, by Searles.

By F. C. C. Lynch, A.M.E.I.—Index Map, 1919, corrected.

By H. W. B. Swabey, M.E.I.C. Standard Instructions for Chief Examiners to Govern Inspection of Steel, Shell and Forgings.

By The Canadian Engineer.—Bound Volume XXXV, The Canadian Engineer, July-Dec. 1918. Bound Volume XXXVI, The Canadian Engineer, January-June 20, 1919.

By The Trautwine Company.—The Civil Engineer's Pocket Book.

By The American Institute of Consulting Engineers, Inc.—Constitution and By-Laws and List of Members.

By R. E. Horton.—The Measurement of Rainfall and Snow, by Robert E. Horton, Consulting Engineer, Albany, N.Y.

By The Canadian Ingersoll-Rand Company.—Compressed Air Data.

By C. F. Herington.—Powdered Coal as a Fuel.

By The Public Works Department of the City of Boston.—Annual Report for 1917.

By The Hydro Electric Power Commission of Ontario, Toronto.—Annual Reports for 1909; 1911, 1912, 1914, 1915, 3 volumes for 1916, 3 volumes for 1917, 1918.

By The Sturtevant Engineering Company.—Mechanical Draft.

By The Association of Dominion Land Surveyor.—Annual Report of Twelfth Annual Meeting.

By The Department of the Interior.—Topographical Surveys Branch Bulletin No. 42, The Testing of Aneroid Barometers at the Laboratory of the Dominion Land Surveys.

By The National Xray Reflector Company.—Lighting from Concealed Sources.

By The Altantic Loading Company, New York.—Construction and Operation of a Shell Loading Plant and the Town of Amatol, New Jersey, prepared by Victor F. Hammel, M. Am.Soc.C.E.

By The United States Housing Corporation, Washington, D.C.—Report of the United States Housing Corporation—Houses, Site-planning, Utilities.

By Octave Doin & Fils, Publishers, Paris France.—Mines, Grisou, Poussières.

By The D. Van Nostrand Company, Publisher, New York.—Motor Vehicles and Their Engines, by Fraser & Jones, The Location, Construction and Maintenance of Roads, by John M. Goodell, Asphalts and Allied Substances, by Herbert Abraham.

By Doran & Company, Publishers.—Gas and Flame, Aircraft in War and Commerce, Practical Flying.

By The Société Générale d'Etude et de Travaux Topographiques, d'Etudes et Travaux Géodésiques et Topographiques.

By Masson & Company, Publishers, Paris, France.—Les Applications de la Physique pendant la Guerre.

By McGraw-Hill Book Company, New York.—Concrete Engineers' Handbook, by Hool & Johnson.

The following additions were made in exchange of *The Journal* or the Transactions:

Technical Supplement to the Review of the Foreign Press, The Associated General Contractors of America Publications, Experiment Station Record, U.S. Department of Agriculture Revista Del Centro Estudiantes De Ingenieria, Professional Memoirs, Corps of Engineers, U.S. Army, Geological Survey Publications, U.S. Geological Survey Department, Publications of the Société Industrielle du Nord de la France, Journal of the U.S. Artillery, Publications of the University of Illinois Library, Shipbuilding and Harbour Construction Magazine, Oil News.

Respectfully submitted,

ALEX. BERTRAM,
Chairman.

Montreal, January 14th, 1920.

Report of Publications Committee

On behalf of the Publications Committee I beg to submit the following report for the year 1919:—

We recommend that the papers named below, and discussion thereon shall be printed in Transactions.

Manufacture of Munitions in Canada	H. H. Vaughan.
The Mount Royal Tunnel from an Economic Point of View	H. K. Wicksteed
The Mount Royal Tunnel	J. L. Busfield.
Mean Sea Level as a General Datum for Canada	W. Bell Dawson.
The Mining and Metallurgy of Cobalt Silver Ores	President Leonard.
The Design and Construction of Reinforced Concrete Viaducts. North Toronto. C.P.R.	B. O. Eriksen and H. S. Deubelbeiss.
Notes on the Test of a Girderless Floor	P. Gillespie. and T. D. Mylrea.
Suggested Harbour Improvements For Greater Montreal	E. S. M. Lovelace.
The Design of Hydro-Electric Power Plants for Combatting Ice Troubles	R. M. Wilson.
Railway Electrification	John Murphy.
Economics of Electric Operation of Railways	W. G. Gordon.
Railroad Electrification	F. H. Shepard.
Sooke Lake Water Supply. Victoria, B.C.	C. H. Rust.
The Bloor Street Viaduct. Toronto	Thomas Taylor.
The Operation of Railways as an Engineering Problem	V. I. Smart.
The Design and Construction of Reinforced Concrete Covered Reservoirs	R. deL. French.
Proposed Tidal Hydro-Electric Power Development of the Petitcodiac and Memramcook Rivers	W. R Turnbull.
The Toronto Drifting Sand Water Purification Plant	William Gore and William Storrie.

It is understood that discussion shall be revised where necessary before publication, and that in the case of papers, any general remarks pertinent only to the occasion of presentation of the paper, shall be deleted from Transactions. Members concerned will be expected to co-operate in making such revisions as are necessary.

Owing to the shortness of time available it was found impossible to give adequate consideration to the papers appearing in the December issue of *The Journal.* It is therefore recommended that these papers be considered by the Publications Committee for 1920, and that a similar procedure be followed in future.

According to By-laws the Transactions will also contain reports of the General Professional Meetings to which extended reference has been made in *The Journal* from time to time.

It is also recommended that a list of all papers appearing in *The Journal* be printed in Transactions, with corresponding reference, so that there may be available in one volume a complete statement of all publications in the form of papers by members of *The Institute.*

The report of the committee is unanimous.

On behalf of the committee I beg to remain,

Yours faithfully,

E. BROWN,
Chairman.

Montreal, December 29th, 1919.

Report of Honour Roll Committee

Since the report of your Committee last year considerable additional data has been received showing that the members of *The Institute* made even a greater and more creditable record at the Front than our previous report indicated.

This Committee is compiling all available information regarding the records of our men at the Front and it is hoped that within another year this work can be completed so that a final report may be made and published for the benefit of the membership.

Respectfully submitted,

C. N. MONSARRAT,
Chairman.

Montreal, January 14th, 1920.

Report of Board of Examiners and Education

The principal work of the Board during the year has been the consideration of such applications for admission and transfer as have been referred to the

Board by Council with a view to appraising the educational qualifications of the candidates. Although examinations have been specified for many applicants, very few offer themselves for examination, as the great majority of candidates, for Associate Membership particularly, prefer to wait until their experience enables them to attain that grade without examination.

The following table shown the number of candidates who presented themselves for examination and the general results:—

Schedule B	Passed	Failed	Total
Physics and Mechanics	2	3	5
Strength of Materials	4	1	5
Schedule C			
Railway Engineering	1	1	2
Electrical Engineering	1	0	1
Hydraulic Engineering	1	0	1
Total	9	5	14

H. M. MacKay,
Chairman.

Report of the Committee on Steel Railway Bridges

Your Committee desires to report as follows:—

It has during the year followed developments in the art of bridge design and construction, especially with regard to physical and chemical properties of material, the question of impact, standard engine loadings, standard clearances, column formulae etc., and a number of written communications have been discussed on these and other details of the subject.

During the year co-operation has been effected with Committee XV of the American Railway Engineering Association, which is doing similar work as this Committee, by submitting copies of our specification to that body and discussing various phases of our work with it. Members of their Committee were complimentary regarding the general makeup and sequence of our specification, and it is understood that their new specification will be modelled along similar lines. As a matter of information may be mentioned the fact that they have decided to recommend, as standard practice, a clearance diagram practically the same as ours, viz. 16 ft. wide x 22′6″ high from base of rail with small differences in the lower corners, and in addition they are adopting the Specifications on Materials put forth by the American Society for Testing Materials.

A rather full discussion has also been going on regarding assumed loadings for bridges. The concensus of opinion seems to be that Cooper's system of loading should be maintained, while there is a growing feeling that this system no longer gives the best results in view of the advent of the Mallet, Decapod and the Electric Locomotive, which are entirely different from the Consolidation Engine used in the Cooper system.

In addition to the foregoing some discussions have been sent in by various members of the Committee with respect to moveable bridges, which have been considered and are held for later action.

Your Committee thinks, therefore, in view of the still unsettled state of opinion in the various bodies studying these questions, it is not justified in making a definite report involving revisions at the present time in connection with the current specifications.

Respectfully submitted,
On behalf of the Committee,

P. B. Motley,
Chairman.

Montreal, Dec. 20, 1919.

Committee on International Affiliation

Your Committee on International Affiliation report that, while nothing of an official nature has transpired during the past year, the relations of our *Institute* with the great United States Engineering Societies have been of the most agreeable nature.

At our Annual Meeting in Ottawa last year, we were honored by the attendance of Dr. Ira C. Hollis, representing the American Society of Mechanical Engineers, Professor Comfort A. Adams, representing the American Institute of Electrical Engineers, and Mr. Flynn, representing the United Engineering Societies, who each delivered an address conveying the friendly and co-operative feeling of these Societies to our own.

Invitations have been received by many of our members to attend meetings of the various United States Engineering Societies and our Secretary was cordially welcomed by the American Society of Mechanical Engineers at their recent Annual Meeting in New York. We have enjoyed the friendly co-operation of the American Societies throughout the year and they have frequently expressed their willingness in every possible way to assist us in our Society work and in building up a strong engineering organization in Canada.

A concrete example of the splendid assistance rendered by the American Society of Mechanical Engineers is furnished by the arrangement they have made permitting *The Engineering Institute of Canada* to publish in its *Journal* the Engineering Index, which is compiled by that Society at great expense, for a nominal sum per annum. This Index is of great value to our membership, who receive it every month in our *Journal* and thus obtain a survey of all important articles relating to every branch of the Engineering profession.

H. H. Vaughan,
Chairman.

Report of the Engineering Standards Committee

Your Committee desires to present the following Report to *The Institute* as to the activities of the Canadian Engineering Standards Association for the year 1919:—

The Canadian Engineering Standards Committee was incorporated under Federal Charter on January 31st, 1919, as the Canadian Engineering Standards Association with the object of carrying out in Canada for the benefit of Canadian industries work similar to that done in England by the British Engineering Standards Association which has proved of such great industrial value.

The original members of the Canadian Engineering Standards Committee, before incorporation, are as follows:

Chairman—Sir John Kennedy, Consulting Engineer, Montreal, Harbor Commissioners & Chairman Advisory Cons. of Council, Institution of Civil Eng.

Vice-Chairman—Capt. R. J. Durley, O.B.E., Engineer, i/c Div. of Gauges & Standards I.M.B.

H. H. Vaughan, General Manager, Dominion Bridge Company, Montreal.

Hon. Sec'y.—Professor J. B. Porter, D.Sc. McGill University.

Lt.-Col. W. P. Anderson, C.M.G.—Chief Engineer, Dept. Marine, Ottawa.

M. J. Butler, C.M.G.—G. M. Armstrong-Whitworth Co., Montreal.

K. M. Cameron—Supervisory Engineer, Dept. Public Works, Ottawa.

E. Deville, L.L.D.—Surveyor General, Dept. of Interior, Ottawa.

G. H. Duggan—President, Dominion Bridge Co., Montreal.

J. M. R. Fairbairn—Chief Engineer, Canadian Pacific Railway Co., Montreal.

L. A. Herdt, D.Sc.—Chairman, Can. Electro Technical Commission, Montreal.

R. Hobson—President, Steel Co. of Canada, Hamilton.

Wm. Inglis—President, John Inglis Co., Toronto.

Major W. J. Keighthly—Chief Inspector, Military Stores, Ottawa.

A. B. Macallum, D.Sc. F.R.S.—Chairman, Hon. Advisory Council, Ottawa.

D. H. McDougall—President, Nova Scotia Steel Co., New Glasgow.

J. C. McLennan, D.Sc. F.R.S.—Professor of Physics, University of Toronto, Toronto.

P. L. Miller—G. M. Canadian Vickers Co., Montreal.

Lt.-Col. C. N. Monsarrat—Cons. Eng. Dept. Rys. & Canals, Ottawa.

R. A. Ross—Cons. Eng. & Member Hon. Advisory Council, Montreal.

R. F. Ruttan, M.D.—Prof. Chemistry, McGill University & Member Hon. Advisory Council, Montreal.

A. Surveyer—Cons. Eng. & Member Hon. Advisory Council, Montreal.

A. Stansfield, D.Sc.—Prof. Metallurgy, McGill University, Montreal.

W. F. Tye—Con.s Engineer, Montreal.

E. O. Way—Chief Inspector, Weights & Measures, Ottawa.

Officers of the Canadian Engineering Standards Association as of December 1st, 1919.

Chairman	Sir John Kennedy
Vice-Chairmen	H. H. Vaughan T. A. Russell
Hon. Secretary	J. B. Porter, D.Sc.
Secretary.....	R. J. Durley, O.B.E., Room 112, Western Block, Ottawa, Canada.

The Nominated Members of the Main Committee of the Association as of November 1st, 1919, Are:

	Nominated by
Robert Hobson, Steel Co. of Canada Hamilton............ R. E. Jamieson, President, Dominion Rubber Co., Montreal. A. R. Goldie, Goldie & McCulloch Co., Galt, Ont.	Canadian Manufacturers Ass'n.
D. H. McDougall, Nova Scotia Steel & Coal Co., New Glasgow A. Stansfield, D.Sc., Prof. Metallurgy, McGill Univ., Montreal.	Canadian Mining Institute
W. J. Francis, Cons. Engineer, Montreal.................... W. F. Tye, Cons. Engineer, Montreal.................... H. H. Vaughan, Dom. Bridge Co., Montreal..	Engineering Institute of Canada
A. B. Macallum, F.R.S., Chairman, Research Council, Ottawa. J. C. McLennan, F.R.S., Prof. Physics, Toronto University R. A. Ross, Consulting Eng., Montreal.	Advisory Council for Scientific and Research

G. H. Duggan, Dominion Bridge Co., Montreal................ Sir John Kennedy, Consulting Engineer, Montreal. J. B. Porter, D.Sc., Prof. Mining Engineering, McGill University, Montreal.	Institution of Civil Engineers
P. Gillespie, Prof., Applied Mechanics, University of Toronto. T. A. Russell, Willys-Overland of of Canada, Toronto. J. Watson Bain, Chemical Engineer, University of Toronto.	University of Toronto
A. S. Eve, F.R.S., Prof. Physics, McGill University, Montreal. L. A. Herdt, D.Sc., Prof. Electrical Engineering, McGill University, Montreal. H. M. Mackay, Prof. Civil Engineering, McGill University, Montreal.	McGill University
Aurelien Boyer, Ecole Polytechnique, Montreal. Sir J. Geo. Garneau, Nat. Battlefields Commission, Quebec. A. Surveyer, Consulting Engineer, Montreal.	Laval University

Ex-Officio Members Are:

Lt.-Col. W. P. Anderson, C.M.C., Ottawa......................	Dept. of Marine.
K. M. Cameron, Assistant Chief Engineer....................	Dept. Public Wks.
E. Deville, LLD. Surveyer General	Dept. Interior.
A. D. Dion, Ottawa Electric Co.	Canadian Electrical Ass'n.
J. M. R. Fairbairn, Chief Engineer, C. P. R., Montreal.....	Canadian Pacific Ry.
F. A. Gaby, Chief Eng., Hydro-Electric Commission of Ontario, Toronto.....................	Hydro-Electric Comm. of Ontario
J. H. Grisdale, Deputy Minister..	Dept. Agriculture
H. G. Kelley, Pres. G.T.R., Montreal.....................	Grand Trunk Ry.
Mjr. W. J. Keighthley, Chief Inspector of Artillery Stores, Ottawa......................	Department of Militia and Defence
W. S. Locky, Acting-Sec'y., War Purchasing Commission, Ottawa......................	War purchasing Commission
Lt.-Col. C. N. Monsarrat, Consulting Eng..................	Dept. Railways and Canals
Lt.-Col. G. Ogilvie, C.M.G. Chief Inspector of Explosives........	Dept. of Mines
Eng-Commander T. C. Phillips, Consulting Naval Engineer....	Dept. of Naval Service
J. Stadler, President, Belgo-Canadian Pulp & Paper Co., Shawinigan Falls.............	Canadian Pulp & Paper Association
A. F. Stewart, Chief Engineer, Canadian National Railways..	Canadian National Railways

Co-Opted Members Are:—

Prof. L. W. Gill................	Queen's University
J. G. Morrow — Inspecting Engineer, Steel Co. of Canada......................	Hamilton

Sectional and Sub-Committees

Eight sectional committees, four sub-committees and one special committee have now been formed, as per following list, but none of these committees has yet had time to complete its report.

Name	*Authorized*	*Chairman*
Sectional Committee on Aircraft Parts	In 1918 by the then existing Engineering Committee. Confirmed by Main Committee, June 4, 1919.	Prof. P. Gillespie, University of Toronto.
Sectional Committee on Steel Bridges and Construction	June 4, 1919	G. H. Duggan, Dominion Bridge Co.
Sub-Committee on Steel Railway Bridges	June 4, 1919	R. B. Motley, Engineer of Bridges C.P.R.
Electrical Sectional Committee	June 4, 1919	Dr. L. A. Herdt, McGill University.
Sub-Committee on Incandescent Lamps	June 4, 1919	John Murphy Dept. of Railways & Canals.
Sub-Committee on Telegraph & Telephone Wire	June 4, 1919	W. J. Duckworth, G. N. W. Tel. Co.

Sub-Committee on Transformers	June 4, 1919	A. A. Dion, Ottawa Electric Co.
Sectional Committee on Wire Rope	June 4, 1919	Prof. H. M. Mackay, McGill University
Sectional Committee on Rails & Track	June 4, 1919	J. M. R. Fairbairn, Chief Engineer, C.P.R.
Sectional Committee on Screw Threads	Sept. 8, 1919	H. H. Vaughan, Dominion Bridge Co.
Sectional Committee on Steel	Sept. 8, 1919	J. G. Morrow, Steel Co. of Canada, Hamilton
Sectional Committee on Machine Parts	Sept. 6, 1919	A. R. Goldie, Goldie & McCulloch Galt, Ont.
Special Committee to confer with British Delegates regarding Electrical Fittings	Sept. 8, 1919	E. G. Burr, Consulting Engineer, Montreal

Work in Progress

Aircraft Parts

The Sectional Committee on Aircraft Parts, which was the first to be formed at the request of the British Engineering Standards Association, has acted as the Canadian Committee of the *International Aircraft Standards Commission* and has sent delegates to England to take part in the work of that body. Its advisory sub-committees act as the Canadian members of the Advisory Committees of the I.A.S.C. and have furnished reports on the following subjects for submission at the next plenary meeting of the I.A.S.C. which is expected to be held in Paris in the early part of 1920.

Reports by Canadian Members of Advisory Committees of the International Aircraft Standard Commission

(1) Mechanical Tests,
(2) Chemical Analysis of Steel,
(3) Tolerance on drawn bars,
(4) Magnetos and Sparking Plugs, Electrical Work,
(5) Propeller Hubs, Ball Bearings, Wheel Axles, Hubs, Rims and Tires,
(6) Steel Tubes,
(7) Tests on Wood,
(8) Fabric.

Communications have been addressed to the Air Board, Canada, with the view of obtaining for the Sectional Committee on Aircraft Parts proper governmental recognition as the Canadian section of the International Aircraft Standards Commission. If this approval is given, the C.E.S.A. Committee will have the same recognition from the Canadian Government as the British Government has given to the corresponding Committee of the B.E.S.A.

Incandescent Lamps

In accordance with a suggestion forwarded by *The Engineering Institute of Canada* a sub-committee has been formed with instructions to draft a Canadian specification for tungsten and gas-filled lamps which will be acceptable to makers, importers and users in this country. The opinions and suggestions of the various members are being obtained in writing and will be submitted as a basis of discussion at the first meeting which is shortly to be held.

Transformers

At the suggestion of some of the engineers of the Ontario Hydro-Electric Commission, a sub-committee has been formed and is engaged in drafting a Canadian specification for the external characteristics of pole and service type transformers. As complete information as possible has been collected regarding American and British practice and is being forwarded to the members for consideration.

Galvanized Telegraph and Telephone Wire

At the request of one of the large steel companies a sub-committee has been formed with a view of drafting uniform specifications for two or three grades of iron telegraph and telephone wire which will be acceptable to all telegraph and telephone authorities in Canada. The idea has the interest and support of all concerned and information regarding present practice is being collected and placed before the members for consideration.

British Electrical Fittings

At the request of the B.E.S.A., a Committee has been appointed to receive the views of the Institution of Electrical Engineers of Great Britain and the British Electrical and Allied Manufacturers' Association regarding the difficulties experienced by British electrical manufacturers in obtaining the same recognition in Canada for their fittings as is accorded to equipment of American or Canadian manufacture. A delegation from the above-named bodies is expected to visit Canada in the near future for the purpose of placing its views before the committee in question. The results of this conference will afford much necessary information for another special committee which is in course of organization with the purpose of formulating the electrical portion of a Canadian Underwriters Code.

Rails and Track

A sectional committee has been appointed to endeavour to obtain uniform practice in regard to the requirements for rails and track fastenings on behalf of the various railroad administrations in Canada. The necessary preliminary information is being collected, the views of the engineering departments of the railroads are being obtained. The committee will consult with the manufacturers regarding any commercial difficulties that may occur in furnishing the desired material and will then formulate their specifications.

Wire Rope

In response to a desire expressed in several quarters for authoritative Canadian specifications for wire rope in accordance with which tenders could be asked for, a sectional committee has been appointed to investigate the question and report whether it is possible to draw up such specifications for wire rope for mining, dredging and similar purposes as will obtain general acceptance in Canada. The opinions so far expressed indicate the desirability of preparing such specifications, and this Committee will shortly be in a position to report.

Steel Railway Bridges

A committee of *The Engineering Institute of Canada* has for the past two years been engaged in the preparation of a Canadian specification for steel railway bridges, which is now in draft form. It has been handed over by the E.I.C. to the C.E.S.A. in order that the specification as finally issued may have the widest possible acceptance and may agree in all essential points with the corresponding specifications of authoritative bodies in the United States. Co-operation with the corresponding committee of the American Railway Engineering Association is being arranged for, and it is hoped will result in substantial agreement and an early issue of the specification.

Work About to Commerce

Committees on the following are being formed but have not yet commenced work:—

Screw Threads

A Sectional Committee on Screw Threads is being formed for the purpose of co-ordinating any work in connection with screw threads which may be carried out by any of the other committees. It will also report to the main committee regarding certain measures looking to the International standardization of screw threads and will co-operate with similar committees in Great Britain and the United States.

Steel

A sectional committee on steel is in process of formation, its duty being to co-ordinate the work in connection with the quality of steel carried out by any other committees of the Association and also to consider such questions regarding steel specifications as may be submitted to it. One of its first tasks will be the drafting of a Canadian specification for steel billets for forging purposes.

Machine Parts

A sectional committee on Machine Parts has been authorized for the purpose of dealing with a number of questions which have been raised, such as standard forms for rivet heads, standard proportions for bolt heads and nuts, etc., on which agreement between various Canadian manufacturers seems very desirable.

Work Under Consideration

The following subjects are being considered by the Main Committee with a view to further action. Enquiries are being made in each case as to the possibility and desirability of successful work:—

Canadian Electrical Code,
Standard sizes for mining drill steel & drill chucks,
Railroad frogs and switches,
Uniform grading rules for lumber,
Tooth, sprocket and bevel gearing,
Automobile details & components, and Coil Chains.

Respectfully submitted,

L. A. Herdt,
Chairman.

Engineering Standards Committee.

Report of the Committee on Uniform Boiler Specifications for the Dominion of Canada

Members of Committee

R. J. Durley, W. G. Chace, F. G. Clark, D. M. Robb, Logan Waterous, H. H. Vaughan; L. M. Arkley, *Chairman.*

In our report of last year it was intimated that the Chief Boiler Inspectors of Ontario and the Western Provences were working along the same lines as your Committee and that they had agreed to submit their proposed Uniform Boiler Rules to us for constructive criticism before sending them to the respective Provincial Legislatures for adoption.

In accordance with the above agreement R. N. Blackburn, Secretary, Chief Inspector of Boilers for Sask. forwarded a copy of the proposed rules to your Committee for consideration. The rules are divided into three sections.

First, those covering high pressure steam boiler installations, second, those covering low pressure or heating installations, and third, rules for the construction of tanks and receptacles for compressed air and other gases.

The rules follow closely in many respects those of the Boiler Code Committee of the American Society of Mechanical Engineers, differing from them only in certain points where the changes were considered to afford a greater element of safety.

Some of the good features of the Board of Trade Rules are also included. The Toronto Sub-Committee of your Committee considered these very carefully and drew up a list of changes, (mostly of minor importance), which were submitted to Mr. Blackburn, and most of them were accepted by him as improvements.

Your Committee is of the opinion that the adoption of these rules by all Provinces of the Dominion would be an excellent thing for Canada, and that the E.I.C. should lend its influence to this end.

J. M. Arkley,
Chairman.

Report of Electro-Technical Committee

This Committee takes pleasure in being able to report that during the year 1919 the activities of the Commission have considerably increased, this condition being rendered possible by the cessation of hostilities.

Meetings of the Special Committee on Rating were held in Paris, France, during the month of May, Canada being represented by Col. L. W. Gill, a member of the Canadian Committee.

The Canadian Committee met in Ottawa in September, C. Le Maistre, the General Secretary of London, Eng., being present.

A plenary Commission Congress was held in London in October, Canada being represented by A. P. Trotter, of London, Eng. At that meeting decisions were reached on a number of important questions, particularly on the rating of electrical machinery, a full report thereon being now on the press. It was arranged to hold the next congress on this side of the Atlantic.

Respectfully submitted on behalf of the Canadian Committee.

A. B. Lambe, *Secretary.* L. A. Herdt, *Chairman.*

Meetings

Professional meetings were held as follows:—

Ottawa Professional Meeting, held at Ottawa, February 11th, 12th and 13th, at which the following papers were read:—

Standards in Engineering, by Capt. [illegible], M.E.I.C.

The Development and Future of Aviation in Canada, by M. R. Riddell.

Soldiers' Civil Re-Establishment, by Major [illegible].

National Highways and Good Roads, by Capt. J. Duchastel, M.E.I.C.

Design of Hydro-Electric Plants for Combatting Ice Troubles, by R. M. Wilson, M.E.I.C.

Railway Electrification, by John Murphy, M.E.I.C.

Montreal Tunnel, by J. L. Busfield, A.M.E.I.C.

Mean Seal Level Datum for Canada, by Dr. W. Bell Dawson, M.E.I.C.

Mining and Metallurgy of Cobalt Silver-Ores, by Lt.-Col. R. W. Leonard, M.E.I.C.

Maritime Provinces Professional Meeting, held at St. John, September 10th, 11th and 12th, at which the following papers were read:—

The Usefulness of Vegetation in Maritime Engineering, by E. T. P. Shewen, M.E.I.C.

Forestry in New Brunswick, by G. H. Prince.

Water Powers of New Brunswick, by C. O. Foss, M.E.I.C.

Proposed Tidal Hydro-Electric Power Development of the Petitcodiac and Memramcook Rivers, by W. Rupert Turnbull, F.R.Ae.S.

The Construction of the Bear River Bridge, by A. T. Macdonald, A.M.E.I.C.

High Potential, High Frequency Apparatus and Experiments, by F. P. Vaughan, A.M.E.I.C.

Engineering Problems Involved in the Use of Telephone Cables, by F. A. Bowman, M.E.I.C.

Heating Problems Produced by Some of the Modern Methods of Building Construction, by W. F. MacKay, A.M.E.I.C.

Problems of the Canadian Engineers in France, 1918, by R. F. Armstrong, A.M.E.I.C.

Western Professional Meeting, scheduled for Edmonton, Alta., July 11th, 12th and 13th, was postponed until next year.

ANNUAL REPORT OF BRANCHES

Victoria Branch

The list of Branch Members contains 81 names, 27 Members, 47 Associate Members, 4 Juniors and 3 Students. There are 59 *Institute* members of all grades still resident in Victoria, 10 have left or retired and 12 are still not back from war service. Of the 59 resident in the city only about 28 are active, and one has to give the word all the latitude possible to include so many. 6 of these 59 have either been elected or transferred this year.

It appears that 59 is not a large percentage of the total number of Engineers who are eligible to be elected as members of *The Institute* in one or other of the grades, and 11 seems a small number to show as members on the Island outside the radius of the jurisdiction of the branch.

Officers for 1920

Chairman	A. E. Foreman.
Vice-Chairman	A. W. R. Wilby.
Treasurer	E. Davis.
Secretary	H. M. Bigwood.
Executive	R. A. Bainbridge, W. M. Stokes.

Report of Legislation Committee

In accordance with instructions, the Legislation Committee forwarded a letter on June 5th to members of each of the following bodies:—

B.C. Technical Association.
British Institute of Civil Engineers.
Electrical Engineers.
Engineering Institute of Canada.
Engineering and Technical Institute of B.C.
Mechanical Engineers.
Mining Institute of Canada.

After the different Associations had met and appointed their representatives, the Joint Committee was called together on August 14th—the following officers were elected:

A. E. Foreman	Chairman.
G. P. Napier	Secretary.

A meeting was again called on Oct. 6th, and business arising out of resolutions passed at previous meetings discussed, and the draft bill was considered clause by clause.

A Sub-committee, consisting of A. E. Foreman, D. O. Lewis, E. N. Horsey was appointed to submit a revised draft of the proposed bill. This Sub-committee reported to the Joint Committee on Nov. 17th, and the suggested changes were approved. A. E. Foreman and D. O. Lewis were appointed a Sub-committee to meet the representatives from the Vancouver Sub-committee.

The Chairman met the members of the Vancouver Branch of *The Engineering Institute* and placed before them the amendments suggested by the Victoria committee.

The Joint committee met on Tuesday, Dec. 16th, and considered a draft Bill as prepared by the Vancouver committee, and this bill, as amended, is being mailed to engineers throughout the Province, with a questionaire requesting their opinion upon the principle of asking for legislation restricting the practice of engineering, or legislation restricting the use of the term "Professional Engineer."

Respectfully submitted,

A. E. Foreman,
E. N. Horsey.

Papers Committee

The Papers Committee submitted the following programme:—

Dec. 17th.—Address by A. E. Foreman:
"Organization and Work of the Provincial Public Works Department."

Jan. 21st.—Paper by D. O. Lewis:
"Development of Railways."
Feb. 18th.—Paper by W. F. Best:
"Geology of Coal Mines."

Mar. 18th.—Illustrated address by Prof. E. G. Matheson:

"Sub-aqueous Foundations."

Apr. 15th.—Illustrated Paper by E. P. Girdwood:
"River Protection, Roads and Bridges."

Balance Sheet 1st December, 1918, to 1st December, 1919

Balance in Bank, 1st December, 1918	$181.61	
Cash in hand	8.98	
		$190.59
Receipts:		
Fees due prior to 31st December, 1918	66.50	
Fees due for 1919	119.02	
Rebates from Engineering Inst., Montreal	102.12	
Interest on War Bond	5.50	
		$293.14

Disbursements:

Rent of Club Room, 1st December, 1918, to 30th November, 1919	$180.00		
Telephone	4.80		
Telegrams	[illegible]		
Postage Stamps, etc	13.74		
Stationery	.50		
Binding Books	5.00		
Technical Papers	12.20		
Lecture by A. S. Wheeler	13.00		
Tobacco Fund for Soldiers	25.15		
Typewriter	60.00		
Frame for Roll of Honour	7.00		
		$331.17	
Excess of Disbursements over Receipts			$ 38.03
			$152.56

Liquid Assets:

Victory Bond	$ 99.11
Bank Balance	139.10
Cash	13.46
	$251.67

HORACE H. BIGWOOD,
Secretary.

Calgary Branch

During the year 1919 there have been held four general meetings and two special meetings with addresses and ten Executive Committee meetings.

The following were the speakers at the general and special meetings:

January 15th, Eugene Coste, Member British Institute of Mining and Metallurgy, Member Canadian Mining Institute, "Petroleums and Coals."

January 29th, Dr. T. H. Blow, M.L.A., "Technical and Scientific Education."

February 18th, Arthur O. Wheeler, D.T.S., "Surveying the Great Divide of the Rocky Mountains."

This lecture, to which the public was invited, was given in the auditorium of the Public Library and was well illustrated by lantern slides of the Mountains.

February 24th, Mr. Dalzell, Secretary of the Vancouver Branch and the representative of the Cement Gun Company both addressed the meeting.

Mr. Dalzell spoke on the "Protective League for Technical Men" just organized in Vancouver and the Cement Gun Company's representative gave an informal talk on the many remarkable uses of the Cement Gun, both subjects proving very interesting.

March 21st, Brig.-Gen. Harold F. McDonald, Junior Member E.I.C., "The Work of Engineers in the War."

As viewed by the speaker from his standpoint of "Fighting Man", who was himself an Engineer by training before the war.

The meeting was in the nature of a welcome to the General by the Branch, and a renewal of old friendships. At the same meeting Major Muckleston, M.E.I.C., former Chairman and one of the organizers of the Branch was given a hearty welcome on his return from overseas.

May 1st, G. W. Craig, M.E.I.C., Chairman; Mr. A. S. Chapman, A.M.E.I.C., "Sewage Treatment."

It had been anticipated that the Western Professional Meeting for the Western Provinces would be held in Edmonton in July but Fraser S. Keith who was here in June reported that prospects for any attendance from Manitoba and Saskatchewan were not good on account of strike conditions.

It was therefore decided to suggest to the Edmonton Branch that it be postponed. This was done and eventually this meeting was definitely cancelled for this year on account of lack of support which made this course seem advisable.

During the year thirteen have joined *The Institute* and Branch or obtained transfer to higher grade as follows:

1 Member
6 Associate Members
2 Junior Members
1 Student Member
2 Affiliates of the Branch

and in addition one Transfer from Junior to Associate Member.

The following applications have been received and are being dealt with:—

1 Member
5 Associate Members
1 Transfer Associate Member to Member
1 Transfer Student to Associate Member.

While the Branch has lost some of its members quite a few of our former active and valued ones have returned from overseas notably. Messrs. Muckleston, Jennings, Duke, Meek, Montague, Beach and Hanna.

The present Membership of the Branch totalling 87 is divided as follows:—

Members	[illegible]
Associate Members	[illegible]
Junior Members	[illegible]
Student Members	[illegible]
Associate Member	[illegible]
Affiliates of the Branch	[illegible]
Total	87
With 8 applications pending	8
Making a Total	[illegible]

against 76 a year ago.

This includes but four men who as far as our present information goes are still considered as with the Allied Armies.

Legislation

During the year good progress has been made on the subject of Legislation.

The Membership of the Alberta Branches prepared a draft Act which met with the approval of the Alberta membership, and it was decided to introduce it at the 1919 session of the Provincial Legislature.

Late in December 1918 opposition to the proposed effort to secure the passage of this act was encountered from the Northern Alberta Branch of the Candian Mining Institute and a Committee headed by Mr. Peters was sent to Edmonton to meet them.

This Committee with several members of the Edmonton Branch were successful in securing at that time an interview with the Premier.

The joint Rocky Mountain and Northern Alberta Branches of the Mining Institute were again addressed on the subject at their meetng in Calgary in January.

As they were still opposed to any effort we might make toward the passage of the bill until they had more time to consider the matter, it was decided to drop it for the time being.

Later on, the subject was discussed at the annual meeting at Ottawa and as a result a Committee of delegates from the Branches met at Montreal in April and framed a Model Act which was submitted to the whole membership of *The Institute*, the plebiscite showing a strong sentiment in favor of legislation along the lines of the Model Act.

It is expected that an effort will be made this coming winter to get an Act passed in this Province.

A financial statement for the year is attached hereto.

Calgary, Alberta,
November 26th, 1919.

Dec. 2nd, 1919.

Financial Statement for the Year ending Nov. 30th, 1919

Receipts

Balance in Bank, Dec. 1st, 1918	$200.63
Fees from Members	19.35
Rebates from Parent Institute	119.95
Interest on Bank Account	2.38
Interest on Victory Bond	16.50
	$358.81

Expenditures

Stationery, Printing and General Expense	$ 91.00
Books and Magazines	25.30
Miscellaneous	101.80
Balance in Bank Nov. 30th, 1919	140.71
	$358.81

Assets of Branch

Bank Balance	$140.71
3—$100.00 Victory Bonds	300.00
	$440.71

Respectfully, submitted,

C. M. Arnold,
Sec.-Treas.

Saskatchewan Branch

The third annual report of the Saskatchewan Branch, *Engineering Institute of Canada*, is herewith respectfully submitted:—

The outstanding feature of the past season was the fact that our Branch was able to extend a hearty welcome to all of its members, except two, who had been overseas. One of our members, Major A. de C. Meade, A.M.E.I.C., met an accidental death in Ireland, while another member, Lt.-Colonel K. M. Perry, A.M.E.I.C., has been detained in England in connection with special duties. The Branch is very thankful for the fact that it has not lost a single member in action, while nearly all of them were decorated; the last one being Lt. W. E. Longworthy, who received the Military Medal from the hands of the Prince of Wales during his recent visit here.

A gratifying sign of the interest which engineers throughout the Province are taking in *The Institute* is the fact, that the membership of our Branch has increased during the past year by 21 members, while there are still about 12 applications from engineers in this Province in the hands of Council. We lost one Affiliate through resignation, on account of his transfer to the United States and five Members, through their having moved to another Province. Though the membership in the Branch is voluntary for any member of *The Institute* living more than twenty-five miles from Regina, yet there is not a single member who does not belong to the Branch. We have at present a membership of 108, including Affiliates.

The Branch can look back upon a very active year, as far as the participation of the membership at large and the Committee work is concerned. Special mention has to be made of the work of our Concrete Committee (Chairman, H. McIvor Weir, M.E.I.C.), with headquarters at Saskatoon, and of our Legislation Committee (Chairman, C. P. Richards, A.M.E.I.C.). The former is conducting a series of experiments as to the influence of Alkali Soils on Concrete. The University of Saskatchewan very generously put their laboratories and a special assistant at the disposition of this research work and Prof. C. J. Mackenzie, A.M.E.I.C., is in charge of all work in this connection.

Our Legislation Committee had a very busy year, considering the proposed Legislation and the new Branch By-Laws. The bill as proposed by the Montreal Committee of *The Engineering Institute of Canada* was submitted to the Government of the Province for enactment at the present session. The Government has approached our representatives recently, suggesting certain changes in our Act, before they would submit it to the house, and the negotiations in this respect are still pending at the time of making this report.

There were ten meetings of the Executive Committee of the Branch, seven regular and three special meetings of the Branch during the past season and some of the papers read are as follows:—

"Can Earth Roads be made Satisfactory," by H. S. Carpenter, A.M.E.I.C.

"Rural Paved Roads for Saskatchewan," by D. A. R. McCannell, A.M.E.I.C.

"Economical Road Building," by W. M. Stewart, A.M.E.I.C.

"Recent Experiments with Gas Engines," by Prof. A. R. Greig, M.E.I.C.

"Drainage Assessments," by H. G. Phillips, A.M.E.I.C.

"Remarks on Saskatchewan River Water Supply," by A. J. McPherson, A.M.E.I.C.

We again had the privilege of welcoming Fraser S. Keith, the General Secretary at our Annual Summer Meeting, which was held at Regina, and hope that his visit will be a regular annual event. We were very sorry that General Sir Alexander Bertram was prevented at the last minute from making his proposed Western trip, and we regretted that circumstances made it advisable to cancel the proposed Western Professional Meeting.

We were favored by a paper on "Briquetting of Lignites," by R. deL. French, Engineer of the Lignite Board, and also by a vist of A. J. Dalzell, M.E.I.C., the past Secretary of the Vancouver Branch.

The financial statement is very satisfactory, but our Branch was obliged to levy a Special Assessment of five dollars for 1919 from their members, owing to the reduced rebates from Montreal.

Total Income	$555.40
" Expenditure	374.29
Balance on hand	$179.11

Of the total Income, $34.70 was carried forward from last year, and $145.70 represent rebates received from Montreal. A grant of $50 was made by the Branch towards the work of the Concrete Committee, to which the University of Saskatchewan was good enough to contribute considerable funds.

Assets and Liabilities

Assets:

Cash Balance in Bank	$179.11
" " in hands of Concrete Committee	34.00
Outstanding Branch Assessments and Fees of Affiliates	107.00
Outstanding Rebates	59.00
Total Assets	$379.11

Liabilities:

Outstanding Accounts	$ 17.82
Excess of Assets over Liabilities	$361.29

All of which is respectfully submitted.

H. S. Carpenter,
Chairman.

J. S. De Speir,
Sec'y.-Treasurer.

Regina, January 5th, 1920.

Sault Ste. Marie Branch

On December 16th, 1918, a meeting of Corporate Members of *The Engineering Institute of Canada* resident in Sault Ste. Marie, Ont., was called with a view to forming a local Branch. It was the unanimous opinion of those present that permission should be sought from Council to form such a Branch. On December 27th petition was forwarded to Council, permission granted and inaugural meeting held January 9th, 1919, with Fraser S. Keith present. At this meeting the permanent officers were elected, including a representative on the Provincial Division.

Preliminary Branch By-Laws were drawn up at an executive meeting on January 21st, in which the regular meetings of the Branch were to be held monthly on the last Thursday, except in the months of July and August.

During the year of 1919, the meetings have been well attended, papers, generally of local interest, read and freely discussed and some action taken in matters pertaining to the affairs of *The Institute* and the engineering profession as a whole.

Due to the very diversified interests of local engineers, it has been found practically impossible to touch deeply professional matters, and for this reason, the aim has been to keep the papers and discussions to topics of general and local interest. It has been impossible to divide the different branches of engineering, i.e., civil, mechanical, etc., and to hold meetings of particular interest to the separate branches, due to lack of members rather than enthusiasm.

The membership of the Branch is gradually increasing. We have lost a few members and have added to our numbers one Member, eight Associate Members, one Junior and one Student, making a total membership of:—

3 Members.
15 Associate Members.
2 Juniors.
1 Student.
[illegible] Branch Affiliates.

At the time of formation of the Branch, an advance of fifty dollars was made by Headquarters. Present Bank balance is forty-four dollars and sixty-two cents. The deficit is due to the expense of starting the Branch being rather heavy in proportion to the Membership. The balance, however, will return to the correct side of the ledger on the next rebate of dues.

On the whole, the past and first year of the Branch has been successful. It is the hope of the Executive to make the year 1920 more successful and to bring a number of new members into *The Institute.*

Respectfully submitted,

NEWTON L. SOMERS,
Sec.-Treas.

Border Cities Branch

The Border Cities Branch wish to submit the following report of their activities for the year 1919.

The early months of the passed year were taken up chiefly with matters of organization. On January 17th an informal dinner and meeting was held to which were invited all those interested in the proposed Branch. At this meeting Mr. Keith, who managed to be with us for a few hours, spoke on the aims and objects of *The Engineering Institute of Canada*, the necessity of such an organization, and the benefits of membership.

The first regular meeting for definite organization was held on March 21st. At this meeting the following officers were elected for the year 1919:—

Chairman	J. A. W. Brown.
Secretary	G. C. Williams.
Executive Committee	A. J. Stevens,
	M. E. Brian,
	H. Thorne.

Following this, five regular meetings were held. At these meetings time was taken up chiefly with discussions on general subjects of membership, finances, by-laws, legislation, etc.

At the meeting held on October 17th, W. E. Janny gave us a talk on Blast Furnace and Coke Oven construction, which was followed by interesting questions and discussion. At this meeting Mr. Williams' resignation as Secretary was accepted, owing to his having moved to Detroit and being unable to be in regular attendance. J. E. Porter was elected to fill the vacancy.

At our November meeting held on 21st, it was necessary to elect a Vice-Chairman owing to the moving to Hamilton of our Chairman, J. A. W. Brown. Mr. H. Thorne was elected Vice-Chairman. At this meeting also M. E. Brian was elected representative on Provincial Division Committee. The proposed Professional Act was discussed and Mr. Brian instructed to carry our sentiment to the Provincial Council meeting on November 22nd.

The Annual Meeting of the Branch was called for December 5th. The regular business of the meeting was held up by discussion on the standing of Junior Members. It was decided to postpone election of officers, etc., until the Secretary had taken up with Mr. Keith the matter of Junior Membership.

The adjourned Annual Meeting was held on December 19th. The Branch By-laws were altered in accordance with suggestions from Mr. Keith. Reports were received from Executive Committee, Treasurer, and Special Committees. The following officers were elected for 1920:—

Chairman	H. B. R. Craig.
Sec'y.-Treas	J. E. Porter.
Executive Committee	J. J. Newman,
	H. Thorne.
	M. E. Brian.

Mr. Brian presented his report of the November meeting of the Provincial Council. Owing to the late hour a proper discussion on the matter of Legislation was held over for another meeting.

The Branch has suffered a real loss in the moving to Hamilton of our first Chairman, J. A. W. Brown. Mr. Brown was wide awake in all matters of interest to the Branch and *The Institute* in general. He carries with him our best wishes for every success in his new work.

A copy of the Treasurer's Report is attached.

Yours respectfully,

H. THORNE,
Vice-Cairman.

J. E. PORTER,
Secretary.

Copy of Treasurer's Report, Border Cities Branch, Year 1919.

Receipts:

Mar. 21—Collection for use Chamber of Commerce dining room, Mar. 14th. 12 Members — 50c	$6.00
Apl. 12.—Advance from Headquarters	50.00
Oct. 22.—Twenty per cent remittance from fees	31.40
Total	$87.40

Expenditures:

Mar. 24.—To Chamber of Commerce for use of room	$5.00
Apl. 12—Book for Secretary	5.00
Apl. 25.—Post cards, $1.00; Telegram, 30c; Exchange, 15c	1.45
Oct. and Nov.—Postage Telegrams and Telephones	1.97
Dec. 11.—Expenses Representative to Provincial Council Meeting	19.40
Dec. 19.—Balance in Bank	54.58
Total	$87.40

Dated Windsor, Ont., Dec. 19th, 1919.

F. J. BRIDGES,
Treasurer.

Niagara Penninsula Branch

During the month of February, following a proposal made last year, some of the members of *The Engineering Institute*, resident at Niagara Falls proposed that a branch of *The Institute* be formed in the Niagara District.

A meeting was called to discuss the proposal and it was unanimously agreed that steps should be taken to form a "Niagara Peninsula Branch," provided that members living in St. Catherines would express themselves similarly. It was, therefore, decided that St. Catherines should be visited and an expression of opinion obtained from members resident there.

On March 3rd. members motored from Niagara Falls to St. Catherines to lay the proposition before the members in that city. The matter was discussed and it was decided immediately to proceed towards the formation of a "Niagara Peninsula Branch."

A general meeting and supper of all the engineers in the district was called for March 11th. at Niagara Falls for the purpose of organizing the Branch. The general secretary was present and the Branch was launched with an attendance of sixty-four engineers at the meeting and with an initial membership of twenty-eight.

Since organization the Branch has held five general meetings, six executive meetings and three trips and has made its influence felt in connection with the Civil Service reclassification, the salary question, legislation and has initiated steps in connection with the appointment of engineers to public positions. The 1920 Ontario professional meeting is to be held at Niagara Falls under the auspices of the Branch, and already there has been substantial progress towards preparing for this meeting.

All the meetings of the Branch have been devoted to either business or social affairs and as yet there has not been a meeting at which a paper or technical subject has been discussed.

On April 1st. a well attended "Smoker" was held at Niagara Falls at which the President of *The Institute* was present.

On May 9th. a business meeting was held at the Engineers' Club, Thorold, at which the question of Engineers' salaries and status was considered. A Branch salary committee was appointed at this time and has since made its report which has been adopted by the Branch.

On June 12th. a legislation meeting was held when the draft legislation bill was taken up in detail with E. R. Gray, A.M.E.I.C., of Hamilton explaining the many points.

On September 20th. a social function in the way of a dinner and dance was held at the Clifton Hotel, Niagara Falls. This proved to be a very enjoyable affair for those present.

Early in the fall a trip of inspection was made to the Lackawanna Steel plant in Buffalo. This was very well attended and proved extremely interesting and instructive.

On October 4th, a trip over the Welland Ship Canal work was enjoyed by a large number of the members. The canal engineers and contractors arranged splendid facilities for seeing the work.

Another trip was run over the construction work of the Hydro Electric Power Commission near Niagara Falls. Members were shown over this great power development by the Commission's engineering staff and transportation was supplied by the Commission in the form of motor buses.

On November 26th. a general business meeting was held in Thorold, at which the salary committee made its report and the report of the Branch representative on the Executive of the Ontario Provincial Division was received. Business growing out of this latter report resulted in a decision to ask the Division and Council for permission to hold the 1920 professional meeting at Niagara Falls under the auspices of the Branch. A professional meeting committee was appointed and this committee has already appointed sub-committees and outlined the work of each for preparing for this meeting. The Branch is desirous of co-operating with the American Institute of Chemical Engineers in holding a joint professional meeting and steps are now being taken towards arranging this if possible.

The Branch has no definite quarters but a tentative arrangement has been made with the Thorold Engineers' Club for the use of their building for holding meetings. This is a central point for the various towns within the the Branch radius.

The Branch has had a phenomenal growth since organization. A large number of members have returned from the war and many have joined *The Institute* through the activities of the Branch and the field in this region still has many prospects, particularly among the electrical engineers connected with the power plants at Niagara Falls.

The Branch membership to date is shown as follows:—

Members	9
Associate Members	[illegible]
Students	2
Juniors	8
Affiliates	5
	72

Rex Johnson,
Branch Sec.-Treas.

Financial Statement

Receipts

Advance rebate from Headquarters	$20.00
Affiliate's Fees	14.00
Receipts from members for social functions	65.25
Rebate from Headquarters on members fees up to September 1919	60.60
	$159.85

Disbursements

Expense Account — Branch representative to Ontario Provincial Division	5.15
Printing	21.25
Rent for Quarters	19.40
Headquarters for Affiliates Subscription to the Journal	7.00
Stenographer	10.00
Clifton Hotel and Thorold Engineer's Club for social functions	58.00
Stationary	1.35
Postage, Long Distance, Telegrams, etc	15.59
	$137.74
Bank Account	47.80
Cash on Hand	4.31
	$189.85

A. C. D. Blanchard,
Chairman.
Rex Johnson,
Branch Sec.-Treas.

Ontario Provincial Division

As 1919 witnessed the inauguration of the Ontario Provincial Division, too much must not be expected from its first report. Nevertheless substantial progress has been achieved of permanent advantage to the profession and *The Institute.* An appropriate Constitution has been formally adopted; constructive collaboration betwen the Division and the Branches has been accomplished; intra-branch co-operation has been definitely encouraged; the non-resident membership in the province—208 strong—has achieved a direct and definite voice in *Institute* affairs; co-operation with other professional engineering bodies within the province has been encouraged; action has been initiated to secure a more equitable representation upon Council for the members resident in Ontario; preparations have been perfected for a vigorous but conservative membership drive.

There has been an increase in membership of within the province of Ontario. Three new branches have been established; the Niagara Peninsula Branch at Niagara Falls, the Border Cities at Windsor, and the Peterborough Branch. The Kingston Branch has recently renewed its activities after temporary suspension during the war.

Definite arrangements have been made for a General Professional Meeting in Ontario under the auspices of the Niagara Peninsula Branch. The meeting will be held in September at the Clifton House, Niagara Falls, and opportunity will be afforded for visits of inspection to the Chippewa-Queenston Power Development of the Hydro-Electric Commission, the Welland Canal Construction, and to the existing power developments at Niagara.

It is confidently felt that the developments thus generally outlined not only indicate a considerable and commendable degree of accomplishment for those in authority in *Institute* matters, especially Branch officers and the General Secretary, but it portends much for the permanent utility and advantage of the Ontario Provincial Division. If such progress is to be maintained in Ontario *The Institute* must evolve promptly and pursue vigorously a positive policy and progressive programme, not only in professional matters but in cognate public affairs. Certain technical and semi-professional bodies in the Province are by their activities in professional and public endeavour, and by well directed publicity propaganda, rapidly increasing their membership among engineers who should and would join *The Institute* if its various Branches exerted equal effort. One thing only can maintain the present outstanding position of *The Institute*—progressive positive service for the engineer, individually and collectively, as well as for the national weal.

The officers of the Ontario Division are convinced of the urgent necessity for closer solidarity among the constituted parts of *The Institute,* not to combat and compete with regional or local engineering organizations, but primarily to prevent the engineering fraternity from splitting into many parts working at cross purposes, with the inevitable result of becoming a mere collection of isolated and ineffective units. Much of the present activity of regional engineering bodies within the Province of Ontario is largely based upon diverse objectives, impossible of attainment with the present divisive methods. As all are labouring for the advance and advantage of the profession, it should be possible to compose both objective and methods in order that harmonious and homogeneous action can prevail. Consolidation of effort and co-operation of forces are essential.

In the greater vision resulting from the stressful efforts of the many engineering societies of Great Britain, of Australia and of the United States to secure in their respective countries, through effective and economical means, conjoint action by engineers generally in the interests of national, municipal and professional matters, it must be realized that, in *The Institute,* the engineering profession in Canada has an immediately available organization, national in scope, constituted, prepared and willing to realize with least expenditure of effort and with a minimum of delay, the goal of the profession in all English-speaking countries, which goal has been ably expressed by the Joint Conference Committee of the four founder societies of the United States in the following inclusive terms:—

1.—To render the maximum of service to the nation through unity of action.

2.—To give the engineers of the country a more potent voice in public affairs.

3.—To secure greater recognition of the services of the engineer, and to provide for his advancement.

4.—To promote esprit de corps among the members of the profession.

5.—To provide the machinery for prompt and united action on matters affecting the profession, among which are:—

Licensing and registration of engineers;
Scientific and Industrial Research;
Conservation of Natural Resources;
Publicity;
Classification and compensation of engineers;
General employment bureau;
Engineering education;
Industrial relations.

It must be further realized that not only does *The Institute* as now constituted offer an efficient, economical, adaptable and immediately available means for consolidating the engineering profession in Canada into one outspoken, homogeneous body, but in practically every province, except Ontario, it does in practice as well as in theory achieve this proud position. Unfortunately, while Ontario engineers may enthusiastically agree in their concepts of a desirable goal for the profession, they vigorously disagree respecting both the methods and the means of achieving it. A small but active engineering group resident in Toronto favour for the present at any rate the setting up of a new over-all Joint Provincial Committee which can in purely provincial matters, represent and speak for all their technical and semi-professional engineering organizations. Although the Ontario membership strength of *The Institute* is much greater than the combined resident engineering membership of all regional organizations, it is not considered that mere preponderance would warrant the Provincial Division in refusing to confer with and where considered advisable to collaborate with such Committees. This proposal, however, involves a new alignment, and if agreed to by the majority of the professional engineering bodies already interested, most of which are but regional in scope and influence, must be seriously reckoned with by the Ontario Division. This proposal is and will be given serious and sympathetic consideration, but care must and will be taken to avoid the abrogation of the responsibilities and the freedom of action of *The Institute*.

It is the confirmed conviction of the undersigned officers that the necessity for dealing in an adequate way with such problems in Ontario, precipitates the consideration of questions of policy which are of such import to *The Institute* that the undersigned respectfully submit, for the consideration of Council, the advisability of taking early and appropriate action to have such matters considered in the most careful and comprehensive manner possible. As they not only affect Ontario but are of equal import to other provinces, we suggest that they be referred to a special Committee on Development, instructed to consider and report respecting (a) the technical activities, (b) the internal relations and local associations, (c) the relation with other national societies and related organizations, and (d) the relation to public affairs of *The Engineering Institute of Canada*. If such a Committee is properly constituted, its conclusions should not only compose many of the difficulties now confronting *The Institute* in Ontario, but it should result in a declaration of policy that will place *The Institute* in a proper light with the profession and the interested general public throughout the Dominion. *The Institute* must expand to new and greater duties.

Respectfully submitted,

J. B. CHALLIES,
Chairman.

E. R. GRAY,
Vice-Chairman.

GEO. HOGARTH,
Secretary-Treasurer.

The President and Council of
The Engineering Institute of Canada.

Ottawa Branch

On behalf of the Executive Committee of the Ottawa Branch, we beg to submit the following report for calendar year, 1919:—

The outstanding activity of the past year has been the Annual General and Professional Meeting of *The Institute* held at Ottawa last February. Over four hundred registered at this meeting, and it has been a source of great pleasure to the local members that they have been able to show their hospitality to so many members of *The Institute*.

The success of this meeting was largely due to the efforts of the Special Committee in charge, under the chairmanship of Colonel C. N. Monsarrat, with G. B. Dodge as secretary.

The subject of Legislation has received much attention at the hands of the Executive Committee, which, through the branch representative Mr. [illegible], has been in close touch with the work of the Special Committee appointed at the last annual meeting, and the work which is now being done by the Ontario Provincial Division, which is energetically following up the subject in this province.

The Civil Service Classification has, also, been a very live question during the past year, and close co-operation has been maintained with all the branches, in order to secure their advice and assistance from time to time.

The Special Committee of Council, appointed to interview the Civil Service Commission and to deal with the Minister in charge of the Civil Service Bill, came to Ottawa on several occasions, at personal inconvenience and expense, and we have to thank them for pressing the claims of the engineering profession for more adequate pay and improved status.

The branch representative on this committee, C. Gordon [illegible], rendered very valuable services, and was ever ready to assist members of the Ottawa Branch in presenting the case of the government engineer.

Doctor Alfred Thompson, M.P., having kindly volunteered to interest himself on behalf of the technical men of the service, a committee, including representatives of the Ottawa Branch, was formed by O. S. Finnie. This committee met Doctor Thompson and prepared a memorandum making a strong case for the engineers and other technical officers, for submission to members of parliament in connection with the reclassification of the technical service of the Dominion Government.

Through the co-operation of the other branches, a large number of members of parliament were interviewed, and their views obtained with respect to this question. To all those who expressed themselves as being favorable to the improvement of the status of the technical service, copies of this memorandum were distributed from the headquarters of *The Institute* so as to be available during the discussion of the bill.

Proceedings.

No branch meetings were held prior to the Annual General and Professional Meeting. Continuing the regular meetings from March 20th, a good programme was arranged and the meetings and luncheons were well attended.

The following is a list:—

Evening Meetings

Mch. 20—Paper on Radio-Telegraphic Reception, by Lieut.-Commander C. P. Edwards.

Mch. 27—Discussion on the Draft Legislation Bill, led by Messrs. R. F. Uniacke, A. G. Dalzell, and John Murphy.

Aprl 17—Paper on "Mean Sea Level as a General Datum for Canada," by Doctor W. Bell Dawson.

May 8—Paper on "The Production and Inspection of Steel for Munitions in Canada," by Captain H. W. B. Swabey.

May 15—Description of "The Hydro-Electric System of the Aluminum Company of America," by James White.

Nov. 20—Motion picture "Coal is King" (R. E. Cleaton and Company), distributed by the Ford Company.

Luncheons

Apr. 5—Address by Lt.-Col. C. Peck, V.C., D.S.O., M.P., on "Some Phases of the Great War."

Nov. 4—Address by J. Grove Smith, Dominion Fire Commissioner, on "Fire Protection."

Dec. 4—Address by Major-General Sir Edward Morrison, K.C.M.G., C.B., D.S.O., Deputy-Inspector-General of Artillery, on "Some Reminiscences of the Great War."

Dec. 18—Address by Flag Commander B. H. Ramsay, M.V.O., R.N., on "The Dover Patrol."

Membership

During the early spring, the Committee on Membership compiled a list of some seventy-six men in this district who were considered eligible for membership in *The Engineering Institute of Canada*, and, where possible, they were canvassed personally by members of the committee; in other cases they were communicated with in writing.

The results of this canvas have been highly gratifying, as they show a net increase of thirty-seven, or thirteen per cent over that for 1918, against five per cent for the previous year.

The Branch Year Book has been found very useful in keeping in touch with the members, and a careful revision is made each year to take account of the many changes which are constantly occuring.

The following are comparative figures of the Branch Membership for 1917, 1918 and 1919.

	1917	1918	1919
Honorary Members....	1	—	1
Members.............	60	68	81
Associate Members....	113	123	148
Associates...........	2	2	2
Juniors..............	38	33	31
Students.............	25	24	28
Branch Affiliates......	27	28	24
	266	278	315

The Executive Committee, with the assistance of the Committee on Membership, has carefully considered all applications for admission to *The Institute* and transfer from a lower to a higher grade coming within the territory covered by the branch, and have endeavoured to give Council every assistance in their work of dealing with these applications.

Publicity.

Special mention should be made of the work of the Publicity Committee, under the chairmanship of H. L. Seymour.

Their work consists principally in providing material for *The Journal* of *The Institute* and arranging for reports and editorials in the local papers in connection with branch meetings.

The recent addresses, given by Major-General Morrison, Commander Ramsay and His Excellency The Governor General, were fully reported in a satisfactory manner.

Finances.

The financial position of the branch continues to be highly satisfactory, as may be seen by reference to the attached financial statements of assets and liabilities and of receipts and expenditures.

The principal assets of the branch consist of eight hundred dollars ($800.00) in Victory Bonds and about one hundred and seventy-nine dollars ($179.00) in cash. The net income shows a slight increase over that for 1918, while the net expenditure for purely branch purposes has been slightly reduced.

Officers for 1920.

The Annual Meeting of the branch was held on January 8th, at which the following officers and members of the Executive Committee were elected for the coming year:—

Chairman..............G. B. Dodge.
Secretary...............M. F. Cochrane,
Managing Committee....A. F. Macallum,
Lt.-Col. C. N. Monsarrat,
John Blizard,
K. M. Cameron,
Lt.-Com. C. P. Edwards.

The activities of the branch will be fully maintained during the present year, and there is already a prospect of a considerable increase in the branch membership.

R. de B. Corriveau, *Chairman.*
M. F. Cochrane, *Secretary.*

Statement of Assets and Liabilities Year Ending December 31st, 1919

Assets		Liabilities	
Furniture (Cost $[illegible])	$ 80.00	Printing Account, 1919	$ [illegible]
Library:		Surplus	1,1[illegible]
Book Case (Cost $[illegible])	40.00		
Bound Magazines (Nominal)	1.00		
Books (700 Volumes) (Nominal)	25.00		
Rebates due from Main *Institute* on 1919 Fees	[illegible]		
Unexpired Insurance	1.00		
Stationery and Equipment	20.00		
Due from Ontario Provincial Division a/c Postage	9.53		
Victory Bond due Dec. 1st, 1922	[illegible]		
Victory Bond due Nov. 1st, 1934	500.00		
Cash in Bank	174.27		
Cash on Hand	4.72		
	$1,223.76		$1,2[illegible]

Statement of Receipts and Expenditures for the Year Ending December 31st, 1919

Receipts

Balance in Royal Bank, 1st January., 1919	$ 446.56
Rebates from Main *Institute*, Montreal, quarter ending 31st Dec., 1918	57.28
Branch Affiliate Fees Arrears, 1915	2.00
" " " " 1916	2.00
" " " " 1917	8.00
" " " " 1918	28.00
" " " 1919	40.00
Subscriptions towards Expenses General Meeting. Cheques drawn in favour of *Institute*, instead of favour of G. B. Dodge, of General Meeting Committee	10.00
Cheques in payment for entertainment tickets General Meeting, handed Secretary but payable to *Institute* Account	20.00
Refund from G. B. Dodge of General Meeting Committee for postage and souvenirs	14.00
Refund from G. B. Dodge of unexpended balance of amount advanced by branch towards General Meeting expenses	187.44
Amount received from Main *Institute*, Montreal, towards Expenses General Meeting	87.82
Rebates from Main *Institute*, Jan. to Sept. 30th, 1919	370.62
Proceeds of sale of playing cars	4.15
Interest on $500 Government Bond, Year 1919	27.50
	$ 1,305.37

Expenditures

Printing	$ [illegible]
Branch Year Book	70.00
Balance to Main Society a/c Overseas Tobacco Fund	6.15
Advanced Ladies' Committee General Meeting	100.00
" G. B. Dodge, a/c Expenses General Meeting	323.00
M. F. Cochrane, a/c cheques cashed for Entertainment tickets General Meeting, deposited to credit of Branch Account	20.00
G. B. Dodge, a/c cheque made payable to *Institute* Account as subscription toward expenses General Meeting	[illegible]
Long Distance Telephone Account	[illegible]
Stenographic and Clerical Services, Secretary's Office	85.00
Refund of L. G. Denis' Affiliate Fee, 1919	[illegible]
Paid for Victory Bond, Minister of Finance	[illegible]
Postage	[illegible]
Caretaker, Carnegie Library, evening meetings	4.00
Complimentary Luncheon Tickets	[illegible]
Subscription to Engineering News Record, 1919	[illegible]
Telegrams	[illegible]
Insurance	[illegible]
Sundries	77.95
Balance in Bank, 31st Dec., 1919	[illegible]
Cash on Hand	4.72
	$1,305.37

Montreal Branch

The Montreal Branch has been very active during the year just passed. The main items of activity of the Branch as a whole have been recorded from time to time in *The Journal*, and your Executive feels that it is unnecessary to repeat in detail in this report what has been already published and distributed to the members. For those sufficiently interested, therefore, reference may be made to the following numbers of *The Journal*:—

January, 1919,	pages	26 and 27.
February, "	page	132.
March, "	"	236.
June, "	"	472.
July, "	"	524 to 526.
August, "	"	572.
November, "	"	740 and 741.
December, "	"	791 and 792.
January, 1920,	"	21 and 22.

The regular weekly meetings of the Branch have been a marked success. "Every Thursday Evening at 8.15" is now well established. The quality of addresses and papers given at the twenty-five or more of these meetings has been high and the subjects have proved of great interest to the members. The attendance at the various meetings has been very large and on several occasions additional chairs have had to be used to accommodate those present. Light refreshments were served on two or three occasions and were much appreciated.

The membership of the Branch is as follows:—

Honorary Members	3
Members	126
Associate Members	260
Juniors	42
Students	138
Associates	8
Affiliates	3

The question of legislation has occupied the attention of the Branch and several meetings were held to discuss it. A number of the above-mentioned articles in *The Journal* deal with this phase of the Branch's activities. Probably the outstanding single event of the year's operations was the banquet to General Mitchell on June 12th, which is described in the July *Journal*.

The Executive Committee has met regularly and has devoted a great deal of time to Brarch work in the interests of the members. A large number of individual members have throughout shown a real interest in the affairs of the Branch and of *The Institute*, and have unstintingly given of their time and work on behalf of the members, and the Committee wishes to take this opportunity of thanking them.

Financially our Branch has had no standing heretofore, being dependent on the generosity of Council for the necessary funds to carry on the work. It is hoped that the amendment to the by-laws to be submitted at the annual meeting will result in this state of affairs being done away with and the Branch placed on an independent financial footing like any other branch.

It is evident that great interest is being aroused in the Branch activities and a number of members who formerly evinced very little interest are now taking an active part in its affairs. There still remains much to be done and, like a savings bank, the various members will only get returns in proportion to the amount deposited in the institution. There is an opportunity for every Member, Associate Member, Junior, Student, Associate and Affiliate to give service to the profession and receive large returns. The Executive sincerely hopes that the ensuing year may show a continuation of the splendid interest aroused and that each member will do his part to not only keep up the good work, but increase the interest and efficiency by giving his best to the *Institute* and the *Branch.*

A number of important problems are now before the Executive for consideration, action upon which will be taken in due course and the members notified from time to time.

The whole respectfully submitted on behalf of the Executive Committee of the Montreal Branch.

WALTER J. FRANCIS,
Chairman.
FREDERICK B. BROWN,
Secretary.

Montreal, January 16th, 1920.

Vancouver Branch

Public affairs, legislation, and engineering classifications, have been prominent features of the activities of the Vancouver Branch during the past year.

A memorandum was presented to the local members of Parliament regarding the rating of engineers by the Civil Service Commission and the members of Parliament interviewed in that connection. In co-operation with the Victoria Branch, this Branch has endeavoured to keep the engineering profession before the public.

Legislation has taken up considerable of the time and thought of Vancouver engineers and in conjunction with other engineers in the Province, a Bill has been drawn up which is coming before the Provincial Legislature during the month of January.

Ten meetings of the Branch were held during the year.

The membership of the Branch is as follows:—

Members	48
Associate Members	58
Juniors	4
Associates	2
	112

The financial statement of the Branch shows a balance of ninety-seven dollars in the bank.

Respectfully submitted,
J. N. ANDERSON,
Secretary-Treasurer.

Executive

D. J. Carter H. W. Jones
A. Cunningham D. Donaldson
H. P. Graves

Approved Yours truly,
E. J. Glass H. P. Graves
Chairman Secretary-Treasurer

Edmonton Branch

We beg to submit the 1919 Annual Report of the Edmonton Branch.

The Branch membership is as follows:

Members	10
Associate Members	20
Junior Members	6
Student Members	19
Associates	1
Total	56

Twenty-seven of the above members were on Active Service and as they have gradually returned active interest in the Society is increasing. It is hoped that the year 1920 will bring the Branch to normal and that other than papers dealing with local affairs will be added to the programme of the general meetings.

Four general meetings and eleven executive meeting were held during the year these dealing general with City topics and proposed legislation in respect to Professional Engineers. The close of the year finds the various Engineering Societies almost unanimous in favour of legislation and preparation almost complete for submission of a bill to the Legislature which sits in February 1920. The prospects look very favourable that the bill, which is based on that drawn by the parent Society, will be passed.

The Branch had a cash balance on hand of $11.35 on December 31st with all accounts paid.

The Officers for the year were:

Chairman..........J. L. Cote
Vice-Chairman......A. W. Haddow
Secretary-Treasurer..R. J. Gibb.

Manitoba Branch

On behalf of the Winnipeg Branch we submit the following Report for the year 1919.

We are pleased to state that forty-one of our Members who so valiantly fought for the high principles of democracy and civilization as exemplified by Great Britain, have safely returned to us. Nine of these have received special honors for heroic and valuable service in the field. One, Capt. C. N. Mitchell, V.C., M.C., has been honored with the coveted Victoria Cross.

Our Membership as at the end of 1919 totalled [illegible], being distributed into the various classifications as follows:

Members	53
Associate Members	121
Juniors..	[illegible]
Students	31
Associate	1
Affiliates of the Branch	31
	[illegible]

It is with deep regret we have to record the death of one of our esteemed Members, A. T. Fraser.

Nineteen meetings have been held during the year as follows:

Date 1919		Subject	Speaker	Attendance	Remarks
Jan.	2	Reconstruction................	W. J. Dick, M.E.I.C.	26.	Regular
Jan.	8	Consideration of Proposed By-Laws.......		19	Special
Jan.	11	Reconstruction...........................	Alderman A. W. Puttee	40.	Special Luncheon
Jan.	15	Relation of Engineering to Agriculture.........	Theo. Kipp, M.E.IC	49	Regular
Feb.	5	Can the Standard Measure of Value be Improved?..........................	J. G. Sullivan......	48	Regular
Feb.	15	Wealth of the West.......................	H. A. Lovett, K.C..	52	Luncheon
Feb.	19	Consideration of Development of Manitoba's Natural Resources......................		23	Business
Mar.	6	Construction of Greater Winnipeg Water District Tunnel under the Red River.........	John Armstrong, M.E.I.C.	36	Regular
Mar.	19	Civic Management.........................	Theo. A. Hunt, K.C.....	29	Regular
Apl.	3	Manufacturing Overhead Costs..............	T. R. Deacon, M.E.I.C	35	Regular
Apl.	17	Natural Resources of Western Canada.........	Dr. R. C. Wallace........	39	Regular
May	1	Problems of Western Manufacturers...........	Hugh Mackay, A.M.E.I.C.	24	Regular
May	14	Hydraulic Governors for Low Head Hydro-Electric Units..........................	J. W. Sanger.	[illegible]	Regular
Oct.	2	Pressing Problems of the Day.	J. W. Dafoe..............	46	
		Some Experiences Overseas	[illegible], A.M.E.I.C.		Regular
Oct.	6	Outline of Work done by the Lignite Utilization Board..............................	R. A. Ross, M.E.I.C......	32	Special Luncheon
Nov.	6	Military Engineering.....................	Prof. E. P. Featherstonhaugh, A.M.E.I.C.	9	Regular
Nov.	26	Legislation, By-Laws and Banquet...........		[illegible]	Business
Dec.	4	Design and Operation of Terminal Grain Elevators	C. D. Howe	[illegible]	Regular
Dec.	17	History and Development of Niagara Power..	F. H. Martin	[illegible]	Regular

The average attendance during the year was 38, being an increase of five over the year previous.

Through the generosity of R. deL. French, Engineer of the Lignite Utilization Board, the number of books in our library has been increased by the addition of bound volumes of the "Engineering News and News Record" from 1908 to 1917 inclusive, and also "Transactions of the American Society of Civil Engineers" from 1906 to date.

The By-laws of the Branch have been revised, approved by Council and adopted by the Branch as from May 1st, 1919. Our local organization is now the Winnipeg Branch instead of the Manitoba Branch. The adoption of the revised by-laws contemplates the organization of a Manitoba Division. The latter becomes more essential if the proposed legislation is obtained at the coming Session of Provincial Parliament.

The Bank Balance as at December 31st was $396.72. The Branch also holds five $100.00—1937—Victory Bonds, par value—$500.00. As against the Bank Balance shown the Branch has an outstnding obligation to the Royal Bank for $250.00.

As our new By-laws call for our Annual Meeting to be held in May, at which officers are elected for the ensuing year, the present staff of officers are continuing services to that date.

Respectfully submitted,

W. P. Brereton,
Chairman.

George L. Guy,
Secretary-Treasurer.

Toronto Branch

During the year just completed, the Toronto Branch held fifteen General Open meetings, devoted to the following purposes:—

Four meetings were devoted chiefly to lectures and discussions on various technical subjects as follows:—

On February 7th a lecture by Mr. Cleaton on the subject "Coal is King," in which the Lecturer dealt with good and bad methods of coal mining, transportation, firing, etc.

On March 6th a lecture by Frank Barber on "Reinforced Concrete Bridges in Canada."

On December 4th a lecture by Professor J. Roy Cockburn on the "Scientific Application of Locating Guns by Sound Ranging."

On January 8th a lecture by F. G. Engholm on "Reinforced Concrete Construction."

All above lectures were illustrated by numerous lantern slides.

Two meetings were devoted to the discussion of the economic and social position of the Engineering profession and suggested remedies for improving same.

On February 28th, the younger members of the Branch were given an opportunity to present their views and express their opinion as to what steps *The Institute* could take to improve the status of the Engineering profession in Canada.

Four papers by different members of the Branch were read at that meeting and a number of valuable suggestions were brought forward. But the outstanding features of the evening's discussion were the facts brought forward with regard to the relatively small salaries paid for engineering services, a condition which not only affects the individual members, but also the prestige of the entire profession.

Accordingly a Salaries Committee was appointed to study the question and prepare a schedule of minimum salaries to be paid for Engineering services.

This Committee, which at one time consisted of fourteen members, spent the greater part of eight months in carrying out this work. Altogether fourteen general meetings were held by the Committee, with Sub-committees working all the time on the preparation of the details.

On October 16th the Salaries Committee, through its Chairman, submitted the final report and Salary Schedules to the Branch, which received and endorsed it with only a few minor alterations and modifications. Copies of the adopted schedules were sent to all Branches and to the Council of *The Institute.* These Branches and Council having been kept constantly in touch with the work of the Committee as it was progressing.

Before the end of the year the Executive Committee sent a copy of the adopted Schedule to every employer of engineers in the district of Toronto, the Schedule being accompanied by a letter of transmittal requesting the various employers to adopt the salary schedule for their respective engineering staffs.

Five meetings of the Branch were devoted to the much discussed subject of "Legislation for engineers."

On March 13th a meeting was called for the purpose of discussing Legislation, in order to give Mr. Chipman, the Toronto Branch representative on the Legislation Committee at Montreal, an idea as to the attitude of the members on this subject. At this meeting were also represented members of their technical organizations in Toronto, who expressed their opinion as to the probabilities of securing Legislation in this Province.

At a meeting on March 28th Arthur Surveyor of the Montreal Branch read a paper on "Legislation for Engineers." His paper embraced the principal points affecting all branches of the profession. At that meeting Walter Francis and Frederick B. Brown were also visitors of the Toronto Branch and addressed the meeting, telling of the activities carried on in Montreal.

On May 19th a meeting was called for the purpose of discussing the draft Bill on Legislation for Engineers as prepared by the Legislation Committee at Montreal. A very extensive discussion developed, in which many members of the Branch took part. Several clauses of the original Bill did not seem quite satisfactory to many of the members. It was decided, therefore, to endorse the general principles of the proposed Act and suggest that the details be carefully revised before submitting the Bill to the Legislature.

Another meeting to discuss the same subject was called for June 12th on request from several of the younger members of the Branch. The meeting occupied itself chiefly with the consideration of those contentious clauses which have been the cause of considerable criticism of the Bill in the Canadian Technical papers. At the end of the meeting a Legislation Committee was appointed to study the entire Bill and prepare such amendments and modifications as will make it more satisfactory to the great number of engineers.

For nearly six months the Legislation Committee worked on the Bill. Such clauses as 21 have been revised in a way so as to remove the objections raised by salaried engineers. Several new sub-clauses have been added and the whole Bill has been rearranged, the position of various clauses being changed so as to bring them to a more logical and satisfactory order.

On November 20th the Legislation Committee presented its report. This final report, with only very slight modifications, was adopted by the Branch. Copies of this amended Bill are being sent to all Branches, to the Provincial Division, and to the Council of *The Institute*, in order to get an expression of their opinion.

Two meetings were devoted chiefly to a smoking concert and musical programme. One was held on April 24th at which meeting Mr. Chipman also reported on the work done by the Legislation Committee at Montreal. The other meeting was held on October 30th, at which meeting were also received the report and suggested amendments to the Branch By-laws as prepared by the By-laws Committee of the Toronto Branch.

The Annual Meeting of the Toronto Branch was held on January 22nd and the Annual Dinner on December 16th. At the Annual Dinner, Brigadier General C. H. Mitchell addressed the members on the subject "The Future of Applied Science."

The Executive Committee held nineteen meetings during the last year at which all matters in connection with the business of the Branch were transacted.

In addition to the Salaries Committee and the Legislation Committee, which are described above, the following Committees were also active during the year: City of Toronto Building By-laws Committee, Toronto Branch By-laws Committee, Employment Committee, Fees Committee and a Committee to collect back dues.

With all those activities carried on it is quite natural that the expenses of the Branch should have been heavy during the year. The work of some of those Committees involved a considerable amount of typewriting and printing. But after having paid all expenses incurred during the past year, the Branch starts off the new year with a cash balance in the bank of one hundred and eighty dollars and fifty two cents.

A. H. Harkness,
Chairman.

H. A. Goldman,
Acting Secretary.

Hamilton Branch

January 22.—A resolution passed by the Hamilton Branch on the question of legislation for the Incorporation of Engineers. This covered and supplemented action taken by Montreal Branch on December 12th, 1918.

January 30.—An illustrated lecture by E. L. Cousins, Chief Engineer of Toronto Harbor Commission, on improvements which have been made to Toronto Harbor during the past four years. Much information of interest was obtained, especially with regard to the possible future developments of the Hamilton Harbor.

Mr. Cousins recently returned to Hamilton and addressed a large public gathering of citizens on Hamilton Harbor development plans in January 1920.

February 10.—A lecture by F. B. Jewett, Ph.D., Chief Engineer of the Western Electric Company of New York City, on research work and recent developments in Wireless Telephony.

Dr. Jewett who has charge of one of the largest Research Laboratories in the United States spoke on the great need for trained investigators and the many interesting experiments which were carried on during the War, leading up to the rapid perfection of the Wireless Telephone.

February 17. — An illustrated lecture by N. Couchon, Consulting Engineer, on Town Planning and Development, who dealt particularly with a review of the various projects which have been planned for the City of Hamilton, including harbor developments, changes in railwas, public utilities, amusements, etc.

March 14.—By-Laws of Hamilton Branch were prepared and forwarded to Headquarters for consideration and approval, and a notice was received of the adoption of these By-Laws on December 16th.

March 28.—Illustrated lecture on building of Quebec Bridge by G. F. Porter, M.E.I.C., Construction Engineer for the St. Lawrence Bridge Company. This was one of the most successful lectures of the year, the lantern slides being particularly impressive.

March 31.—A committee of three was appointed for the purpose of reporting on the question of Club Rooms for the engineering and professional men of Hamilton. At a subsequent date it was reported by the Committee that suitable rooms could not be obtained within the financial reach of the Branch Members.

April 11. — An address by [illegible] of the Westinghouse Electrical and Manufacturing Company of Pittsburgh on "The Electrification of Steel Mills."

The speaker described, with the help of lantern slides, the advantages of electric motors over steam engines in every application of power to the manufacture of steel, special reference being made to Electric Driven Reversing Mills.

May 1.—Ballots were issued for the election of Officers of the Executive Committee of the Hamilton Branch. The ballot was completed and the Officers notified on the date of the Annual Meeting, May 8th.

May 30.—*Annual Meeting.* At this meeting the Scrutineers appointed announced the result of the election of Branch Officers.

The reports of the retiring Chairman and Secretary-Treasurer were received and adopted.

The report of the Legislation Committee was also presented by E. R. Gray, Representative of the Hamilton Branch.

A resolution was passed recommending the establishment by the Government of Canada of a National Research Institute to carry on and direct research in such industrial, agricultural, commercial and medical problems as will best promote the conservation of Canada's resources.

Nov. 13.—The first meeting of the Fall and Winter Season was held on this date at the Royal Connaught Hotel, where a large number of members enjoyed dinner and a musical and entertainment programme, followed by the address of the Chairman, dealing with matters of business and plans for future meetings.

Owing to the approach of the Christmas Season it was found impossible to arrange anymore open meetings or addresses before the first of the year. A number are in contemplation, but some difficulty has been experienced in getting speakers who will come at their own expense to address the Branch on new or original topics.

Legislation.

During the year considerable interest has been taken by the Executive and Members of Hamilton Branch in the proposed Legislation concerning the Engineering Profession, which has been the subject of much thought and fruitful endeavor on the part of various Branches and bodies of the Engineering Profession, and particularly the Members and Organization of *The Engineering Institute of Canada.*

The local Branch has given its support in the matter through the Local Members of Parliament and by co-operation with the various Branches of *The Institute.*

Financial.

The present financial standing of Hamilton Branch is as follows:—

Balance on Hand January, 1919, as per last Annual Report	$ 78.26
Total receipts during year from Membership, Affiliate Fees, Etc.	108.00
Total	$186.26
Total expenses to December 31, 1919, including sundry unpaid items	150.73
Balance on Hand	$ 35.53

R. K. Palmer,
Chairman.

Corbett F. Whitton,
Secretary-Treasurer.

Peterborough Branch

The Peterborough Branch of *The Engineering Institute of Canada* was formed on Nov. 6th, 1919, at a banquet in the Empress Hotel, at which the following prominent engineers and members of Council were present, Col. R. W. Leonard, Walter J. Francis, Prof. H. E. T. Haultain, R. A. Ross, Prof. Peter Gillespie, James White, J. B. Challies, Fraser S. Keith, A. H. Harkness, Frank Barber. The City Council, and the Chairmen of all the local Municipal bodies were present, as well as the heads of all the local manufacturing concerns employing engineers, and there is no doubt that the prestige of engineers in Peterborough has been measurably increased as a result of that function.

Previous to the inauguration of the Branch, there had been in existence in the City an Engineers' Club, which had been carrying on successfully for over two years. While the results were excellent, it was felt that much better work could be done if a connection were formed with *The Engineering Institute of Canada.* After a visit from Fraser S. Keith, the General Secretary, who explained the Aims and objects of *The Institute* to those who were not already members, it was decided to form a Branch. A petition was presented to the Council and on its being granted the inauguration was proceeded with.

The following are the officers of the Branch for the Season of 1919-20.

Honorary Chairman	Richard B. Rogers, M.E.I.C.
Chairman	G. Reid Munro, M.E.I.C.
Vice-Chairman	Roy H. Parsons, M.E.I.C.
Secretary	R. L. Dobbin, M.E.I.C.
Treasurer	D. L. McLaren, A.M.E.I.C.
Executive Committee	P. L. Allison, M.E.I.C.
	A. L. Killaly, A.M.E.I.C.
	G. R. Langley, M.E.I.C.
	E. R. Shirley, M.E.I.C.
	C. E. Sisson, M.E.I.C.
	P. P. Westby, M.E.I.C.

At present the membership of the Branch is as follows:—

11 Members
17 Associate Members
5 Juniors
23 Affiliates.

56

Since the Inauguaration one meeting was held in December, at which a paper was presented by G. B. Smith of Belleville on the Central Ontario System of the Hydro-Electric Power Commission of Ontario.

All of which is respectfully submitted,

G. R. Munro,
Chairman.

R. L. Dobbin,
Secretary.

Quebec Branch

The Quebec Branch has the pleasure to send the following report displaying its activities during the year 1919.

Eight general meetings were held and honored with an average presence which not being very large still showed the continued interest taken by some of our members in the professional welfare and solidarity.

The momentous question of a provincial legislation adequately protective of the engineering profession— which legislation has been extensively studied by the different branches of *The Institute*—has received from the Quebec Branch one of the effective impulses that brought it to the desired end. The correspondence at the Headquarters, the records of all the Branches include a resolution sent from Quebec in January 1919. The same could be retraced in the proceedings of the General Convention at Ottawa and of the Special Committee originating there. The work of the Quebec delegates was then duly recognized.

To this Branch and especially to one of its members must be credited the elaboration of a legislation project extensively utilized by the Special Committee in the drawing of a uniform legislation bill for all provinces.

When the Branches were urged by the Council to meet the Members of the House of Commons and obtain their approval of a Classification Bill duly protecting the engineers employed by the Federal Government, our members repeatedly corresponded with several representatives of the Quebec District and sent reports claiming the justice of the previous Bill.

Through our Branch, the action inaugurated by *The Institute* was extended to the Provincial field. A list of salaries paid to the engineers employed by the Quebec Government has been prepared and suggestions proposed.

Sharing in the work carried by other branches towards fixing schedules of salaries that should be paid to engineers employed by public service companies, municipalities, industrial companies, and to consulting engineers practising their profession, this branch has through several committees made enquiries, compiled facts and made suggestions helpful to the Council when determining the proper salaries the engineers of this district should receive. Our Branch pays due tribute of thanks to the Ottawa and Toronto Branches, also to the Association of American Engineers for their sending precious reports on salaries.

The establishment of a provincial Division of *The Institute* has received an extensive part of the attention of this branch having a committee to that aim since February 1918. After much study and canvassing with a similar committee of the Montreal Branch, a referendum was carried that showed the strong assent of the engineers of this province.

Answering the desire of the Council and of the Montreal Branch, our Branch called for Committees to help returning soldiers seeking positions.

This Branch also deserves to mention the work of a "Comité de surveillance" which has reported about all the applications [illegible] to it, has investigated several bills of our Legislature in order to prevent the passing of clauses infringing upon the rights of the profession. The Committee has also conducted an active propaganda for the right use of the terms "engineer" and "ingénieur."

To the president of this Branch must be credited the warning given to the engineers of this country about the possible infringement of Architects in the Engineering field, following a recent practice of the kind at [illegible].

It is hoped that within a near future the efforts of this Branch will obtain at the Parliament Library the creation of a technical and scientific section in which the most up to date books and reviews will be at the disposition of the engineers of this district.

The Quebec Branch deeply regrets the death of one of its founder members, Louis A. Vallée, Engineer of the provincial Public Works and Inspector of Railways in the province. We also with the Council and all the Branches of *The Institute* [illegible] regret the grave of the late Ernest Marceau, whose high training and [illegible] have added much to the standing of our Institute.

Our membership at the end of 1919 was the following:

Members........	15
Associate Members	[illegible]
Juniors	[illegible]
Students	16
Associates	[illegible]
	[illegible]

The expenses our Branch has undergone for [illegible] tion purposes were the largest in all past years, but the results obtained may be considered as perfectly [illegible] [illegible] such expenses. To face future needs, this Branch has the pleasure to hold assets amounting to [illegible] on January the [illegible], 1920.

Respectfully submitted,

[illegible],
Chairman.

[illegible],
Secretary.

St. John Branch

We beg to submit herewith our second annual report of the St. John Branch of *The Engineering Institute of Canada*, covering the year ending December 31st, 1919.

The Executive Committee met 14 times during the year and transacted a large amount of business. There were 10 meetings of the Branch, besides the General Professional Meeting held September 10th, 11th and 12th. The following papers were read at the regular meetings:—

"A Contractor in a Clyde Shipyard," by G. S. Baxter, A.M.E.I.C.

"Reminiscenses of the Early Days of Railway Location," by C. O. Foss, M.E.I.C.

"The Reconstruction of the Bridges on the Dominion Atlantic Railway," by G. G. Hare, A.M.E.I.C.

"Aids to Navigation in New Brunswick Waters," by G. S. Macdonald, A.M.E.I.C.

"Experiments with High Potential High Frequency Electric Currents," by F. P. Vaughan, A.M.E.I.C., M.A.I.E.E.

"Cape Bald Breakwater," by Geoffrey Stead, A.M.E.I.C.

"New Brunswick Highways," by B. M. Hill, M.E.I.C.

"The Dominion Housing Act and how it applies to types of Houses suitable to St. John under local building conditions," by Chas. L. Archibald, A.M.E.I.C.

The programme of the second Maritime General Professional Meeting and the report of the proceedings have been published in "*The Journal.*"

Two of the Branch meetings were held in conjunction with the St. John Board of Trade, when reports were submitted on building a Community Centre with court House and City Hall instead of rebuilding the Old Court House, destroyed by fire. The information furnished and the discussion will undoubtedly have a beneficial effect on public opinion.

During the year a new set of By-laws, patterned after the E.I.C. standard set, were drawn up, adopted, and have been approved by the Council.

The matter of obtaining legislation for New Brunswick engineers has taken up a large amount of time and effort, culminating in the formation of the "Association of Professional Engineers of the Province of New Brunswick" at a public meeting called by our Chairman and held September 12th, in St. John. An executive council was elected, with C. C. Kirby as chairman, and this has revised the E.I.C. draft of Act to suit New Brunswick conditions, and will bring it before the next Section of the Legislature.

Effective work has been done by the several committees. The Employment Committee actively co-operated with the Provincial Soldiers Civil Re-establishment Committee and the Government Labor Bureau. The passing of the Civil Service Act and the Re-classification of the Government employees was urged. Data has been gathered re the salaries paid engineers in N.B. and considerable work has been done by the committee appointed to investigate the subject of concrete in sea water and of the concrete structures in local waters. A very complete bibliography has been prepared for the use of the committee, etc. A Halifax Branch committee is co-operating in this work.

Delegates of the Branch are on the local Vocational Training Committee, which has been able, after much difficulty, to get the City to take action and established Vocational Training schools, which are already proving a popular success.

The statement of Membership at the end of the year is as follows:—

Grade	Resident	Non-Resident	Total	Application Pending
Members	11	3	14	..
Associate Members	25	3	28	3
Juniors	9	..	9	1
Honorary Associate	1	..	1	..
Associate	1	..	1	..
Affiliates	10	..	10	..
	57	6	63	4

Membership end of 1918	43
Net gain for year	20

Four members have moved away during the year.

The financial statement for the year 1919 is as follows:—

Receipts.

Balance from 1918	$ 12.77
Rebates on dues by Headquarters	107.35
Dues from Affiliates	8.00
General Professional Meeting subscriptions	124.50
General Professional Meeting sale of tickets	69.00
General Professional Meeting expenses chargeable to any paid by Headquarters	49.70
	$371.32

Expenditure

Postage	$ 23.14
Stationery and printing	24.85
Telegrams	4.92
Stenographic work	15.00
Advertising	[illegible]
Sundries	[illegible]
General Professional Meeting Expenses	[illegible]
Balance in Royal Bank of Canada	60.11
	[illegible]

Respectfully submitted,

C. C. KIRBY,
Chairman

A. R. CROOKSHANK,
Secretary-Treasurer.

Halifax Branch

During the year 1919, the Halifax Branch held eight meeting as follows:—

January 15th, Annual meeting, at which the report of the Secretary-Treasurer was presented and the following officers elected for the coming year:—

Chairman	F. A. Bowman
Secretary-Treasurer	K. H. Smith
Executive	J. L. Allen
	L. H. Wheaton
	A. G. Robb
	W. P. Morrison
	A. F. Dyer

February 20th, which marked the beginning of the supper meetings which have proved so popular. A paper was read by Capt. T. S. Scott, M.E.I.C. on roads.

March 20th, This was an open meeting to which were invited members of the Board of Trade, Commercial Club and other commercial bodies. W. G. Gordon, Transportation Engineer, Canadian General Electric Co., read a paper on "Main Line Railway Electrification in Canada."

April 3rd, Special meeting at which the question of Legislation was dealt with and recommendations made to the representative of the Branch on the Committee for *The Institute.*

April 25th, at which the results of the meeting of the Legislative Committee held in Montreal were discussed.

June 4th, which was devoted to making preliminary arrangements for the proposed Professional Meeting to be held in St. John in September, and to a discussion of the proposed Legislation for Engineers.

October 22nd, at which a paper was read by A. C. Brown, A.M.E.I.C. on "The results of experiments of the effects of freezing on Cement and Lime Mortars."

December 17th, which was chiefly devoted to a discussion of the proposed Halifax-Dartmouth bridge.

The meetings this year have been marked by an increasing attendance. It is especially gratifying to note the number of young members of the profession who have been accepted for membership and their interest in the meetings and in the affairs of the branch.

During the last two months of the year, the Branch has particularly interested itself in the technical side of the proposed bridge between Halifax and Dartmouth. A bridge committee under the able leadership of L. H. Wheaton, A.M.E.I.C., has been appointed to carry on investigations. The various commercial organizations of the city and Dartmouth have joined in forming a committee to further the project vigorously and the Halifax Branch has a representative on this committee to advise on technical points. The Branch has accepted a tentative offer to conduct the preliminary investigations at the proposed site and have offered to conduct these investigations at cost. In this way the Branch will be able to perform a distinct service to the community and to demonstrate to the general public the value of such an organization as ours.

The membership of the Branch has shown a gratifying increase. At the beginning of the year the Secretary's report showed a membership as follows:—

Members	24
Associate Members	29
Juniors	6
Branch Affiliates	2
Total	61

The present membership is as follows:—

Members	31
Associate Members	[illegible]
Juniors	10
Students	6
Branch Affiliates	2
Total	[illegible]

an increase of:—

Members	7
Associate Members	19
Juniors	4
Students	6
Total	36 or 60%

Summary for 1918

Receipts:

July	6	Cheque from Head Office	$50.00	
Oct.	17	Cheque from N.S. Society	100.00	
Nov.	18	Fees from Branch Affiliate	.70	
		St. John Branch, share of Professional Meeting	12.50	$163.20

Disbursed:

Stationery	26.79	
Advertising	20.97	
Expense in connection with meetings	28.00	
Entertainment of Guests	23.75	
Postage	6.29	
Printing	2.20	
Incidental office expenses	2.35	
Telegrams	.31	
Expenditures 1918		$110.66
Balance January 1st, 1919		52.54

Summary for 1919

Receipts:

Jan.	13	Rebate on Advertising from Head Office	$20.97	
		Rebate on dues from Head Office	68.20	
Feb.	22	Cheque from N.S. Society	44.02	
May	14	Rebate on dues from Head Office	34.50	
Oct.	27	Rebate on dues from Head Office	71.60	
		Receipts for 1919		$239.29
		Balance January 1st, 1919		52.54
				$291.83

Disbursed:

Clerical help	60.00	
Rebate to N.S. Society Members	78.00	
Postage	21.49	
Advertising	9.75	
Telegrams	2.55	
Entertainment of guests	2.50	
Part's Picture Store	3.80	
Wreath for D. McD. Campbell	5.00	
Expenses in connection with meetings	5.00	
Stationery	1.88	
Incidental office expenses	2.90	$192.87
Balance January 1st, 1920		98.96

Respectfully submitted,

F. R. FAULKNER,
Secretary-Treasurer.

Approved,

F. A. BOWMAN,
Chairman.

Annual and Professional Meeting, Montreal

January 27th, 28th and 29th, 1920

PROGRAMME

[illegible]

Tuesday, January 27th, 1920

9.00 A.M. Opening of Registration at Headquarters.

10.00 A.M. Calling to Order, Annual Meeting—Appointment of Scrutineers, Reception of Reports.

12.50 P.M. **Adjournment until 2.45 P.M.**

1.15 P.M. Luncheon at Windsor Hotel for Members and Ladies, and invited Guests.

1.50 P.M. **Formal Welcome and Greeting.**

2.00 P.M. Address—"Modern Highway Problems," by Mr. E. W. James, Assistant Chief Engineer, Bureau of Public Roads, Washington, D.C.

2.45 P.M. **Resuming of Business Session,** Annual Meeting.

4.10 P.M. **Reception of Report of Scrutineers.**

4.20 P.M. **Address of Retiring President.**

5.00 P.M. **Inauguration of Incoming President.**

5.30 P.M. **Closing of Annual Meeting.**

8.30 P.M. **Reception and Dance,** Rose Room, Windsor Hotel.

Wednesday, January 28th, 1920

10.00 A.M. **Calling to Order,** Professional Meeting, at Windsor Hotel.

"THE GATEWAY OF THE PROFESSION"

"The Training of the Chemical Engineer," by R. F. Ruttan, M.A., M.D., Sc.D., F.R.S., Professor of Chemistry and Director of the Chemical Laboratories, McGill University.

"The Importance of Physics in Engineering Education," by A. S. Eve, D.Sc., C.B.E., F.R.S., Macdonald Professor of Physics, McGill University.

Discussion, by four authorities on technical education—Brig.-Gen. C. H. Mitchell, C.B., C.M.G., D.S.O., M.E.I.C., Dean of the Faculty of Science and Engineering, University of Toronto; Frank D. Adams, Ph.D., D.Sc., F.G.S.A., F.R.S., Hon. M.E.I.C., Dean of the Faculty of Applied Science and Acting Principal, McGill University; Arthur Surveyer, B.A., B.A. Sc., C.E., M.E.I.C., Member of the Board of Governors, University of Montreal; Prof. Chas. F. Scott, Past President, A.I.E.E., Professor of Electrical Engineering, Yale University, New Haven, Conn.

12.50 P.M. Adjournment.

1.10 P.M. Leave Windsor Hotel on special cars for Northern Electric Company's works.

1.30 P.M. Luncheon, as guests of the President and the Directors of the Northern Electric Company, Limited. At the conclusion of the luncheon the members will be escorted in parties over the works, and will be at liberty to depart any time before the closing hour.

7.30 for 8 P.M. Annual Banquet of the Institute, Rose Room, Windsor Hotel.

Thursday, January 29th, 1920

10.00 A.M. **Continuation, Professional Meeting** at Windsor Hotel.—

"ENGINEERING ACTIVITIES OF THE PROVINCE OF QUEBEC"

"Quebec's Water Power Policy and the Work of the Quebec Streams Commission," by Olivier Lefèbvre, B.A.Sc., C.E., M.E.I.C., Chief Engineer, Quebec Streams Commission.

"The Operation of the Quebec Public Health Act," by Theo. J. Lafrenière, B.A.Sc., C.E., M.Sc., Chief Sanitary Engineer to the Superior Board of Health of the Province of Quebec.

"The Evolution of the Public Roads **Problem in the Province,"** by Alex. Fraser, B.A.Sc., C.E., A.M.E.I.C., Assistant Chief Engineer, Quebec Department of Roads.

12.45 P.M. **Adjournment.**

2.30 P.M. Resuming of Session, Professional Meeting.—

"AVIATION"

"The Policy of the Air Board of **Canada,"** by Lieutenant-Colonel O. M. Biggar, B.A., K.C., Vice-Chairman of the Air Board of Canada.

"PULP AND PAPER,"

"The Pulp and Paper Industry," by Ferd. van Bruyssel, C.E., D.P.S.

"QUEBEC FORESTS"

"The Forests of Quebec," by G. C. Piché, A.M.E.I.C., Chief of Forest Service, Quebec Lands and Forests Department.

5.00 P.M. Adjournment.

8.30 P.M. **Smoker,** Ladies' Ordinary, Windsor Hotel.

Retiring President's Address

The very high honour which you conferred upon me a year ago in electing me President of this *Institute* for the year 1919, is a distinction which I value most highly. The office has entailed much responsibility and many onerous duties, in connection with which I take this opportunity of acknowledging, with sincere appreciation, the enthusiastic energy of our Secretary, Mr. Keith, and the hearty co-operation and most valuable assistance rendered by the Vice-Presidents and the Council.

The constant and untiring attention devoted by the members of Council to the large problems and the many details involved in the management of this *Institute,* with its rapid growth in membership and functions—necessitating the "burning of the midnight oil" on frequent occasions at Headquarters, and the carrying on of a great deal of correspondence and telephonic communication daily—has amply demonstrated the keen interest which is being taken in the present work and ensures the future success and prosperity of our new *Institute*

The last, but not the least duty, which custom has required of your President has been the delivery of a Retiring Address, and when I look back upon the high standard and importance of the Addresses of some of my worthy predecessors, and the enormous field now covered by the profession, I feel that this is a duty not to be taken lightly and one which can be looked forward to only with trepidation. The greatest difficulty is to determine what subjects to select and where to stop.

In the wonderful and rapidly-changing age in which we live ("Reconstruction" being the generally accepted term for the immediate changes which are taking place), I feel that it would not be amiss at this time to review briefly some of the more important changes or developments in the various departments of engineering—especially as our *Institute* now embraces all branches of the profession—and consider how they affect the members of it, individually and collectively.

The necessity, created by the War for rapid and unprecedented improvements in many arts and sciences has wrought changes which will prove of great benefit in the arts of peace, and if the war has had any redeeming features, the improved relations between the various classes of the community and the great strides in advance which it has impelled in scientific and industrial pursuits, are results which cannot be overlooked.

It is said by some that the engineers won the war; but, as there are many claimants to that distinction, the members of our modest profession will be content if they are accorded credit for the part they have taken in the trenches, the laboratories and the workshops. That aid has not been restricted to any one branch of warfare, but has been as diversified as are the many branches of the engineering profession, extending from aeronautics to submarine navigation, and including the design, manufacture and operation of all manner of munitions and vehicles of transport by air, land and sea. Nor should we overlook the equally essential work of sanitation and water supply over the great area of the war zone.

Mention should also be made of the splendid service of your Vice-President, Mr. Haultain, in connection with the work of Soldiers' Civil Re-Establishment.

During the year we have welcomed home, with thankful hearts, the large number of our Members who have rendered such notable service in the great War, and last year we sadly unveiled an Honour Roll in the entrance of our Head Office to the memory of those Members who gave up their lives for the cause.

Well, if this is the period of "Reconstruction," let us start at the beginning. Sir Oliver Lodge is quoted as saying: "The Universe has been in labour for a hundred million years, and has produced—us! We are a remarkable product and we are behaving at the present moment in a remarkable manner." Of course, he speaks of only what we can comprehend. The ant is so blind that he cannot see the man who observes his diminutive habitation.

We are behaving in a remarkable manner partly because our education has been of a remarkable character and partly because we have recently allowed ourselves to be unduly influenced by a few noisy and peculiar people who have been very badly educated. The recent Educational Conference at Winnipeg is a remarkable indication of the recognition by many thinking people of the great needs of our times. We have left untaught much fundamental knowledge which should have been taught and we have taught much that should have been left untaught, and there is an apparent lack of national sanity in us.

A few years ago it would have been unnecessary to deal with the fundamentals of our civilization; they were so imbued in our beings that it was almost silly to formulate them into words. We rested securely in the belief that "Truth is might and will prevail." Of late, however, so much false teaching and distortion of fundamental truths has been disseminated, and accepted by so many, that downtrodden Truth would appear to need the assistance of some Minister of Propaganda if she is to hold her place and prevail before the structure of our civilization is badly shaken. Sound economic doctrine is just as much the foundation of the engineer's professional education as mathematics and physics.

We have the much-taught doctrine that "all men are born "equal," which is an obvious fallacy. It is a self-evident fact that there is as great natural inequality-physically and mentally—in the different branches of the human race as in any other species of the animal kingdom. This difference greatly increased by the moral and spiritual inequalities of the human race—is influenced again and emphasized by environment and education from the cradle to the grave. The very men who ignorantly preach that one man is as able as another and as well qualified to rule or hold office—that race and family count for naught—will spare no pains, in breeding his live stock to select parents having certain desired characteristics of disposition and physique.

G. F. Swain, late President of the American Society of Civil Engineers, in his Address at their Ottawa Convention in 1913, made the following remarks:—

"Equality of condition means stagnation or savagery; the inequality of man means the division of labor, progress and civilization.

"In the second place we should encourage the recognition and admiration of superiority.

"In the third place, we should preach the gospel of content instead of discontent. 'Do violence to no man, neither exact anything wrongfully; and be content with your wages', said John the Baptist. There are two kinds of discontent, one praiseworthy, one ignoble. The former springs from a laudable ambition, and a desire to perfect oneself so far as natural endowment will permit. The other springs from envy and the desire to reap the rewards of the industry of others. The former kind of discontent is to be encouraged; every man should be given an opportunity to develop himself and to be confirmed in the possession of the prizes which he may gain; but the discontent which springs from envy, which leads men to depend on Government help instead of self-help, which sanctions form of unjust taxation which may be nothing less than legalized robbery, should in every possible way, be repressed. The attention of men, instead of being concentrated on what they want, should be directed to a realization of what they have. In contrast with the conditions which existed one or two centuries ago, even the conditions of the poorest classes at the present time are immensely improved. Yet with all the reduction in working hours that has taken place in the last fifty years, and the other improvements in conditions, I doubt if there is any more real happiness and content among the poorer classes. Nor have I any doubt that the excessive talk about bettering the condition of the working classes blinds them to the opportunites for their own thrift and industry."

When I begin to quote Mr. Swain's very notable Address I scarcely know where to stop. I commend it all to you as a splendid example of a well-reasoned statement of social conditions which does justice to the disciplined and trained mind of the educated engineer.

The value of such expedients as Old Age Pensions, Unemployment Insurance, etc., may be overestimated, as they must tend to increase a spirit of irresponsibility and extravagance, to lessen the incentive to thrift, to encourage carelessness in quality of work performed, and to reduce the sense of filial responsibility. Such results do not tend to advance our civilization.

"The hand of the diligent shall bear rule, but the slothful shall be under tribute."—Proverbs XIII, 24.

A popular cry of the ignorant, uneducated "socialist" is: "Why should the many support the few." All thinking men know that it is the few who have the energy, intelligence, courage and enterprise to overcome the great natural obstacles that frequently lie in the road to success—to explore the unknown wastes of the earth and make them accessible to man, and to delve into the hidden resources of nature, geographical, geological, physical and chemical, and force her to yield up her undiscovered secrets, and who, through their natural and acquired ability to develop and harness nature's great resources to serve the needs of man, are creating industry and the benefits of industry for the great masses of the people. We realize now in greater measure than ever before that the labour of the explorer, the inventor, the engineer, the manager and the skilled and unskilled workmen is none equally required to restore the world's wealth, wasted in war, and to build up again a well balanced economic and social structure. Achievement along such lines is deserving of honour and distinction, and of the wealth which properly accrues from such accomplishments, for these rewards constitute the foundation stones of the arch of civilization, just as industry, integrity and thrift form the arch stones. It was the tearing out of these arch stones that was largely responsible for the fall of the ancient civilizations of Greece and Rome; it is the tearing away of the foundation stones that has caused the utter collapse of Russia, as we see her to day.

On our own Continent we have to-day attempts by the ignorant and misguided to destroy both the foundation and arch stones of our industry and civilization, and at times it would appear that some temporary progress were attending their efforts. Therefore, it behooves the educated, who realize the dire consequences which must follow any such success—and especially the engineers who have, perhaps, a keener and deeper realization of the physical and economic consequences—to fortify themselves with a thorough knowledge of the subject and prepare to resist such dangerous tendencies as threaten the present arch of civilization as we have it to day.

The foundation stones may be popularly (though loosely and incorrectly) described as "Capital" and the arch stones as "Labour." Each is dependent on the other. I say "may be popularly described," because every man who possesses a constructive mind or owns one dollar's worth of any useful commodity or one dollar in money, is a capitalist; and every man who works, mentally or physically, is a labourer. But the man upon whose work of eight or ten hours per day depends the well-being of himself and those dependent upon him only, cannot be counted of the same value to society as the one upon whose enterprise, ability and industry depends the well-being of a factory full of employees and their families by maintaining the factory in continuous operation on a profitable basis.

In the Bulletin of the A. I. M. & M. E. for May 1919, Calvert Townley, President, is quoted as follows:

"We emerge from war time into a political arena where the voice of reason is drowned between the clamor of labour and the sentimental appeals of the soft-hearted reformer. Never has the clear reasoning of the engineer been more in demand; never was it [illegible] when the trained brain which thinks things through, back from the eternal principles to the inevitable consequences, so much needed as at present.

"We need the engineer's clear thought, always working from cause to effect, constantly exposed in the open, to help neutralize the power of these soft-hearted reformers, who face not facts as they are, but think them as they wish them to be. We need the engineer's clear reasoning to call not only their own minds, but the world, back to some elementary truths."

"That the hand deserves not the same reward as the brains; that there is no justice in a demand to share profits unless losses be divided; that there is no partnership where gains and not risks are shared; that no wages are earned or can endure that are not fully reproduced in product; that there is no great limitless body of wealth that can continue to pay labour which does not reproduce its wage plus a profit to be added to accumulated capital; that all products are the result of joint effort of brains and labour, plus capital and opportunity, and that all of these, save the last, must share the output or the industry shortly ceases.

"We need fearless men who, in the market-place and from the house-top, will force back to the knowledge of the world: that since the beginning of history brains have ruled brawn; that the brain deserves and in the ultimate will inevitably receive greater reward than the hand; that any proposed condition that puts brawn over brains plans the pyramid on its apex and necessarily is one of unstable equilibrium."

"Labour Unrest" is largely the result of failure or refusal to recognize such facts and conditions as fundamentally right. The workers are led, by observation of occasional large returns upon capital (always featured in our newspapers with sensational head-lines) to ignore the risk and more frequent losses incident to industry—(hidden in very small print, if mentioned at all). The taxation of excess profits has incited the worker to seek a share in these profits, while overlooking the logical conclusion that they would necessarily require also to share in the losses, as it is difficult to understand how partnership in industry can long exist without joint distribution of the risks as well as the rewards.

Occasionally one hears of apparent success in some scheme of profit-sharing, joint industrial councils or suggestion of "sweating the machinery instead of the men," and doubtless there are some industries to which such schemes can be adapted so long as the results of operation are profitable. In the event of losses, however (if only over a short period of time), I fear that the system would not long survive such treatment. I defy any engineer to tell me how to "sweat" a pick and shovel without some measure of perspiration on the part of the wielder thereof.

Under many of the proposed schemes it would be difficult to obtain the labour necessary to start a new enterprise or to continue an established one during a time of temporary business depression.

A great part of what is termed "common labour" in this country does not understand our language, our laws or our business methods, beyond the signing of a name or marking of a cross on the pay-roll at regular intervals; and the meaning of a stock certificate would be utterly beyond their comprehension.

As ability to understand what, to him, are the intricacies of business as applied to profit-sharing, etc., is absolutely essential to the success of such schemes, and as practically the only education these men receive in this direction is such as is instilled into them by agitators who find fomenting industrial strife a much pleasanter occupation than working for a living, the prospects for the general successful adoption of these innovations is not bright.

If solutions are possible whereby the lot of the working man can be improved, the engineer—whose training and life-work are devoted to the solution of practical problems —is most capable of finding them.

Engineers know, as well as the intelligent workmen, how fictitious are most of the alleged grievances in many of the recent strikes. These workmen, perhaps, are not to be too severely criticised if they are content to accept any immediate advantage that may be secured by means of some temporary trouble. The frequent argument that "If all vote for a strike there won't be any" is very seductive.

All mankind tends to crystallize into tribes or factions under a leader. Sometimes the employer, by his strength of character or fair dealings, commends himself to the employees as a leader, and in such cases there is seldom serious labour troubles. Lacking this condition the men select their own leaders and—as frequently in democracies—the selection is not always of the wisest or most moderate man. This leader in order to justify himself works day and night and Sundays to find trouble, in the solution of which he can demonstrate his fitness for the job.

Until the wise heads in the Unions get together, take control and educate the others along lines of duty and honest service to their fellow men, there can be no industrial peace.

The present tendency appears to be toward the obtaining of special legislation and privileges for highly organized bodies of labour beyond its proportional value, which, if continued, must result in the eventual extinction of the particular Union, Trade or Business involved, just as the Trade Guilds of the Middle Ages perished, and as the stone-cutter's trade dwindled when concrete took the place of cut stone. A striking example is the headway that the use of concrete is making for house-building in England as a result of the "ca-canny" of the Bricklayers' Unions, which is largely responsible for the increased cost, and, therefore, the rent, of the labourer's cottage.

W. R. Ingalls, in an admirable Address before the Canadian Mining Institute in May last, cites the case very clearly, as follows:—

"It was the theory of Karl Marx, from whose teachings are drived so many of the fallacies of the present time, that labour, in its narrowest sense, produces everything, and, therefore that labour should have all that it produces. That idea is frequently expressed now, all over the world. We have already seen that labour gets almost all as it is, and what remains it would not get, for if profits for example are the reward of intelligence, the removal of intelligence would remove profits also. So long as the world was dependent upon mere man-power there was no very great advance in the wealth of nations beyond what was due to increase in population. There is no good reason to believe that an Englishman in the reign of George IV could carry any more weight per hour or for any more hours, or could exhibit any other superiority of physical power than an Englishman in the time of William the Conqueror. The great increase in production has happened during the last century and a quarter, and has not been because men have grown any stronger, but because mind has taught labour how to become more effective and has provided it with machines and with organization. It is the minds of the capitalists that have produced the great increase in wealth and to these capitalists might reasonably have accrued all that they earned but the economic principle that labour is the residual claimant prevented any such result, even if it were desired. The income of England in 1801 was about £180,000,000. The income of the United Kingdom, at the same rate but allowing for the increase in population, in 1907, would have been about £800,000,000. Actually it was about £1,800,000,000, excluding the income from foreign investments. In the words of Mallock 'the mind of the larger employers was the primary producer of an income of some £1,000,000,000 added to an income that would have otherwise have been £800,000,000 only.' Then he shows conclusively that of this increment the representatives of Mind got only about £250,000,000 for themselves, including both profits and the interest on industrial capital.

"I have shown I hope that there cannot be anything essentially wrong in the existing system of the distribution of the produce of industry as between labour and capital. Labour cannot divide among itself any more than there is to divide, i.e., the total of what is produced. That is self-evident. It may attempt to seize the modest share of capital, but if it succeeds in doing so, that share dries up. If it confiscates capital itself it does not gain anything, for capital, without the directing minds to use it productively, ceases to be of advantage to anybody. The experiences in Mexico and Russia have shown what happens. The Bolshevists of other countries will lead to the same end if they have their way. Why is it that while socialists are shouting from soap-boxes, inflaming the populace with irritant poisons, while doctrinaires who hold professorial chairs are issuing fallacies, while a motley crowd in Russia is performing the most cruel and disastrous experiment every known, we cannot drive into the heads of people that even as things are under the capitalistic system they get all they can, that they can get no more than they produce, and that it is not the power of the mass but rather the minds of the few that have uplifted them to the stage of comfort that they enjoy to day, which is vastly superior to what it was a century ago. If the Marxian doctrine has been true labour would be paid now what it was 100 years ago, no more."

"It is of profound importance to make the millions of workers see things correctly, for they are blindly approaching a time when adverse economic conditions are going to drive them, and no socialistic rantings or paternalistic policies by the Government are going to help them. The world has become so much poorer by the squandering of wealth and manpower during the war that no advance in the scale of living is to be expected from it. The pressure is [illegible] the sooner. The farmer may not lose his cattle but [illegible] for his future because of the loss. The people in a city do not become [illegible] [illegible] has turned away their houses. No more do national incomes [illegible] because war has consumed their substance. Instead of labour holding what it has gained during the war it is probable that it will suffer a relapse to a condition inferior to what it held just before the war, although the unions will struggle bitterly against it. Fortunately, we shall not see a loss of consumer improvements, such as safety measures in industry, the provision of proper working quarters and conditions, because they are necessary, but labour is in danger of losing the eight-hour day for the simple reason that it will have to work nine to ten hours in order to produce enough on which to live.

During the progress of the War, in order to differentiate in a popular way the aims of the belligerents, the word "Democracy" became almost a war-cry, like "Remember the Maine" in the Spanish-American War. Both have served their purpose. "Democracy" is defined as "The form of Government in which sovereignty of the State is vested in the people, or indirectly, by means of representative institutions."

It is the ideal form of Government where "the people" are intelligent and educated on sound principles. If, on the other hand, the majority of the voters—the ruling class—are ignorant, badly led or imbued with false political doctrines, it means the downfall of that State. Lenine is credited with stating that, of every one hundred of his followers, one is a Bolshevik, 39 are criminals and sixty are fools. We see the result in Russia to-day—the most terrible famine and misery that a white nation has probably ever experienced, certainly since the Thirty Years' War.

We must be very jealous about extending the franchise to alien immigrants who become the ready and fanatical followers of irresponsible, self-seeking agitators.

The combination of various classes of workmen into Trades Unions has undoubtedly been the means of bettering the living conditions and wages of the members, by bringing to the attention of the public the defects in those conditions. These successes have naturally led ambitious members to aspire to greater things, until the public who are neither employers or employees in the union sense feel that the limit has been passed, and that, in many cases, the power of the unions is being exercised unwisely and selfishly.

The hope for further progress in trade unions appears to depend on the ability of their leaders to recognize the necessity of instilling sound knowledge into their memberships, with a sense of their duties and responsibilities to the public as well as their rights. These duties include increasing efficiency with increasing pay and decreasing hours of labour. Otherwise, there is no limit to the high cost of living which, in the last analysis, depends largely on the high cost of loafing. Co-operation among all classes and nations there must be if we are to escape the downfall of civilization.

The result of the feeling mentioned, on the part of the public, is the tendency to form unions in other walks of life for self-protection, such as the "Middle Classes Union" in London; or to secure proper recognition of the professions by the public and the Government through legislation.

Doctors, lawyers, dentists and land surveyors have long enjoyed legislative protection, doubtless to the great benefit of the whole community.

The engineering profession is so all-embracing that much difficulty has been found in framing suitable legislation in the past to meet the manifest requirements of the profession.

Last April, however, in obedience to the Resolution passed at the last Annual Meeting, a Committee from the whole Dominion met in Ottawa and drafted an Act for submission to the several Provincial Legislatures. We are advised that much progress has been made looking toward the enactment of this legislation and that our individual members in each Province are co-operating with the members of the Mining Institute and other members of the profession who are not enrolled on our list.

This is not a new movement. I think I remember it as quite a lively subject of debate in the old Society meetings thirty years ago, and I read that it was seriously under discussion by the Institution of Civil Engineers about the same time.

In the United States ten individual States have enacted laws licensing or registering engineers. Eighteen States require the licensing or registering or architects, and six States require the licensing or registering of land surveyors. These laws overlap in a confusing manner, are not all uniform and are likely to prove very embarrassing and annoying to engineers whose activities extend beyond the limits of a single State. Consequently, the Engineering Council has made a report, dated December, 1919, recommending a uniform registration law. In this they have followed the precedent of *The Engineering Institute of Canada* and the great engineering societies in England.

The Institution of Civil Engineers is endeavoring to have passed legislation to make it illegal for local Government authorities to expend public funds upon works unless under the supervision of a properly qualified engineer; also to obtain statutory powers to prescribe the qualifications and to conduct examinations for admission to the profession of Civil Engineers; to keep a register of civil engineers, and to prevent persons who are not duly qualified from holding themselves out as members of that profession.

In this connection, we must consider the difficulty caused by the confusion in the popular mind between the professional engineer and the skilled artisan (often a member of a trades union) who, in England, is defined as an "engineer." A possible solution in Canada is a more distinctive name for our *Institute*.

During his recent visit to Canada, His Royal Highness, the Prince of Wales, graciously honoured our *Institute* by consenting to become an Honorary Member. This distinction I am sure is a subject of much pleasure to all our Membership, and especially to those who had the honour of serving with His Royal Highness in the late War.

Your Council has taken an active and, we believe, a useful part in endeavoring to obtain reasonable salaries for members of the engineering profession employed in the Government service.

A Committee of your Council waited several times upon the Civil Service Commission and the Minister to present the case of our members,—we believe with very good success. The Act when passed will, of course, not be perfect nor meet the views of all our members, but in the Act is provision for further consideration of individual cases of injustice, so that they may be dealt with from time to time.

Your monthly "*Journal*" is now well established and is commending itself very favorably to all the membership. Let us all help to increase its circulation among the profession and its usefulness to the utmost.

The financial statement shews a deficit for the year, due largely to extraordinary expense of legislation committee meetings and the starting of *The "Journal"*; but it is fully expected that this deficit will be speedily wiped off.

Government official recognition of *The Institute* was accorded by the Minister of Labour in granting representation to *The Institute* at the Industrial Conference at Ottawa in September, at which conference our delegates took part as representatives of the majority of the population who are neither employers nor labour unionists, but none the less are suffering on account of the disputes between these two classes.

The membership of *The Institute* during the past year has increased greatly in excess of previous years. It should be the aim of each member to get every qualified engineer of good character into our *Institute*. Those who cannot qualify for full membership, may be very useful as Affiliates, who will find their association with our *Institute* of great service to them.

We now have Provincial Divisions of *The Institute* actively working, including eighteen very energetic Branches which are enthusiastically vieing with each other in a friendly contest for the best results in increase in membership and the contribution of valuable papers.

Our endeavour should be to make this *Institute* more than ever a national society, and thus increase our prestige and usefulness to our country and to one another.

It should be our policy, even our duty, to do all we can to the end that engineers employed by Governments—Federal, Provincial and Municipal, and even industries as far as practicable,—shall be efficient and shall be Canadians; to insist on all machinery and supplies, the purchase of which we may individually control, being of Canadian manufacture.

Some years ago I was asked by a very prominent and capable engineer from the United States to take charge of the development of some important mines in a foreign country, which development would necessitate the installation of a large amount of machinery. The capital invested in that enterprise was largely English and American, with some interest from the country itself. I was given clearly to understand by this engineer that, in case I was appointed to the position, every dollar's worth of machinery required must be purchased in the United States. One reason then dawned upon me why this gentleman was frequently featured in U. S. technical journals as the most highly paid and prominent Mining Engineer in the world. Through unforeseen circumstances the project was deferred indefinitely, but I have often wished that Canadians generally—and particularly engineers—and those in control of the purchase of machinery and supplies for Canadian developments, were imbued with some of this spirit, even if it were not carried to such an extreme.

If you can afford a motor car, (few professional engineers can) see that it is made in Canada, and that the fruit on your table is grown in Canada. If your requirements cannot be purchased in Canada, get them from the Mother country, in preference to foreign countries.

Take an active interest in Municipal and Government measures of an engineering nature. Do not be backward in assisting the public to understand the engineering and economic features of any project that may be under consideration by Municipal, Provincial or Dominion Governments. Your opinions will gain attention and respect if you are a disinterested critic.

The newspapers need your help. Their life blood is advertising, and that depends on circulation, and I am afraid circulation depends to a great extent on sensational head-lines and reading matter rather than on truth and sanity. The easiest and cheapest matter a newspaper can publish to increase its circulation is that which caters to sectional or personal prejudices, and the "Freedom of the Press" makes this form of attack difficult to correct. Undue prominence in head-lines and photographs is given to any radical or extreme utterance of even the most ignorant. Naturally, when any situation points to the possibility of a spicy article, merited or unmerited, at the expense of an industry, it is not neglected. A home industry is selected rather than a foreign corporation doing business in this country, and this tends to discourage our home enterprises to the advantage of foreign concerns. You can do much to correct this by advertising in papers that show a regard for truth and justice rather than in "The Morning Headliner," "The Evening Spasm" or "The Weekly Hysteria," even if the circulation be not so great.

If newspapers were obliged to attach the name of the writer to each article they publish the reader would be in a much better position to know what importance should be attached to the article, than under the present system. Such a practice would tend to produce a saner class of writers and greatly lessen social unrest. One shudders to think of the verdict of posterity on the sanity, wastefulness and sense of humour of our age if it is to be judged by some examples of our daily and weekly newspapers stored in museums 100 years hence.

Railroad construction all over the world was seriously affected by the war. In some cases it was completely suspended, in others retarded, and in a few exceptional cases it was actually hastened by the war. Probably the most complete suspension occurred in Brazil, but with the return of normal conditions steps are being taken to resume operations. In China work was greatly retarded, but nevertheless about 500 miles of new construction was completed, the principal sections being a 150-mile section which will constitute a link in the line by which it is proposed to unite South China and Peking, and a 150-mile branch feeder of the Trans-Siberian Railway in Manchuria. Financial arrangements were also made for a line across Southern Manchuria. In Siberia construction was carried on rapidly and the lines built have given practically a double-track railway from European Russia to Vladivostock. A number of feeders have also been constructed, opening up rich agricultural sections and important coal and iron fields.

In Africa remarkable progress was made in the construction of the Southern section of the Cape-to-Cairo route, the completed mileage now standing at 2000 miles from Capetown to Bukama on the Congo. To complete this transcontinental line now requires but the construction of 600 miles from the Congo to Lake Albert. The extension of the railway in East Africa to Lake Tanganyika, which was practically completed at the outbreak of war, affords a rail and water route across the centre of the Continent. A second East and West transcontinental line passes through Katanga, a rich mineral region in the Belgian Congo, and reaches the Indian Ocean at Beira. The British Expeditionary Forces laid a permanent, standard gauge railway from Egypt into Palestine.

In Australia the work of construction on her east and west transcontinental line was carried on during the war. This line was begun in 1912 and was completed in 1917. 3500 miles of road were built in the Commonwealth during the years 1915-17, and over one-third of the mileage of her north and south transcontinental line is now in operation. All this in spite of the wonderful contribution of Australia to the Allied cause in the War.

In Canada the construction of our second and third transcontinental lines was nearing completion at the outbreak of war. Some work has been done in the building of feeders, and work on the Hudson Bay Railway, which was suspended during the war, will doubtless be resumed at an early date.

It is unfortunate that there are at this time a number of our members, especially returned soldiers, previously engaged on railroad construction, who are out of employment, and they are naturally looking forward rather anxiously to the future.

With the exception of necessary branch feeders and connections to complete and co-ordinate existing systems, Canada has built more railways than she immediately requires. Canada, on the other hand, is very deficient in good roads, and there is no class of men so fitted to undertake the construction of highways as engineers trained on railway construction when they have added to their qualifications a knowledge of the different kinds of materials required for road making on different soils, the most desirable surfaces to meet varying conditions of traffic; and have studied the best form of organization to carry along such work with the greatest economy.

As an indication of the future of highway construction, it is interesting to note to day the development of motor-truck haulage in the conveyance of freight, particularly household goods, from a home, say, in Hamilton or Toronto to another home in New York, returning with freight of a similar nature, in competition with the railroads. Such traffic between cities and towns in southern Ontario is reaching considerable proportions, and the time is not far distant when the Railway Commission will find it necessary to take this traffic under its control. At present it is profitable and promises to expand in much greater proportion than the mileage of good roads. Interurban electric railways do not serve requirements as do the motor trucks, and can not replace them (given good roads) even at the cost of a great extension of unprofitable investment therein.

In electric railway work, advance will be made in electrifying busy terminals, and the high cost of fuel will encourage the electrifying of some main line sections where dense traffic and convenient water power indicate.

The load on hydro-electric stations is generally very irregular, and where the flow of water is abundant it is possible that the spare power (during slack hours or days) might be used to heat reservoirs of water or oil for heating buildings. I have read of such surplus power being used to heat boilers in Swecen to supplement the heat from very expensive coal.

The Scientific and Industrial Research Commission is carrying on a great deal of most valuable work of an engineering nature, such as the preparation of peat and the lignites of the Western Provinces to warrant their more extended use. This is a very promising field for the engineer.

Associated with this problem is the similar one of the coking of U.S. bituminous coals at well-selected centres, to produce coke for domestic and metallurgical purposes, gas for domestic lighting and heating and power transmission, and the saving of the valuable liquid by-products.

The transmission of power by gas made under these conditions may well supplement the transmission by electricity where comparative costs are favorable.

In metallurgy great strides have been made in the past few years, particularly in the flotation of minerals from the finely-ground ore by the aid of a small amount of oil and the formation of a froth. Wasted sand tailings in the Cobalt district, containing as low as 3½ ounces of silver to the tons, are being re-ground and "floated" economically with an extraction of about 66% and a loss in tailings of under 1½ ounces.

Canada has of late increased the range of her metallurgical manufactured products to include many alloys of iron with manganese, chrome, molybdenum, etc.

The refining of nickel, which has been carried on for some years in Canada in connection with the refining of silver, cobalt and arsenic, has recently been greatly increased by the operations of the International Nickel Corporation at Port Colborne. The British American Nickel Company is opening up its extensive refinery near Aylmer, P.Q.

Such industries have created a demand for Canadian-made soda ash, bleach, liquid chlorine, etc., which are now to be obtained in needed quantities.

The fixation of atmospheric nitrogen has been carried on at Niagara Falls, Ont., for some years as cyanimid, and this same plant is now manufacturing sodium cyanide for the extraction of silver and gold from their ores and for insecticide purposes.

In all these technical industries may be found scope for the young engineer who is adaptable and ambitious.

In the industrial world, paper-making, iron and steel making, machine-shop work, etc., there are great opportunities for the energetic, resourceful engineer.

In conclusion, help the other fellow and you won't need help. Maintain, as you have always done, the dignity of the profession, even if the disproportion is at present very marked between your salaries and the pay of the unskilled labourer. Such conditions cannot be permanent.

Let us all help to make *The Engineering Institute of Canada* an institution of national pride. Do not discourage members from joining other Engineering Societies which they believe will be of service to them, but impress upon all professional engineers the duty of helping this *Institute* to be of service to Canada, to the Empire, and to their professional brethern.

We should increase the number of our Branches from eighteen to fifty and our membership from nearly 4000 to 10,000 and put the Engineering Profession where it properly belongs by virtue of the wonderful importance of its work in almost all branches of human endeavor.

Canadian Mining Institute

The Twenty-Second Annual General Meeting of the Institute will be held in the King Edward Hotel, Toronto, on Monday, Tuesday and Wednesday, *March 8th, 9th and 10th, 1920.*

C. W. Knight, Bureau of Mines, Toronto, is secretary of the Local Committee and members wishing to make hotel reservations should notify him at an early date.

"Who's Who"

Annual and Professional Meeting, — Engineering Institute of Canada, Montreal

January, 27, 28, 29, 1920.

MONTREAL MEMBERS

No.	Name	No.	Name	No.	Name	No.	Name	No.	Name
1	R. A. Ross	69	F. Peden	137	G. B. Mackwood	204	[illegible]	[illegible]	[illegible]
2	F. F. Cameron	70	James Ferguson	138	J. H. Valiquette	205	[illegible]	[illegible]	[illegible]
4	F. J. Cunningham	71	H. W. Johnston	139	J. P. N. Gauvreau	206	[illegible]	[illegible]	[illegible]
5	F. B. Maxwell	72	[illegible]	140	L. A. Herdt	207	[illegible]	[illegible]	[illegible]
6	L. R. McCurdy	73	W. Chase Thomson	141	H. W. Lea	208	[illegible]	[illegible]	[illegible]
7	A. Ferrier	74	H. B. Stuart	142	A. E. Simpson	209	H. L. Drummond	[illegible]	[illegible]
8	J. S. Costigan	75	A. J. Edmond	143	S. W. Hamilton	210	[illegible]	[illegible]	[illegible]
9	[illegible]	76	E. F. Wilson	144	[illegible]	211	[illegible]	[illegible]	[illegible]
10	J. A. Lee	77	[illegible]	145	[illegible]	212	[illegible]	[illegible]	[illegible]
11	R. S. Eadie	78	[illegible]	146	H. V. Brayley	213	[illegible]	[illegible]	[illegible]
12	A. W. Sweet	79	[illegible]	147	K. B. Thornton	214	[illegible]	[illegible]	[illegible]
13	H. L. Mahaffy	80	C. H. Kennedy	148	C. Stephen	215	[illegible]	[illegible]	[illegible]
14	S. F. Rutherford	81	[illegible]	149	G. H. Duggan	216	[illegible]	[illegible]	[illegible]
15	H. S. Van Scoyoc	82	[illegible]	150	C. C. Vessot	217	[illegible]	[illegible]	[illegible]
16	J. R. Dunbar	83	Frank D. Adams	151	[illegible]	218	[illegible]	[illegible]	[illegible]
17	C. M. Hodson	84	[illegible]	152	A. S. Clarson	219	[illegible]	[illegible]	[illegible]
18	A. M. Robertson	86	C. A. Freeman	153	G. M. Pitts	220	[illegible]	[illegible]	[illegible]
19	[illegible]	87	[illegible]	154	V. I. Smart	221	[illegible]	[illegible]	[illegible]
20	[illegible]	88	[illegible]	155	[illegible]	222	[illegible]	[illegible]	[illegible]
21	[illegible]	89	Arthur Surveyer	156	[illegible]	223	[illegible]	[illegible]	[illegible]
22	N. M. Campbell	90	S. C. Hill	157	B. H. T. Mackenzie	224	[illegible]	[illegible]	[illegible]
23	[illegible]	91	Wm. D. Lawrence	158	A. D. Swan	225	[illegible]	[illegible]	[illegible]
24	[illegible]	92	[illegible]	159	W. J. Rutherford	226	[illegible]	[illegible]	[illegible]
25	H. M. Jaquays	93	[illegible]	160	A. B. Rutherford	227	R. deM. Prevost	[illegible]	[illegible]
26	F. C. Kirkpatrick	94	[illegible]	161	[illegible]	228	[illegible]	[illegible]	[illegible]
27	P. L. Pratley	95	[illegible]	162	E. M. Dawson	229	J. S. H. Wurtele	[illegible]	[illegible]
28	[illegible]	96	[illegible]	163	[illegible]	230	[illegible]	[illegible]	[illegible]
29	K. R. McLennan	97	[illegible]	164	H. Ralph	231	[illegible]	[illegible]	[illegible]
30	W. J. Muir	98	J. S. Morrison	165	H. S. Philips	232	[illegible]	[illegible]	[illegible]
31	F. A. Combe	99	[illegible]	166	R. M. Robertson	233	[illegible]	[illegible]	[illegible]
32	[illegible]	100	D. W. Smith	167	G. E. Bell	234	[illegible]	[illegible]	[illegible]
33	[illegible]	101	[illegible]	168	G. V. Douglas	235	J. M. Robertson	[illegible]	[illegible]
34	T. Kearney	102	[illegible]	169	L. H. Armstrong	236	[illegible]	[illegible]	[illegible]
35	[illegible]	103	[illegible]	170	R. Sprenger	237	[illegible]	[illegible]	[illegible]
36	C. W. Stokes	104	[illegible]	171	[illegible]	238	[illegible]	[illegible]	[illegible]
37	H. M. Lamb	105	[illegible]	172	W. S. Cole	239	[illegible]	[illegible]	[illegible]
38	Walter J. Francis	106	P. B. Motley	173	Chas. McKergow	240	A. R. Harris	[illegible]	[illegible]
39	C. Percy Cole	107	[illegible]	174	E. Brown	241	[illegible]	[illegible]	[illegible]
40	Fraser S. Keith	108	E. S. M. Lovelace	175	A. J. Kelly	242	D. H. Macfarlane	[illegible]	[illegible]
41	K. C. Kemp	109	J. H. Hunter	176	K. B. Jenckes	243	[illegible]	[illegible]	[illegible]
42	R. M. Charlton	110	M. J. A. Vermette	177	J. K. Wilson	244	[illegible]	[illegible]	[illegible]
43	Frank Peden	111	J. A. Burnett	178	Ernest V. Moore	245	[illegible]	[illegible]	[illegible]
44	P. E. Demers	112	H. Wickenden	179	B. K. Salanis	246	[illegible]	[illegible]	[illegible]
45	S. A. Neilson	113	G. E. Desy	180	[illegible]	247	J. A. G. Bishop	[illegible]	[illegible]
46	A. S. Wall	114	C. J. Armstrong	181	J. M. White	248	[illegible]	[illegible]	[illegible]
47	C. N. Shanly	115	G. A. Wallace	182	W. H. Magwood	249	J. A. Lalonde	[illegible]	[illegible]
48	O. H. Cote	116	J. B. Brown	183	R. W. Hannaford	250	O. Lefebvre	[illegible]	[illegible]
49	G. E. Templeman	117	W. D. Stroud	184	Leslie R. Thomson	251	C. A. Mullen	[illegible]	[illegible]
50	Frederick B. Brown	118	[illegible]	185	H. W. Vaughan	252	[illegible]	[illegible]	[illegible]
51	H. H. Vaughan	119	F. O. Sullivan	186	[illegible]	253	H. M. MacKay	[illegible]	[illegible]
52	[illegible]	120	V. A. Fournier	187	F. S. Williamson	254	[illegible]	[illegible]	[illegible]
53	Jos. Landry	121	[illegible]	188	P. E. Jarman	255	[illegible]	[illegible]	[illegible]
54	G. H. Kirby	122	[illegible]	189	[illegible]	256	[illegible]	[illegible]	[illegible]
55	[illegible]	123	C. V. Christie	190	[illegible]	257	[illegible]	[illegible]	[illegible]
56	R. H. Mather	124	P. Johnson	191	J. A. Duchastel	258	[illegible]	[illegible]	[illegible]
57	W. P. Murray	125	[illegible]	192	[illegible]	259	[illegible]	[illegible]	[illegible]
58	D. H. Ross	126	[illegible]	193	F. H. Pitcher	260	[illegible]	[illegible]	[illegible]
59	E. MacEwen	127	[illegible]	194	C. W. Austin	261	[illegible]		
60	[illegible]	128	J. F. Pringle	195	G. M. Thompson	262	[illegible]		
61	G. K. McDougall	129	Sir John Kennedy	196	[illegible]	263	[illegible]		
62	J. F. Pringle	130	W. B. Seath	197	[illegible]	264	[illegible]		
63	Arthur Vincent	131	A. R. Ketterson	198	[illegible]	265	[illegible]		
64	C. M. Stewart	132	[illegible]	199	A. Peden	266	[illegible]		
65	J. N. Levesque	133	G. H. Rochester	200	W. R. Way	267	[illegible]		
66	Wm. MacNab	134	[illegible]	201	[illegible]	268	[illegible]		
67	F. H. McKechnie	135	G. L. Fortin	202	[illegible]	269	[illegible]		
68	A. Pepin	136	R. E. Crawford	203	L. Kirk Greene	270	[illegible]		

OUT OF TOWN MEMBERS

No.	Name	Address
2	R. W. Leonard	St. Catharines, Ont.
351	Alex. Fraser	Quebec, P.Q.
352	L. G. Trudeau	Rimouski, P.Q.
353	J. G. Legrand	Winnipeg, Man.
355	N. Goodman	Shawinigan Falls, P.Q.
356	H. W. D. Armstrong	Toronto, Ont.
357	Westropp Armstrong	Toronto, Ont.
358	G. Kydd	Orillia, Ont.
359	A. C. Crepeau	Sherbrooke, P.Q.
360	F. DeC. Davies	Winnipeg, Man.
361	J. P. Mullarkey	New York, N.Y.
362	N. M. McLeod	Toronto, Ont.
363	F. C. Jewett	St. Catharines, Ont.
364	P. J. Duff	Philadelphia, Pa.
365	E. A. Evans	Quebec, P.Q.
366	Alex. Macphail	Kingston
367	John Murphy	Ottawa, Ont.
368	Willis Chipman	Toronto, Ont.
369	R. S. Weston	Boston, Mass.
370	C. McN. Steeves	St. John, N.B.
371	H. A. Goldman	Toronto, Ont.
372	P. Gillespie	Toronto, Ont.
373	B. E. Norrish	Ottawa, Ont.
374	C. L. Hayes	Toronto, Ont.
375	S. E. Oliver	Quebec, P.Q.
376	A. R. Dufresne	St. John, N.B.
377	F. M. Perry	Sault Ste. Marie, Ont.
378	J. B. Challies	Ottawa, Ont.
379	D. MacPherson	Ottawa, Ont.
380	J. Mackintosh	Peterborough, Ont.
381	G. G. Murdoch	St. John, N.B.
382	W. H. Breithaupt	Kitchener, Ont.
383	A. S. Miller	Brighton, Ont.
384	H. J. Lamb	Toronto, Ont.
385	A. A. Anderson	Ottawa, Ont.
386	C. N. Monsarrat	Ottawa, Ont.
387	J. C. Stewart	Ottawa, Ont.
388	R. J. Durley	Ottawa, Ont.
389	G. Grant	Ottawa, Ont.
390	G. H. Ferguson	Ottawa, Ont.
391	S. Troop	Moncton, N.B.
392	H. N. Putnam	Halifax, N.S.
393	W. F. V. Atkinson	Sault Ste. Marie, Ont.
394	J. R. Freeman	Halifax, N.S.
395	W. P. Morrison	Dartmouth, N.S.
396	R. McColl	Halifax, N.S.
397	C. C. Kirby	St. John, N.B.
398	V. E. Belanger	L'Orignal, Ont.
399	G. H. Bryson	Brockville
400	C. M. Odell	Sydney, N.S.
401	V. Taylor	Quebec, P.Q.
402	J. W. Harkom	Melbourne, P.Q.
403	F. R. Wilford	Lindsay, Ont.
404	G. Claxton	Shawinigan Falls, P.Q.
405	Alex. Gray	St. John, N.B.
406	H E. T. Haultain	Toronto, Ont.
407	J. E. Gibault	Quebec, P.Q.
408	C. Carniel	St. John, N.B.
409	W. P. Wilgar	Kingston, Ont.
410	A. K. Grimmer	Fredericton,
411	A. R. Decary	Quebec, P.Q.
412	H. A. Terreault	Sorel, P.Q.
413	P. P. Westbye	Peterborough, Ont.
414	G. Reid Munro	Peterborough, Ont.
415	F. O. Orr	Alfred, Ont.
416	T. A. MacLean	Halifax, N.S.
417	D. S. Barton	Levis, P.Q.
418	J. S. Bates	Kenogami, P.Q.
419	C. W. Innes	Halifax, N.S.
420	C. E. Hogarth	Berthierville, P.Q.
421	C. L. Cate	Sherbrooke, P.Q.
422	Geoffrey Stead	Chatham, N.B.
423	F. G. Engholm	Toronto, Ont.
424	E. M. Proctor	Toronto, Ont.
425	Geo. Hogarth	Toronto, Ont.
426	W. A. McLean	Toronto, Ont.
427	R. H. Harcourt	St. Catharines, Ont.
428	H. B. R. Craig	Windsor, Ont.
429	R. Yuill	Truro, N.S.
430	W. P. Anderson	Ottawa, Ont.
431	L. G. Denis	Ottawa, Ont.
432	Alex. J. Grant	St. Catharines, Ont.
433	D. W. McLachlan	Ottawa, Ont.
434	B. F. Haanel	Ottawa, Ont.
435	W. Matheson	Hawkesbury, Ont.
436	J. A. Boyle	Ottawa, Ont.
437	T. H. Jones	Brantford, Ont.
438	E. A. Stone	Ottawa, Ont.
439	A. B. Lambe	Ottawa, Ont.
440	R. F. Uniacke	Ottawa, Ont.
441	James White	Ottawa, Ont.
442	E. T. Wilkie	Toronto, Ont.
443	J. A. Reid	Cobalt, Ont.
444	M. Wolff	Ottawa, Ont.
445	F. H. Emra	Ottawa, Ont.
446	M. B. Atkinson	Ottawa, Ont.
447	J. S. Armstrong	Fredericton, N.B.
448	J. Sinton	Toronto, Ont.
449	A. W. Sullivan	Valleyfield, P.Q.
450	G. H. Kohl	Sault Ste. Marie, Ont.
451	E. A. Markham	Regina, Sask.
452	D. H. Lunam	Regina, Sask.
453	A. F. Stewart	Toronto, Ont.
454	R. J. Lecky	Regina, Sask
455	C. M. Goodrich	Walkerville, Ont.
456	M. A. Lyons	Winnipeg, Man.
457	C. H. Keefer	Ottawa, Ont.
458	J. Aird	Toronto, Ont.
459	C. G. Moon	Vancouver, B.C.
460	H. K. Wicksteed	Toronto, Ont.
461	C. V. Gale	Ottawa, Ont.
462	G. Gordon Gale	Ottawa, Ont.
463	D. S. Scott	Quebec, P.Q.
464	Arthur Dick	Quebec, P.Q.
465	C. F. Whitton	Hamilton, Ont.
466	R. L. Latham	Hamilton, Ont.
467	J. A. Elliott	Nelson, B.C.
468	D. Walter Munn	Kingston, Ont.
469	F. A. Dallyn	Toronto, Ont.
470	Morris Knowles	Windsor, Ont.
471	A. LaRoche	St. Zotique, P.Q.
472	J. N. T. Bertrand	Isle Verte, P.Q.
473	Roger A. DeValter	Sherbrooke, P.Q.
474	F. H. Kester	Walkerville, Ont.
475	F. F. Miller	Napanee, Ont.
476	Romeo Morrissette	Three Rivers, P.Q.
477	D. A. Evan	Three Rivers, P.Q.
478	P. H. Mitchell	Toronto, Ont.
479	Gen. C. H. Mitchell	Toronto, Ont.
480	H. G. Acres	Toronto, Ont.
481	H. T. Routly	Toronto, Ont.
482	C. H. Fullerton	Toronto, Ont.
483	P. E. Amiot	Chicoutimi, P.Q.
484	J. A. DeCew	New York, N.Y.
485	A. M. Jones	Ottawa, Ont.
486	G. L. Guellet	Kingston, Ont.
487	C. R. Lindsey	Shawinigan Falls, P.Q.
488	S. W. Sainworth	Ottawa, Ont.
490	E. H. Mathewson	Morrisburg, Ont.
491	W. L. Ketchen	Temiskaming, P.Q
492	A. D. Macallum	Ottawa, Ont.
493	Norman Maar	Ottawa, Ont.
494	E. S. Henderson	Windsor, Ont.
495	C. H. Connell	Quebec, P.Q.
496	H. A. Morrow	Peterborough, Ont.
497	N. A. Garrow	Victoria, B.C.
500	T. U. Fairlie	Toronto, Ont.
887	W. A. Duff	Moncton, N.B.
888	T. Linsey Crossley	Toronto, Ont.
899	Jas. L. Millen	Pembrooke, Ont.

GUESTS

No.	Name	Address	No.	Name	No.	Name	No.	Name
503	P. J. [illegible]	Montreal	538	D. L. McLeod	565	H. [illegible]	594	E. G. M. [illegible]
504	E. W. [illegible]	Washington, D.C.	539	A. E. [illegible]	567	W. R. Gould	595	M. E. [illegible]
505	J. B. Taylor	Montreal	540	Major W. H. D. [illegible]	568	D. S. [illegible]	596	E. C. [illegible]
506	R. M. [illegible]	Montreal	541	R. M. [illegible]	571	E. [illegible]	597	R. D. [illegible]
509	Prof. C. A. [illegible]	Montreal	542	Mr. [illegible]	572	[illegible]	598	Capt. F. [illegible]
510	Gordon W. [illegible]	New York	543	[illegible]	573	A. E. Bell	599	H. G. [illegible]
511	H. H. [illegible]	Montreal	544	Armand [illegible]	574	E. M. [illegible]	600	E. J. [illegible]
512	F. S. Parsons	Montreal	545	H. Roy Cromwell	575	E. C. [illegible]	601	J. W. [illegible]
513	W. H. McLean	Montreal	546	J. W. Lewis	576	E. B. [illegible]	602	A. Kennedy
514	S. M. [illegible]	Montreal	547	Geo. E. [illegible]	577	D. W. [illegible]	603	N. [illegible]
515	M. C. Stewart	Montreal	548	Bruce Ross	578	E. J. [illegible]	604	G. E. [illegible]
516	F. N. Gill	Montreal	549	F. L. Maxwell	579	C. F. [illegible]	605	J. E. Smith
517	F. [illegible] Green	Montreal	550	C. E. L. Irving	580	E. W. [illegible]	606	P. [illegible]
518	Kenneth B. Patterson	Montreal	551	J. M. Purcell	581	J. M. [illegible]	607	N. A. [illegible]
519	C. M. [illegible]	Montreal	552	Ben [illegible]	582	E. H. [illegible]	608	J. W. [illegible]
520	C. D. [illegible]	Montreal	553	J. Purcell	583	N. L. [illegible]	609	W. D. [illegible]
521	K. [illegible]	Montreal	554	H. J. Emery	584	C. R. [illegible]	610	F. A. [illegible]
522	W. B. Scott	Montreal	555	Walter C. Adams	585	F. C. [illegible]	611	J. C. [illegible]
523	L. S. [illegible]	Montreal	556	Dr. Norman [illegible]	586	C. R. [illegible]	612	Wilson
524	J. G. Gardner	Montreal	557	James A. Yates	587	G. E. [illegible]	613	D. A. [illegible]
525	H. I. Kirkpatrick	Montreal	558	Lester O. [illegible]	588	D. J. [illegible]	614	W. [illegible]
526	Mr. & Mrs. Bruce Vernon	Montreal	559	P. I. [illegible]	589	E. H. Smith	615	T. E. [illegible]
527	H. [illegible]	Montreal	560	G. R. Giles	590	C. S. [illegible]		
528	C. M. M. Edwards	Montreal	561	J. [illegible]	591	N. S. [illegible]		
529	Hal C. Lee	Montreal	562	Alex [illegible]	592	A. G. [illegible]		
530	Joseph Cohen	Montreal	563	C. W. [illegible]	593	M. I. [illegible]		
531	A. [illegible]	Montreal	564	D. L. Cal[illegible]n				
532	F. W. [illegible]	Montreal						
533	S. [illegible]	Montreal						
534	C. E. Draper	Montreal						
535	Leon S. [illegible]	Kenogami, Que.						
536	F. L. Darrell	Kenogami, Que.						
537	R. J. [illegible]	New York						

LADIES

No.	Name	No.	Name	No.	Name	No.	Name	No.	Name
700	Miss [illegible]	739	Mrs. Vaughan	778	Mrs. [illegible]	817	Mrs. [illegible]	856	Mrs. [illegible]
701	Miss [illegible]	740	Mrs. Landry	779	Mrs. Armstrong	818	Miss Campbell	857	Mrs. [illegible]
702	Miss Stewart	741	Miss [illegible]	780	Miss Radley	819	Mrs. [illegible]	858	Miss [illegible]
703	Miss Clarke	742	Mrs. [illegible]	781	Miss Stroud	820	Miss [illegible]	859	Mr. [illegible]
704	Mr. Roche party	743	Mrs. Mather	782	Mrs. [illegible]	821	Mrs. [illegible]	860	Mrs. [illegible]
705	Mr. Roche party	744	Mrs. Murray	783	Mrs. W. H. Stewart	822	Mrs. McArthur	861	Mrs. [illegible]
706	Mr. Roche party	745	Mrs. Ross	784	Mrs. Christie	823	Miss Kennedy	862	Mrs. [illegible]
707	Miss Melvy	746	Miss Findlay	785	Mrs. McCall	824	Miss [illegible]	863	Mrs. [illegible]
708	Miss I. Melvy	747	Mrs. [illegible] party	786	Mrs. Davies	825	Miss [illegible]	864	Miss [illegible]
709	Mrs. S. F. Rutherford	748	Mrs. Pringle	787	Mrs. Belanger	826	Mrs. Moore	865	Mrs. [illegible]
710	Mrs. Wm. Rutherford	749	Mrs. Stewart	788		827	Mrs. Orr	866	Mrs. Joseph
711	Miss D. Charlton	750	Miss Levesque	789	Miss Reynolds	828	Mrs. Hannaford	867	Miss [illegible]
712	Miss H. [illegible]	751	Miss Levesque	790	Miss [illegible]	829	Miss [illegible]	868	Miss [illegible]
713	Mrs. D. MacFarlane	752	Mrs. [illegible]	791	Mr. [illegible] party	830	Miss D. [illegible]	869	Mrs. [illegible]
714	Miss Fulton	753	Miss Wilkinson	792	Mr. [illegible] party	831	Miss M. Campbell	870	Mrs. [illegible]
715	Mrs. Eardley Wilmot	754	Miss [illegible]	793	Miss Donald	832	Mrs. Budden	871	Miss [illegible]
716	Mrs. [illegible]	755	Mrs. Greene	794	Mrs. Valiquette	833	Mrs. [illegible]	872	Miss [illegible]
717	Mrs. H. E. Bates	756	Miss Smith	795	Mrs. J. P. B. Casgrain	834	Miss [illegible]	873	Miss [illegible]
718	Mrs. J. M. Brown	757	Mrs. Hogarth	796	Miss Ketterson	835	Mrs. [illegible]	874	Mrs. [illegible] party
719	Mrs. Kirkpatrick	758	Mrs. [illegible]	797	Mrs. Tabb	836	Mrs. [illegible]	875	Mrs. [illegible] party
720	Mrs. Pratley	759	Miss Bliss	798	Mrs. Hamilton	837	Mrs. Mattice	876	Mrs. [illegible]
721	Miss Lewis	760	Miss [illegible]	799	Miss Alexandre	838	Mrs. Bertrand	877	Mrs. [illegible]
722	Miss Allan	761	Mrs. F. D. Adams	800	Mrs. Bryson	839	Mrs. Brooks	878	Mrs. [illegible]
723	Mrs. [illegible]	762	Miss Finney	801	Miss [illegible]	840	Mrs. W. J. [illegible]	879	Mrs. [illegible]
724	Mrs. J. L. Busfield	763	Miss [illegible]	802	Miss Odell	841	Miss [illegible]	880	Lady [illegible]
725	Mrs. M. Lamb	764	Mrs. Surveyer	803	Mrs. [illegible]	842	Mrs. [illegible]	881	Miss [illegible]
726	Mrs. Brown	765	Miss Young	804	Mrs. Walters	843	Miss [illegible]	882	Miss [illegible]
727	Mrs. H. D. Robertson	766	Mrs. Ranbeney	805	Mrs. Stephen	844	Mrs. [illegible]	883	Miss [illegible]
728	Mrs. G. P. Cole	767	Mrs. Nolan	806	Mr. [illegible] party	845	Mrs. Wright	884	Miss [illegible]
729	Mrs. Fraser Keith	768	Mrs. J. B. Challis	807	Mr. [illegible] party	846	Miss [illegible]	885	Miss [illegible]
730	Mrs. Peden	769	Mrs. E. G. May	808	Mr. [illegible] party	847	Miss [illegible]	886	Mrs. [illegible]
731	Mrs. [illegible]	770	Mrs. [illegible]	809	Miss [illegible]	848	Mr. [illegible] party		
732	Mrs. Stanley party	771	Miss [illegible]	810	Mrs. [illegible]	849	Miss [illegible]		
733	Mrs. Cote	772	Miss S. Wood	811	Mr. [illegible] party	850	Mrs. [illegible]		
734	Mr. Cote party	773	Mrs. Sherwood	812	Mrs. Hunter	851	Mrs. Wilson		
735	Mrs. Templeman	774	Miss Sherwood	813	Mrs. [illegible]	852	Mrs. [illegible]		
736	Mrs. Holman	775	Mrs. Hunter	814	Miss [illegible]	853	Mrs. [illegible]		
737	Miss Smythe	776	Miss Hunter	815	Mrs. Ralph	854	Miss [illegible]		
738	Miss Robertson	777	Miss [illegible]	816	Mrs. H. S. Phillips	855	Mrs. [illegible]		

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

Vol. III.   February 1920   No. 2

Thirty-Fourth Annual Meeting

Combined Annual and General Professional Meetings inaugurated at Ottawa last year with such success and repeated with the meeting just closed by the combination of the Thirty-fourth Annual and Sixth General Professional Meeting, at Montreal January twenty-seventh, twenty-eight and twenty-ninth, nineteen hundred and twenty, and having the assets of the experience gained and the enthusiasm aroused a year ago, establishing a record in attendance and interest, have doubtless become a permanent fixture of the features of *The Engineering Institute of Canada.* While comparisons with previous meetings do not detract from any of them, the application of the word "greatest" to the meeting just held in universally conceded. The unusually large attendance is a direct reflection of the greater part that engineers are taking in connection with the affairs of their own profession and are an evidence that we have taken a considerable step in imbuing the profession with a sense of its own importance.

Original plans included holding all sessions at the headquarters of *The Institute,* but before the first session of the Annual Meeting on the morning of January twenty-seventh had well advanced, it was apparent that larger quarters were needed, against which contingency arrangements had been made for the Ladies Ordinary at the Windsor Hotel where the sessions of Tuesday afternoon and Wednesday morning were held. This in turn proved inadequate to accommodate the members attending, as nearly one hundred were unable to be seated at the Wednesday session, and adjournment for Thursday's sessions were made to the Windsor Hall.

President Leonard who occupied the chair for the Thirday-fourth Annual General Meeting, showed himself an adept at having the various items of business on the long agenda put through on scheduled time and with such success that the entire business proceedings were concluded as arranged. The official report of this meeting will appear in the next issue of *The Journal.* the admirable address of the President being printed in this issue.

The Committee reports were all adopted and a number of constructive suggestions made by the various Committees were referred to Council for action, as was the question of the re-appointment of *The Institute* committees. The suggestion of the Finance Committee regarding *The Journal* will be brought more prominently to the members at an early date. Branch reports from sixteen of the Branches and one Provincial Division spoke more eloquently than any general statement possibly could of the remarkable development that has taken place in Canada regarding the interest of engineers in matters concerning their own and the profession's welfare. Every Branch of *The Institute* showed a prosperous financial condition and a substantial numerical increase of membership which shows clearly that they are all live energetic societies. In most of the Branch reports the question of legislation and compensation of engineers was referred to and the fact brought out that in many of the provinces legislation is an active issue of the present moment.

The report of the Scrutineers showed the following elected:—

President	R. A. Ross
Vice-Presidents	Brig.-Gen. C. H. Mitchell
	W. G. Chace
Councillors	
District No. 1	Frederick B. Brown
	Julian C. Smith
District No. 2	A. R. Decary
District No. 3	F. A. Bowman
District No. 4	J. B. Challies
District No. 5	E. R. Gray
District No. 6	Guy C. Dunn—(For Three Years)
	B. S. McKenzie—(For One Year)
District No. 7	J. R. C. Macredie
District No. 8	G. W. Craig
District No. 9	H. M. Burwell

Hearty congratulations were tendered by the visiting members to the Montreal Branch, whose Executive and various committees have had, for weeks, to work with untiring zeal to complete arrangements for the social and professional features that made such a strong appeal to the personal and professional instincts of all who attended. The arrangements for the registration of delegates and all the details were carried out by the committees of the Branch in a manner that did credit to all concerned.

Courtesy Appreciated

Every member of *The Institute* will appreciate the courtesy received from the President and Executive of the Association of Canadian Building and Construction Industries. When the matter was brought to their attention that the dates fixed for the Annual Meeting of their Association corresponded with those arranged for the Annual and Professional Meetings of *The Institute*.

Although President Anglin was good enough to say that in making this change they were only reciprocating the kindness received from members and officers of *The Institute* when the Association was being formed, nevertheless it necessitated trouble and expense, and involved the upsetting of plans carefully completed, so that the spirit shown exemplifies not only a cordial feeling of good followship, but a desire to work together to mutual advantage and to co-operate in the many points where the interests of the Association and *The Institute* are in common. The following correspondence between Secretary J. C. Reilly, of the Association of Canadian Building and Construction Industries and the Secretary of *The Institute* will explain the situation more fully:—

Association of Canadian Building and Construction Industries

Executive Committee

J. P. Anglin, President, Montreal.
J. C. Reilly, Acting General Secretary.
65, Victoria St., Montreal.

Fraser S. Keith, Esq.
Secretary, *The Engineering Institute of Canada*,
176 Mansfield Street,
Montreal, P.Q.

Dear Mr. Keith:—

Following our conversation of a few days ago, and your previous talk with President Anglin, I should say that we have arranged to change the dates of our coming General Conference, in order to avoid conflicting with your Annual Convention.

Our new days are, Monday, Tuesday and Wednesday, the second, third and forth of February. Sessions will be held in the Chateau Laurier, Ottawa, commencing at 10 a.m., on Monday, February 2nd.

I would ask that if possible you make some announcement of our Conference during the progress of your Convention, as there will probably be a good number of contracting engineers present.

With best wishes for a most successful meeting of your organization, I remain,

Yours very truly,
(Sgd.) J. C. REILLY,
Secretary.

ROBERT A. ROSS, M.E.I.C., President, 1920
The Engineering Institute of Canada.

LIBRARY NOTES

The following has been received and is to be found in the Library:—

American Society of Civil Engineers.—Final Report of the Special Committee to formulate principles and methods for the valuation of railroad properties and other public utilities.

Mines, Grisou Poussière

[illegible]

This text-book on Fire-damp and Dust in Coal Mines forms one of a series of practical text-books known as the Encyclopédie Scientifique which corresponds to a certain extent to the Reference Libraries of the Correspondence Schools in this country.

Professor Grussard first takes up the question of the factors controlling the ignition and combustion of Fire-damp and Coal Dust; temperature of combustion, delay factor, etc. The second section deals with actual "flaming" in mines, and discusses thoroughly the Davy and other safety lamps with a simple explanation of the principle of the Davy screen lamp. The question of explosives is next taken up; the various explosives used in coal-mine practice with their characteristics in connection with explosions of fire-damp and coal-dust are discussed, and the rules adopted in France for use of explosives in coal-mines are given. In the last two sections of the text-book Professor Grussard discusses prevention and localisation of explosions, with a chapter on problems in mine ventilation.

The style of the book is conversational throughout, and in few places are figures quoted in detail. From the purely scientific standpoint the text-book is not intended to present results of research work, but would undoubtedly be of value to the mine superintendent, particularly in regard to ventilation and explosives.

Catalogue of the Watt Centenary Exhibition (Science Museum, South Kensington).

Catalogue of the Mechanical Engineering Collection (Science Museum, South Kensington).

Copies of Acts concerning registration of engineers have been received from the following States:—Florida, Illinois, Oregon, Michigan, Iowa, Idaho, Colorado, and copies of the Acts are at present in the Library.

A recent addition to the journals received by the Library is the weekly bulletin of the Department of Trade and Commerce Intelligence Branch. This bulletin gives a useful weekly summary of Canada's export trade in reference to Great Britain and others countries. The publication is free, and can be obtained by any member by writing to the Department of Trade and Commerce.

Practical Flying

By Flight Commander W. G. McMinnier, R.N., G. H. Domico., New York. $1.50.

This book is the outcome of the author's experience in the training of service air pilots. It is very clearly written and the illustrations are excellent. After a brief discussion of the principles of flight, the details of machines and engines and the use of instruments are considered and the course of training in elementary flying, cross-country flying and stunting are freely dealt with. There is a short introduction by General W. S. Brincher, R.A.F. and a chapter on the Medical aspects of aviation by Dr. Graens Anderson.

The glossary of aeronautical terms given as a appendix is rather out of date and should be revised for later editors in the light of the standard glossary recently published by the Royal Aeronautical Society of Great Britain.

The book can be confidently recommended, not only to those wishing to learn to fly, but to all general readers, posesssing the rudiments of engineering training, who are interested in aeronautics.

Gas and Flame in Modern Warfare

By Major S. M. Auld, M.C., Geo. H. Doran, Company, New York.

This book is not a comprehensive study of gas and liquid-fire, but is an interesting narrative of their use by the Germans against the British Forces in France and Belgium until the end of 1917.

The author explains both the gas-cloud attacks first employed, and the gas shell bombardments which superseded them.

He shows how gas-cloud attacks were made, and how the anti-gas measures became so effective that gas-cloud attacks were abandoned in August 1916.

With regards to the gas shell bombardments, the different gases, their characteristics, and their tactical use are all clearly set forth.

The anti-gas measures are fully described, such as the evolution of the respirator, the Vermorel sprayer, the Ayrton fan and the gas-proof dug-out.

The last chapter explains the construction, use and limitations of the "Flammenwerfer", or flame-projector.

No mention is made of the gas and other forms of frightfulness used by the British.

Y. LAMONTAGNE.

CORRESPONDENCE

O'Brien Mine, Cobalt, Ont.

Dec. 14, 1919.

Editor, *Journal*,

Dear Sir:

In the matter of the Engineering Profession Act (in the success of which I personally feel keenly interested), if it may be permitted me to offer a constructive criticism, it is that a little propaganda work would greatly aid in getting the Act favourably considered by those members of the profession who are not connected with *The Institute*, and with that end in view, I would suggest that a small pamphlet or brochure be prepared explaining the intentions of *The Institute* along those lines, also giving the history of previous attempts in that direction, what success they attained, and the nature of the opposition they encountered.

The pamphlet could furthermore enlarge on the superior remuneration obtained by members of the legalized professions compared with that received by engineers and on their higher standing in the community; for it is the humiliating truth that while the engineering profession forms the basis of the structure of present day industrial civilization, the bulk of its members do not enjoy the same consideration as those belonging to the older professions.

I do not mean that a pamphlet or brochure of this nature be scattered broadcast, but that it be distributed privately to members of *The Institute* who are interested in furthering the matter of legislation, by them to be used as a fund of information in gaining converts and combatting the arguments of their opponents. It may be objected to this proposal, that such work can better be done by the various branches; that is, no doubt, true in the large centres of population where they exist, but a great many engineers do not live in these centres; this is especially so with respect to the mining profession among the members of which, propaganda has to be carried on by isolated individuals, many of whom, like myself, have not been long enough connected with *The Institute* to be thoroughly conversant with its history, and hence are sometimes at a loss for facts to support our arguments. I may say that in my opinion a large proportion of mining engineers are thoroughly disgusted with the conditions at present existing in that branch of the profession, and if a vigorous effort be made by those in favour of legislation to shew that it would result in an amelioration of these evils it would have the support of the greater part of the younger generation at any rate. The time is certainly ripe for something to be done along these lines. Regarding the Act itself, there is one clause, which in the interest of the mining industry, could stand some modification, to wit: (1) "Any person who is not a resident of Canada, but is a member of an engineering or technical organization, or society of standing recognized by the Council, may obtain a license to act in an advisory or consultative capacity to a registered member of the Association." Now, in the case of foreign corporations investing in mining property in Canada, they not unnaturally have more confidence in their own advisers than in any native engineer, and it seems to me that the above clause could be construed to prevent any foreign engineer from making mine examinations or doing similar work in the Dominion, if such is the case it is likely to prove a hindrance to foreign capital entering the country, so I would suggest that the said clause be modified so as to permit a foreign (mining) engineer of approved standing to obtain a temporary license to practise.

Yours truly,

J. A. Reid, M.E.I.C.

Re Draughtsmen and Engineers

I wish to draw your attention to a great injustice, for which skill in draughting is responsible, in the Government service.

The majority of engineers are not finished draughtsmen, and when one of the departments here gets hold of a graduate engineer who shows skill in draughting, it keeps him at it to the neglect of his proper work, and to serious detriment of his career and remuneration.

We have had ample opportunity to observe cases amongst the permanent men, and cases such as the following amongst the temporaries.

The Civil Service Commission sends a couple of temporary men out who say they are draughtsmen. The department finds them useless for draughting and promotes them to higher duties. If they are graduates sending them in the field etc., but leaving the original engineer at draughting all the time drawing a draughtsman's pay without even a chance of being classified as an engineer, instead of an engineer who is a good draughtsman doing better in his profession. This is a great drawback in the civil service. In many cases in these branches the chief engineer is a member of *The Engineering Institute of Canada*. Can *The Institute* do nothing in such cases to better the situation?

Two Engineers of Dept. of Interior.

Class and Clash Legislation

The Editor, *Journal*:

Dear Sir,

The subject of legislation has been a live one in Ontario during the past year and few remarks on the subject may not be out of place at the present time.

The proposals of the Special Committee on Legislation of *The Engineering Institute of Canada* contemplate legislative action that will be all-embracing, and which will not give *The Engineering Institute* control of the operation of the Act. In general, the Bill advanced by this Special Committee of *The Institute* contemplates compulsory and consolidated registration for all practising professional engineers, which will place them in a position comparable to the position now enjoyed by lawyers and doctors. Neither the lawyers nor the doctors have found it advisable or necessary to secure separate registration for each branch of their profession. There may be many specialists in each profession, but in all cases they are either lawyers or doctors. If a Bill substantially similar to *The Engineering Institute* Committee Bill is obtained for the Province of Ontario, all engineers, mining, civil, electrical, chemical, etc., will become registered under its provisions. The engineering profession will be one consolidated entity.

On the other hand, the proposals of the Sub-Committee of the Joint Committee of Technical Organizations contemplate a general Bill, which by expressed intent and by means of ancillary Bills may be made all-embracing, including even lawyers, doctors, dentists, veterinary surgeons, etc., and if their recommendations and conclusions are carried out consistently, and a Bill similar to the Illinois Act (upon which they state their proposals are modelled), is passed, the registration may include nurses, movie operators and practically every special endeavour which may be considered to be technical. The Joint Committee proposals, therefore, involve, directly or indirectly, either now or sometime in the future, the possibility of the inclusion of other established professions and sundry technologists. Surely it is manifest that it would be impossible for purely professional engineers to make any headway to secure registration for themselves if their proposals contemplate affecting the status quo of such firmly established and powerfully entrenched professional organizations like those controlling the professions of law, medicine and dentistry. We would only invite their concentrated opposition and even the U.T.C. could not save us.

It is, therefore, submitted that whatever is advisable for the engineering profession must stand on its own merits and not, directly or indirectly, involve, now or in the future, the established rights and privileges of the other professions mentioned. Further, it is surely quite unnecessary for the engineering profession deliberately and seriously to propose a scheme of legislative effort which can be made to include technical or semi-technical organizations which are not, in their essence, engineering. By so doing, engineers will simply carry an unnecessary burden, and the more comprehensive the inclusion of the semi-technical bodies, the more complex and the less powerful will our position as a profession become.

The Ontario Bar Association does not include the technically trained assistants employed regularly by its members. The Ontario Medical Council does not include in its purview the nurses and hospital assistants which are integral parts of its professional activities. The Dental Association does not affect the mechanical and other technical assistants used by the dentists.

Even if the Bill proposed by the J.C.T.O. is maintained as a purely engineering registration scheme, and is confined to purely engineering branches, it portends an ultimate result which is fundamentally antagonistic to the aims and objects of *The Engineering Institute of Canada*, which are to, by every manner and means, coordinate and consolidate all professional engineering endeavour.

The aims and objects of *The Engineering Institute of Canada* do not involve, as a few engineers wrongly claim, the co-ordination and consolidation of the engineering profession in Canada under its aegis in a manner which may result in *The Engineering Institute of Canada* controlling matters. *The Engineering Institute of Canada* is quite prepared to efface itself wherever necessary for the general advantage of the profession. No better examples of this can be cited than the work of the Special Committee of *The Engineering Institute of Canada* on Legislation, the activities of *The Engineering Institute of Canada* in British Columbia in connection with the efforts there to obtain legislation, or than the support of *The Engineering Institute of Canada* to the Town-Planning Institute, a co-operative organization involving conjoint action in the interests of the engineer, the architect, and the town-planner, for a specific purpose.

The J.C.T.O. legislative proposals provide for ancillary Acts, one for each branch of the engineering profession,—structural, chemical, electrical, mining, architectural, etc., and must inevitably produce an ultimate grouping of the engineers into many distinct registration organizations. This simply spells devolution and disintegration. It is *clash* legislation in effect, and *class* legislation carried to its absolute limit.

Most engineers in private practice can only carry on successfully if they act from time to time as civil, electrical, mining, mechanical and even chemical engineers. Surely it is a fallacious and ridiculous proposition to put forth that such an engineer must be registered under the provisions of three or four different ancillary Acts and in each case satisfy a group of theoretical specialists, jealous of their prerogatives and anxious to confine, by limited registration, their numbers to the absolute minimum. Take for instance a mining engineer who is in charge of a large mine in the Cobalt country, he is suddenly called upon in the ordinary course of his work to act as a mechanical engineer and design some piece of mechanism, complex or otherwise, which must be produced immediately and can be worked out in his own shops. Next he has to straighten out and probably even design and superintend the construction of a more or less elaborate electrical equipment. Again he has to act in a hydraulic capacity and possibly construct a dam across a stream for control purposes, along with the necessary pipes, water works system, etc. Over all, he is the director of the mining operations of the property. There are many mining engineers of this type, and such would have to secure registration under each ancillary Act. What chance would such a man have with a group of electrical men controlling the registration of electrical engineers, jealous of their prerogatives and keenly anxious to preserve their membership limited to those who are practicing as electrical specialists? Even if all the registration bodies provided by these proposed ancillary Acts might be willing to strain a point and admit prominent engineers who have to carry on in various phases of special engineering effort, there will always be circumlocution and red tape with the accompanying delay and expense necessary to secure registration under every ancillary Act.

The engineering profession has no greater divisions by way of specialties than have the legal and the medical professions, but both of these professions have but one registration. Surely no better example could be obtained of the paramount practicable advantages of uniform registration than the position now enjoyed by members of the legal and the medical professions. Their prerogatives, prestige and powers are precisely what most engineers desire.

It must further be remembered that the age of specialization in education in the engineering profession is past, the pendulum is undoubtedly swinging back to general courses so that the engineering curricula of our colleges and universities will correspond to the general curricula of the medical and the legal courses. The time of specializing will come, as in those professions, after the graduate gets into actual practice, or by means of post-graduate work. The influence upon the profession generally in the years to come by this tendency for generalization in engineering courses, will make uniform registration of the profession absolutely necessary. Why not adopt the principle now?

While detrimental to the consulting or general practitioner, it will be a tremendous handicap on the young engineer on the threshold of his professional career. If he must go to the expense and the trouble of registering under three or four different groups, he will be up against a handicap in the most critical and difficult period of his professional lifetime, which it will be very difficult for him to overcome. He may be forced to adopt one specialty and carry on for some time in it, whether he desires to or no.

Briefly and in conclusion, the legislative proposals of *The Engineering Institute* contemplate action which will consolidate into a constructive, co-operative entity, all branches of the engineering profession. On the other hand, the proposals of the J.C.T.O. Sub-Committee involve action which means ultimate dispersion of engineering organizations, and disintegration of professional engineering activities so far as the Province of Ontario is concerned.

The Engineering Institute of Canada's legislation proposals follow several years' persistent continuous action with resultant concentrated consultations by representative committees in different parts of the Dominion, all of which culminated in a final conference at Montreal of prominent engineers who have for years given the subject great attention, as a result of which they are recognized as authorities on the subject, and who after a whole week's deliberation, produced what is herein referred to as *The Engineering Institute of Canada's* Bill. This Bill is, therefore, the culmination of years of research and pioneering of many groups of engineers from Halifax to Victoria. It has been by no means confined to one class of engineers, every specialty has been represented, and the Bill may, therefore, be safely stated to represent the considered judgment of the vast majority of the mining, civil, mechanical, electrical and chemical engineers throughout the Dominion. The J.C.T.O. proposal is understood to be the product of a very small group of Toronto engineers after a few weeks' study, and the small group was not unanimous in its conclusions.

The report of the J.C.T.O. Sub-Committee has been given wide publicity by the "Canadian Engineer," it being published in full in the issue of December 4th. In view of this publicity and of the fact that it really does offer a means to an end with the same objective substantially different from the means suggested by *The Engineering Institute of Canada*, it should be given adequate and serious attention by those members of *The Institute* responsible for the moulding of its policy and for advising respecting appropriate action in the premises by *The Institute*. The J.C.T.O. enthusiasts have produced proposals which must be considered on their merits.

It is hoped that the recently constituted Provincial Division is actively functioning in this fundamentally important matter.

Yours truly,
An Ontario Member.

REPORT OF COUNCIL MEETING

A special meeting of the Council was held at headquarters, on Monday, December 29th, at 5 P.M.

The meeting was called for the purpose of considering applications. Classifications were made for a ballot returnable in January.

The adjourned meeting of the Council from December 16th was held at headquarters on Tuesday, December 30th at 8 P.M.

Finances: Following the reading of the final report of the Finance Committee a lengthy discussion took place bearing on the finances of *The Institute*. The Secretary was instructed to go into the question of lowering the cost of reproducing the Engineering Index. Action in this connection was left in the hands of the Executive Committee and the Secretary. It was considered advisable that the [illegible] be [illegible] at the earliest possible moment to enable the Finance Committee to meet at an early date and present the yearly report.

Municipal Standards: The suggestion of the Canadian Engineering Standards Association for a Committee in connection with engineering standards was referred to R. A. Ross for a reply.

War Souvenir: A letter from Dr. Doughty to President Leonard [illegible] consideration when [illegible] were made, was read. Lt.-Col. C. N. Monsarrat was appointed a Committee to keep in touch with Dr. Doughty on this question.

Legislation: The request from the British Columbia Technical Association and Vancouver Branch that their Bill be endorsed by the Council was [illegible] and the Secretary instructed to prepare a letter to be forwarded after having the endorsation of the Legislation Committee. The request for advice from the Saskatchewan Branch was referred to the Legislation Committee with power to act. The circular of the Nova Scotia engineers re engineering legislation was noted.

Classification and Compensation of Engineers: The resolution of the Winnipeg Branch regarding classification and compensation of engineers in connection with the Civil Service was referred to a Committee for report at next meeting.

Registration of Engineers: The report of the Committee of Engineering Council on Licensing Engineers of Engineering Council was noted.

Engineering Appointments: A letter from F. J. Niven, Secretary to the Hon. Mr. Bowman, Minister of Lands and Mines, re appointing an engineer as Chairman of the Toronto and Northern Ontario Railway was noted.

Editing Committee, Journal: A letter from H. H. Vaughan, Chairman, was received, giving the names of Sir Alex. Bertram and J. M. Robertson to complete his committee, which was adopted.

Reports of Committees and letters from Chairmen: The following reports of Committees were submitted and received:

Electro-Technical, L. A. Herdt, Chairman; Steel Railway Bridges, P. B. Motley, Chairman; Roads and Pavements, W. A. McLean, Chairman; International Affiliation, H. H. Vaughan, Chairman; Honour Roll, C. N. Monsarrat, Chairman; Leonard Medal, R. W. Leonard, Chairman; Plummer Medal, A. Surveyer, Chairman; Engineering Standards, L. A. Herdt, Chairman; Board of Examiners & Education H. M. MacKay, Chairman; Publications and Report of Calgary Branch, E. Brown, Chairman.

The Secretary was instructed to have the reports printed as a section of *The Journal* in time for the Annual Meeting.

Mr. Vaughan was appointed Chairman of the Leonard Medal Committee on nomination of President Leonard.

In connection with the Plummer Medal the Secretary was instructed to bring to the attention of the Chairman of this Committee suggestions in addition to his own that might be considered.

A. S. M. E. Correspondence: The Secretary was instructed to forward this to the Mechanical Section of the Montreal Branch for suggestions, with the request that they deal with the matter.

Ballot: A ballot was canvassed and the following admissions and transfers effected:

Members

George Walter Winckler, C. E. (Calcutta Univ.), of Toronto, Ont., in private practice as consult. engr.

Associate Members

Frederick Thomas Ames, of Bentley, Alta., supt. i/c of constrn. and operation, Lacombe and N. W. Ry.; John Marshall Anderson, of Vancouver, B.C., previous to enlistment in 1917 with the C. P. R. as transitman, since 1917 with Canadian Overseas Ry. Constrn. Corps; Percy Halcro Buchan, B.A.Sc., Lieut. (Univ. of Tor.), of Vancouver, B.C., asst. ch. engr., Way Dept., B. C. Electric Rly. Co.; Richard Drummond, of Lindsay, Ont., i/c of drafting dept., Boving Hydraulic and Engineering Co., Ltd.; Leo Gleeson, B.Sc., (Queen's Univ.), of Ottawa, Ont., with Reclamation Service; Harold Chester James, of Vancouver, B.C., Vice-Pres. and Mgr., Pacific Coast Pipe Co., Ltd.; Frederick Simeon Jones, B.Sc. (C.E.) (Univ. of N.B.), Capt., M.C., of Cambridge, N.B., asst. engr., River St. Lawrence Ship Channel, Sorel, P.Q.; Joseph Edouard Lionais, B.Sc. (McGill Univ.), of Montreal, P.Q., Elec. Distribution Dept., Montreal Light, Heat & Power Co.; James Freeman Lumsden, B.Sc. (E.E.) (N. S. Tech. Coll.), of Halifax, N.S., professor of electrical engineering, N.S. Technical College; Marvin Wilbur Maxwell, B.Sc. (C. E.) (Univ. of N. B.), Major, M.C., of Montreal, P.Q., engr. i/c of timber tests, Forest Products Laboratory; Charles Herbert McDougal, of Niagara Falls, Ont., res. engr., Niagara Power Development, H. E. P. C.; Rowland Chapman Moore, B.Sc. (N. S. Tech. Coll.), of Halifax, N.S., asst. engr., Foley Bros., Welch, Stewart & Fauquier; Neil Lyman Morgan, B.Sc., (McGill Univ.), of Montreal, P.Q., research engr., i/c of research laboratory, Northern Electric Co.; James Marshall Morton, B.Sc. (Glasgow Univ.), of Winnipeg, Man., engr., J. & J. J. Allen, on new theatres in western Canada; Hugh Campbell Boyd Nourse, B.Sc. (M.E.) (Queen's Univ.), of Sherbrooke, P.Q., engr., Canadian Ingersoll-Rand Co. Ltd.; Forest Millen Pratt, B.A.Sc. (Univ. of Tor.), of Ottawa, Ont., engr., E. B. Eddy Co.; Alexander M. Ross, of Winnipeg, Man., instrumentman, G. T. P.; Joseph Ernest Roy, of Quebec, P.Q., draftsman, Dept. of Colonization, Mines and Fisheries; Joseph Warren Smith, of Toronto, Ont., ch. draftsman, Dominion Bridge Co., Toronto, also manager, Robb Engineering Works, Toronto; Neil Macmillan Waddell, of Winnipeg, Man., res. engr., C. N. R., Brandon, Man.; George Herbert Whyte, Major, M.C., of Calgary, Alta., div. hydrometric engr., Reclamation Service; William Brand Young, of Vancouver, B.C., ch. draftsman, City Engineer's office; Alexander Claude Roy Yuill, of Vancouver, B.C., conslt. engr.

Juniors

Harold Montgomery Campbell, B.A.Sc., (M.E.) (Univ. of Tor.), Major, of St. Catharines, Ont., mechanical draftsman, Welland Ship Canal; John Murray McCordick Lamb, of St. John, N.B., since 1917, works officer for N.B. under the Canadian Engineers; Henry Petit Lancaster, of St. Catharines, Ont., draftsman, Hydro Electric Power Commn.; Riginald James Maxwell, Lieut., of St. Stephen, N.B., since 1915 on active service as Lieut., 104th Batt., at present convalescing from gas wounds; Frank Stuart Merry, of Toronto, Ont., previous to enlistment with National Tube Works, Pittsburgh, 4¼ yrs. in C.E.F.; John Brooke Molesworth, (Lord Congleton), of Montreal, P.Q., 1909-19 in Royal Navy, at present 3rd yr. mechanical engineering, McGill University; Lewis Alan Perry, of Firdale, Man., instrumentman G. T. P., James Morrison Watson, of Toronto, Ont., recently demobilized; Harold Oswald Day Wilkins, of Norwood, Ont., 1914-Oct. 1919, officer in Imperial regiment, at present, 3rd year mechanical engineering, McGill University, Montreal; John Samuel Wilson, Lieut. M. C., of Toronto, Ont., 4 yrs. overseas, at present attending University of Toronto.

Associate

Robert Hunter Fraser, of Ottawa, Ont., right of way and lease agent, Dept. of Railways and Canals.

Transferred from the Class of Associate Member to that of Member

John Goodall Dickenson, B.A., B.Sc. (Mining) (McGill Univ.,) of Cobalt, Ont., manager of the O'Brien Mine, The Cobalt Foundry, The Miller Lake O'Brien Mine, Gowganda Power Co., Ltd. and President of The Northern Lumber Mills, Ltd.; Halfdan Fenton Harbo Hertzberg, (Grad. S. P. S.), Col. C. M. G., D. S. O., M. C., of Halifax, N. S., C. R. C. E., Military Dist., No. 6; Edgar Murray MacCheyne Hill, (Grad. S. P. S.), Captain, of Winnipeg, Man., exploration and reconnaisance engr., C. N. R.; George Reid Munro, (Grad. S. P. S.), B.A.Sc. (Univ. of Tor.), of Peterboro, Ont., second vice pres. and ch. engr., Wm. Hamilton Co., Ltd.

Transferred from the Class of Junior to that of Associate Member

James Forsyth, of Winnipeg, Man., supt. of constrn., Carter, Halls, Aldinger Co., Ltd.; Oscar Gesner Gallaher, B.Sc., Queen's Univ.), Captain, of Kamloops, B.C., asst. to div. engr., constrn. dept., C.N.R.; Samuel Willis Shackell, Lieut., of Lachine, P.Q., at present, short engagements on engineering work.

Transferred from the Class of Student to that of Associate Member

Albert Ernest Humphrey, (Grad. R.M.C.), of Chilliwack, B.C., Major, D.S.O., in private practice; Charles Beverley Robinson Macdonald, (Grad. R.M.C.), Captain, of London, Eng., with the Hydro Electric Power Commission, Niagara Falls, Ont.

Transferred from the Class of Student to that of Junior

Rowland Edgar Weeks, B.C.E., (Univ. of Man.), of Souris, Man., municipal engr., Municipality of Glenwood, Man.

BRANCH NEWS

Victoria Branch

Horace M. Bigwood, M.E.I.C., Secretary

The annual meeting of the Branch was held on December 17th, when 23 members were present with Capt. W. M. Everall, M.E.I.C., in the chair. After the names of five Affiliates had been presented and accepted by the meeting, the reports of the Committees on Legislation, Papers, and Entertainment were presented by Messrs. A. E. Foreman and E. F. Cooke, and accepted; that of the Entertainment Committee, verbally.

The Secretary, Horace M. Bigwood, then read his report. In this he referred to the membership of the Branch and the possibilities of increased membership. The formation of three new committees was suggested, in connection with Education and Publicity, Branch By-Laws, and Finance, and it was suggested that the Library Committee be given power to arrange for space for books and papers.

The Balance Sheet of the Branch was then presented by the Treasurer and accepted, after which the notice of a motion to be brought before the next meeting of the Branch was posted.

C. P. Richards, M.E.I.C., Chairman of the legislative committee of the Saskatchewan Branch then spoke for a few minutes on the question as they had found it in his district, and the steps being taken by the government of his province who were introducing a bill as a government measure. A resolution was then passed in connection with legislation situation.

The scrutineers appointed by the Chairman, Messrs. E. F. Cooke and J. B. [illegible], announced the result of the ballot for the election of officers to be as follows:

Chairman	A. E. Foreman
Vice-Chairman	A. W. R. Wilby
Treasurer	[illegible]
Secretary	Horace M. Bigwood
Executive	R. A. Bainbridge
	W. M. [illegible]

After the announcement of the new officers of the Branch, the retiring Chairman, Capt. W. M. Everall, spoke for a few minutes on the work of the Branch generally during his term as Chairman, to which position he succeeded after the resignation of Mr. Young, who had gone to live in Vancouver. He expressed the hope that the work of the Branch would proceed actively now that the war was over and more normal conditions would prevail, and that all the members would help in this work. He thanked the officers and committee who had so ably assisted him and hoped that the new Chairman would be as well served.

A vote of thanks to Capt Everall was carried unanimously.

Mr. Foreman thanked the members of the Branch for the honour done him in electing him Chairman for the coming year. He hoped that something would be accomplished to help engineers generally, and appealed to every one to do everything in their power to assist.

Capt. Everall was called to the chair while A. E. Foreman delivered his address on "The Organization and Work of the Provincial Public Works Department," which proved to be most interesting, and at the conclusion of which a hearty vote of thanks was tendered to the author.

The meeting adjourned at 11.30 P.M.

Resolution

Victoria, Dec. 17th, 1919.

Moved by R. A. Bainbridge, seconded by Lt. A. W. R. Wilby: "That Whereas the need for some action to improve the status of the Engineer in B.C. is generally recognized,

"And Whereas the Victoria Branch of *The Engineering Institute of Canada* has previously shown its sympathy with the proposal to introduce a Bill into the Legislature, to, at least, make registration necessary.

"Therefore be it Resolved, that this meeting of the Branch unanimously endorses the action of its Executive and its Representatives on the Joint Legislative Committee, and recommends all members actively to support the movement, by donations and influence.

Further, that the Secretary be authorized to receive from members and other persons wishing to assist, such sums as they wish to donate, and to give receipts for same, such sums to be used for the purpose of obtaining such legislation."

The Annual Meeting of the Victoria Branch was held in the Belmont Building on the evening of December 17th, Capt. Everall, presiding. The following officers were elected for the year:—Chairman, A. E. Foreman, M.E.I.C.; Vice-Chairman, Lt.-Col. A. W. R. Wilby, A.M.E.I.C.; Executive Committee:—R. A. Bainbridge, M.E.I.C., and W. M. Stokes, A.M.E.I.C.; Treasurer; E. Davis, M.E.I.C.; Secretary, Horace M. Bigwood, A.M.E.I.C.

A. E. Foreman, M.E.I.C., Public Works Engineer for the Provincial Government gave a short address on "Organization and Work of Public Works Department." He referred to some of the results obtained by efficient organization of the department, and stated that the Province had been divided into eight districts with a qualified engineer in charge of each district, and that good results were forthcoming. It meant better graded roads with reduced haulage for settlers in the districts concerned.

The following resolution was adopted by the meeting:

"That whereas the need for some action to improve the status of the engineer in British Columbia is generally recognized, and,

"Whereas the Victoria Branch of *The Engineering Institute of Canada* has previously shown its sympathy with the proposal to introduce a bill into the Legislature to at least make registration necessary;

"Therefore, be it resolved, that this meeting of the Branch unanimously endorses the action of its executive and its representatives on the joint legislation committee, and recommends all members to actively support the movement by donations and influence.

"Further, that the Secretary be authorized to receive from members and other persons wishing to assist, such sums as they wish to donate, and to give receipts for same, such moneys to be used for the purpose of obtaining such legislation."

The following programme of lectures has been arranged for the winter season:—

January 21st—D. O. Lewis, "Development of Railways" (second edition of paper).

February 18th—W. F. Best, "Geology of Coal Mines."

March 18th. Prof. R. G. Matheson, "Sub-aqueous Foundations" (illustrated.)

April 15th—E. P. Girdwood, "River Protection; Roads and Bridges" (illustrated).

The second dance of the season under the auspices of *The Engineering Institute of Canada*, Victoria Branch, was held in the Knights of Columbus Hall, Fort Street, last evening. About seventy members and friends were present. Pianoforte music for the dance was provided by Miss Thain and vocal items were rendered by Mrs. J. B. Shaw and Mr. A. E. Foreman. The Committee responsible for the arrangements were Messrs E. F. Cooke, *Chairman*, J. B. Shaw, E. N. Horsey and H. M. Bigwood, *Secretary*.

Sasketchewan Branch

J. N. deStein, M.E.I.C., Sec'y.-Treas.

The Third Annual Meeting of the Saskatchewan Branch was held on January 8th at the Kitchener Hotel, Regina, with the splendid attendance of over forty members. Amongst the outside members of the Branch were noticed: G. D. Mackie, A.M.E.I.C., from Moose Jaw, also J. B. C. Keith, A.M.E.I.C., and Malcolm Sinclair, A.M.E.I.C., from the same city. Professor A. R. Greig, M.E.I.C., and Professor C. J. Mackenzie, A.M.E.I.C., of the University of Saskatchewan, as well as C. H. Fox, A.M.E.I.C., represented Saskatoon, while Swift Current has sent two members, namely P. J. Macdonal, A.M.E.I.C., and J. R. Reid, A.M.E.I.C. Members from other Branches were W. W. B. Swabey, A.M.E.I.C. (Ottawa) and P. M. Sander, M.E.I.C. (Calgary).

The first function of the day was a luncheon tendered by the local members to the outside members of the Branch, at the conclusion of which, the retiring Chairman, H. S. Carpenter gave an address dwelling on the functions of the Branch and its achievements during the past year.

The luncheon was followed by the business session, the greatest part of which was devoted to the subject of Legislation. The Government of the Province had suggested several changes of the proposed Act, such as giving the University exclusive control of the examinations, waiving the right to hold court and collect fees, etc., all of which changes the members present were willing to cede, provided however, that no further concessions would be made, which would eliminate entirely the purpose of the Act. It was, therefore, resolved, following the suggestions communicated to the Branch by Arthur Surveyer, Chairman of the Legislation Committee of *The Institute*, to withdraw the Act for the present, in case the opposition of the Government to the most important clauses could not be overcome.

After reading the report of the Auditors and Standing Committees, the scrutineers announced the result of the ballot for the election of Branch officers for 1920:—Chairman: Professor A. R. Greig, M.E.I.C. (Saskatoon); Vice-Chairman: W. R. Warren, A.M.E.I.C. (Regina); Sec'y.-Treasurer : J. N. de Stein, M.E.I.C. (Regina); and an Executive Committee of five, composed of A. J. MacPherson, A.M.E.I.C. (Regina), D. A. R. McCannell, A.M.E.I.C. (Regina); J. R. C. Macredie, M.E.I.C. (Moose Jaw), W. M. Stewart, A.M.E.I.C. (Saskatoon) and H. McIvor Weir, M.E.I.C. (Saskatoon).

Following the business session a paper was read by Professor, C. J. Mackenzie, A.M.E.I.C., on "Concrete Mixtures in Alkali Soils," being the result of one year's investigations carried on by the University of Saskatchewan in conjunction with the Concrete Committee of the Branch. The discussion of the paper was postponed until it had appeared in print. As there is considerable further research work necessary in this connection, it was decided that the Branch should memorialize the Provincial, Dominion Government and the various cities in the Province with a view of securing contributions and grants for this work.

In the meantime the time set for the Annual Banquet had arrived. Nearly sixty members and guests of the Branch had gathered for this function and every one present admitted that it was one of the best ever attended. During the dinner and in the intervals between the speeches following the dinner, an orchestra rendered an excellent program. After the toast to the King, Professor A. R. Greig, the new Chairman, gave his inaugural address, followed by a splendid toast to "Our Province," proposed by H. R. MacKenzie, A.M.E.I.C., and responded to by Dr. W. D. Cowan, M.P. (an affiliate of our Branch) and George Spence, M.L.A. Mr. Mackenzie gave a brief historical sketch on the Province, enlarging on the important role played by the engineers in its development. Dr. Cowan, in his eloquent way, urged our profession to take the lead in the industrial development of our Province. Numerous questions were only awaiting their solution by the trained brains of the engineer, such as the development of the natural resources, study of power schemes, irrigation of the Southwest parts of the Province, establishment of technical schools, water supply for our Cities, etc. Those questions should all be solved and the necessary plans, etc., be made before the coming influx of new settlers would render the immediate attention to those questions imperative.

Mr. Spence reminded the assembled Engineers, that he somewhat belonged to our profession. He enumerated the natural resources of the Province, especially its mineral wealth. A splendid dramatic recitation, rendered by R. S. Salmond. followed the speech, after which P. J. Macdonal, A.M.E.I.C., toasted the City of Regina, to which Mayor Grassick responded. M. . L. Wade, A.M.E.I.C., proposed the toast on the "Sister Professions," to which Lt. Colonel A. C. Garner responded on behalf of the Saskatchewan Land Surveyors.

A short, but very interesting address on "Sanitation during the War" was given by Capt. R. H. Murray, A.M.E.I.C. The improvement in the sanitary conditions could best be judged by the fact, that in former wars as many as 83% of the total men lost had died of disease, while in this war that number amounted only to 5.14%.

The speeches were then interrupted by a "Muscial Recitation," rendered by *The Engineering Institute of Canada Minstrels*, Conductor R. W. E. Loucks, A.M.E.I.C., followed by a toast on "The Engineering Profession—Ourselves," by G. D. Mackie, M.E.I.C. Going from east to west four of the greatest engineering works place the Canadian engineer amongst the foremost Engineers in the world: The Quebec Bridge, Winnipeg Water supply, C.P.Ry. Irrigation and the Connaught Tunnel. Mr. Mackie dwelt at length upon the objections of the Saskatchewan Government to our proposed Act, which was hard to understand as we were trying to save the Province from faulty Engineers. Any man without any qualification whatever, could build a bridge, water supply, etc., thereby endangering the lives of scores of people.

The last one on the list of speakers was given by Professor C. J. Mackenzie, A.M.E.I.C., who very [illegible] explained the proposed development of the Engineering faculty of the Provincial University.

"Auld Lang Syne" led by the orchestra and sung by the whole assembly, concluded the day.

Peterborough Branch

R. L. Dobbin, M.E.I.C., Secretary.

The first meeting of the Branch for 1920 was held in the Empress Hotel parlors, on Thursday, Jan. 8th, at 8.00 P.M.

A good attendance heard Jas. Macdonell, A.M.E.I.C., give a digest of the proposed legislation for engineers in Ontario. He discussed the progress that had been made up to date, and analyzed the various bills that have been brought forward. The members present took part in the discussion, and it was finally decided to postpone any decision until the next meeting on Jan. 22nd, when the matter will be gone into further.

The Chairman was authorized to appoint a Legislation Committee, to prepare for this meeting, and it was suggested that it take the form of a debate, with members of the Committee on each side.

The question of Branch By-laws was reported on by the Chairman, G. Reid Munro, M.E.I.C., and after discussion was laid over until the meeting on the 22nd.

A resolution along the lines asked for by the Manitoba Branch was passed, calling upon Council to make the strongest effort to secure the representation of the Engineering Profession on the Civil Service Commission.

Congratulations were extended to C. E. Sisson, M.E.I.C., one of the Branch members, on his being elected at the recent municipal elections, as one of the Utilities Commission of the City.

Toronto Branch

H. A. Robinson, A.M.E.I.C., Acting Secretary.

An Open Meeting of the Branch was held at the Engineers' Club at 8 p.m. on Thursday, January 8th, 1920.

The Chairman, A. H. Harkness, presided.

The minutes of the previous meeting were read and approved.

A formal resignation was read from W. S. Harvey, resigning from the office of Secretary-Treasurer to which he was recently elected.

The Secretary read a resolution which was adopted by the Manitoba Branch, whereby the Manitoba Branch requests the Council of *The Institute* to make the strongest effort possible to secure due recognition of the Engineering profession, by either having the engineering profession represented on the Civil Service Commission, or by having a special committee within the Commission composed of technically trained men and members of the engineering profession to pass upon classification, qualification and remuneration as now set forth in the Classification of the Civil Service Commission, and to pass upon applications of candidates for positions in the future.

Moved by Mr. Wynne-Roberts, seconded by Mr. Milne: "that the Toronto Branch endorse the resolution adopted by the Manitoba Branch, and that the Toronto Branch also request the Council of *The Institute* to make the strongest effort possible to secure due recognition of the engineering profession as outlined above." *Carried.*

The Chairman then called upon F. G. Engholm, who delivered a lecture on "Reinforced Concrete Construction." The lecture was illustrated by numerous lantern slides which made it very interesting. The lecturer dwelt considerably on tests made by the Emergency Fleet Corporation, which would indicate that our unit stresses commonly employed in reinforced concrete design are very low. This being particularly true in the case of shear, where the lecturer claimed that if properly designed very much higher stresses should be permitted than the ordinary maximum stresses allowed by our building by-laws. The lecturer maintained that the tying down of the engineer to the given unit stresses is a hindrance to the development of reinforced concrete construction in this country.

Mr. Mylrea, who opened the discussion, agreed fully with the lecturer that the unit stresses commonly employed particularly in the case of shear were too low. He suggested that *The Institute* appoint a committee to study the data supplied by the tests of the Emergency Fleet Corporation. He further suggested that as the stresses must be left to the judgment of the designer, the profession should become a closed profession to protect the public from incompetent designers.

Mr. Oxley believed that the real uncertainty about concrete is in the construction, since a good deal depends on how the concrete is made, and, therefore, proper inspection must be made to insure the safety of the structure. He was afraid that if the unit stresses are raised to conform with the results of the tests, there is the danger that large factories built in small towns, where there are no by-laws and no proper supervision, the structure may be unsafe since we cannot be sure of the material.

Mr. Harkness emphasised the fact that while it may be good economy to get a first class concrete for the building of ships, it may not be quite as economical in the case of an ordinary building, and this point should be considered.

Others who took part in the discussion were Messrs. Scott, Crossley, McLeod and Krumm.

Suggested by Mr. Oxley that Mr. Engholm be added to the Committee on the Building By-laws.

Meeting adjourned at 11.15 p.m.

Ottawa Branch

M. E. Cochrane, A.M.E.I.C., Secretary

The address by His Excellency, the Duke of Devonshire, at the luncheon, Dec. 18th, of the Ottawa branch of *The Engineering Institute of Canada,* and the intensely interesting reminiscences of Commander B. M. Ramsey, M.V.O., of the Royal Navy on the work of the Dover Patrol in the great war, was an occasion that will not soon be forgotten by those fortunate enough to be present.

Commander Ramsay with a modesty characteristic of the best traditions of the navy, told in a most delightful way and with much humor of the great naval force that worked from Dover keeping the enemies' forces from the channel, and protecting the troopships between Britain and France.

Commander Ramsay was flag commander to Admiral of the Fleet, Viscount Jellicoe. For three and a half years of the war he was attached to the Dover Patrol, during which time he was in command of H.M.S., M.-25, engaged on the Belgian coast, and of H.M.S. "Broke," flotilla leader.

Over a hundred and thirty members of *The Institute* sat down to lunch in the ladies' room of the Chateau, in addition to the members of Viscount Jellicoe's staff then in Ottawa, and the headquarters staff of the Naval Service Branch of Canada.

The chairman, R. de B. Corriveau, had with him at the head table the following: At his right, His Excellency the Governor-General, Col. Leonard, G. J. Desbarats, A. Sladen, G. A. Mountain, Commander Sawbridge, R.N., Commander Hemstead, R.N., Gordon G. Gale; on his left, Commander Ramsey, Col. Anderson, Admiral Kingsmill, Col. MacPherson, Commander Stephens, John Murphy, Wing Commander Robertson, Commander Edwards, Lieut. Morgan, and Flag-Lieut. Nelles.

Mr. Corriveau stated *The Institute* was honored in the presence of His Excellency. The visit of Admiral Jellicoe and his staff had been a valuable thing for Canada. Moreover, England too was naturally interested in the development of Canada's national marine fleet with the necessary harbors, docks and dry docks. Many Canadians had taken part in the work of the British fleet during the war in the R.N.A.S. and in the naval patrols. The Dover Patrol had shown a dash and efficiency that had contributed not a little to the safety of Canada's thousands of troops in the passage between Britain and France.

Commander Ramsay, on rising, expressed the honor done to the navy and the Dover Patrol, by the presence of His Excellency. At first he had refused to speak and only consented when he was told the occasion would be informal and that he could talk the same as he would in his own mess.

He had chosen as his theme, the subjects that so far had been least written about and spoken of. The Dover Patrol extended from North Foreland to the mouth of the Scheldt river and from Brighton to the French coast. Its functions were fourfold:—

1. To deny the passing of the straits to the enemy.

2. To protect troops and supplies running between Britain and France.

3. To protect the shipping entering and leaving the Thames.

4. To make offensive against German bases on the Belgian coast.

A most illuminating story of the difficulties of equipment met with in 1914 was told of. Old mines, the only ones available were furnished the patrol.

"Several thousand of these were dropped," said Commander Ramsay, in his witty way, "and while they frequently went off as soon as they were dropped overboard, or when our ships approached near them, they never seemed to operate as long as a German ship was around! Nevertheless they had, I hope, a certain moral effect."

Then when the big ships were found useless for the bombardment of the Belgian coast the monitors started to come and these were a big help.

There was also a ship known as the "bulged ship" which was a great success. This was built with an outer protecting hull, then an area of water between this and the real hull of the ship. When a torpedo from a submarine struck this outer hull the water between it and the real hull took up the shock. "Not one of these ships, hit by a torpedo, was materially injured," stated the speaker amid hearty cheers.

Commander Ramsay told how the patrol started out in a small way but grew in strength and importance as its need was realized. In 1918 it consisted of 14 monitors, 30 destroyers, 12 patrol boats with rams, 20 coastal patrol boats with a speed of 22 knots, 50 trawlers, 200 drifters, 40 motor launches and some other vessels.

It was important to keep submarines out. When they got through the barrage they could operate for three or four days longer than if they had to go around the other way. At first they used to slip through the straits in the dark with the conning towers just out of the water. In 1915 there was only a timber barrage—a sort of boom across the straits, and this was always breaking, owing to its length and to the strong tides and currents.

Next the net barrages were invented and in 1915 fifty miles of these were laid. There was one up and down the Belgian coast and twelve miles from shore, another across the channel. These were large wire mest nets attached to which were contact mines. A submarine would go against the net and push it ahead till the net closed in and the mines would then hit against the stern of the submarine and explode.

Each day the drifters would go out and repair the damage done to the nets. And the German destroyers would come out and try to sink the drifters and there were frequent fights.

"The drifters didn't like this particularly," said the speaker, "but we did."

Then came the contact mines. There were twenty thousand miles of these laid twenty feet apart, and no surface craft could sail safely over them, but no submarine could penetrate them.

In front of these contact mines in the straits were two rows of lighted vessels under which the night-running submarine had to dive. And when it dived it ran into the mines and was accounted for. It took the Germans a long time to realize the nature of the trap. They kept sending submarines which never returned. They then started sending their submarines around close to the shore line, and another device had to be invented.

Control mines were put in near the shore, and the submarines were located by detectors which measured a range of from one to three miles. When the sub got over the mine a button was pressed and that was the end of it.

And in 1916 for a considerable time this stopped the passage of all submarines down the channel.

But again the Germans learned and they made their bearings noiseless and ran at their silent speed, and could not be detected by sound. But another device was invented much better—a device the speaker was not at liberty to explain.

Commander Ramsay also told of the famous great concrete towers it was proposed to build at a weight of 20,000 tons and launch in the channel and then build up so as they would be forts against which torpedoes would dash in vain. Two of these only had been built and finished when the armistice was signed and it was the speaker's opinion that these two would be launched at some suitable spot and the original plan carried out.

The speaker's description of sound ranging was most interesting. On the darkest night and behind a smoke screen the British guns could bombard the Belgian coast. But again the Germans soon discovered this method and could answer back.

Why the large naval guns did not shoot oftener was explained. When a gun had shot 400 rounds it had to be sent to be re-lined which took eight months. Each gun had a spare one, thus the actual number of shots that could be fired in eight months was the four hundred. And the guns always had to be kept in shape to repel any big German attach. Thus shots were not wasted, but most carefully conserved.

In conclusion Commander Ramsay told of a proposed landing on the Belgian coast by the British—a landing that never came off. The landing depended on the British land forces reaching Roulers by a certain time which they were unable to do.

However, the naval patrol had two great monitors lashed together and ahead of them, but shoved by them, was a great pontoon six hundred feet long, thirty feet wide with two feet draft at the bow and eight feet at the stern. There were three of these and it was proposed to land 13,500 men on the Belgian coast between Ostend and Nieuport, in three sections two miles apart.

On the pontoons were first the tanks, which would get off first and destroy the barbed wire entanglements, then the guns, then the other army supplies, and the 4,500 men on each. Elaborate practices and tests were made and it was believed the attempted landing would be successful, especially as there was to be a great British attack on land at the same time. But the British did not make the land advance expected at this time and the attempt was abandoned.

Commander Ramsay recalled that in the first coastal motor patrol boats out from Dover was an Ottawa man, R. E. Sproule, who was present at the luncheon he was addressing. Also the first four men in this service to be decorated were four Canadians, two Ottawa men, and two Montreal men. This evoked hearty cheers.

Mr. Corriveau then announced that His Excellency the Duke of Devonshire had consented to say a few words.

The Governor-General spoke with great eloquence and with evident sincere conviction. He congratulated Commander Ramsay on the modest character of his speech which was in line with the best traditions of the navy. For all time the deeds of the Dover Patrol would be known and they had added another fine tradition to the many surrounding the British navy.

The navy had carried out the great expectations Britishers had of it and kept up the credit of its great name.

After the chairman offered the thanks of the Engineers to Commander Ramsay the luncheon adjourned with the National Anthem.

The Annual Meeting of the Branch was held on January 8th, at the rooms of the Commission of Conservation, through the kindness of Mr. James White.

The attendance was larger than that at any previous annual meeting.

Besides the formal reading of the reports of the Secretary-Treasurer and the Chairmen of the various sub-committees, a summary of which will be found on another page, in the annual report of the Ottawa Branch, there was an interesting discussion on the future activities of the branch.

After the meeting refreshments were served, and the members were glad to have this opportunity for informal discussions and the formation of plans for the future.

On January 15, the branch held a meeting jointly with the Ottawa branch of the Town-Planning Institute and the Ottawa chapter of the Ontario Association of Architects. The meeting was held in the Carnegie Library, and Mr. Frank Barber, of Toronto, A.M.E.I.C., give an interesting address on "Bridges."

The Speaker gave a summary of the historic development of bridges up to the present time, and, as is natural, dwelt strongly on the aesthetic features of bridge design and their relation to architecture and town planning.

There was a large attendance, and it was felt that the policy of holding joint meetings, so as to establish closer union between engineers and the professions most closely allied to them, should be encouraged as much as possible.

Quebec Branch

J. A. Buteau, A.M.E.I.C., Secretary.

At a general meeting held on December 15th, the following committees were appointed to investigate the salaries paid to engineers employed in different fields of activity, to make suggestions as to equitable salaries which should be given to such professional engineers:—

Government Public Service Committee: Messrs. B. Normandin, A. Amos, A. Fraser.

Industrial Companies Committee: Messrs. F. T. Cole, H. J. Simon, L. S. de Carteret, L. Larivière.

Railway Committee: Messrs. J. E. Gibault, C. H. Connell, L. C. Dupuis.

City Committee: Messrs. E. A. Hamel, A. Tremblay.

The Branch also expressed its views as to the importance of continued efforts towards obtaining from the Federal Government equitable salaries for engineers in the Government service. It was resolved that the committee formed to urge such interests at Ottawa should be urged to continue the efficient work done to the fullest extent authorized, by the putting into force of the proposed classification.

Quebec, Que., Jany. 7th, 1920.

J. A. Buteau, Esq.,
Sec.-Treas., *Eng. Inst. of Canada,*
Quebec Branch,
Que.

Dear Sir:—

Referring to your letter addressed to the undersigned, of Dec. the 17th, advising that we have been solicited as a committee to prepare and submit to you a schedule of salaries actually paid to the engineers employed by the Canadian National Railways. I herewith attach your statement showing actual salaries and proposed salaries; also another statement showing the salaries received by employees of other Railway departments.

From the above you will be able to judge that the engineers are very much underpaid, considering the responsibility and technical requirements required to fill the positions. If you figure capital invested for technical education you will at first sight see that the situation needs immediate attention.

Employees of other departments have received salaries during thier education.

Yours very truly,

C. H. N. Connell,
L. G. Dupuis,
J. E. Gibault.

STATEMENT OF SALARIES

		Actual	Proposed
Chief Engineer		$10,000.00	
Asst. Chief Engineer....		7,200.00	
Engineer of Construction		6,600.00	
Bridge Engineer		6,600.00	
Engineer of Maintenance		6,600.00	
Principal Asst. Engineer		6,600.00	
District Engineer	3,600.00	5,400.00 to	$6,000.00
Signal Engineer		3,900.00 to	5,000.00
Architect or Engr. of Building		3,900.00 to	5,000.00
First Asst. Engineer		3,300.00 to	4,500.00
Asst. Bridge Engineer		3,900.00 to	5,000.00
Division Engineer	$2,400 to 2,700.00	3,900.00 to	5,000.00
Chief Draughtsman or Off. Engr.	2,880.00	2,700.00 to	3,000.00
Senior Transitman	1,800.00	2,400.00 to	2,700.00
Instrumentman	1,620.00	1,800.00 to	2,100.00
Draughtsman	1,500.00	1,800.00 to	2,100.00
Rodman	1,050.00		1,500.00
Chainman	900.00		1,200.00

STATEMENT OF SALARIES PAID
OPERATING DEPT.

Engine Drivers	$3,000.00 to	$4,800.00
Firemen	1,800.00 to	3,000.00
Conductors	2,100.00 to	3,600.00
Brakemen	1,500.00 to	2,700.00
Division Superintendents........	4,500.00	
Assistant Superintendents.......	3,300.00	
Master Mechanic...............	4,500.00	
Asst. Master Mechanic..........	3,000.00	
Roadmasters..................	2,472.00	
B. & B. Masters	2,472.00	
Extra Gang Foreman	2,280.00	
Section Foreman	1,404.00	
Brick Layers	2,496.00	
Station Agents (Terminal).......	2,100.00 to	3,600.00
	(5,000 with Commission-Terminal)	
Station Agents (General)........	1,500.00 to	2,400.00
Operators	1,224.00 to	1,440.00

General Supt.'s Staff

Chief Clerk......	2,100.00
General Clerk	1,440.00
File Clerk	1,200.00
Secretary	1,620.00
Other	1,200.00

Supt. Division

Chief Clerk	1,800.00
Staff Clerk	1,320.00
Secretary	1,380.00
File Clerk	1,080.00
Stenographers	1,050.00
Accountant	1,740.00
Timekeeper	1,380.00
Main. of W. Clerk	1,440.00
Stor. & Clerk	1,080.00

Dispatchers

Chief	3,300.00
Dispatchers	2,880.00

St. John Branch

A. R. Crookshank, M.E.I.C., Secretary.

At an adjourned meeting of the St. John Branch held on December 18th, a resolution was unanimously adopted favoring the tearing down of the old Court House, and the erection of a modern civic and community centre in the block bounded by King Street East, Sydney, Carmarthen and Leinster Streets. A most interesting paper on the federal Housing Act and the houses being built by the St. John Housing Commission was read by Charles Archibald, A.M.E.I.C.

In the absence of R. H. Emerson, A.M.E.I.C., the chair was taken by C. C. Kirby, A.M.E.I.C., who read the report of Messrs. Rose & McDonald, the architects who made a survey of the site. The report pointed out the possibilities for the erection of a community centre and suitable municipal building. Two schemes were submitted, one taking in the entire block from Sydney to Carmarthen between Leinster and King Street, East, and the other the erection of a building with large tower in the centre on the present Court House site.

F. A. Dykeman, moved and M. E. Agar seconded the following resolution:—

"That whereas the immediate construction or reconstruction of the St. John County Court House is necessary:

That this meeting declares itself in favour of a scheme of building which shall eventually include the Court House, Registry Office, City Hall and a Community Hall within the same block, and that such buildings be in architectural symmetry with each other; and it is deemed advisable to have the city acquire all property in the block bounded by Sydney, Leinster and Carmarthen;

That the buildings be located on Sydney Street, occupying the whole frontage between King and Leinster Streets;

That copies of this resolution be forwarded to the Council of the Municipality of the City and County of St. John and to the Board of Commissioners of the City of St. John. This passed unanimously.

A plan prepared by Mr. Kirby, showing how the work might be proceeded with a portion at a time was considered. This provided for the building of the Court House on the site of the present building, the City Hall on the corner of Leinster Street, and a community hall in the centre.

It was suggested that the St. John Branch of The Engineering Institute appoint a committee of five to co-operate with other committees in preparing plans for the proposed buildings.

Mr. Kirby then called on Charles Archibald, A.M.E.I.C., to read his paper on the "Housing Act" and the work of the St. John Housing Commission. After pointing out the limitations of the Act he drew attention to some of the requirements. It called for a lot with 1800 square feet for each house in cities, and 4500 square feet in villages and rural communities. The Buildings were not to occupy more than fifty percent of the space. Where buildings were built in groups, if the houses were of frame there must be sixteen feet between each side wall; if built of fireproof material, nine feet.

Dealing with the operations of the St. John Housing Commission Mr. Archibald showed a number of slides of the houses being built on the west side. The type A were costing $4,400, including the land and required between $25. and $30. per month to meet the fixed charges. The double houses would cost the purchaser about $8,000. or $8,500.

Halifax Branch

F. R. Faulkner, M.E.I.C., Secretary

A meeting was held on January 8th in Halifax in connection with Legislation, at which nearly fifty engineers were present, chiefly from Halifax, but a few from outside. Favorable letters were also received from about forty engineers from other parts of the Province. The Committee appointed last October was re-elected and instructed to proceed with the campaign in regard to Legislation, and to take steps to introduce the Bill which had been prepared to the Legislature of Nova Scotia.

PERSONALS

E. A. Carl, A.M.E.I.C., has been appointed Assistant Engineer, on the construction of the Tafo-Kumasi Railway.

*

Marcel Pequegnat, A.M.E.I.C., has been appointed Supt. of Water Commission to succeed Henry Hymmen, who resigned recently.

*

R. L. Nixon, A.M.E.I.C., has accepted the Chair of Engineering at King's College, Windsor, N.S., and is entering on his new duties at once.

*

John H. Ryckman, A.M.E.I.C., has recently changed his position and is now c/o the Bureau of Engineering, Dept. of Public Works, Chicago, Ill.

*

George L. Stephens, A.M.E.I.C., is at present Engineer Lieutenant, R.C.N. of H.M.S. "Ramillies," and can be reached c/o G.P.O. London, England.

Adrian A. St. Laurent, Jr. E.I.C., returned to Canada on July 12th, 1919, and is now employed in the District Engineer's Office, Public Works Dept. Ottawa.

*

G. Gordon Gale, M.E.I.C., vice-president and general manager of the Hull Electric Railway has been elected vice-president of the Canadian Electric Railways Association.

*

A. L. Morgan, A.M.E.I.C., Chief Engineer of the Mapleleaf Mfg. Co., Limited, has moved from Windsor, Ont., to Montreal, as the Mapleleaf Company has transferred its headquarters to Montreal.

*

J. A. W. Brown, A.M.E.I.C., has severed his connection with the Trussed Concrete Steel Company of Canada, Limited, and is now chief engineer of the W. H. Yates Construction Co., Limited, Hamilton, Ont.

*

H. A. Paquette, A.M.E.I.C., of Levis, P.Q., formerly general manager of the Lauzon Engineering Works has resigned his position and has organized the Levis File Company at Levis, P.Q., of which he will be the directing head.

*

E. L. Cousins, A.M.E.I.C., is leaving for England shortly in connection with the business interests of the Toronto Harbor Commissioners coupled with industrial matters relative to the development of waterfront properties.

*

G. B. Smith, now suprintendent of the Central Ontario Division of the Hydro-Electric Power Commission of Ontario recently lectured before the Peterborough Branch of *The Institute* on the growth and operation of the system under his direction.

*

The marriage took place in Stanley Presbyterian Church, Westmount, on December 11th, 1919, of Mary Beatrice (Mame), daughter of Mrs. William Macdonald to Douglas Bremner, A.M.E.I.C., son of Mr. and Mrs. R. H. M. Bremner.

*

Pierre Charton, A.M.E.I.C., has been awarded the Croix de Guerre, and has been mentioned for his gallantry at the front. Mr. Charton was with the French Army, and distinguished himself while commander of the 6th Regiment of Engineers, and as liaison officer between the Railway Sappers and British Army.

*

H. Victor Brayley, A.M.E.I.C., who has been for some time in private practice as Industrial Counsellor and Engineer has formed an association with Kenneth F. Dewar, and Sherwood W. Stevenson, forming the firm of Brayley, Dewar & Stevenson, Industrial Counsellors at 99 St. James Street, Montreal.

*

William Young, M.E.I.C., for six years controller of Water Rights for the Province of British Columbia has resigned and is now practising as a consulting engineer in Vancouver. At the time Mr. Young resigned he was Chairman of the Victoria Branch of *The Engineering Institute*, in the welfare of which he took an active interest.

At the Annual Convention of the Canadian Electric Railways Association held on December 3rd and 4th, 1919, at the Windsor Hotel, Montreal, Acton Burrows, A.E.I.C., Managing Director of The Canadian Railway & Marine World, was elected Honorary Vice-President, and C. Gordon Cale, M.E.I.C., was elected Vice-President and General Manager.

Lieut. J. W. McCammon, Jr., E.I.C., has been recently demobilized after service with the artillery since 1915. Lieut. McCammon enlisted with the 6th Siege Battery in April 1915 at Montreal, was commissioned with the Royal Garrison Artillery in June 1917, transferred to the Canadian Garrison Artillery with the rank of Lieutenant in October 1918. Lieut. McCammon was demobilized in Canada in January 1919.

The Nova Scotia Power Commission has been authorized to proceed with the development of what are known locally as the Margarets Bay water powers, about 20 miles from Halifax. The Commission is undertaking immediately and will carry forward as rapidly as possible an initial development of about 8,000 horse-power. It is probable that at a comparatively early date work will be undertaken at another site in the province with an ultimate capacity of approximately 10,000 horse-power. K. H. Smith, A.M.E.I.C., Chief Engineer.

C. E. Sisson, M.E.I.C., Peterborough, was elected on January 1st to the one vacancy on the Peterborough Utilities Commission by a large plurality over three other candidates, two of whom were ex-mayors. Mr. Sisson's nomination to the office has inspired the enthusiastic gathering of engineers held in Peterborough on November 6th, and his election is due to his high qualifications for the position. The claim of his friends was that an engineer was the best qualified of any class of citizen for position such as this and the work was done on his behalf by a relatively small number of enthusiastic fellow members of the Peterborough Branch.

Lieut. G. J. Dodd, Jr. E.I.C., enlisted with the Canadian Engineers in November, 1914, as a sapper. He was transferred to Ottawa in December, 1914, and promoted to Corporal in the 2nd Signal Co., with which he went to England in May, 1915. He went to France in Sept., 1916, and entered action as Brigade Signal Officer to the 3rd Brigade, New Zealand Division. He was on the Signal Staff of the 15th Corps Signal Company, from September to November, 1916, of which the New Zealand Division formed a part. He was sent to the 3rd Heavy Artillery Brigade in November, 1916, and stayed with this unit through the remainder of the Somme battle, the battle of Arras in April and May, 1917, and the battle of Ypres, starting in July 1917. In Sept., 1917, he was invalided to England with an injured knee and was in hospital till May, 1918. In January, 1919, he helped to organize the Khaki University of Canada at Ryson, Yorkshire, where he was given charge of the Faculty of Applied Science. The University was closed in July 1919, and he was discharged in Canada on Sept. 17th, 1919.

Captain L. W. Klinger, M.C., A.M.E.I.C., has returned from overseas. Captain Klinger was commissioned as Lieutenant, 2nd Field Company of the Canadian Engineers on instruction and training of infantry in field work and military engineering at Toronto, construction work at Niagara, and was later O.C. of the Depot Company, at the Engineers Training Depot, Ottawa, from September, 1915 till March, 1916. From March, 1916 till July, 1916, he was Lieutenant in the 9th, 11th and 12th Field Companies, Canadian Engineers in England. He went to France in August, 1916, and from that date till the signing of the Armistice, Captain Klinger was in the following battles:—Ypres Salient, Somme, Vimy Ridge, Hill 70, Passchendaele, Amiens, Valenciennes. After the signing of the Armistice Captain Klinger was in the Canadian Army of Occupation on the Rhine, and was later stationed in Belgium until May 1919. He was finally demobilized in Canada on July 6th, 1919. Casualties nil. Captain Klinger was awarded the Military Cross on November 16th, 1916, at the Somme Battle.

Capt. Yves Lamontagne has returned to Canada from India after an absence from this country of four years. Captain Lamontagne joined the C.O.R.C.C. (Railway Corps) in April, 1915, and with this unit sailed for England in June, 1915. Two months later the Railway Corps was transferred to France and worked with the Belgian engineers in the trenches for some months. Later they were recalled to England and returned to France a few weeks after on construction of standard gauge track. Lieut. Lamontagne was given a commission in the Royal Engineers, was gazetted 2nd Lieut. in Feb., 1916, and was later posted to the 91st Field Company, 15th Division, remaining with them in the Somme until January, 1917, when he was invalided to England. While in England he supervised the training of sappers and was Adjutant of the training company. In September, 1918, he embarked for India, and arrived at Bombay a few days before the Armistice. Riots and the war with Afghanistan prevented his return to England until October 1919, at which time Capt. Lamontagne was working on erection of aeroplane hangars at Ambala.

Herbert Graham Starr, A.M.E.I.C., graduated from the Royal Military College, Kingston, in 1905. He was transferred from Reserve of Officers to C.E.F. in July, 1915, and posted to the 84th Overseas Battalion as lieutenant. He was promoted to Captain and appointed Adjutant in November, and promoted to field rank and third in command in January, 1916. The 84th Battalion proceeded overseas in June 1916, and was disbanded on arrival for reinforcements. After two weeks in England Major Starr was ordered to France and posted to the 29th Battalion (Vancouver), joining this unit in the Ypres Salient. This unit was moved to Picardy for the advance of September 15th with Battalion Headquarters in Pozieres. Major Starr was wounded while with a working party digging a jumping-off trench on the night of September 12th, and was invalided to England, being in hospital almost continuously till invalided home in March 1918. In August 1918, he was posted to Corps Military Police as Assistant Provost Marshal while remaining

Military Service Act, serving in St. John, Toronto, and Kingston, in that capacity until he was demobilized in January, 1920.

*

Lieut. T. E. A. Hall, A.M.E.I.C., enlisted with the C.A.S.C. in March, 1915, proceeded overseas in June, 1915, was stationed at Shorncliffe, and in July was appointed to Staff of D.A.A.G. In November he was posted with the Canadian Cavalry Brigade Supply Column, and left for France in January, 1916, where this unit joined the Canadian Cavalry Brigade which had then been mounted ater serving as infantry with the 1st Division. After serving at the Somme from July to November, 1916, Lieut. Hall was posted to headquarters of the Division for several months and afterwards was attached to Umbala Brigade Headquarters as Brigade Transport Officer in March, 1917, and took an active part in pursuit of the Boche in his retirement to the Hindenburg line. The Division then took over trenches near St. Quentin where they remained until moving to Passchendaele at the beginning of November. On Nov. 20th they took part in the attack on Cambrai, and after a rest of one day in billets they were sent back to the Cambrai front to help repulse the Boche counter-attack. The 5th Cavalry Division was disbanded, the Umbala and Secunderaba Brigades going to Palestine. They became a part of the 3rd Cavalry Division and were attached to the 5th Army, coming in for a full share of the Boche attack in March, 1918. During this retreat they covered a front extending from St. Quentin to points south of Compeigne. In July they were again near Amiens holding forward positions for two weeks at a time and one week in billets. About this time Lieut. Hall went to hospital at Rouen and on his return in July was transferred to the 2nd Canadian Division, remaining with them until they reached the Canal du Nord near Cagmicourt. In October, 1918, Lieut. Hall left France for an appointment at Witley, where he remained until July 1919, when he returned to Canada and was demobilized at Toronto on July 26th, 1919.

*

The Harbour Commissioners of Vancouver, B.C., have appointed W. G. Swan to the position of chief engineer. Mr. Swan is a Member of *The Engineering Institute of Canada* and holds the degrees of B. A. Sc. and C. E. of the University of Toronto, where he acted for two years as demonstrator and lecturer on mechanics of building materials. In the practice of his profession Mr. Swan has had a varied experience that specially fits him for the class of work that will engage his attention in the services of the commissioners.

In 1903 Mr. Swan acted as assistant hydrographic engineer for the Dominion Government and in the following year transferred to the Canadian Northern Railway, in which service he filled the various capacities of residence,bridge, divisional, terminal and district engineer, with headquarters at New Westminster.

In addition to his general railway constructional experience Mr. Swan was in charge of the Pacific Coast mainland terminals for three years previous to the war, during which time he designed and superintended the construction of the Port Mann wharves. He also had charge of the reclamation of False Creek mud flats for railway terminals.

W. G. SWAN, A.M.E.I.C.

Mr. Swan has to his credit three and one-half years' military service, two years and three months of which he spent in France.

He was an officer in the 10th Westminster Fusiliers Regiment when war broke out and took an active part in the formation of the 131st Battalion, with which unit he served with distinction overseas. He holds the D. S. O. and the French Croix de Guerre and is one of the most popular officers of the famous Fraser Valley unit.

R. G. Swan, chief of the hydrographic survey for British Columbia, is a brother, but A. D. Swan, consulting engineer for the Harbor Commissioners, is in no way related.

The commissioners have also under consideration applications for the position of chief accountant and the appointment will be made within the next few days.

The Annual Meeting of the Association of Canadian Building and Construction Industries has been postponed, and will be held at Ottawa on Monday, Tuesday and Wednesday, the 2nd, 3rd, 4th of February at the Chateau Laurier.

EMPLOYMENT BUREAU

The demand for trained men continues to exceed the supply, we have more requests for young graduate engineers of two or three years standing than we can at present fill. The demand for draughtsmen is also very brisk. The usefulness of the employment bureau is being extended by increasing co-operation with the Branches. When applications are received early in any month, copies will be mailed to the Branch Secretaries who are most likely to be interested. When positions are filled, it is desired that this information be supplied to headquarters so that the cards may be duly cancelled.

Situations Vacant

Engineer wanted for electric interurban railway in Ontario. Should have knowledge of high tension work in order to be able to supervise sub-stations and electrical work in general. Experience in civil railway engineering desirable. Apply Box No. 72.

Assistant engineer wanted in connection with construction of water power plant, in Quebec, should be technical graduate with experience in surveying or construction. Work will last for a year and a half or more. Salary $150.00 per month up according to qualifications. Apply Box No. 73.

Two graduates in electrical engineering wanted for motor department of large electrical manufacturing firm in Toronto. Graduates of two or three years preferred. Good opportunities. Apply Box No. 74.

Two salesmen wanted for electrical firm in Montreal graduates preferred. Excellent opportunities for the right men. Apply Box No. 75.

Resident civil engineer required to supervise construction in Northern Ontario of a Hydro Electric Power Development including dam, power station and transmission line, previous experience on similar work essential. Apply Box No. 76.

Recent graduate or railway man with experience wanted by railway company. Work for four or five months and probably permanent. Address Box No. 77.

Reinforced Concrete Engineer

Montreal firm of contracting engineers requires the services of an expert in reinforced concrete. Liberal salary to the right man. Box 78.

Steel Company requires experienced mechanical engineer to install special equipment. This will lead to a permanent position if services satisfactory. Salary $2,000 to start. Box 79.

The Crown Agents for the Colonies, London desire to obtain the nomination of a candidate for the appointment of Logging Engineering Assistant to the Timber Superintendent in the Railway Department of the Federated Malay States. The salary is six hundred dollars (Straits Settlement), the value of the dollar being fixed at two shillings and six pence. Full particulars can be obtained from the Department of the Secretary of State in Canada, Ottawa.

A Shipyard Superintendent, Sorel, P.Q. Salary, [illegible] per annum.

A Shipyard Superintendent for the Government Shipyard at Sorel, P.Q., Department of Marine, at an initial salary of [illegible] per annum, which will be increased on recommendation for efficient service at the rate of $180 per annum until a maximum of $3,240 has been reached.

Candidates must have education equivalent to graduation in engineering from a school of applied science of recognized standing; at least five years of experience in ship design and construction, two years of which must have been in responsible charge of such work; thorough knowledge of various types of ships and ship machinery and the construction and repair thereof; initiative, tact, good judgment, and ability to manage men; preferably a knowledge of both French and English. No special age limit is fixed for this position, but the appointee must be of such an age as to ensure a reasonable period of satisfactory service after appointment.

The successful candidate will be required to perform the following duties: Under direction to have charge of the Sorel Shipyard; to be responsible for the design, estimate, construction, and repair of ships; to supervise the buying and safekeeping of stores and stock and the work of all employees, and to perform other related work as required.

An examination will be held in Education and Experience along the lines indicated above. An oral examination of the best qualified candidates will be held, if necessary in the opinion of the Commission.

Junior Engineers. Initial Salary $1,080 per Annum.

Junior Engineers, at an initial salary of $1,080 per annum, which will be increased, on recommendation for efficient service, at the rate of $120 per annum until a maximum of $2,040 has been reached. This initial salary is supplemented during the present fiscal year by the following bonus: If head of a household (irrespective of age), $400 per annum; if not the head of a household, $42 per annum, if over 21 years of age; no bonus if below 21.

Candidates must possess the following qualifications: Education equivalent to high school graduation; either graduation in engineering from a school of applied science of recognized standing, with two years of engineering experience or four years of engineering experience in design, estimate, construction, and maintenance work; good physical condition. Candidates must not be more than 35 years of age.

Candidates must be able to perform the following work: To lay out and supervise construction work, to plot survey notes and draw plans, to make soundings for dredging purposes and supervise dredging operations; to run a transit, level or other surveying instruments, to calculate quantities and prepare estimates of cost of proposed works, to lay out work for draughting or office staff.

Candidates will be examined in the following subjects which have the relative weights indicated: Education, Training and Experience, 300; Oral Interview, if necessary in the opinion of the Commission, 100.

A list of eligibles will be established for vacancies in the above class throughout the Dominion, but the only vacancy required to be filled at present is that of Junior Engineer, Fisheries Branch, Department of the Naval Service, at Vancouver, B.C. This particular appointee will be required under direction to perform the following duties: To supervise the removal of obstructions in rivers and streams which hinder the free passage of fish up stream; to assist in the design, construction, and maintenance of fish hatcheries, fish ways, and other engineering work in connection with the Fisheries Branch in British Columbia.

So far as this position is concerned, preference will be given to the residents of the province of British Columbia, but persons from other parts of the Dominion are urged to qualify through this competition for other positions of Junior Engineer, vacancies of this nature being of frequent occurrence

Application forms properly filled in, must be filled in the office of the Civil Service Commission. Application forms may be obtained from the offices of the Employment Service of Canada, or from the Secretary of the Civil Service Commission. Ottawa.

Air Station Superintendent, Initial Salary $3,360 per Annum.

832. An Air Station Superintendent for the Air Board at an initial of $3,360 per annum, which will be increased on recommendation for efficient service at the rate of $180 per annum until a maximum of $3,900 has been reached.

Note.—If board, lodging, or ordinary clothing is supplied the value thereof shall be deducted from the above compensation.

Qualifications—Education equivalent to university graduation; at least two years of flying experience; must hold or obtain commercial pilot's and navigator's flying machine certificates or airship pilot's and navigator's certificates; thorough knowledge of the theory of flight and the principles and practice of air navigation; wide acquaintance with all types of aircraft accessories and equipment and their use; administrative and organizing ability; good physical condition.

Duties.—Under the direction of the Director of Flying Operations of the Air Board, to have charge of an air station and to direct the work at flying sub-stations; to direct or personally undertake flying operations; to supervise the staff and be responsible for the maintenance and repair of aircraft and equipment at a flying station; to supervise the care and issue of stores, and to perform other related work as required.

General Directions

Candidates for these positions will be examined in the following subjects, which have the relative weights indicated: Education, Training and Experience, 300; Oral Interview, if necessary in the opinion of the Commission, 100.

According to law preference is given to persons who have been on active service overseas on the military or naval forces of His Majesty, or any of the Allies of His Majesty, during the late war. Returned soldiers must furnish a certified copy of their discharge certificates, or in case of commissioned officers a certified statement of their military service.

Applicants for positions under the Air Board, advertised in July, 1919, who wish to be reconsidered in connection with the positions now advertised must advise the Commission to this effect.

The positions advertised herewith are grouped in the following classes:—

(*a*) Flying.
(*b*) Technical.
(*c*) Mechanical.
(*d*) Other appointments.

Applicants for more than one class of positions must file a separate application for each class for which they are making application. Application forms must be filed in the office of the Civil Service Commission not later than February 19. Such forms may be obtained from the Secretary of the Civil Service Commission, Ottawa, the Secretary of the Air Board, Ottawa, or the offices of the Employment Service of Canada.

By order of the Commission,
W. FORAN,
Secretary.

Ottawa, January 22, 1920.

Situations Wanted

Change wanted — Graduate Engineer, A.M.E.I.C., desires change, six years Civil and Mechanical experience, four of which spent on general steel plant construction and maintenance. Can produce results. No objection to going abroad. Box 12 P.

1920 Executive Committee of the Ontario Provincial Division

Ex-Officio. — Lt.-Col. R. W. Leonard, St. Catharines, Past President, 1920-21-22; Major-General C. H. Mitchell, Toronto, Vice-President, 1920-21; Geo. Hogarth, Toronto, Immediate Past Sec. Treas. Ont. Prov. Div.; John Murphy, Ottawa, Councillor, Dist. No. 4, 1918-19-20; G. G. Gale, Ottawa, Councillor, Dist. No. 4, 1919-20-21; J. B. Challies, Ottawa, Councillor, Dist. No. 4, 1920-21-22; P. Gillespie, Toronto, Councillor, Dist. No. 5, 1918-19-20; W. A. McLean, Toronto, Councillor, Dist. No. 5, 1919-20-21; E. R. Gray, Hamilton, Councillor, Dist. No. 5, 1920-21-22.

Appointed by Branches. — A. C. D. Blanchard, Niagara Peninsula Branch; H. B. R. Craig, Border Cities Branch, Hamilton Branch, Toronto Branch; A. B. Lambe, Ottawa Branch; Lt.-Col. A. MacPhail, Kingston Branch; G. R. Munro, Peterboro Branch; F. M. Perry, Sault Ste. Marie Branch.

Elected by Non Resident Members.—J. A. Bell. St. Thomas; H. A. Brazier, London; G. H. Bryson, Brockville, S. B. Clement, North Bay; T. H. Jones, Brantford; Major W. H. Magwood, Cornwall; F. D. Reid, Cobalt.

At a meeting of the above Committee held in Montreal on January 29, Mr. Craig was elected Chairman, Mr. Jones Vice-Chairman, and Mr. Lambe, Secretary-Treasurer.

Preliminary Notice

of Applications for Admission and for Transfer

[illegible] January, 19[illegible]

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher. [illegible]

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references. [illegible]

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, they should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in February, 1920.

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:— [illegible]

[illegible]

Every candidate who is not a graduate of some school of engineering recognized by the Council, [illegible]

[illegible]

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ABBOTT—WILLIAM HAMILTON, [illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible] M. Archibald, J. E. [illegible]

CLARK—GL[illegible]

References: [illegible]

[illegible] Born at Callao, Peru, [illegible]

References: [illegible]

[illegible]

References: A. L. Hertzberg, E. G. [illegible]

[illegible]

References: [illegible]

FINDLAY—[illegible]

References: [illegible]

FYLES—LYNDON FULFORD, of Calgary, Alta. Born at Abercorn, Que., June 3rd, 1890. Educ., B.Sc., McGill Univ., 1915. 1908, rodman, International Boundary; 1910, drafting, C.P.R., maintenance; 1911-13, with C.P.R., inst'work and inspection; 1915-17, with C.E.F.; 1918, asst. to equipment engr., Soldiers Civil Re-Establishment, Ottawa; 1918-19, supervisor, technical education for Alta., S.C.R; at present, deputy district vocational officer for Alta., D.S.C.R

References: A. R. Greig, G. L. Guillet, H. S. Johnston, H. O. Keay, C. M. McKergow.

GRAY—CHARLES FREDERICK, of Winnipeg, Man. Born at London, Eng., Dec. 17th, 1879. Educ., Dulwich Coll., London, Eng. 2 yrs., line work and telephone constrn. B.C.; 6 mos., Sprague Elec. Co., N.Y. and N.J., shop experience; 6 mos., Waldorf Astoria Hotel, N.Y., Sprague Elevators upkeep; 1 yr., general repair shop work; 2 yrs., engr. in charge, West Kootenay Light & Power Co., Bonnington Falls, B.C.; 2 yrs., Interborough Rapid Transit Co., N. Y.; 2 yrs., Metropolitan District Underground R.R. Electrification, London, Eng., charge of erection and supt. of operation for British Westinghouse; 1916-12, supt. of constrn. for Dominion, Can. Westinghouse Co., and supervision of this dept's. work in most large plants throughout Canada; at present, mayor of Winnipeg and since 1912, practicing as conslt. engr.

References: E. V. Caton, J. G. Glassco, G. L. Guy, R. S. Kelsch, T. L. Roberts, H. N. Ruttan.

HAIGHT—HARRY VERCOE, of Sherbrooke, P.Q. Born at Sprata, Ont., July 16th, 1873. Educ., B.A.Sc., Toronto Univ., 1897. 1897-99, sales engr. in N.S., Canadian Rand Drill Co.; 1900, draftsman, same firm; July 1900 to date, chief engr., Canadian Ingersoll-Rand Co. Ltd.

References: A. A. Bowman, N. M. Campbell, C. H. Mitchell, S. R. Newton, J. M. Robertson.

HANKIN—FRANCIS, of Montreal. Born at London, Eng., Aug. 26th, 1882. President, Francis Hankin & Co. Ltd., Montreal, engaged in the sale of technical apparatus, appliances for water filtration, sewage disposal, etc.

References: F. B. Brown, J. T. Farmer, W. J. Francis, R. DeL. French, L. R. Thomson.

HANLY—ARTHUR F., of Montreal. Born at Waubaushene, Ont., May 15th, 1892. Educ., 3 yrs. elec. eng., Toronto Univ.; 3 yrs., Can. Gen. Elec. testing dept.; 1 yr. drawing office, N.S. Steel & Coal Co.; 6 mos., drawing office, Can. Ingersoll-Rand Co., in charge of design and erection of new substations, also had eng. charge of steam plant, etc., same firm; at present, dist. eng., Can. Ingersoll-Rand, estimating on installations of waterwheels, etc.

References: A. A. Bowman, N. M. Campbell, C. J. Desbaillets, S. R. Newton. J. M. Robertson, M. A. Sammett.

HARRISON—GEORGE, of Winnipeg, Man. Born at St. Ives, England, Feb. 24th, 1882. Educ., Council School, St. Ives; 2½ yrs., private study while teaching. 1898-1903, apprenticed to contractor, office and field; 1903-06, foreman in charge of works, supervision of extension to school, England; 1913-15, with C.N.R. as material checker, rodman, inst'man; 1915 to date, asst. engr., under bridge engr., C.N.R., Winnipeg.

References: H. A. Dixon, A. W. Smith, A. J. Taunton, T. Turnbull, W. Walkden, T. W. White.

HILL—ALFRED HODSON, of St. Lambert, P.Q. Born at Sheffield, Eng., Oct. 24th, 1886. Manager of Francis Hankin & Co. Ltd., engaged in the sale of municipal equipment, including sewage disposal apparatus, etc.

References: W. Chipman, R. DeL. French, W. Kennedy, Jr., R. H. Parsons, W. R. Worthington, R. O. Wynne-Roberts.

INGRAHAM—ALEXANDER, of Calgary, Alta. Born at Canterbury, N.B., June 29th, 1860. Eudc., LL.B., Univ. of Minnesota, 1893; 2 yrs., Coll. of Eng., Univ. of Minn., member, A.S.M.E. 1895-05, vice-pres.; 1905-17, pres. and chief engr., Willford Mfg. Co., Minneapolis, Minn., designers and bldrs. of flour mills and grain storage elevators; at present designing and supt'g. constrn. of flour mill and grain elevators for Alberta Flour Mills, Calgary.

References: C. M. Arnold, A. S. Chapman, G. W. Craig, A. S. Dawson, W. Pearce, F. H. Peters, B. L. Thorne.

INGRAHAM—HARRY ALEXANDER, of Calgary, Alta. Born at Minneapolis, Minn., Aug. 26th, 1886. Educ., 1904-07, Coll. of Eng'g., Univ. of Minn. 1907-17, with Willford Mfg. Co., Minneapolis, as follows:—1907-10, draftsman, detailing of mill bldgs. and mech. equipment; 1910-12, constrn. foreman; 1912-14, engr., asst. in. design of mill bldgs., etc.; 1914-17, res. engr. in charge of reinforced concrete design and constrn., mill bldgs., grain elevators, etc.; 1917 to date, reinforced concrete designer, A. Ingraham, Calgary.

References: C. M. Arnold, G. W. Craig, W. J. Gale, W. Pearce, F. H. Peters, B. L. Thorne, J. H. Walshaw.

JEFFERY—CHARLES JOHN, of Armstrong, B.C. Born at Tring, Eng., Feb. 17th, 1879. 1903-06, articled to J. W. Cundy, land surveyor, Linly, Eng. 1906, obtained diploma, Prof. Assoc. Surveyors Inst.; Apr.-Nov. 1906, rodman, G.T.P., Sask.; 1907-08, rod and inst'man on constrn., G.N.Ry., New Westminster; 1908-10. inst'man on constrn., G.T.P., Skeena River, B.C.; 1911-12, gen. eng. work as asslt, munic. of North Vancouver; Apr.-July 1913, draftsman, P.W.D., Victoria; 1913-14, res. engr. in charge of constrn. of steel and concrete highway bridge, Lytton, B.C., P.W.D.; 1914-15, asst. engr. on constrn. of steel and concrete highway bridge over Pitt River at Port Coquitlam; 1917-19, with Can. Ry. Troops in France, in charge of survey parties on location and constrn. of light and standard gauge rlys., rank, sergeant; Apr. 1919 to date, res. engr. on constrn., C.N.R., Okanagan branch.

References: J. R. Cosgrove, C. W. Gamble, J. E. Griffith, H. L. Johnston, W. G. Swan.

LAFRENIERE—THEO J., of Montreal. Born at Sorel, Que., Aug. 3rd, 1888 Educ., B.A.Sc., Ecole Poly. 1909; M.Sc. (sanitary eng.) Mass. Inst. of Tech. 1912, 1909-10, asst. engr. on constrn. work, Bordeaux Jail; 1910-12, asst. sanitary engr., Board of Health, Prov. of Quebec; 1912 to date. sanitary engr. in charge for Board of Health, of Que. Prov.; also at present professor of sanitary eng., Ecole Poly.; conslt. engr., Housing Comm. of the Province.

References: A. Boyer, H. G. Hunter, R. S. Lea, O. O. Lefebvre, J. O. Meadows, A. Surveyer.

LEDGER—GEORGE NOEL, of Winnipeg, Man. Born at Blackheath, Eng., Dec. 20th, 1888. Educ., Colfe's Grammar School; Goldsmiths Coll., England. 1903-07, apprentice, Telegraph Constrn. & Maintenance Co. Ltd., London, Eng., covering pattern shops, marine work, etc.; 1907-09, in drawing office of J. Stone & Co. Ltd., gen. engrs., London; 1 yr., marine engr., 3rd engr. on board S.S. Ortlan, of Gen. Steam Navigation Co. Ltd., London; 1910-11, right of way dept., MacKenzie, Mann & Co., Winnipeg; 1910-14, bridge engr's. dept., same firm, specializing on bridge work, reinforced concrete substructures, etc., and 1913-14, with field party on constrn. as asst. bridge engr.; 1914-15, inspector on bridge material, MacKenzie, Mann & Co. on constrn. in B.C.; 1915-16, inspector for Greater Wpg. Water Dist., in charge of mixture of all materials used for concrete in Wpg. Aqueduct; Jan. 1916-July 1919, with C.E.F., 2 yrs. in France; July 1919 to date, chief of field party, Manitoba Drainage Comm.

References: W. G. Chace, D. L. McLean, M. V. Sauer, J. G. Sullivan, W. Walkden.

MacDONALD—JOHN ROBERT, of Regina, Sask. Born at Ardrossan, Scotland, Jan. 30th, 1887. Educ., The Academy, Ardrossan; tech. side, Allan Glens, Glasgow; Glasgow School of Art. and Glasgow Tech. Coll. 1903, apprentice to Jas. Robertson, architect, Glasgow, asst'g. in preparation of plans, estimates, etc.; 1908, private practice as architect, Troon, Scotland; 1911, surveys branch, P.W.D., Sask., as draftsman; 1912-Sept. 1919, appointed chief draftsman and plan checker of surveys branch; at present, chief clerk, surveys branch, Dept. of Highways, Sask.

References: A. N. Ball, K. N. Crowther, J. N. deStein, E. Markham, W. R. W. Parsons, M. B. Weekes.

MARTIN—EDWARD BYRON, Lieut., of Moncton, N.B. Born at Moncton. Nov. 20th, 1887. Educ., B.Sc., Univ. of N.B., 1912. Summers 1906-11 (20 mos.) apprentice, rodman, inst'man, etc., with engr. of maintenance, I.C.Ry.; 1914-15, asst. city engr., Moncton, asst. in charge of constrn. of new water supply system, and constrn. of sewers, sidewalks, etc.; 1915-19, Lieut., O.M.F.C., part of time with Can. Engrs. in France; at present, comm'r. of streets and sewers dept., Moncton, N.B.

References: J. Edington, R. H. Emmerson, H. R. Logie, G. E. Martin, J. D. McBeath.

McCALLUM—GEORGE HUGH, Major, M.C. and Bar, of Ottawa, Ont. Born at Smiths Falls, Ont., Aug. 4th, 1882. Educ., B Sc., McGill Univ. 1907. D. & B.C.L.S. Apr.-Sept. 1906, with C.N.R., Winnipeg, in charge of fencing in Manitoba and location at Fort Francis; Apr.-Dec. 1907, D.L.S. work in B.C. with J. E. Ross; 1908-10, in charge of reconnaissance, Geodetic Survey in Quebec, N.B. and N.S.; 1911-14. in charge of triangulation, Geodetic Survey in B.C.; 1915-19, enlisted in Can. Engrs., promoted to major, awarded M.C. and bar; at present, geodetic engr. Geodetic Survey of Canada.

References: C. A. Bigger, J. D. Craig, F. S. Keith, D. W. McLachlan, N. J. Ogilvie.

McLEAN—HOWARD JOSEPH, of Calgary, Alta. Born at Toronto, Ont., Apr. 1st, 1895. Educ., senior matric., 1 yr. S.P.S.; I.C.S. 1913, O.L.S. work with Speight & Van Nostrand, 3 mos., as inst'man and rodman; Aug.-Oct. 1913, inst'man on township subdiv. in northern Ont.; 1913-15, inst'man, with ry. and bridge section, P.W.D., Toronto; 1915-18, with eng. and inspection dept., Imperial Ministry of Munitions as chief examiner in charge of testing and inspection at contractors plants; 1918, pilot in R.A.F., discharged Dec. 1918; Mar. 1919 to date, hydrometric engr., in charge of Moose-Jaw, later Calgary dist., and current meter rating station, irrigation branch, Dept. of Interior.

References: N. P. Dalziel, A. L. Ford, D. W. Harvey, F. H. Peters, P. M. Sauder.

MEECH—HENRY WILLIAM, of Lethbridge, Alta. Born at Blandford, Eng., June, 27th, 1881. Educ., Milldown School, Blandford; bronze medallist, science of eng'g. constrn., South Kensington. Asst. to W. H. Simpson, conslt. engr. and architect, Leicester, Eng.; asst. to city engr., Lethbridge; at present comm'r. of Public Works and city engr., Lethbridge, also charge of bldg. inspection.

References: C. M. Arnold, A. C. D. Blanchard, G. W. Craig, A. W. Haddow, W. S. Harvey.

NORTHEY—ROBERT KIRKPATRICK, Capt., of Regina, Sask. Born at Toronto, Ont., Oct. 11th, 1890. Educ., B.A.Sc., Toronto Univ. 1912. May-Oct. 1909, rodman and concrete inspector on rly. constrn., T. & N. O. Ry.; May-Oct. 1910, transitman, rly. location; May-Oct. 1911, res. engr., maintenance, northern div., T. & N.O.Ry.; May-Oct. 1912, asst. supt. of bldg. constrn., with Frid-Lewis Co. Ltd., Saskatoon; Oct. 1912 to date, sec-treas., Dom. Lime & Coal Co. Ltd., gen. bldrs. supplies, equipment and fuel; July 1915, lieut., 68th Batt., C.E.F., promoted to captain, overseas 1916; demobilized March 1919.

References: A. C. Garner, R. J. Lecky, A. P. Linton, A. J. McPherson, J. McD. Patton, S. Young.

O'BRIEN—DOMINIC EDWARD, of Halifax, N.S. Born at Merrickville, Ont., Aug. 5th, 1882. Educ., C.E., Toronto Univ., 1905; Coll. Inst. Vacations; 1903, levelman, locomotive and machine works, Montreal; 1904, asst. to town engr., Cornwall; 1905, transitman, T.C.R.; 1906, transitman, C.P.R.; 1907-08, res. engr., Waters & Sewers, Dalhousie, N.B. under supervision of Willis Chipman, Toronto; 1909-13, res. engr., T.C.R.; 1913-18, asst. engr., Welland Ship Canal; July 1918 to date, chief engr., Halifax Shipyards Ltd.

References: T. S. Armstrong, C. B. Brown, W. Chipman, W. H. Sullivan, J. L. Weller.

[illegible]

SHERMAN—GRANT SIMMONS, of Shelburne, N.S. [illegible]

References. J. E. [illegible]

SIMSON—DOUGLAS CHARLES [illegible]

References. J. [illegible], R. J. Lecky, A. J. McPherson, A. G. [illegible]

SMITH—SYDNEY [illegible]

[illegible]

FOR TRANSFER FROM THE CLASS OF ASSOCIATE MEMBER TO [illegible]

[illegible]

References. C. M. Arnold, [illegible]

[illegible]

NEAR—WILLIAM PERCIVAL, of St. Catharines, Ont. Born at St. Mary's, Ont., Dec. 27th, 1880. Educ., B.A., 1903; B.Sc., 1907, Toronto Univ. 1903-04, lecture asst., dept. of physics, Toronto Univ.; summer 1905, Dom. Observatory, Ottawa, and member of First Canadian Eclipse Expedition to Labrador; 1906, asst. to D.L.S. on International Boundary Survey; 1907-08, transitman on prelim.surveys and revision of grades, T. & N.O.Ry.; 1908, asst. on survey between B.C. and Yukon; 1909, city engr's dept., Toronto, main drainage dept., res. engr. on constrn. of trunk sewers 1½ yrs.; 1911-12, engr. in charge of constrn. of all trunk sewers, same dept.; Jan. 1913 to date, city engr., St. Catharines, Ont., bridges, pavements, sewers, etc.

References: A. C. D. Blanchard, P. Gillespie, R. W. Leonard, G. A. McCarthy, G. G. Powell, W. H. Sullivan.

WALKEM—GEORGE ALEXANDER, Major, of Vancouver, B.C. Born at Kingston, Ont., July 8th, 1872. Educ., B.Sc., McGill Univ. 1896. B.C. Elec. Ry., track work; 1900-06, gen. manager, Vancouver Engineering Works Ltd.; 1906 to date, managing director, Vancouver Machinery Depot Ltd., plant design, steam and elec., etc.; military service; engr. in charge maintenance on Palestine Military Rys., etc.; with Royal Engrs. during war.

References: W. Anderson, C. E. Cartwright, H. K. Dutcher, R. F. Hayward, J. H. Kennedy, E. G. Matheson.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

BROWNE—ERNEST FRANK, Lieut., of Ottawa, Ont. Born at Great Yarmouth, England, July 27th, 1887. Educ., B.Sc., Queens, Univ. 1914; D.L.S., etc.; 1906-09, surveyors gen. asst. on Militia Topog. Surveys and D.T.S., also in charge levelling, etc.; 1910-14, in charge transit work, D.L.S.; 1914-19 Lieut., Can. Engrs. on various eng. work, 1917, layout of 2 reproduction schemes in France, etc.; at present, temporarily employed as eng. clerk in drainage div., Reclamation Service.

References: L. W. Gill, W. C. Gillis, J. C. Gwillim, G. H. Herriot, A. Macphail, W. L. Malcolm, W. P. Wilgar.

CASSIDY—JOHN FRANCIS, of Toronto, Ont. Born at Toronto, Sept. 2nd, 1884, Educ., St. Michaels Coll. and Toronto Tech. School. 1903-06, clerk in mech. dept., 1906-07, clerk in acct. dept., operation and constrn., C.P.R.; 1907-08, stock-keeper and asst. foreman, N.T.C.Ry.; 1908-10, estimate clerk and asst. to chief engr., C.N.R.; 1910-12, draftsman and asst. to chief engr. of surveys, C.N.R.; 1912-13, draftsman and asst. to chief engr., Can. Nor. Elec. Lines; 1912-13, draftsman and asst. architectural and bridge dept., C.N.R., Toronto; 1913-15, concrete inspector and asst. on constrn. of new wharves, St. John, N.B., Maritime Dredging & Constrn. Co.; 1915-18, asst. engr., Toronto harbor improvements, P.W.D.; 1918, asst. engr., British America Nickel Corp. Sudbury, and National Iron Corp., Toronto; at present, asst. engr., Dept. Public Highways, Ontario.

References: G. Hogarth, E. D. Lafleur, W. A. McLean, C. McN. Steeves, H. K. Wicksteed.

HEYWOOD—HERBERT PERCY, of Toronto, Ont. Born at Lincoln, Eng., May 24th, 1889. Educ., Lincoln Municipal Tech. Coll. 1906. 1906-09, articled pupil to waterworks engr., Lincoln; 1909-10, asst. engr., on design of water supply, Lincoln; 1910-11, asst. res. engr. on constrn. of reservoir, sewer laying, pumping, etc.; 1911-12, engr. in charge of constrn. of div. bldgs., C.N.R., Regina; 1912-13 (3 mos.) asst. engr., maintenance of way dept., and (12 mos.) draftsman, bridge engr's office, C.N.R., Winnipeg; 1913-14, dist. engr., on constrn. of asphaltic pavements, reinforced concrete bridges, etc., Man. Prov. Govt., highways dept.; 1914-16, draftsman, bridge inspector and senior concrete inspector of aqueduct, Greater Winnipeg Water Dist.; July 1916-Apr. 1919, with 3rd Can. Ry. Troops, France, on constrn. of light and standard gauge rlys.; Apr.-Dec. 1919, eng'g. representative in Eastern Canada for Lock Joint Pipe Co., New York; at present, asst. engr. on sewerage design, Toronto Harbor Comm.

References: A. C. D. Blanchard, W. G. Chace, G. T. Clark, H. A. Goldman, W. S. Lea, G. F. Richan, R. O. Wynne-Roberts.

HOOPER—JOHN HAROLD, of Port Arthur, Ont. Born at Milton, P.E.I., Sept. 3rd, 1886. Educ., B.Sc., McGill Univ. 1911. Summers; 1908-09, with Can. Copper Co., Colon Hill Mine; 1910, transitman, geological survey, N.B.; 1911, on investigation of peat bogs in Man.; 1911-13, detailing structural steel, Dom. Bridge Co., Winnipeg; 1913-14 (9 mos.) checking structural steel, Man. Bridge Co., Wpg.; 1914 (3 mos.) transitman, J. G. White Eng. Co., Grand Du Bonnet Falls, Winnipeg River, Man.; 1915-17, engr. on constrn. of Spirit Lake Internment Camp, P.Q., also Lieut. of military guard; 1917-18, detailing rly. and highway bridges, Dom. Bridge Co., Lachine; 1918 to date, designing engr., with C. D. Howe & Co., conslt. engrs., Port Arthur, at present asst. engr. on reconstrn. of Port Colborne grain elevator.

References: G. H. Duggan, L. M. Jones, R. S. Lea, W. S. Lea, J. J. Macdonald, H. M. MacKay.

McKAY—JAMES KENNETH, of Clyde River, N.S. Born at Clyde River, Jan. 22nd, 1885. Educ., public schools and I.C.S. 1902-06, inst'man, etc. on land surveys; 1906-07, draftsman, transitman on location; 1908-09, inst'man on constrn., T.C.Ry.; 1910-14, res. engr. on constrn., G.T.P., Branch Line Coy.; 1915, maintenance work on G.T.P.; 1917, transitman on rly. location and constrn. as private and non-com. officer, A. Coy., 3rd Can. Ry. Troops, France, 1918, lieut. in charge of surveys and constrn., asst. to chief engr., 12th C.R.T.; Apr. 1919 to date, charge of party on road survey, with N.S. Board of Highways in Yarmouth and Shelburne counties.

References: G. C. Dunn, C. O. Foss, A. J. Gayfer, H. Longley, J. W. Roland.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

BARNES—LYMAN F., of Hamilton, Ont. Born at Brantford, Ont., July 26th, 1893. Educ., B.A.Sc., Toronto Univ., 1916; eng. course for commission, Royal Engrs., Chatham, Eng. 1914, inspector on road constrn work and sidewalks, Toronto; 1915, inspector, with Frank Barber, conslt. engr., Toronto, on municipal constrn. work; commanded a field coy. of engrs. in Persia for constrn. of bldgs., forts, roads, etc.; recently demolilized.

References: F. Barber, J. R. Cockburn, P. Gillespie, R. Latham, C. R. Young.

BOURBONNAIS—J. ALBERT, of Quebec, P.Q. Born at St. Clet, P.Q., June 17th, 1890. Educ., classical studies; 2 yrs. Polytech. School. May-Oct. 1910, asst. engr., P.W.D., on Soulanges Canal, constrn. and telegraphy; 1911-12 inst'man on constrn. of Que. & Sag. Ry.; Jan.-June 1912, transitman on location, Que. & Eastern Ry.; June-Nov. 1912, res. engr., Que. & Sag. Ry.; 1912-13, asst. engr., F. C. Laberge, conslt. engr. and land surveyor; Feb.-May 1913, topog. survey at discharge of Lake St. John; May 1913 to date, surveys, constrn. and office work, Dept. of Roads, Que. Prov.

References: A. O. Bourbonnais, A. Fraser, F. C. Laberge, J. O. Montreuil, J. P. Piche.

COLLINS—WILLIAM SCOTT, of Winnipeg, Man. Born at Miami, Man., Aug. 10th, 1888. Educ., B.C.E., Manitoba Univ., 1914. 6 mos., rodman, T.C.R., 6 mos. draftsman, C.N.R.; 6 mos., inst'man, Sask. river survey, P.W.D.; 4 mos.; asst. munic. engr., munic. of Rockwood; at present, draftsman, bridge eng. dept., C.N.R.

References: C. N. Mitchell, J. A. H. O'Reilly, A. W. Smith, A. J. Taunton, W. Walkden.

CROUCH—WILLIAM WESLEY, of Selkirk, Man. Born at Sharon, Pa., Nov. 22nd, 1891. Educ., B.C.E., Manitoba Univ. 1916; 4 yrs. high school; 1 yr. B.A. course, Wesley Coll., Wpg. Summers 1913-15, with Manotoba Public Works, on drainage; 1916, asst. to McColl Bros.; Apr.-Dec. 1917 and Mar.-Dec. 1918, res. engr., Winnipeg Aqueduct Constrn. Co.; at present, inst'man on constrn., C.N.R.

References: E. E. Brydone-Jack, D. L. McLean, R. W. Moffatt, J. A. H. O'Reilly, G. F. Richan, W. Smaill.

WEST—FRANK LESLIE, Lieut., of Saskville, N.B. Born at Coles Island, N.B., May 24th, 1891. Educ., B.A., 1912; M.A., 1914, Mt. Allison Univ.; B.Sc. (C.E.) McGill Univ. 1916. 1913-14, rodman, C.N.R.; June-Sept. 1916, asst. to peat expert on investigation of peat bogs; 1916-17, testing engr., Imperial Ministry of Munitions; Dec. 1917-Aug. 1919, Lieut., Can. Engrs., 1919, inst'man C.N.R.; at present prof. of civil eng., Mt. Allison Univ.

References: E. Brown, H. M. Lamb, H. M. MacKay, K. S. Pickard, H. W. Read.

YUILL—RUSSELL, Lieut., of Truro, N.S. Born at Truro, Oct. 6th, 1892. Educ., B.Sc., McGill Univ., 1915. 1912-13 (9 mos.) rodman on rly. constrn., C.N.O Ry. & I.B. & E. Ry.; 1914 (4 mos.) geological survey, Pictou sheet; 1915 18. asst. engr., on H.B.Ry. Terminal at Port Nelson, Man.; Jan. 1918-Apr. 1919, lieut., Can. Engrs.; Apr. 1919 to date, asst. engr., Dept. Rys. and Canals.

References: C. W. Archibald, W. A. Bowden, E. Brown, C. B. Daubney, H. M. MacKay, D. W. McLachlan.

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

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Volume III | MONTREAL, MARCH 1920 | Number 3

Report of Thirty-Fourth Annual Meeting

The Meeting was called to order at ten a.m. at the headquarters of *The Institute*, 176 Mansfield Street; President, Lieut.-Col. R. W. Leonard in the chair.

Reading of Minutes: On motion by Wm. McNab, seconded by H. H. Vaughan, and carried, the minutes of the Thirty-Third Annual Meeting as published in *The Journal* of February, Nineteen Hundred and Nineteen, were taken as read and approved.

Appointment of Scrutineers: On motion by R. A. Ross, seconded by Chase Thomson, and carried, Messrs. McNab and Van Scoyoc were appointed Scrutineers.

Appointment of Auditors: On motion by John Murphy, seconded by Walter J. Francis, and carried, Messrs. Riddell, Stead, Graham and Hutchison were appointed Auditors for the year Nineteen Hundred and Twenty.

Report of Council for Nineteen Hundred and Nineteen

On motion by the President, seconded by Walter J. Francis, the Report of Council as printed in the advance proof of *The Journal* (February, page forty-one) and distributed at the meeting, was adopted.

Presentation of Committee Reports

Finance Committee: It was moved by H. H. Vaughan, seconded by R. A. Ross, that the report of the Finance Committee as published in *The Journal* (February, page forty-six), be adopted. It was further moved by Mr. Vaughan, seconded by Frederick B. Brown, that recommendation number six of the Committee's report should be acted upon by the meeting. This recommendation is as follows:

6. Your Committee, therefore, recommend that the by-laws be amended to restore the subscription fees to *The Institute* to the amount at which they stood before the subscription was deducted from them and that the present by-law charging $2.00 per annum for a subscription to *The Journal* be retained. This would increase the revenue of *The Institute* about $[illegible] per annum and with the larger receipts we may confidently expect from the current fees, should place it in a sound financial condition. In view of the length of time necessary to make a change in the by-law your Committee would suggest that the Annual Meeting recommend the Council to request our membership to voluntarily agree to this proposition for the ensuing year.

The motion was carried.

Library and House Committee: It was moved by Mr. Surveyer and seconded by Mr. Francis, that the report of the Library and House Committee, *The Journal* (February, page fifty), be adopted. Carried.

Publications Committee: The report of the Publications Committee, *The Journal* (February, page fifty-[illegible]) was taken as read and the supplementary report read to the meeting. It was moved by Chase Thomson, seconded by J. G. Legrand that the report be adopted. Carried.

Honor Roll Committee: In the absence of the Chairman of this Committee, Mr. Walter J. Francis, moved the adoption of the Report, published in *The Journal* (February, page fifty-one) seconded by Col. Lamb. Carried.

Board of Examiners and Education Committee: Moved by Arthur Surveyer, seconded by Professor Haultain, that the report, published in *The Journal* (February, page fifty-one) be adopte. Carried.

Committee of Steel Railway Bridges: It was moved by Chase Thomson, seconded by Walter J. Francis, that the report published in *The Journal*, (February, page fifty-two) be adopted. Carried.

Engineering Standards Committee: It was moved by Prof. L. A. Herdt, seconded by Arthur Surveyer, that the report published in *The Journal*, (February, page fifty-three) be adopted. Carried.

Committee on Uniform Boiler Specifications: Moved by H. H. Vaughan, seconded by Mr. Gray, that the report published in *The Journal* (February, page fifty-six) be adopted. Carried.

Electro Technical Committee: This report published in *The Journal* (February, page fifty-seven) was read by Dr. Herdt, who moved its adoption, which was seconded by John Murphy and carried.

Legislation Committee: Mr. Surveyer read the report as follows:

Report of Legislation Committee

Dear Sir:—

Notwithstanding the renewed activities within *The Institute* on the subject of Legislation for Engineers, your Legislation Committee has had less to do this year than during previous years. This report is therefore a synopsis of events rather than a resumé of the work performed by your Committee.

The Annual Meeting appointed a Legislation Committee of its own independent of the Legislation Committee of the Council. This special Committee of the annual meeting met in Montreal and prepared a model act for the registration of all professional engineers, which was submitted to the members of *The Institute* and approved by a very large majority, seventy seven per cent of the votes cast being in favour of Legislation.

Since the publishing of this model act in *The Journal* of *The Institute*, New Brunswick and British Columbia have submitted bills to their respective legislature and it is expected that Saskatchewan and Alberta will do the same in the very near future.

Respectfully submitted.

ARTHUR SURVEYER,
Chairman of the Legislation Committee.

Mr. Surveyer moved the adoption of this report, which was seconded by Mr. Francis and carried.

International Affiliation Committee: This report published in *The Journal* (February, page fifty-two) was adopted on motion by Mr. Vaughan, seconded by Professor H. E. T. Haultain.

Gzowski Medal Committee: Mr Vaughan read the report of this Committee as follows:

Dear Sir:—

The Committee on the Gzowski Medal and prizes for students' papers have decided to award the Gzowski Medal for 1920 to Messrs. Phelps Johnson, M.E.I.C., G. H. Duggan, M.E.I.C. and George F. Porter, M.E.I.C. for their paper on "The Design, Manufacture and Erection of the Superstructure of the Quebec Bridge."

Your Committee does not consider it desirable to make any award for a student's paper.

Yours truly,

H. H. VAUGHAN,
Chairman of Committee.

and moved its adoption, seconded by Mr. Francis. Carried.

Leonard Medal Committee: The Chairman of the Committee on the Award of the Leonard Medal reported that no decision had been reached regarding the award of the Medal and that the announcement concerning same would be made at a later date.

McGill University, Montreal.
January 20th, 1920.

The President and Council,
The Engineering Institute of Canada.

Gentlemen,

On behalf of the Publications Committee I beg to make the following recommendations with reference to papers published in *The Journal* from May to December 1918, on which no report has been made in regard to the question of publication in Transactions.

We recommend that the following papers be published in Transactions together with all discussion and reports relating to them:—

The Fuels of Canada	B. F. Haanel
Low Temperature Carbonization of Fuels	E. Stansfield
Canada's Water Powers and their Relation to The Fuel Situation	J. B. Challies
Deterioration of Concrete	B. S. McKenzie
Concrete in Alkali Soil at Saskatoon.	H. McI. Weir
Causes of the Disintegration of Concrete	A. G. Blackie
Fuels of Western Canada	J. White
The Use of Reinforced Concrete Construction in Harbour Work	A. F. Dyer
The Diving Bell in Use at Halifax Ocean Terminals	J. J. Macdonald
St. John Harbour	Alex. Gray
Heat Transfer Tests for Building Materials	L. M. Arkley

The Committee recommend also that an index of all papers appearing in *The Journal* be printed in Transactions so that there may be a suitable reference to all papers which have been read during the year.

On behalf of the Committee I beg to remain,

Yours faithfully,

E. BROWN,
Chairman, Publications Committee.

Reports of Branches

On motion by Mr. Francis, seconded by Mr. Brown, the reports of the Branches as published in the February Journal, Victoria Branch, page fifty-eight; Saskatchewan Branch page fifty-nine; Sault Ste. Marie, page sixty; Border Cities Branch, page sixty; Ottawa Branch, page sixty-three; Montreal Branch, page sixty-five be taken as read and adopted. Carried.

Ontario Provincial Division: In moving the adoption of the report of the Ontario Provincial Division, Mr. Challies read the final paragraph of the report, February Journal page sixty-two, and referred to the fact that although the Division was constituted only last year, at an enthusiastic meeting that was held in Toronto in November a number of questions of import to *The Institute* were discussed which included the interest of *The Institute* in public affairs, legislation and other questions. The officers of the Division had felt that *The Institute's* policy had not been voiced as it should be, and therefore the matter was being brought up at the Annual Meeting with the suggestion that the Council be requested to appoint a committee on development as suggested. The motion to adopt the report included referring to Council the recommendations made therein. On seconding the motion Professor Haultain stated that this recommendation of the Provincial Division was a very wise one and should be acted upon. The motion was carried.

Quebec Branch: The report of the Quebec Branch was read by Mr Fraser, (February Journal, page seventy-three), who move its adoption, seconded by Mr. Evans. Carried.

Calgary Branch: The Secretary stated that this report had been printed but was not yet distributed, (February Journal, page fifty-nine) which he read and moved its adoption, seconded by Col. McPherson. Carried.

Niagara Peninsula Branch. The Secretary read the report of the Niagara Peninsula Branch stating that while it had been organized only in February, Nineteen Hundred and Nineteen, it had made great progress. He moved the adoption of the report which was seconded by Lt.-Col. H. J. Lamb. Carried.

Toronto Branch: The Secretary-Treasurer of the Toronto Branch Mr. H. A. Goldman, read the report of the Branch (February Journal, page seventy) and moved its adoption, seconded by Professor Gillespie. Commenting on the report, Professor Haultain stated that the Toronto Branch had had a good year, and has made an excellent start for the following year, so that Toronto would have a still better report for next year. The older men in the Branch were doing things and the Branch had awakened to great activity. Motion carried

Halifax Branch: The report of the Halifax Branch was read by the Secretary (February Journal, page seventy-five), and its adoption was moved by Mr. Francis and seconded by W. P. Morrison. Carried.

St. John Branch: Chairman, C. C. Kirby, read the report of the St. John Branch, (February Journal page seventy-four), and moved its adoption. This was seconded by G. G. Murdoch and carried.

Edmonton Branch: The report of the Edmonton Branch (February Journal, page sixty-one) was read by the Secretary, who, seconded by Mr. Cassels moved its adoption. Carried.

Vancouver Branch: The Secretary read the report of the Vancouver Branch, (February Journal, page sixty-eight), and moved its adoption, seconded by Mr. Lefebvre. Carried.

Hamilton Branch.

Winnipeg Branch: The report of the Hamilton Branch (February Journal, page seventy-one), and the report of the Winnipeg Branch (February Journal, page sixty-nine), on motion by Mr. Vaughan, seconded by Mr. Davies were taken as read and adopted.

Communications: At the suggestion of President, a number of communications were read by the Secretary, mainly from invited guests and their contents noted.

Announcements: Frederick B. Brown, Secretary-Treasurer of the Montreal Branch, made a number of announcements, two of which referred to McGill University. He pointed out that in Nineteen Hundred and Twenty-one there will be a great re-union of all the graduates of McGill University, which would be of great interest to the graduates, particularly to those in engineering. Brig. Gen. Eric McCuaig, A.M.E.I.C., is the Chairman on the Committee. Further, a special invitation had been received from Dr. Frank D. Adams, Hon. M.E.I.C., Acting Principal of McGill, to all members of *The Institute* to visit McGill University during the Convention. Another announcement was the dinner being held by the Engineering Graduates of the University of Toronto, at the Windsor Hotel at noon on Thursday. Mr. Brown read a letter from the Secretary of the Canadian Forestry Association regarding validating certificates. The courtesy of the Association of Canadian Building and Construction Industries in changing the dates of their Convention was acknowledged and a letter from the Presdient of the Association, Mr. Anglin, was read. The final announcement was included in a letter from Mr. Bowman, Chairman of the Halifax Branch, inviting *The Institute* to hold the Annual Meeting in Halifax in 1924, which was the year of Old Home Celebration and Olympic Games.

Discussion: The items of the agenda having been disposed of and a few minutes left before having to adjourn to luncheon at the Windsor Hotel, the President opened the meeting for discussion.

A brief discussion on the financial statement took place when Messrs. Challies, Vaughan, Ross and Francis referred to the situation, Mr. Francis taking advantage of the occasion to refer particularly to the splendid service rendered *The Institute* during the past year by President Leonard and also by Past Presidents Vaughan and Duggan.

Luncheon at the Windsor Hotel.

The members and their lady friends with a number of invited guests were tendered a luncheon in the Rose Room of the Windsor Hotel, the hosts being the Montreal Branch. Walter J. Francis, Chairman of the Montreal Branch occupied the chair and extended a hearty welcome to all present on behalf of the Montreal Branch. He introduced Mr. Calvin W. Rice, Secretary of the American Society of Mechanical Engineers who had kindly come from New York to be with us on this occasion.

Mr. Rice who was warmly welcomed on rising to speak, conveyed the greetings of the President and Council of the American Society of Mechanical Engineers and expressed the hope that he would have an opportunity of meeting the Committee on International Affiliation of which Mr. Vaughan is the Chairman. With the opinion of the Chairman of the Committee on Sections of the American Institute of Electrical Engineers confirming his own emphatic views he was firmly convinced that respecting membership in *The Engineering Institute of Canada* every qualified technical man in Canada should be a member of *The Institute* as a first duty to his profession. Then as he progressed he might very properly become a member of other societies which would best serve his particular specialty. He repeated that every man domiciled in Canada, whether a citizen or not, owned his professional allegiance to the national society of this country.

Continuing, Mr. Rice paid a compliment to the Ontario Provincial Division report which showed an unusual breadth of vision. He believed that the relative part that sections would take was of minor importance when all joined together to render maximum service to the nation.—Cheers.

The Chairman then introduced Mr. E. W. James of Washington, D.C., Assistant Chief Engineer of the Bureau of Roads of the United States, who gave a splendid address on the requirements of highway development based on the experience of the Federal Government in that connection. Following Mr. James' address, hearty votes of thanks were tendered to Mr. Rice and to Mr. James for their addresses.

Afternoon Session, Tuesday, January 27th

The afternoon session convened in the ladies ordinary of the Windsor Hotel, President Leonard in the chair.

The first order of business was receiving the nominations to the Nominating Committee for the year Nineteen Hundred and Twenty, of the various Branches. The personnel of the Committee was noted as follows:

H. M. MacKay, Chairman	W. Lefebvre
A. E. Doucet	G. W. MacLeod
P. Gillespie	J. G. Legrand
D. A. R. McCannell	A. J. Riddell
H. E. C. Carry	H. U. Hart
A. A. Dion	G. G. Murdoch
W. M. Everall	H. L. Bucke
G. N. Houston	B. E. Barnhill
J. Lorn Allan	P. P. Westbye

Changes in By-laws: The recommendations of the Council regarding changes in the By-Laws, on motion by Lt.-Col. Lamb, seconded by Lt.-Col. McPherson, were adopted as follows; after some discussion regarding the rebates of the Montreal Branch:

(1) That Section 57 be amended by the deletion of the words "except the Montreal Branch," after the twelfth word "Branch." The Section would then read:

Revenue

Section 57: The Secretary of *The Institute* shall each year remit to each Branch, twenty-five per cent. of the annual fees, current of arrears, received from the members of the Branch during that year, payments being made quarterly. A statement showing the individual amounts, and from whom collected, shall accompany each quarterly remittance.

For the purpose of this By-Law, the Branch Membership list shall be revised on the first day of January and the first day of July in each year, but the change shall not be retroactive, except in the case of new admissions to *The Institute.*

(2) That Section 61 be amended to provide for the election of a Vice-Chairman of a Provincial Division, by the addition of the words "a Vice-Chairman" after the tenth word "Chairman." The Section would then read:

Officers

Section 61: The Officers of a Provincial Division shall be a Chairman, a Vice-Chairman, and a Secretary-Treasurer, or a Secretary and a Treasurer, who shall be elected by the Executive Committee of the Division.

(3) That Section 65 be amended to provide for an additional District in Ontario. This proposal involves changes of boundaries and re-numbering of Districts. The Section as amended would then read:

Nomination and Election of Officers
Electoral Districts

Section 65: For the purpose of the nomination and election of officers the membership of *The Institute* shall be divided into ten Electoral Districts as follows:—

District No. 1, shall include all members resident within twenty-five miles of the headquarters of *The Institute* and all members resident outside of Canada.

District No. 2, all members, outside of District No. 1, resident in the Province of Quebec.

District No. 3, all members resident in the Province of Nova Scotia, New Brunswick and Prince Edward Island.

District No. 4, all members resident in the Province of Ontario east of longitude 77° 30.'

District No. 5, all members resident in the Province of Ontario between longitude 77° 30′ and a line starting at Lake Ontario and running as follows:—along the centre line of Halton Country in a north-westerly direction to longitude 80° 30′, thence northerly to latitude 47° 0′, thence westerly to longitude 82° 0′, and thence northerly to the boundary of the Province.

District No. 6, all members resident in the Province of Ontario west of District No. 5.

District No. 7, all members resident in the Province of Manitoba.

District No. 8, all members resident in the Province of Saskatchewan.

District No. 9, all members resident in the Province of Alberta.

District No. 10, all members resident in the Province of British Columbia and in the Yukon Territory.

Report of Scrutineers.—The report of the Scrutineers was read by Mr. McNab showing the following newly-elected officers and members of Council:—President, R. A. Ross; Vice-Presidents, Walter J. Francis, D. O. Lewis, C. H. Mitchell, W. G. Chace; Past Presidents, J. S. Dennis, H. H. Vaughan, R. W. Leonard; Councillors, Frederick B. Brown, Julian C. Smith, Alex. Bertram, J. M. Robertson, Arthur Surveyer, A. R. Decary, N. E. Brooks, J. E. Gibault, F. A. Bowman, Alex. Gray, D. H. McDougall, J. B. Challies, G. Gordon Gale, John Murphy, F. R. Gray, W. A. McLean, P. Gillespie, Guy C. Dunn, W. P. Brereton, B. S. McKenzie, J. R. C. Macredie, G. D. Mackie, L. A. Thornton, G. W. Craig, L. B. Elliot, Wm. Pearce, H. M. Burwell, R. W. MacIntyre, E. G. Matheson.

New Business.—Under the item of new business a cordial invitation was received from Lt.-Col. H. J. Lamb to hold the Annual Convention in Toronto next year, where it was felt by the engineering profession that the honour of holding an Annual Meeting there was unanimously desired. This proposal was endorsed by Prof. Haultain who expressed the regrets of Chairman Wynne-Roberts of the Toronto Branch at his inability to be present. He felt that Toronto would be in good shape next year to undertake and make a success of the Annual Meeting. On behalf of the Winnipeg Branch an invitation was extended by M. A. Lyons that the next Annual Meeting be held in Winnipeg. This was endorsed by R. J. Lecky of Regina. Both proposals were referred to Council for consideration.

Discussion on Legislation.

By special request Mr. Challies, the retiring Chairman of the Ontario Provincial Division gave a resume of the legislation situation in Ontario as follows:

Mr. President—As very lively interest has been evidenced among the members of *The Institute* in the present status of legislation in the province of Ontario, a brief resume of the sequence of events with regard to legislation since the Ontario Provincial Division was constituted, may be appropriate upon this occasion.

Early in October the Provincial Division received an official communication from the General Secretary intimating, "That the Council would further in every "way the desire of the members regarding legislation, "and inasmuch as the actual application of such legisla-"tion is in the hands of the engineers in each province, "it is desirable that the Branches and Provincial Divis-"ions in co-operation with other engineering organiz-"ations in each province take the initiative, in "which they are assured of the moral support of *The "Institute*."

Accordingly, a special meeting of the Provincial Division Committee was held in the Engineers' Club in Toronto on the 22nd of November, when representatives were present from every Ontario Branch, as well as from the non-resident membership. At this meeting the whole question was thoroughly traversed, and after several hours' discussion it was unanimously agreed that satisfactory progress with regard to legislation in the Province of Ontario could only be obtained by the co-operative efforts of the various technical organizations of the province, the majority of whose members are professional engineers. It was decided to suggest to these organizations that an Advisory Conference Committee, consisting of two representatives from each organization be set up for the express purpose of considering ways and means for securing desirable legislation in the interest of the engineering profession in the Province of Ontario.

At this meeting in Toronto on November 22nd certain advance information was available respecting a legislative scheme advocated by a group of engineers resident in Toronto, known as the J.C.T.O. Although full information regarding this legislation was not available, it was apparent that the J.C.T.O. scheme differed radically from the legislation scheme advanced by the Special Legislation Committee of the E.I.C. Owing to the radical differences between these two legislative schemes, the Provincial Division Committee considered that the Advisory Conference Committee referred to would be a particularly appropriate medium for compromising all differences, and would be the proper body to evolve some constructive scheme and method for realizing it which would be most generally acceptable to all professional engineers in the Province, whether members of the various professional bodies or not.

The proposals for the Advisory Conference Committee referred to have been agreed to by the various members organizations invited by the Provincial Division to participate, and its personnel now comprises:—R. W. Angus, Professor of Mechanical Engineering, Toronto University, and Chester Hamilton,—President and Secretary of the Ontario Section of the American Society of Mechanical Engineers; J. Watson Bain, Professor of Applied Chemistry, Toronto University, and E. G. R. Ardagh, Assistant Professor of Applied Chemistry, Toronto University,—President and Secretary of the Canadian Institute of Chemical Engineers; Messrs. A. B. Cooper and F. R. Ewart, representing the Toronto Section of the American Institute of Electrical Engineers; C. E. Smith of Toronto and E. T. Corkill of Coppercliff,—representing the Canadian Mining Institute; J. P. Hynes, representing the Ontario Association of Architects; Willis Chipman, Consulting Engineer, Toronto, and the speaker, representing *The Engineering Institute of Canada.*

At the time of the setting up of the Committee it was considered that as the land surveyors of the Province had satisfactory legislation, the Ontario Association of Land Surveyors would not be interested. However, it has since been decided to invite this Association to appoint two representatives.

As considerable publicity has been given to the legislative proposals advanced by the J.C.T.O., it might be pertinent for me to briefly explain the main differences between the J.C.T.O. scheme and that of the E.I.C. The E.I.C. Bill contemplates the setting up of a Registration Board by an association of professional engineers which will be given legislative authority and control over the practice of professional engineering. There will be but one registration of engineers. Every engineer whether he is mechanical, electrical, civil, hydraulic or mining, will, if entitled to registration, use the title of "professional engineer." The J.C.T.O. proposal contemplates control of the engineering profession by several registration boards, which will be set up upon the initiative and under the control of a Provincial Minister. There will be one Registration Board of five or six members for electrical engineers, another for civil, another for mining, etc. Furthermore, the J.C.T.O. proposal provide for a scheme of general professional registration which may, upon the initiative of the Government be made applicable to all professions, including law, medicine, dentistry, etc. It is modelled after the Illinois legislation scheme, which has recently been roundly criticized by a special committee on Legislation of the Engineering Council, representing the five Founder professional engineering societies in the United States. The originators of the J.C.T.O. Bill claim that the E.I.C. Bill is class legislation, that it will simply result in the control of the engineering profession in Ontario by an association of Provincial engineers, which will merely be another name for the E.I.C.

Such an assumption is ridiculous because *The Engineering Institute* has given many practical evidences of its desire to have appropriate legislation secured without in any way directly or indirectly, desiring to control the legislative machinery. The action of Council in referring the E.I.C. Bill to the Provincial Division with a specific request that other professional engineering bodies be consulted before any action is taken, and the subsequent decision of the Provincial Division Committee that an Advisory Conference Committee should be set up for the purpose of advising as to appropriate means for securing legislation in Ontario, is sufficient answer to the charges that the E.I.C. is desirous of controlling the engineering profession so far as the Province of Ontario is concerned. It must be remembered that although the numerical strength of the corporate members of *The Engineering Institute* resident in Ontario is greater than the professional membership of all other engineering bodies combined, the Provincial Division officers took the initiative to have an Advisory Conference Committee constituted, upon which the E.I.C. would have but two representatives within a total of fourteen.

The E.I.C. Bill contemplates the consolidation of all engineers into one homogeneous and harmonious body; whether they are miners, electricals, mechanicals, chemicals or "what not" engineers they will all be registered as "professional engineers." The J.T.C.O. Bill on the other hand, contemplating as it does special registration for each group, electrical, mining, mechanical, chemical, etc., must inevitably cause the separation of the profession into a number of groups whose tendencies will be to guard jealously their own collective membership, with the ultimate result of a divided and antagonistic profession.

It is confidently expected that when the Advisory Conference Committee referred to makes its report, the differences of opinion among various groups of engineers in the Province of Ontario with regard to legislative schemes, will be satisfactorily composed, and that they may eventuate some legislative proposal and programme which will be acceptable to the vast majority of the professional engineers of the Province of Ontario.

In my opinion it is fortunate that such radically different legislative schemes are being advanced because such action not only indicates a lively constructive interest in the general question, but furnishes something tangible to use as a basis for further consideration. Furthermore, I can say from my knowledge, that the most enthusiastic supporters of both the E.I.C. and J.C.T.O. schemes freely admit that there are advantages and disadvantages in both proposals, and are all quite content to leave the matter in the hands of the Advisory Conference committee. This Committee will be convened in Toronto very shortly, and should reach a satisfactory conclusion and make definite recommendations for appropriate action without undue delay".

Continuing the discussion Mr. Kirby stated that legislation should assist in creating an engineering profession not an engineering trade. Referring to the Bill drawn up in Toronto regarding the engineering profession in addition to the one recommended by the Legislation Committee of the Toronto Branch, Professor Haultain stated that it was being taken too seriously. A committee was appointed some time ago to consider the status of the engineer and as a result a very worthy document concerning the status of the engineer was produced. After the completion of this, one active, restless, energetic member of that committee who is also a member of the E.I.C., and a member of the Executive of the Toronto Branch of the E.I.C. sat up until four o'clock one morning and produced the Bill referred to by Mr. Challies doing it in one sitting. This Bill was printed before it was approved by the committee.

President's Address: As there was no further discussion Lieut.-Col. R. W. Leonard, President of *The Institute,* then gave his excellent retiring-presidential address, published in the February issue of *The Journal.* Before introducing the incoming President, Sir John Kennedy expressing his gratefulness for the President's paper moved a very warm vote of thanks for the research, labor and clear exposition of the important questions embodied in the address. This motion was seconded by Past President, Lt.-Col. Anderson and received by the meeting with applause.

New President: President Ross was then invited to take the chair, and on doing so was enthusiastically received, following a eulogistic reference to his work on behalf of *The Institute.* Mr. Ross expressed his appreciation of the honour received in being made President of *The Engineering Institute of Canada.* He hoped to be able to fill the chair as worthily as his predecessor. *The Institute* had now a surplus of, so-called, intangible assets which do not show in the financial report but which would greatly assist in enabling a good report to be made for the coming year.

As there was no other business on hand, President Ross declared the Thirty-Fourth Annual Meeting closed, the sessions to resume in the morning at ten o'clock of the Sixth Professional Meeting of *The Institute.*

Reception and Dance

The Rose Room of the Windsor Hotel was the scene of a happy social function on Tuesday evening, when, as guests of the Montreal Branch, at a reception and dance over four hundred of the members and their lady friends were present.

An interesting programme of eighteen dances and four extras, comprising one steps, fox trots and waltzes, was provided and the popular selections rendered by the Great War Veterans' Orchestra were particularly pleasing to the dancers. Dancing commenced shortly after nine p.m. and at eleven thirty p.m. a buffet supper was served in the Rose Room, one end of which was arranged with long trestle tables elaborately decorated with red roses and fern. Bridge tables were arranged in the farther end of Peacock Alley, where those who did not join in the dance could play cards. The ladies' reception committee comprised the following: Mrs. H. G. Hunter, convener of the reception committee, Mrs. Frederick B. Brown, Mrs. S. J. Armstrong, Mrs. E. V. Moore, Miss Roche and Mrs. Beaubien. The gentlemen's reception committee was as follows: Messrs. [illegible], Chairman, Hanbury A. Budden, C. M. McKergow, H. [illegible] Mahaffy, [illegible] Roche and de G. Beaubien.

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General Professional Meeting

Morning Session, January 28th.

This session was convened at ten o'clock with President Ross in the chair, being the initial session of the sixth General Professional Meeting, the subject under discussion being, "The Gateway of the Profession," the entire proceedings being of intense interest from start to finish. In calling the meeting to order President Ross announced that this session would be most informative inasmuch as the subject of education in relation to the training of the engineer was being considered by a number of distinguished experts on the subject including Professor R. F. Ruttan, who was scheduled to give the first paper on the subject of "The Training of the Chemical Engineer", followed by that of Professor A. S. Eve on "The Importance of Physics in Engineering Education", the whole subject of technical education to be afterwards discussed by Brig.-Gen. C. H. Mitchell, C.B., C.M.G., D.S.O., M.E.I.C., Dean of the Faculty of Science and Engineering, University of Toronto; Frank D. Adams, Ph. D., D.Sc., F.G.S.A. F.R.S., Hon. M.E.I.C., Dean of the Faculty of Applied Science and Acting Principal, McGill University; Arthur Surveyer, B.A., B.A.Sc., C.E., M.E.I.C., Member of the Board of Governors, University of Montreal; Prof. Chas. F. Scott, Past President, A.I.E.E., Professor of Electrical Engineering, Yale University, New Haven, Conn.

Continuing Mr. Ross stated that this group of talented men would have much to say of fundamental interest which would be of great importance than the mere details of some technical study. This illustrated the policy of The Institute in broadening its scope and discussing the subject such as this of the broadest possible interest and importance. He then called upon Professor R. F. Ruttan, M.A., M.D., Sc.D., F.R.S., Professor of Chemistry and Director of Chemical Laboratories, McGill University, who read [illegible] subject, which showed his high qualifications for [illegible] such a subject, which was, so to speak, very near his own heart.

At the conclusion of Professor Ruttan's paper, Professor A. S. Eve, D.Sc., C.B.E., F.R.S., Macdonald Professor of Physics, McGill University, addressed the meeting. [illegible] these papers are published in this issue [illegible] considerable [illegible]. He considered it of great [illegible] for the future progress of The Institute that the question of education should be placed in the forefront of the programme. He emphasized the point that the art of engineering is the application of [illegible] physics.

Following the discussion by Professor Ruttan and Professor Eve came the discussion by Brig.-Gen. C. H. Mitchell, M.E.I.C., Frank D. Adams, D.Sc., Hon. M.E.I.C., Arthur Surveyer, M.E.I.C., and Professor Chas. F. Scott, Past President, A.I.E.E. These papers will be printed in the April number of the Journal.

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Visit to Northern Electric Company's Works

At the conclusion of the morning session the members found special cars awaiting them to convey the party to the plant of the Northern Electric Company on Shearer Street. Over two hundred and fifty members availed themselves of this opportunity to accept the kindness of the President, Paul F. Sise, and the directors of the Company, as guests at luncheon at the works, followed by a visit through this modern plant. During the course of the luncheon, President Sise extended a cordial welcome to the members of The Engineering Institute of Canada, trusting that the visit would be enjoyed and be found interesting. Those who were favoured in being present at this occasion were loud in the praises of the courtesy extended and spoke in the highest terms of what President Ross stated was one of the finest manufacturing plants in Canada.

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Annual Banquet, Windsor Hotel

Humanizing the engineer was to a large extent the key-note struck at the Annual Banquet held at the Rose Room in the Windsor Hotel on Wednesday evening with an attendance of over two hundred. [illegible] that there was abundant evidence of the social and humanitarian [illegible] [illegible] are not becoming [illegible] with one another and with those whose phases of life is of a different nature.

In the absence of [illegible] Chairman of the Montreal Branch, who the President [illegible] to act as toastmaster, the chair was presented by President Ross, who expressed the regret of Sir Lomer Gouin, Premier of the Province and of the Hon. L. A. David, Provincial Secretary, who were expected but were unfortunately unable to attend.

The toast list was as follows: The Province of Quebec, proposed by Brig.-Gen. Mitchell, responded to by the

Hon. Chas. Marcil, M.P., Commissioner of the City of Montreal; The Engineering Profession, proposed by Lt.-Col. Leonard, responded to by Prof. Chas. Scott; Sister Professions, proposed by President Ross, coupled with the names of Mr. Justice Surveyer and D. K. Sandwell. God Save the King.

Brig.-Gen. Mitchell : After felicitating *The Institute* on the fact that the Annual Meeting was being held in the Province of Quebec, General Mitchell reminded those present that the Province of Quebec was unique in this unique Canadian Confederation and in this unique British League of Nations — Quebec, the oldest Province, the Province which is the gateway of Canada, and the Province which with its long years of early struggles did all the pioneering work of this magnificent Canada of ours. The first power plant on the western hemisphere was built on the shores of the St. Lawrence by one of the early settlers about fifteen hundred and fifty. To the pioneers of Quebec belong the honour of laying the foundation of the country's first and greatest heritage—the heritage of brains. The sons of Quebec are remaining in Quebec and are doing their share in that great spirit of co-operation which will enable us to work out our own destiny. General Mitchell paid a splendid tribute, as one of the First Contingent who saw them in action at Courcellette, to the gallantry of the Twenty-second Battalion which was one of which the Province of Quebec and all Canada should be proud. In the war of peace which is bringing many problems, the sons of Quebec by their steadfastness are solving the great industrial question. It is this spirit and the spirit of co-operation among the provinces which will enable us to succeed in working out the destiny of this Canada of ours and in the great development which is our future.

Hon. Chas. Marcil : In an eloquent address and with that splendid oratory for which he is noted, Hon. Mr. Marcil responded to the toast to The Province of Quebec. He reviewed the early history of the Province showing the place it has occupied in the history of Canada. He felt that if the people in Ontario would mingle more with the people of Quebec and vice versa there would never be any friction. He believed that no body of men could do more effective work in bringing the people of Canada closer together, in making a homogeneous nation than the engineers. The future of Canada lies largely with the engineering profession which is being realized more and more every day. Every session of Parliament is taken up with that great problem, the development of our natural resources and that lies pre-eminently in the hands of our engineers. He congratulated *The Institute* on having elected as its new President, Mr. Ross, with whom he was associated on the Administrative Commission and who was performing great public work for the citizens of Montreal. Quebec was striving in a modest way to make Canada what it is destined to be ultimately, the keystone of the British Empire of the foremost part of the North American continent.

Lieut.-Col. R. W. Leonard proposed a toast to The Engineering Profession coupled with *The Institute,* to which Professor Chas. Scott replied. Col. Leonard compared the limited amount of engineering thirty years ago which consisted of opening up new country by means of railway surveys and canal construction and some harbour work, with the tremendous engineering undertakings of the present day following the development of electrical power, which included not only construction but the development of the mining industry, electro-chemical, electro-metallurgical, pulp and paper and other industries which at that time did not exist or were negligible. So has the engineering profession in this country grown. And as Canada has grown, as Canada has brought in Provinces, which at that time were not in the Confederation, and has become not only a great country but is now recognized as a nation, so *The Engineering Institute* has grown apace. *The Engineering Institute* as a national institute embracing every branch of the profession had made advances throughout the country in the past few years in numbers and in corresponding influence that are almost unbelievable, and the good work still continues. These advances have been the result of the individual work of a great number of men in forming the branches of which there are now eighteen. In the Provincial Divisions, and at headquarters at Montreal, the men sitting around the Council Board, he predicted greater strides in the future of *The Institute* with much larger membership and a corresponding increased influence.

Professor Chas. F. Scott, who was introduced as a grandfather to the profession, a distinguished engineer and one whose word carries weight, illustrating the rapid development in engineering, stated that only a few years ago a great man who had taken such a constructive part in the building up of Canada, had left one hundred thousand pounds to Yale University to be devoted to the development of transportation by land and water. The third element and one which is today playing a wonderful part in transportation—the air, was left out entirely. The human race has been condemned to labour in its earliest days, and except for the use of domesticated animals this was the case until a hundred years ago. The engineer with his magic took away the burden of mankind by the invention of the steam engine, which has created a miracle for mankind making this world small. Professor Scott showed the wonderful development in industry through the use of power whereby human labour was almost entirely eliminated. Today the electric motor is doing wonders and further lightening the burden. The application of power has changed our methods of living and everything we have in our daily business and social life. He made the startling statement that during the last twenty years engineering enterprises in the world had doubled, that is, all the things which in civilization depend upon engineering and are the outcome of it have increased as much in the last score of years as they had in all time before that. "Electric power has been practically doubling every five years for the thirty or forty years and now electrical engineers are predicting an increase in the next five years equal to all that had taken place in the marvellous electrical growth of the last thirty years. If engineering which transforms the life of the world, which has transformed the whole trend of civilization during the nineteenth century, means anything it means that the engineers who have been responsible for these changes must re-adjust themselves to the new conditions in industry and be able to make the human adjustment to correspond with the changes which the engineer has brought about by his work. The engineering society is guilty of allowing many of the difficulties and problems of the present time to exist, financially, socially and industrially. If this work is to go on, if our engineering is to increase at the rapid rate of acceleration, which it has had in the past, it is placed beyond our imagination. Engineers as we are, see what is coming but other people hardly realize it. We have proved what we can do. Canada has shown clearly the great part she can take when she has a great work to perform. Are the requirements of war really greater than those of peace? Ought we not to put in our best engineering effort to bring the same kind of force which brought results in war time to bear on peace times? Gentlemen, one of my friends made the remark a few moments ago that geographically North America is one. Engineers have done more than anyone else to wipe out national boundaries, to make the whole world a unit. Let us in our professions and in our professional societies, keep that world wide intercourse which the work of the engineer has prepared. Let us be loyal to our countries and protect them; let professional engineers be one for the progress of the world and for civilization. Let us meet the challenge and go forward to do our best."

President, R. A. Ross on rising to propose the toast to the Sister Professions, stated that there were times when one should be very humble and modest but that this was not one of them. He stated that we had had an unprecedented night, an unprecedented ending to our year and an unprecedented meeting, such as we had never had before and he was proud of the men who had made it possible, the committees who had worked to organize the meeting and to bring it to its successful conclusion. Engineers were altogether too modest regarding their accomplishments and any judicious blowing that had been done tonight was nothing to what should have been done. He mentioned that during the strike in Montreal, one enterprising member of *The Engineering Institute*, the morning after the strike, collected fifty engineers of the biggest firms in Canada at *The Institute* rooms and these men supplied the city with engine-men, firemen, boiler-makers in the plant and saved the situation. This was an illustration of what engineers could do and the kind of public service that the engineer can accomplish. He was proud to be at the head of an organization of such men. He urged the engineer to adopt as his finishing course closer contact with humanity. As a result of dealing entirely with inert materials the engineer was inclined to be rigid and dogmatic. Association with members of the human profession, such as law and journalism, would be greatly to the engineers' benefit.

Judge Surveyer stated that there was much kinship between all the professions, that all worship at the altar of the same goddess and that goddess is law, the humblest of whose worshippers are those who call themselves lawyers. The engineer is not only a lawyer but also a judge. A judge between the proposition that his client places before him and the eternal laws of nature; a judge between his own interests and his client's interests; a judge between the various incidents that may happen throughout the execution of his contract; a judge between the workmen and the client; a judge between the contractor and the client for him the job is undertaken and he also undertakes to be a judge when he acts on arbitration tribunals. Thus, the legal profession was honoured to have been called a kindred profession to the earlier and exalted advantages which soldiers, statesmen, ... and sometimes those to get away from the laws of the country.

R. S. ..., representing journalism, and as he termed it a number of other professions, concluded the toast list of the evening with a witty speech, which was followed by the singing of "Auld Lang Syne" and "God Save the King."

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Thursday Morning, January 29th.

The Chairman, President Ross, called the meeting to order at ten a.m. He stated that there were three papers on the programme for the morning on the Engineering Activities of the Province of Quebec, namely, "Quebec Water Power Policy and the Work of the Quebec Streams Commission," by O. Lefebvre, B.A.Sc., A.M.E.I.C., Chief Engineer, Quebec Streams Commission; "The Operation of the Quebec Public Health Act," by Theo. J. Lafreniere, B.A.Sc., C.E., M.Sc., Chief Sanitary Engineer to the Superior Board of Health of the Province of Quebec; "The Evolution of the Public Roads Problem in the Province," by Alex. Fraser, B.A.Sc., C.E., A.M.E.I.C., Assistant Chief Engineer, Quebec Department of Roads. The Chairman suggested that the three papers should be read in order, and that any discussion could be taken up later. The three papers were then read by their respective authors. During the reading of the papers, the chair was taken by Vice President, Brig. Gen. Mitchell.

Discussion: Discussion on the various papers was given by W. A. McLean, M.E.I.C., Deputy Minister of Highways, Province of Ontario; (will be printed in April number of the Journal), Willis Chipman, M.E.I.C., Consulting Engineer, Toronto; Professor Peter Gillespie, M.E.I.C., J. B. Challies, M.E.I.C., after which the meeting adjourned till two thirty, p.m.

Mr. Willis Chipman, M.E.I.C., Toronto: It is quite proper I suppose that I should make some excuse for any remarks that I may make on this excellent paper by Mr. Lafrenière, covering as it does the history of the public Health Act in the Province of Quebec, from the early history of the Province to the present time. It will be a valuable addition to the proceedings of *The Institute*, for further reference and for guidance, and I hope that something of the kind may be prepared for each of the Provinces by the officials of the several Health Departments.

My only justification for speaking on this paper is that I have probably had as lengthy an experience with Public Health Acts in Canada as anyone present, not only in the Province of Ontario, but in some of the other Provinces, in respect to water supply and sewerage.

When I began practising there was not one Municipal sewerage disposal works or water purification plant in Canada. I have seen many types of sewage purification works promoted or experimented with, some being constructed and many abandoned. The list included the B. B.C. process which was the first, introduced here after broad irrigation. Then followed chemical precipitation, after which came the polarite process. Within recent years, the septic tank was proposed as the last word in sewage purification, then bacteria beds, then percolating filters, then the activated sludge process. There are also several electrical and chemical processes that are now being experimented with, also combination of various processes.

The problem of water purification is a much more simple one than that of sewage disposal. Important improvements have been made in filtration plants during the last twenty years, and sterilization by bleach or chlorine is a discovery of the last ten years. It is probable that the competition of the private companies interested in the sale of water filtration equipment contributed materially to the advance of water purification, and at the same time there were many extravagant claims made, and municipal authorities were led to believe that the proper operation of filter plants was a simple matter and that very little attention was required.

Extravagant claims of promoters and salesmen were in many instances based upon laboratory experiments, and too frequently to day the most important factors in the proper maintenance and operation of water purification plants and sewage disposal works are overlooked by the municipal authorities.

Many of the promoters interested in the sale of patents or royalties have made a comfortable incomes in the past from their propaganda at the expense of the rate payers. I will not however say anything respecting the merits or demerits of any of the processes above mentioned.

We have heard valuable papers read at this meeting and interesting discussions on good roads, which have been given the attention of engineers for thousands of years, but yet it is only recently in this country that the public has learned that the solution of the good roads problem is in proper maintenance.

The profession of sanitary engineering is a new one, very little having been known about sanitary matters at the beginning of the last century. The success or failure of a sewage disposal works or of a water purification plants depends largely on the attention given to operation and maintenance, and from my experience I can say that so long as the maintenance of these important engineering works, which are probably contributing more to our health and comfort than works in any other branch of engineering, — so long as they are under the control of politicians, satisfactory results cannot be expected. To day works may be constructed and put into operation which will prove quite satisfactory for a few years. They then may be neglected by the political managers, who would prefer to mortgage the future for new works rather than raise the present rate of taxation. There are now abandoned works that are perfectly good, that would be satisfactory if properly cared for, and there are other works that would give satisfactory results if sufficient sums were expended in intelligent operation. If, however, an active promoter approaches a municipal body with a new scheme, the old neglected works may be condemned as not being up-to-date, and the rate-payers invited to supply funds for new works?

Now, in my opinion the only effectual method of improving the situation in sanitary engineering as to increase the number of engineers on the Provincial Boards. Mr. Lafrenière has informed us that there is but one engineer on the Provincial Board in the Province of Quebec, and this is one more than there is on the Board in the Province of Ontario. As long as the present condition exist we can never expect efficient service, and it rests with the engineers themselves largely as to when conditions will improve.

The suggestion that municipal sewage purification works should be taken out of the hands of municipal politicians and the management transferred to an independent board, preferably of engineers, brings up a question that has hardly been touched upon by engineers, particularly at this convention. I refer to the nationalization of all public works and utilities.

A century ago, our canals and the toll roads, that is good roads, were in the hands of private companies. Not more than sixty years ago there was a boom in the construction of toll roads, which was then an attractive vocations for engineers, and a fertile field for politicians. The road building era was followed by the construction of our canals, and it should not be overlooked that some of our most important canals were constructed by private companies.

The construction of our original canals was followed by the construction of our steam railways, all built by private capital. In the larger cities and towns gas works, water works and electric light systems were as a general rule constructed by a private capital.

Immediately after Confederation the Canadian Government embarked on the construction of a national railway for connecting the Maritime Provinces with Montreal, and shortly afterward the Canadian Pacific Railway was projected as a public enterprise. About 1878 the C.P.R. proposition was handed over to a private company.

Of all our public works the canals were the first to be nationalized. Municipalities followed by acquiring their water works systems, electric light plants and gas works that were installed by private companies, until there are to day few private systems or plants remaining in Canada.

In recent years the nationalization of all steam railways has been urged and within the last year the Government has acquired the C.N.R., and it is proposed to also acquire the G.T.R. system. In our Province the Provincial Government has provided the necessary legislation by means of which municipalities may obtain electric energy through the Hydro Electric Commission, and it will not be many years before practically all of the Province will be supplied through the Provincial Commission. It is also now proposed that radial railways be constructed throughout the Province and be operated as a Provincial concern, the electric power to be provided by the Hydro Electric Commission.

To my mind the engineers should give this question of nationalization closer study, and decide how far it is wise to go on this course. The public is looking to us as engineers to a certain extent for guidance and we should by careful study prepare ourselves in such a way that we may give the technical guidance that the country requires and demands, and expects from us.

Now, Mr. Chairman and Gentlemen, I think that in the last few days we have been living in a Garden of Eden. We heard some remarks about it yesterday. We are having a pleasant time, we are having bouquets [illegible] to us which have been gratefully received.

It must, however, be obvious to all that we as engineers have not as high a standing in the community as the members of the other professions and the question for us to consider is, how are we to remedy the existing state of affairs and how are we to obtain the recognition to which we should be entitled.

At the present time we should, in my opinion, endorse and support the proposed Legislation in the different Provinces. Our next step should be to endeavor to give the students in Engineering a better training in English. Personally, I regret that I did not take an Arts course as a foundation for Engineering. One reason why engineers do not hold their own with other men in the community is due to the fact that they cannot express themselves in good English. This must be patent to all of you who have attended this Convention.

I am referring to this matter from my own personal experience which I am sure is the experience of the majority of the older men present because there are at this meeting so many young engineers. The Engineering student does not see the necessity of study of English and of other subjects that would give him an equal standing in the community with other professional men, he is too busy with his technical duties and is too anxious to get after the almighty dollar. He does not take the necessary time to provide himself with the education that will enable him to compete in the world with those in the other professions.

In my opinion it is this important omission in our education as engineers that detracts from our usefulness on boards of health, commissions dealing with public works, etc.

The nationalization of our natural resources, transportation facilities and other public works are closely connected with engineering, and I hope the members of the profession will give their careful consideration to education and legislation, and prepare the next generation of engineers for taking a more active part in public affairs.

* * *

Professor Gillespie, M.E.I.C., (University of Toronto) I have had much pleasure, as apparently other have had, in listening to this comprehensive paper on the administrative side of public health problems in the Province of Quebec.

Some two years ago a report on sanitation was prepared by the Toronto Branch of the Canadian Society of Civil Engineers in which, among other things, it was suggested that certain of our provincial legislative enactments should be modified so that provincial boards of health should include engineers as well as physicians in their membership. The Committee that prepared the report felt that it would mean something in the way of status to engineers and would result in an improved service if the proposed change could be made. The provincial government of Ontario, to which the resolution was afterwards presented, has changed since then, and doubtless the policy of the administrative department especially concerned. At any rate no change has been made and the anomaly to which Mr. [illegible] has just referred still continues.

We heard a good deal yesterday about co-operation especially between the physician and chemist on the one hand and the engineer on the other. It would be interesting if we could have the personal views of the Institute members on ways and means of securing such co-operation between the physician and the engineer as the [illegible] report contemplated.

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Afternoon Session, Thursday, January 29th.

Vice-President Mitchell, who occupied the chair, called the meeting to order and asked Lieut.-Col. O. M. Biggar, Vice Chairman of the Air Board of Canada to address the meeting on the subject of aviation, "The Policy of the Air Board of Canada". Col. Biggar's address is published in full in this issue of *The Journal*.

Colonel R. W. Leonard opened the discussion stating that there were two gentlemen present who had made a special study of the subject, and who were in a position to do so from the viewpoint of expert knowledge. He suggested that we hear from Gen. Mitchell, who had been studying the matter for twenty odd years and from Prof. McKergow, one of whose subjects at McGill University was aeronautics.

Brig.-Gen. Mitchell traced briefly the development of aerial navigation from the time of the Chicago Exhibition when he had begun to study it, at which time he knew nothing about the problem of aerodynamics or about the scientific principles underlying the aeroplane as we now have it. The stabilizing of the aeroplane had been developed in the early days of the war; a very important feature of the aeroplane service was due to the fact that it was possible to keep in constant communication with headquarters. Such was the development of the aeroplane and so important was this wireless feature, that it would soon be necessary to consider a new section of The Institute's activities in which the aeronautical engineer would find a place. The Institute should also consider to what extent it would take part in this new development.

Major C. M. McKergow, Professor Mechanical Engineering, McGill University, complimented Col. Biggar on the excellence of his address and stated that he was interested in the aeroplane rather than in aerial navigation. His work had been concerned with making the aeroplane more efficient, the engine and the materials which go to make the plane itself. As an engineer he considered there were two functions of the aeroplane which were most important, namely, for forest protection and surveying. This was now being done in Quebec with remarkable success. For exploration work, plotting out new territory and forest ranging the difficulties incidental to the use of the aeroplane for these purposes had been overcome. It is possible that the Federal Government may adopt these methods. He trusted that the Air Board would in their study of their problems realize that the aeroplane must be more perfect in the engine and in the parts, that an impetus should be given to research in metallurgy to develope stronger materials, to improving carburetion and ignition, or possibly eliminating them entirely in an engine, whereby the engine will be one hundred per cent efficient as regards economy and shall give one hundred percent of service, using materials that will not corrode. He believed it was within the limits of metallurgical research to develope materials of strength exceeding those we have at present and if sufficient opportunity were given to the skilled, engineer who was fond of that type of work that an engine might be developed which would eliminate the carburettor and the sparking device, which he understood gave about sixty-eight percent of all troubles in the air. It spoke well of the mechanical part of the construction that the materials, bearings, etc. gave very little trouble. He felt that this wonderful romantic thing capable of flying through the air was worthy of every engineer's earnest consideration.

Col. Biggar replied that during the past three months the Air Board had been in communication with the Research Council of Canada on the subject of aeronautical research and that arrangements had been completed for the appointed for an Air Research Council in connection with the Research Council of Canada which body was holding its organization meeting next week. The Air Board would welcome suggestions with regard to directions in which research might usefully be undertaken.

The reading of his paper "The Pulp and Paper Industry" by Ferd. van Bruyssel, followed by the "Forests of Quebec" by G. C. Piche, A.M.E.I.C., Chief of Forests Service, Quebec Lands and Forests Department, concluded the afternoon session.

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The Final Session

"Although I have attended many engineering conventions," stated an eminent visitor from the United States at the conclusion of the smoker, which wound up the Convention proceedings, "I have never yet attended one where the interest has been more sustained and which has finished with so much pep as has been witnessed tonight." While this in brief summarizes the situation, it fails to give an adequate impression of the friendly atmosphere and the keen enjoyment of those who were able to be present at the rose room at the Windsor Hotel on Thursday evening. Someone remarked, noting the freedom from restraint and the good-natured fellowship, "Surely the spirit of the engineer has changed. He has come out of his shell and has become as human as anyone" —which he has always been, but for a characteristic shyness and reserve.

During the early part of the evening's proceedings, the retiring President was entertaining the President and Council at dinner at the Mount Royal Club and which was made the occasion for the initial meeting of the new Council. Owing to the fact that the afternoon session was concluded rather hurriedly due to the length of some of the papers, resolutions of thanks were passed at this meeting as follows: to the authors of the excellent papers presented during the professional session; to the visitors from the United States who had added greatly to the interest of the meeting and whose messages were appreciated; to President Sise and the directors of the Northern Electric Company for their kindness in entertaining the members at luncheon and providing an opportunity of visiting their splendid plant; to the Chairman, Executive and various committees of the Montreal Branch for the excellent manner in which they had arranged all the social and professional details connected with the Convention. The party from this function joined the festivities at the rose room about eleven o'clock, where they found a joyous crowd entertaining and being entertained.

The college yells were a considerable feature of the programme, the Canadian universities being well-represented, and in this connection no shyness was exhibited in calling attention to the claims of the various colleges. During the evening an excellent programme was given, a number of artists from the various theatres taking part, some of them volunteering their services. The programme, included songs by Bert Mason, vaudeville entertainment by the Wilson sisters, recitations of Dr. Drummond's poems by Mr. Chas. Godwin, cello solos by Mr. J. Beauchamp, and songs by Miss Eleanor Cochrane, Sandy McGregor, Wilkie Bard and Mr. Fisher. The proceedings were concluded by singing God Save the King and Auld Lange Syne.

A prominent member of the Toronto Branch summarized the situation by saying "This has been a great Convention, every one has had a good time. The Montreal Branch has established a record in every direction and I only hope that we can do as well in Toronto if Council decides to have the Convention there next year."

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Convention Notes

"What's the matter with old McGill?", remarked a Varsity enthusiast. The President of *The Institute*, every one of the four Vice Presidents and the two newly elected Councillors from Ontario are all graduates of the University of Toronto.

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There was universal regret during the Convention that Chairman Walter J. Francis of the Montreal Branch, to whose creative capacity tireless energy and unbounded enthusiasm so much of the success of the Convention was due, was confined to his home after the first day's proceedings suffering from severe throat trouble.

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Secretary Calvin W. Rice met many old friends and made many new ones during his three days sojourn at the Convention. His clear-cut statement of the policy of the founder American engineering societies that the first duty of an engineer residing in Canada was to join the national engineering body of this country was greatly appreciated.

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Prof. McKergow's story of the incident when the members were being milled into place for the taking of the photograph at the Northern Electric Company's works, which photo unfortunately was a failure, illustrates what a keen observer he is. The drivers of two grocery sleighs stopped nearby to see what was going on, whereupon one said to the other, "Say Bill, what the hell is the matter?" to which the other replied, "I don't know, but I suppose those blankety-blank fools have gone on strike again."

* * *

The enthusiastic and efficient manner in which the students of *The Institute* and younger members took hold of committee work allotted to them, and particularly in looking after the registration of members and guests, as well as in other ways of activity, including the social side, is such that it is apparent that never again will we hold an Annual and Professional Meeting of *The Institute* in which the young men, will not be given an active and prominent part. It augurs well for the future of *The Institute* to find such an increasing interest being taken on the part of the younger men, and it is evident to those who [illegible] this interest a place in the general activities of *The Institute* should continue to be allocated to them and [illegible].

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Taking advantage of the occasion presented by the Annual Meeting the engineering graduates of the University of Toronto held a "get together" luncheon at the Windsor Hotel at noon on Thursday with over 100 graduates present. This occasion will long be remembered by the graduates and was historic inasmuch as it saw the formation of the Engineering Alumni Association of the University of Toronto with the following officers:—President, Walter J. Francis, M.E.I.C.; Vice-President, Dr. [illegible], M.E.I.C.; Secretary, C. R. Macdonald; Council, [illegible], M.E.I.C., J. B. Challies, M.E.I.C., E. R. Gray, A.M.E.I.C., J. L. Morris, M.E.I.C., G. Reid Munro, A.M.E.I.C., W. G. Chace, M.E.I.C., and W. A. Bucke, A.M.E.I.C. It was decided to hold a general reunion of the Engineering Alumni Association at Toronto next October. Addresses were given by President R. A. Ross, Past President G. H. Duggan and Vice-President Brig.-Gen. C. H. Mitchell.

The Training of the Chemical Engineer

By Dr. R. F. Ruttan, Director of Department of Chemistry, McGill University

The Need for Trained Men

The great field for development of stable chemical industries in Canada is the utilization of those natural resources, both in material and in forces, which we possess in greater quantity or more conveniently situated than in other countries. To develope these available resources, we require trained men. This need not call for a high capacity of original research at first, but rather the adaptation to our conditions of methods, principles and processes already known and well tried elsewhere. This is obviously the function of what we recognize as the chemical engineer, a well trained chemical engineer, a man with sound training in fundamental principles on which is grafted a practical acquaintance with the methods and processes of industrial practice. When, however, the industry becomes more highly developed, a research laboratory becomes essential.

Specialization in Great Britain

The scientific army of Great Britain before the war consisted of a brilliant group of staff officers, perhaps the finest in the world, but England had not learned how to make the most of mediocre ability. She did not recognize that without the scientific rank and file, she could not staff her industrial research laboratories so as to compete with the more elaborate scientific organizations of Germany and America. In England the proportion of university trained men to other operatives in industries was in the proportion of one to five hundred, while in Germany the proportion of university men to other operatives, was in the proportion of one to forty.

The English idea was that the professions of engineering and of chemistry should be kept separate, each specially trained for his field of work, and that a chemical job should be done by a chemist and an engineering task performed by an engineer. This is a point of view still held by many Canadian engineers and chemists, both in universities and in practice. In a discussion on this subject in London a few years ago, Colonel Smithells, a chemist, summarizes this point of view by asking: If they were to produce a chemical engineer, were they going to superimpose engineering on the chemist or chemistry on the engineer? Those who were primarily chemists would oppose the possibility of superimposing any adequate training to make a man worthy of being called an engineer within the time that was practicable, and the converse equally applied. He held that the two should not be combined because the two subjects were too big for one man, save in a few exceptional cases.

This attitude of mind is thoroughly English. It illustrates at the same time the strength and the weakness of the Englishman's character. His thoroughness is shown in that he stands for the mastery of one profession, for the best of its kind and no compromise. His weakness is his reluctance to recognize, because it is not English, the important rôle played in the chemical industries of America and Germany by a class of scientific men who are not highly trained engineers, nor

Read at the General Professional Meeting, Montreal, Jan. 28, 1920.

highly trained chemists, but who are recognized as a class, many of whom have a great deal more in them than a knowledge of chemistry and a knowledge of engineering. They have the right point of view. What is bringing about a change of ideas on this question in England and elsewhere is the difficulty of obtaining co-operation and collaboration between the two scientific forces in the industries.

Specialization versus a Broad Training

They found in England that as the engineer and the chemist become more highly trained and specialized, their paths become more divergent, their point of view more irreconcilable, in short the experience of many heads of works is that the two types are largely incompatible, conflict of authority and absence of co-operation become the rule rather than the exception. A works chemist once defined the average engineer as "an empyric who has been trained on cotton waste and engine oil," while a works chemist has been described by an engineer as "an organic body more liable than any other of similar nature to spontaneous explosions".

Dr. Charles Carpenter in a recent address while referring to inefficiency which results from having the engineer working in a water tight compartment of his own, and the chemist doing likewise, advocated organizing two distinct staffs, under the headship of a chemist on the one hand and an engineer on the other, who would consult with each other and work together.

To illustrate his point of view, he said he looked upon chemists and engineers as the physicians and surgeons of industry, with their respective parts to play in building up and maintaining in increasing strerght the well being of industrial science and extending its usefulness in the service of man. Dr. Carpenter is most unfortunate in his analogy. For every specialized surgeon or physician, the world utilizes at least 100 general practitioners. He forgets that every physician and every surgeon, almost the world over, receives exactly the same university and clinical training for his qualifications. Even in England where separate qualifications are granted, both are trained to be general practitioners, and only after such a training, may one man specialize and become Mr. So-and-so, Surgeon, and the other Dr. So-and-so, Physician; the vast majority of graduates practise as physicians and surgeons.

The chemical engineer is the well qualified general practitioner of the chemical industries; like the physician, his chemical knowledge enables him to see below the surface, to diagnose from physical signs unseen changes and conditions, and from his experience find a remedy for any abnormal reaction. Just as there is a limited number of unseen organs in the human body to be studied and observed, so in a chemical works there is a limited number of more or less invisible operations in chemical units going on, each with its clinical thermometer, pressure indicator, etc., attached, to give early symptoms of any departure from the normal. The engineer in charge, like the surgeon, has to do with the adjustment, repair and alterations of the anatomical units, the works, the accessible outward portions.

Just as minor surgery constitutes a large part of the activities of the general practitioner, so frequent minor adjustments, alterations, improvements and repairs, skilfully carried out, form the larger part of the duties of the chemical engineer. Like the general practitioner, the chemical engineer should know his limitations and when to consult the specialist, the electrical or hydraulic engineer or the synthetic chemist.

No analogy should be carried too far, but I might recall the well recognized fact in the medical profession, that the best specialists in any field of medicine or surgery are those who have spent some years as general practitioners, so the knowledge of the general practice of chemistry and engineering in works is a very sound experience on which to build the expert knowledge of the specialist in either branch of science.

This English prejudice against chemical engineering would seem to be rapidly disappearing, if one may judge from the recent establishment in London of a special Institute of Chemical Engineering, well endowed and under the auspices of the University of London.

The scientific, well informed, young chemical engineer is the crude material from which we may look for the kind of industrial research which the country needs at present, and who, as circumstances or personal capacity will direct, may ultimately become a works manager or research chemist in his special field.

Training the Chemical Engineer

How can the country develope and retain men of this type, is an important question.

During recent years there has been a very prolific discussion regarding the best course of training for the members of this comparatively new profession. It has become generally recognized that progress in industrial chemistry is based upon both engineering and chemistry. It has been further recognized that universities have failed in giving just the right type of education to the chemical engineer. This is due to the fact that the universities are unable to give instruction regarding the control of chemical reactions and the handling of materials in a large way, and perhaps the regular courses in chemistry and engineering have not been adjusted to meet the requirements of men to be trained in both. Some universities in England and in the United States have introduced a certain number of units to illustrate some of the more common processes, such as filtration, distillation, evaporation, etc., on a comparatively large scale, and operations carried on with such apparatus have formed part of the regular courses. This has been found unsatisfactory in the universities for the most part, and the men so trained have been disappointing when actually engaged in chemical works. The universities found that a great part of the time which should be spent in acquiring a knowledge of the fundamental principles of chemistry and engineering was greatly curtailed by attempting to teach, on a small scale, chemical reactions as they are carried out in factory practice. The works manager found that the products of this type of instruction had gained little or no insight regarding operations in the chemical industry by the study of a few miniature units in the university. In most schools of science, both in America and in England, it is obligatory on the part of the students to spend a portion, at least, of their vacation in some chemical or engineering establishment, where they are supposed to see the application of the principles which the university has given them. This is undoubtedly beneficial and of greater practical use than any attempt which has been made to bring the factory to the university by the introduction of plants on a small scale. It results, however, in a very incomplete and one-sided training, one class of work only is obtained during the vacation. The student undoubtedly acquires a more definite knowledge regarding the character of operations on a large scale in this way, but it is confined to one particular type of work, which may be of very little value as a training for his profession. The student is a mere operative, very rarely receiving any attention from the head chemist or manager, who naturally employs him to the best advantage of the firm rather than with a view of training.

The best that can possibly be expected of the university in a course of four years is to give a foundation, broad and scientific, on which the graduate may build his profession, which is really acquired in the industry to which he subsequently devotes himself.

During his undergraduate career, the chemical side of his training should include, besides the ordinary full courses in general chemistry, organic chemistry, qualitative and quantitative analysis, some advanced work in either organic or inorganic, a well illustrated course in industrial chemistry, and above all, he should be thoroughly trained in physical chemistry, for which he should possess a good knowledge of physics. His thermo-chemistry should be linked up with his thermo-dynamics, in connection with his studies of boilers, gas-producers, steam and gas engines, etc. In this way he would acquire ideas of calculation and efficiency. Industrial chemical engineering is essentially applied physical chemistry. In his organic preparations, as well as in his inorganic analyses, the yield should in every case be carefully determined, the efficiency of different methods compared, or, as it has been concisely stated, he should learn to put the dollar mark in his chemical equations.

Essentials in Curriculum

His engineering training, as pointed out by Professor Donnan, could with advantage be specialized and adapted to his proper sphere of work and should include a good knowledge of—

"(a) Physical and chemical properties of materials of construction (wood, metals, alloys, refractories, glazes, enamels).

(b) Methods of testing materials of construction; strength of materials.

(c) Motion of liquids and gases; hydraulics; valves, pumps, etc.

(d) Thermophysics, including heat transfer.

(e) Principles of design and working of all the chief known types of chemical plant and machinery, and a good knowledge of the chief chemical technological processes.

(f) Generation and transmission of power; fuel economy.

(g) Construction of new plant; calculation of costs and design and lay-out of factories.

(h) The use of engineering tools."

But after all, those of us who have had experience as teachers know that the product we turn out from our laboratories depends not so much on the special curriculum studied, as upon the quality of the student. It has been truly said that higher education (and this applies perhaps in a less degree to a technical education) is the only commodity for which people are prepared to pay a large sum and then refuse to take delivery. To make a good chemical engineer, the qualities of industry and accuracy should be supplemented by certain essential qualities of temperament, such as have been described as "sound horse sense, cool quick judgment, power to control workmen, and courage in the face of danger." Without these qualities of character and temperament, no academic or technical knowledge, in my opinion, makes a successful engineer.

The average student is indifferent to his studies. He is impatient of attainment along lines of self-improvement and broad culture. He regards the institution from which he graduates merely as an influence to enable him to obtain a foot-hold in an industry and is satisfied with the minimum requirements essential for his degree.

Many of the larger industries, such as The General Electric in the United States, offer a special training in their works with a view of determining the fitness of the graduate for the engineering profession or for research or the commercial side of the industry. This can only apply to a limited number of men who are turned out each year from the universities, but it is certainly a very effective method of directing the young man, who is on the threshold of life, to the line of work for which he is specially fitted by nature.

The Boston Plan

The average graduate in chemical engineering, who is turned immediately into the industries, has not received, we all recognize, the ideal education and training for a chemical engineer. An additional year of graduate study, in which he could devote some time at least to special research to enable him to acquire more of the scientific habit of mind, would be an enormous advantage to a large class, who would be able to profit by more advanced study. This type would form the material from which to develope the research chemist and the research engineer. After having once entered upon the work of his profession, it is only in very exceptional cases that a man returns to the university for further training in research. Admitting the unsatisfactory and incomplete training which is now being given to the class of men to whom we must look for the development of industrial chemistry in Canada, the time seems ripe for the consideration of some plan which will provide more adequately trained engineers. The plan which in my opinion gives promise of meeting these requirements is an adaptation to Canadian conditions of one which has been developed and is now being tried by the Massachusetts Institute of Technology of Boston. This plan was evolved by a committee of engineers, appointed in 1913 by The Institute, of which A. D. Little was chairman and with whom were associated E. W. Bowditch, Henry Howard and Jasper Whiting. (The description of the character and objects of this course which follows is largely taken from a circular of information issued by the above committee.) It was tried for part of one year and then dropped during the war. This scheme of education is unique and has, up to the present time, so completely realized the expectations of those who brought it about, that I propose directing your attention to it somewhat in detail. "We recognize that the chemical processes we use on the laboratory or factory scale consist of a series of collected "unit" actions, such as pluverizing, mixing, heating, roasting, absorbing, precipitating, condensing, crystallizing, filtering, electrolizing, etc. The number of these basic unit operations is not very large and only a few of them are to be seen in any practical works. The task of the chemical engineer is to determine the conditions of temperature, pressure, etc., under which these actions must be carried out in different processes, together with the construction and design of the apparatus called for by the physical and chemical character of the reacting substances. There is a real demand and necessity for men trained along these lines."

Industry Stations for the Students

To afford an insight into the real problems requiring industrial chemical research, *The Institute* of Technology has extended the course to five years, one of which is spent in study at a number of industries. It has established five or six chemical engineering and research stations in direct contact with important industries. These were selected with a view of bringing to the attention of the engineering student the largest possible number of the unit operations of which chemical processes are generally composed. These stations have a threefold function; first, for the practical instruction of the students in chemical engineering; secondly for the instruction of ambitious foremen and others in the works in the fundamental principles governing their operations; and thirdly, the advancement of industrial research in special industries. The equipment of each station now connected with The Institute, consists of a small building of one storey, which contains a small reference library on matters connected with the particular industry, and a very complete collection of photographs and drawings of apparatus and machinery utilized by that industry, but not installed in that locality; a conference and lecture room to accommodate 15 or 20; a small laboratory with benches for the same number; an office for the station director and a laboratory for specialized industrial research, with space and equipment for one or two graduate research assistants. The cost of such an equipment would reach from $10,000.00 to $15,000.00 in different industries. The total cost of the five stations is not far from $100,000.00.

The industries, with their stations, are located as follows:—

Station A. Bangor, Maine. At the plant of the Eastern Manufacturing Company, makers of electrolytic caustic soda and calcium hypochlorite, cellulose from wood, bond and ledger paper.

Station B. Everett, Mass. At the plant of the New England Gas & Coke Company, makers of gas, coke, ammonia, and tar by-rpoducts.

Station C. Niagara Falls, N.Y. At the plant of the Carborundum Company, makers of carborundum, silicon, and other electric furnace products.

Station D. Stamford, Conn. At the plant of American Synthetic Color Company, makers of phenol, picric acid, dye-stuffs, and coal tar intermediates.

Station E. Northampton, Pa. At the plant of Atlas Portland Cement Company, makers of Portland Cement.

According to the arrangements at the Boston Institute, the students remain at each of these stations for a period of six weeks. They leave the university about the middle of their fourth year and spend the period from January to September in moving from station to station, giving each station a period of six weeks. An instructor is in charge of each station and maintains the same strict discipline among the students as is found at the university. Each day's work is carefully planned and daily lectures on different stages and different units of the process form a part of the system. It is a great advantage to have one accustomed to teaching in charge of the station. From a prospectus issued by the Massachusetts Institute of Technology in connection with their five years course in chemical engineering, the following synopsis of the work to be accomplished has been taken:—

(1) To acquire a first hand knowledge of the processes of the plant and the machines with which it is equipped; the same to be considered as types of the respective classes of operations, and as representative of the application of the principles of science, already studied, to industry.

(2) To study the chemical control of industrial processes through the laboratory, and to acquire ability in the interpretation of laboratory data in terms of factory practice. All of the stations offer splendid opportunities for this most valuable experience.

(3) To obtain a general knowledge of modern methods of factory management and control, together with methods of apportioning cost of manufacture. Instruction in these subjects will be largely by conference, in which officers of the companies at which the stations are located will at times render valuable assistance.

(4) To obtain the wider viewpoint which comes from contact with those who are employed to superintend or carry on the factory operations, and to acquire the degree of confidence in handling industrial processes and large sized apparatus which comes from actual participation in the active work of the plant.

(5) To acquire that inspiration for further work in science and research which intimate contract with large progressive industries inevitably affords.

In Massachusetts the student will return to The Institute to complete his fifth year by following a course of advanced lectures and doing laboratory work, the value of which he will appreciate as the result of his experience in the works. This, in outline, is the object and method of this new plan of educating chemical engineers.

Adaptations to Canadian Conditions

It seems to me quite feasible to apply it in a modified form to our conditions in Canada, where the students will be drawn from all the universities. It will require co-operation among the engineering faculties in Canadian universities on the one hand, and a successful appeal to the captains of Canadian industry. The universities must agree upon the necessity for a five years' course in chemical engineering, and be convinced that one year chiefly spent in training in works is the best way of employing the students' time. Many of the large schools in the United States are already requiring five years for the degree in chemical engineering. It is certain, however, that the success or failure of such a plan will depend very largely on the manufacturers. Without their cordial co-operation and assistance, the plan is obviously doomed to failure. The difficulty of obtaining the permission of the manufacturers and heads of industries to have stations in their works was one which was appreciated by the Massachusetts Institute. They recognized that the keen competition among industries of the same kind has developed a policy of industrial secrecy, a policy which has long dominated the chemical industry and which, up to a recent time, has so greatly hampered the development of industrial research. But it was found that there were really more applications for stations, from industries willing to assume the cost of laboratories, etc., than could be utilized. Only one institution in the United States objected on the grounds of the necessity of keeping their process a secret one. The tendency to-day is in favor of co-operation among similar industries and of pooling information, as well as financial returns. In Canada two industries have already privately signified to me their willingness to participate in this plan. The Honorary Advisory Council for Scientific and Industrial Research has appointed a committee to look into this question, and,—if the general principles are acceptable to the Canadian universities and to the manufacturers,—to formulate a plan for putting in into effect in the very near future. It is well within the duties of this Council to give substantial financial aid, as it seems to me it is a very obvious and effective method of bringing into closer relationship the universities and the industries of Canada, enabling the former to ascertain the important industrial problems of the country, and giving the industries an opportunity of utilizing in part the teaching and research powers of the universities. Not only would this scheme give our students in chemical engineering a range of experience impossible to obtain otherwise, but the stations could offer special courses in the technology of their industry to superintendents, foremen, etc., thus forming a sort of university extension in chemical industry. An added advantage, so far as training is concerned, is that continuous and intimate intercourse would be maintained between teacher and student. The instruction would become a veritable bedside clinic, where an industrial unit would be the patient whose physiology and anatomy is being studied in every detail. The plan lends itself with peculiar effectiveness to the development of industrial research at each station. The director in charge of the station would obviously be a well trained chemist or chemical engineer, who has specialized or intends to specialize along the lines of the particular industry or industries with which he is connected.

Dr. H. C. [illegible] says, in referring to the plan of the Institute of Technology, "the action and reaction thus has brought about between The Institute and the industries cannot be otherwise than highly beneficial to both, and would possess educational advantages not elsewhere to be had, anywhere in the world."

To apply this scheme of training to Canadian conditions will not be as easy when the details are to be worked out. Many difficulties present themselves. In the first place, the total number of graduates in chemical engineering and chemistry in Canada is much less than is annually turned out by the Institute of Technology, hence the field from which we can select is smaller. The average American student is financially better able to spend the extra year, with its additional tuition fees and travelling expenses, than is our Canadian student. Again, few of our industries are on a scale comparable with many in the United States; in other words, the clinical field for instruction is more limited, but these and other suggested difficulties are more apparent than real.

There is little doubt but that industrial chemistry is offering such a future to our technically trained graduates, that chemical engineering is rapidly becoming the most attractive career for the engineering student, and the required number will soon be available. The universities might give the Bachelor degree at the end of four years, and the men leave in May for the works laboratories, remain until the following Christmas, return to their universities, continue their work and receive a Master's degree in Science after the five years. The fees should be made as low as possible and substantial government assistance be given to these training centres. I feel sure that, as at Boston, the obvious value of the practical training would soon create a competition among the students for the privilege of being admitted to the course.

Again, instead of selecting four or five large industries for stations, one or two of the greater industries such as sugar, paper and pulp, cement or starch might be utilized, and the remaining stations placed near a group of kindred industries, each of which would contribute its quota towards the establishment of the station and receive its benefits; such as the groups at Niagara Falls and Shawinigan.

These stations would to a degree act as local scientific bureaus in these centres, while breeding for the country the very class of chemical researchers which Canada needs most, viz. university men whose point of view has been directed to broad problems of industry. The greatest element in the value of a chemical engineer is the element of experience, and this suggested plan gives it.

These stations will, in each of these centres in turn, become the scientific bureau of information and research for the neighbouring industries, and will go far in stimulating an atmosphere of science in those industries in which chemistry plays a part.

Finally, I feel strongly that the chemical engineer so trained is just the type of man to develop our industries. He would be a university man familiar with the engineering problems presented by Canadian chemical industries, whose capacity for initiative and for attacking scientifically an industrial problem, would be many times that of the present science graduate, however adequate his university training may have been.

The Importance of Physics in Engineering Education

A. S. Eve, D.Sc., F. R. S. Macdonald Professor of Physics, McGill University

It is a happy omen of future progress than in the very forefront of your programme you should find time for a discussion on the most important of all problems—the training of future engineers. The real assets of Canada are not so much mines and waterpowers, farms and forests, as the young men and women, boys and girls, who will in a comparatively short time form the next generation, and carry forward the work and duties which we are endeavouring efficiently to bequeath them.

In the first place I wish to emphasize that the art of the engineer is the exalted application of practical physics.

The term "Physics" is still indifferently understood by the public. To some it suggests merely drugs, and the word is wrongly linked with "physician". To others there is some odd connection with "psychics" or "spooks," to which recent utterances of Sir Oliver Lodge may perhaps give some vague colour!

It is a pity that the old name of "natural philosophy" was not retained to indicate the laws and phenomena of mechanics, light, heat, sound and electricity, which have been somewhat artificially separated from the wider realms of science to constitute what is now commonly termed physics.

You find chemists all over the world in every walk of life. The word chemist calls to mind great pioners like Rayleigh, Rutherford and Ramsay, who are also physicists, great industrialists like Solvay, college professors, and so on, down to the vendors of drugs, of alcohols for medical purposes, of cigars and of ice-cream sodas. There are organic and inorganic chemists, industrial chemists, chemical engineers, biological chemists, physical chemists and so forth.

But physicists are rare birds! They flock to universities. They are all professors. To some the name will call to mind the amusing skit of Stephen Leacock, where the physicist not only pays a pushing journalist for the privilege of being interviewed, but actually makes a further payment for the insertion of a distorted effigy in the pages of the journal.

There is however no boundary line to-day between pure and applied science. The physicist and engineer are mutually dependent for ideas, for materials, for appliances.

Doctors, architects, engineers, naval officers, chemists and inventors all recognize that physics is fundamental to their work and training.

In radio work and telephony, in the vast process of electric generation and supply, in the building, maintenance and control of ships, air-craft and submarines, no less in the matter of bridges, highways and railways, we have complicated and involved applications of relatively few fundamental laws of physics, a clear understanding of which is essential to success.

Read at the General Professional Meeting, Montreal, January 28, 1920.

I appeal to my audience, is there anyone here having a sound practical knowledge who does not wish that his theoretical training had been more thorough and complete? And is there present a single man with a wide theoretical knowledge who does not wish that his practical training had been more wide and efficient?

A few examples of the interaction of pure and applied science may suffice:—

Dewar makes a glass vacuum flask to hold his liquid air, and shortly the public find the thermos bottle on the market.

Richardson explores the emission of electrons from hot wires, and soon we derive from Langmuir and others tungsten filaments, nitrogen-filled lamps, Coolidge tubes, and thermionic valves or electron tubes. The whole still in their infancy!

Nor can I refrain from pointing out that in the recent war, men with sound scientific training, blended with common sense, mainly made good. Two examples will be sufficient,—Sir Auckland Geddes; and Brig. Gen. McNaughton, an electrical engineer who became the best counter-battery commander in France.

Those who claim that you can learn physics without previous sound training in elementary mathematics, are throwing dust in the eyes of the public.

A general education, to the age of sixteen or seventeen at least, is of great importance whenever it can be obtained, but this general education should include a most thorough and careful instruction in arithmetic, algebra and geometry given by very capable teachers to our boys between the ages of eleven to fifteen. Are we getting it? Notoriously, no! We want more enthusiasm for education, primarily among parents, so that it may spread to the children. Nor is the social or financial status of our schoolmasters and mistresses at all commensurable with their responsibilities. The Scottish dominie and the bible made Scotland, and it made Scotsmen successful leaders throughout the world. Indeed Scottish education is still the best, and we should study it.

Go where you will, and you will find young representatives of Japan studying and acquiring the be stand most recent developments in Science. Again consider China. Is it for nothing that they sent an order for a quarter of a million of dollars worth of elementary physics apparatus for their schools, to a single firm in Boston?

In Canada, the teaching of Mathematics and of Physics in our schools is very far below the standard necessary to secure the proper developments of our natural resources and to hold for Canada a place, equal to her rights, among the nations.

Also may I venture to point out, that while the literary achievements of the French-Canadian rank high, their scientific training and output are far from standard. France shows the vast scientific possibilities of the race. Would they not do well to import, or train, the ablest possible scientific teachers for their schools and for their universities? After all, education consists mainly in the creation of enthusiasm. Where enthusiasm exists, progress follows, and the driving power in time of difficulty and disappointment becomes so persistent and intensified that obstacles are overcome, and the goal is reached. Hence in a well ordered state the very ablest brains should be devoted to the teaching of the young, and as the youth of a country is the only real potentiality for the future, no pains should be spared for securing the right men as teachers.

Hence we must view with dismay, and take pains to prevent, the danger of large institutions luring with comparatively princely salaries the professors from our Universities. It used to be said that "those who can, do; the rest teach." To which the war has given the lie Direct.

I have spoken of the importance of elementary mathematics, but if time permitted, it would be desirable to emphasize the fact that sound higher mathematics and physics are the keys to the gateway of your profession. It is not sufficient to carry on, but it is necessary to improve, to invent and to develop. We should not be dependent on Great Britain or the United States for such developments or for expert advice, as we are still to a certain extent.

For the ablest students an honours course in mathematics and physics should precede their engineering training, so that men of the highest mental powers, linked with sound practical knowledge, may be available in various branches of engineering. The existing courses are admirable for average students, but our universities and schools are too apt to proceed on the basis, wholly false, that all men are born equal in intellectual powers. In addition to a good general education, we should strive to develop those rarer gifted intelligences to which so much of the real advance of the human race is due.

I cannot refrain however from a tribute to those men, who, returned from the war, having lost in many cases precious years of early manhood most valuable for education, have with the greatest zeal and perseverance resumed their studies and proved themselves excellent students in face of grave difficulties and disadvantages. It will take some years, however, to replace the losses, both of men and of time, so as to replenish adequately the junior ranks of instructors both of our universities and schools.

In conclusion let us consider the desirability of a closer alliance between engineers and physicists, each working in their own spheres, which do however overlap.

The physicist should endeavour to become a better engineer, and the engineer a better physicist. Water tight compartments lead to narrowness of view, and to delay in progress.

The best fire factory in Great Britain was started, organized, and developed by two college professors, the one of engineering, the other of physics. It is a good blend.

Again in the anti-submarine campaign the Admiralty in 1917 found it necessary in various departments to combine together a naval officer, and engineer and a physicist, so that the seaman could determine what was or was not, possible at sea; the physicist could face the essential scientific problem, while the engineer could create and assemble and develop the ultimate solution.

Hence, gentlemen, I trust that the future may find in your institution great engineers who are sound physicists, and great physicists who are sound engineers.

The Water Power Policy of the Province of Quebec, and the Work of the Quebec Streams Commission

By Olivier Lefebvre, A.M.E.I.C., Chief Engineer, Quebec Streams Commission.

Water power policy has been very much discussed in countries well provided with water-falls and rapids during the last twenty years. While only one of the factors to be considered in a water power development scheme, it may be such that the scheme cannot be financed, and under this condition water power development is stopped altogether.

Before stating the law of Quebec and the rules the province has adopted in connection with the water powers within its territory, it is advisable to explain the legal status of the rivers in this province.

Who Owns the Rivers

Article 400 of the Civil Code declares that navigable and floatable rivers and streams and their banks are considered as being dependencies of the crown domain. It follows that there are two classes of rivers, those that are navigable and floatable, and those that are not navigable and not floatable. The bed of the rivers in the first class is the property of the Crown and consequently, the water powers thereon located are public domain.

The bed of the rivers of the second class is the property of the owners of their banks as far as the middle of the stream, provided the ownership of the bank was acquired before June 1st 1884. Since the latter date, the sales and free grants of Crown Lands are and have been subjected to the reserve of a strip three chains wide in favour of the Crown. Therefore the river bed is owned by the Crown, except in that part of the province where shore lots have been sold before 1884.

It may be of interest to note here that in the valley of the St. Lawrence, the king of France has made certain

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land grants, known as "Seignieuries," and few of these grants include the bed of the rivers. On the other hand, in 1898, the Privy Council decided that in the public harbours the river bed is the property of the Federal Government.

There is no definition of the expression "navigable" and "floatable," and the interpretation of the law has given rise to serious litigation.

The questions naturally arise:

Must the river be navigable and floatable?
During all of the open season?
On its whole course, or part only?
At high water, or at low water?
For large or small boats, for loose logs or rafts?
What shape of boats and what drafts?

In order to avoid litigation, the party acquiring a water power site must, when the shore has been sold before 1884, buy the Crown rights and the rights of the riparian owner.

Water Power Policy of Quebec

Power sites in this province have been disposed of in various ways. From 1867 to 1897, no water powers have been sold as such, but mill sites were sold outright for a nominal sum. At that period, the transformation of water power into electricity was in its infancy, and no great importance was attached to the falls and rapids on our rivers.

From 1897 to 1907, when notable progress was made in the design of generators and the transmission of current, the sale of water powers was largely increased. They were sold outright for what was then considered high prices, and somewhat more severe conditions were imposed, such as the obligation of spending a large amount of capital within a few years. The Shawinigan Falls were sold under these conditions.

This policy was later the subject for much criticism. It was argued that such valuable resources as those represented by water powers should be kept for the people and not vested in private interests. However, in the opinion of the writer this policy was completely justified. The development of water power was to a certain extent an experiment, the water wheel was far from having the efficiency which it has to-day, and the capitalists willing to invest money in such development deserved full encouragement. It is doubtful if they could have financed their power schemes had they not been assured that the improvements carried out would be on a property for which they had a clear title.

One danger of this policy was that as the value of the water powers increased, certain sites might be acquired without any development being proposed, but for the sake of holding the property for speculation purposes. This could be remedied, and was, to a large extent, by stipulating that a certain amount had to be spent for development within a certain time.

From 1907 to the middle of 1910, some water powers were sold and others were leased. A sale took place in the case of small powers only. From the middle of 1910 to date, water powers have been leased for periods of seventy-five and ninety-nine years,—in one case only the lease extending over a period of sixty-two years.

However, in the case of small powers not exceeding two hundred horse-power, the Government sells for a definite sum the bed of the river with the shore rights, and the water powers included. Prior to Law 7 George V chapter 22, article 1636, it was not possible for the Government to sell public land which was included in a territory licensed for timber cutting. Now, this power is vested in the Lieutenant-Governor in Council when such land is necessary to the development of the leased water power. Since March 16th 1916, all concessions of river beds may be made only with the authorization of the Lieutenant-Governor in Council, (article 1524a, 6 George V chapter 17.)

The administration of the water powers of the province is under the Department of Lands and Forests, more particularly through its Hydraulic Service Branch, of which Arthur Amos, member of this Institute, is the Chief Engineer.

The policy which prevails is the following:—

1. Water powers are leased for a period of 25 to 99 years, according to the importance of the power and the capital required for development.

2. The payment for the land granted of a fixed annual rental covering the term of the lease.

3. A supplementary annual rental which may vary from ten to thirty-five cents per horse-power developed, according to the facilities or difficulties of development. This supplementary rental may be revised every twenty-one years.

4. A delay of two years to start development, and two more-years to begin the production of power.

5. A deposit guarantee.

6. The lessee must submit plans of the proposed works and report to the Department of Lands and Forests as to the amount of power developed in the plant.

In the case of rivers which are navigable and floatable, the lessee must submit his plans to the Federal Government which has to protect the interests of navigation.

All water powers which, at mean low water have a capacity of two hundred horse-power and over have been declared of public interest, and the owner of such water powers may proceed to the expropriation of adjacent lands required for the proper development of its property, but this expropriation cannot be exercised against an industry previously established, or waterworks supplying the whole of part of a municipality. (Articles 7287, 7288, 7289, Revised Statues of Quebec, 1909.)

A law was passed in 1918, chapter 66, amending articles 7295a of the Revised Statutes of Quebec, which stipulates that the plans and specifications for works proposed in streams of the province must be submitted to the Lieutenant-Governor in Council for approval. Before 1918 it was not possible to build dams for storage purposes unless authorized to this effect by a bill of the Legislature, but in 1918 a law was passed, article 7300a, by which such works may now be carried out, provided the plans and specifications have been submitted to the Lieutenant-Governor in Council and approved.

Such is to-day the water power policy of the Province, and it is claimed that it affords safety for capital invested. It assures the public of a share in the value of these natural resources, and it prevents any speculation in that development being imposed within a definite period under penalty of the lease being cancelled and the deposit confiscated.

The writer believes that water power development should be encouraged as much as possible. Among our natural resources, it stands in a class by itself. In his work, "Conservation of Water by Storage," George Filmore Swain divides natural resources into three classes, as follows:—

1. Those resources which are not renewable, and in which utilization, even though without any waste, necessarily destroys the store available for future generations. Such are coal, oil, gas, phosphates, and other mineral deposits. Every particle of these resources which is utilized diminishes by so much what is left for our successors.

2. Those resources which are self-renewing, though at a comparatively slow rate, requiring considerable time for a complete renewal. In this class are included the forests, which may be entirely cut down, but which will ordinarily reproduce themse lves in time.

3. Water power falls in a different class from either of the above, and seems to occupy a place by itself, having several peculiar characteristics. In the first place, while resources of the first two kinds, if not utilized, are in general store and preserved for the use of future generations, water power if not utilized is constantly wasting, with no good results to anybody.

While, as stated before, the conditions under which water powers may be acquired from the Crown are only one of the factors which make their development desirable or not, this factor may help that development or it may retard it to a large extent.

Capital will not invest where the conditions are drastic or arbitrary, and it is not assured of proper protection by definite conditions covering a long number of years. It is claimed that the policy followed by the Province offers capital every guarantee of safety.

The amount of power there is available in Quebec has been estimated by Mr. Amos, Chief of the Hydraulic Service, as being five million horse-power, not including any territory above the fiftieth degree of latitude. As to the amount of power in the latter territory, no reliable estimate has been made.

Amount of Power Developed

A census of water powers developed in the Province of Quebec in 1918 was made by the Hydraulic Service. It was found that the amount of power installed was 822,274 horse-power. (See Statistics of the Province of Quebec for 1918, page 421.) And this total does not include any station generating less than one thousand horse-power. It is estimated that, should the smaller developments be included, the amount of hydro-power installed in the Province must be 875,000 horse-power. Statistics prepared by the Dominion Bureau of Statistics, in collaboration with the Dominion Water Power Branch and the Hydraulic Service of Quebec, published recently, state that on the first of January 1918, the primary power generated by water in this province was 579,532 horse-power, or 257 horse-power per thousand of population. The statistics compiled by the Province mention the capacity installed, while the Dominion Statistics mention primary power. The capital invested in the central electric stations in Quebec was at that time $130,000,000. The total revenue from the sale of power at these stations was $14,350,000, and new installations contemplated were estimated at about 200,000 HP.

Work of the Quebec Streams Commission

The writer now comes to a field with which he is much more familiar than the subject dealt with above.

The Quebec Streams Commission has done a large amount of work which has made very important power sites considerably more valuable, both in the case of developed and undeveloped water powers. This Commission was appointed in the latter part of the year 1911. Its powers were defined by Law 1 George V, chapter V, 1910, and among the duties it was called upon to perform, there are the following:—

1. To devise just and practical rules respecting the flow, the drawing off, the disposal, the distribution, the storage and generally respecting the preservation and management of running waters in the Province of Quebec.

2. To consider whether it is expedient to have the rivers of the Province classified as navigable and floatable rivers, and rivers which are not navigable nor floatable, classified by an administrative commission or otherwise, according to uniform rules, and to submit such rules, if it be advisable.

The Commission is formed of three members, the chairman and two commissioners. The chairman is the Honourable S. N. Parent, former Prime Minister of this Province. The two commissioners were, at first, Messrs. Wm. I. Bishop, Civil Engineer, and Ernest

Belanger, Civil Engineer, both Members of this Institute. Since the death of Mr. Bélanger, Arthur Amos, Chief Engineer of the Hydraulic Service at Quebec, Associate Member of this Institute, has been appointed Commissioner.

The first work which The Quebec Streams Commission was called upon to make was an investigation of the characteristics of the rivers of this Province and, in 1913, it submitted a report recommending that the said rivers be classed as being public or private property,—according to the area of their watershed. It recommended that the expressions "navigable" and "floatable" be eliminated, that all rivers having a drainage area of three hundred square miles or over should be public property, and that all rivers with an area less than three hundred square miles should be private property.

The most important work which the Commission has performed to date is the regulation of the flow of the St. Maurice river and that of the St. François river. In the case of the former river, a complete control of the water supplied by a drainage basin of three thousand six hundred fifty square miles has been established near the head waters of the river. A few details regarding these works and the results obtained therefrom should prove interesting.

The St. Maurice River Flow Regulation

The St. Maurice River flows into the St. Lawrence at Three Rivers, about half-way between Montreal and Quebec. Its drainage area is 17,000 square miles and the river is about 365 miles long. The difference in level between its head waters and its mouth is approximately 1300 feet. This grade is distributed in a large number of rapids and some high falls,—the most important of which are

The Grès	44 feet
Shawinigan	135 feet
Grand'Mère	40 feet
La Tuque	90 feet
Rapid Blanc	210 feet
Rapid des Cœurs	93 feet
Rapid Allard	55 feet

Of these powers, full developments have been carried out at Shawinigan under a head of 150 feet, and at Grand'-Mère under a head of 75 feet. At the latter point, the natural fall is forty feet, but by building a high dam the water is backed up about 25 miles and small falls and rapids are flooded.

Under natural conditions, the minimum flow of the St. Maurice river at Shawinigan was six thousand cubic feet per second. It reached the absolute minimum of five thousand two hundred second-feet, but for a few days only during the period 1900-1912. Daily records of the flow of this river at Shawinigan have been kept by the Shawinigan Water & Power Company from 1900 to date. As the demand for power was increasing largely, the need of increasing the minimum flow was felt, and the St. Maurice Hydraulic Company, in 1910, built three small storage dams on the Manouane river,—a tributary to the St. Maurice river into which it flows near the Indian post at Weymontachingue, about 188 miles above Shawinigan. These small reservoirs paved the way of the regulation on a larger scale as carried out by the Commission, for they had proved that the water which was let out from these small dams in winter reached Shawinigan with comparatively little loss. This possibility had been doubted somewhat.

In 1912, the St. Maurice Hydraulic Company Limited applied to the Legislature for authorization to carry out a storage scheme in the upper St. Maurice. The Government did not deem it advisable to grant the power demanded, but it decided the The Quebec Streams Commission was the proper party to look into the question and carry out the scheme if it was thought desirable. After a thorough examination of the whole question, it was decided to build a dam at the foot of a large series of lakes at a point two miles above the falls called "La Loutre." The construction of the dam was started in 1915 and it was completed in the month of December 1917. The cost of the total scheme, including the acquisition by the Commission of the three storage dams on the Manouane river, amounts to $2,500,000.

As a result of the control of the waters by this dam, which is now called "the Gouin Dam," the minimum flow of the river is kept at twelve thousand second-feet at Shawinigan. Thus the primary power capacity of the plants at Shawinigan and Grand-Mère has been doubled.

For the benefits derived from the storage, the power companies are paying to the Government an annual sum amounting now to $191,000. This annual revenue will be largely increased when other water powers are developed'

The capacity of the reservoir created by the Gouin Dam is estimated to be one hundred and sixty billion cubic feet, and it is the largest power reservoir in the world,—having about twice the capacity of the Assuan reservoir in Egypt. It is, however, exceeded by the Gatun reservoir built in connection with the Panama Canal,—the capacity of which is one hundred and eighty three billion cubic feet, but it is only fair to say that part only of this water can be used for supplying part of the Panama Canal. The capacity of some of the largest reservoirs in the world are:

Gatun	183,000,000,000 cubic feet
La Loutre, St. Maurice	160,000,000,000 cubic feet
Assuan, Nile	78,000,000,000 cubic feet
Roosevelt, Salt Lake	52,000,000,000 cubic feet
Pathfinder North Platte	45,000,000,000 cubic feet
Shoeshone, Shoeshone	20,000,000,000 cubic feet

The area of the lakes and the rivers affected by the Gouin Dam is two hundred and nine square miles, and with the reservoir full the area of the lake will exceed three hundred square miles. The water is backed up a distance of one hundred and thirty-five miles above the dam.

The amount of power due to the storage has been calculated by using the flow curve of the lowest year during the period 1900-1912—that is the year 1906, and the figures arrived at were 22,000 horse-power years in the case of Shawinigan, and 16,000 horse-power years in the case of Grand'Mère. It is estimated that the low water power possibility of the St. Maurice river has been increased by about four hundred thousand horse-power.

The control of the head waters of the St. Maurice river is also beneficial to the lumbering trade in this valley. The flood waters in the spring are not so high and the minimum flow is very much increased. Therefore, the driving of logs down the river may be carried out under better conditions. Water may be supplied for the log drive at a time when it is not required by the power companies and when it is needed to destroy log jams which are formed at certain rapids. For example, this year, (1919), early in July, about one million and a half logs were jammed and aground in the rapid Blanc, about thirty-five miles upstream from La Tuque. The Commission was asked to help the Association out of this difficulty by giving a shot of water. The Gouin Dam was opened to discharge thirteen thousand six hundred second-feet during twelve days, raising the water to nearly flood conditions. All of the jammed timber was brought out of the rapid and floated down to La Tuque in about two weeks.

River St. François

The next storage scheme which the Commission was called upon to study was the partial regulation of the discharge of the St. François river, by a control of water supplied to lake St. François and to lake Aylmer, both near the head of the river.

Lake St. François is located six miles east from the town of Disraeli and about ten miles south-west from the town of Thetford Mines. River St. François has a drainage area of four thousand one hundred square miles and drains the largest part of the Eastern Townships. It flows into the St. Lawrence at the head of lake St. Peter and runs through the towns of Disraeli, East Angus, Sherbrooke, Windsor Mills, Richmond and Drummondville. The distance between Lake St. François and Lake St. Pierre is about one hundred and twenty miles, and the slope is practically nine hundred feet. This slope is distributed through numerous falls and rapids, making the river very desirable for the development of power. In facts, power plants are located as follows:—

At Disraeli, St. François Water Power Co. . 40′ head
Disraeli, The Champoux Company . . . . . 30′ "
Weedon, City of Sherbrooke . . . . 30′ "
East Angus, Brompton Pulp & Paper Co. Ltd. . . . . 30′ "
Bromptonville, Brompton Pulp & Paper Co. Ltd . . . . 30′ "
Windsor Mills, Canada Paper Company, Ltd . . . . 16′ "
Drummondville, Southern Canada Power Co. Ltd . . . . 30′ "

By the construction of a dam at the outlet of lake St. François, a complete control of the water running from a basin of 172 square miles has been secured, and this water is being evenly distributed throughout the year at the rate of six hundred cubic feet per second. The minimum flow from this lake, under natural conditions, has been measured at one hundred second-feet. The minimum flow from that source has therefore been increased by five hundred second-feet.

Lake Aylmer is located immediately below the town of Disraeli at an altitude of practically one hundred feet below that of lake St. François. Its drainage area is one hundred and thirty-five square miles, and its run-off is controlled by a dam at the outlet of the lake near the village of St. Gérard. It has been calculated that this lake will supply one hundred and fifty second-feet above its natural minimum flow.

The dam at Lake St. François can raise the water twenty-seven feet above natural low water, and the dam at St.Gérard can raise the water twelve feet above natural low water.

The storage capacity of the reservoir created by lake St. François dam is four hundred and thirty-eight square miles, or 12.2 billion cubic feet. The reservoir is filled up in the spring.

The cost of the storage scheme on river St. François amount to $700,000. Of this capital cost, the power owners who reap benefits from the storage have been called upon to pay a yearly rental which covers the interest charges, the sinking fund within a period of thirty years, the cost of maintenance and repairs and a reasonable profit. The amount necessary to cover the above mentioned items is $59,000. The benefits to be derived by each company using the storage water could not be ascertained as no records of the flow of the river were available, and any figures as to additional power due to the storage could only be approximate. In the case of the St. Maurice river, it was different, our calculations were made from complete data. But in this case, to avoid any discussion or litigation as to the benefits derived, it was decided to divide the charges according to the head under which the water was used multiplied by the increase in the minimum discharge. This is called the "second-foot-head method." It is used by the Wisconsin Valley Improvement Company to distribute the storage charges between the various power companies on the Wisconsin river. For example, the storage reservoir of lake St. François supplies five hundred second-feet above the natural minimum flow. This water is used by the St. François Hydraulic Company under a head of forty feet. The charge of this company would be calculated as being 500 x 40 = 20,000 second-foot-head. The companies which have their power plants located below lake Aylmer receive an additional 150 second-feet and, in the case of the Brompton Pulp & Paper Company Limited which uses that water over a head of 85 feet, the proportion would be 650 x 85 = 55,250 second-foot-head. The rate was therefore fixed at fifty cents per second-foot-head. Some of the plant owners have signed contracts and others have accepted the tariff just mentioned.

River St. Anne de Beaupré

A smaller storage scheme has also been carried out in the watershed of the river St. Anne de Beaupré, to increase the minimum flow at St. Ferréol, Seven Falls, where the Laurentian Power Company operates a plant under a head of four hundred and ten feet. The minimum natural flow of the river at that point was one hundred and sixty-five second-feet, and it is hoped to raise that minimum to two hundred and over.

This storage is provided by a dam at the outlet of Lake Brulé and gives a control of the run-off from a watershed of twelve square miles only.

The Commission is contemplating additional storage on this river.

Other Activities of the Quebec Streams Commission

The other activities of The Quebec Streams Commission have been a complete study of the valley of the Chaudière river, in the Beauce district, where disastrous floods occur occasionally. On the 31st of July 1917, after very heavy rains, the water rose thirty-two feet in less than twenty-four hours. The Commission has been called upon to make a full report on the possible prevention of such disasters, and this report is now being prepared.

The Commission has also made a complete study of the possibilities of Lake St. John as a storage reservoir. It was found that by a suitable control at the outlet of this lake, it was possible to keep the minimum flow of the Saguenay river at twenty-two thousand second-feet without causing any damage to lands, wharves, etc., around the lake. Such a storage would make possible the development of six hundred thousand horse-power on the river Saguenay, above the town of Joncquières. Lake St. John has an area of three hundred and fifty square miles, and drains a watershed of thirty-thousand square miles.

The Commission has also made a complete study of the possibilities of creating a storage reservoir in lake Kenogami, west of the towns of Chicoutimi and Kenogami. This lake has an area of twelve square miles, and there is at present partial regulation under the control of the Chicoutimi Pulp Company. Lake Kenogami has two outlets; one into the river Chicoutimi which flows into the Saguenay river at Chicoutimi about ten miles from Kenogami; the other outlet is through the river Aux Sables which flows into the Saguenay at Kenogami. Lake Kenogami is about four hundred and seventy-five feet above the level of the Saguenay river; its two outlets are well provided with falls and rapids. On the Chicoutimi river, water powers have been developed and are being used by the Chicoutimi Pulp Company to operate their large pulp mills. On the river Aux Sables, Price Brothers Limited have developed water powers for the operation of their pulp and paper mills at Kenogami. The cost of storage in Lake Kenogami was estimated at $1,800,000 in 1916 but, under present conditions, it is believed that its cost would be nearly $3,000,000. The question as to whether this work should be carried out or not is now under consideration.

Among the other activities of The Quebec Streams Commission, there is the study of a certain number of undeveloped water-powers, namely on the St. Maurice River on St. François River, on Bell and Harricana Rivers in the Abitibi district, and on the Manicouagan, Aux Outardes and Natashquan rivers on the north shore of the St. Lawrence.

The Commission has also started systematic gaugings of a certain number of rivers in the province. This field of investigation is being enlarged every year, and it is the aim of the Commission to extend it over the whole of the Province.

Results of Work Done

Beneficial results have been already obtained through the water conservation policy inaugurated by the Government. Very important industries have located in the St. Maurice valley, namely: at Shawinigan and Three Rivers, owing to the large increase in the power possibilities of this valley. On the river St. François, plants are now being constructed at Drummondville, Richmond and Sherbrooke, in which several million dollars must be invested and where two or three thousand hands will be given employment.

As mentioned above, the money invested by the province in the conservation of water is a very profitable investment, not only through the charges which are made to the power companies using the water, but through the industrial prosperity which the said policy will contribute largely to bring here.

The Evolution of the Public Roads Problem in the Province of Quebec

[illegible], B.A.Sc., A.M.E.I.C.

—I—

Historical development of the roads administration

1—The Grand Voyer

From the early days of the colony, up to the year 1841, the roads were under the control of an officer called "Grand Voyer," appointed to this duty by the intendants under the French rule and by the different governments under the British rule. It was but a continuation of a policy existing in France at the beginning of the Colony. (1)

This officer had a complete jurisdiction over all the roads of the Province. He had under him, the "députés grands voyers" also appointed by the same authority as the Grand Voyer. (2)

The duties of those officers consisted in looking after all the matters pertaining to roads:

1.—The location of the new roads, their alignments and construction, and also the construction of culverts and bridges. (3)

2.—Their maintenance and the maintenance of bridges and culverts. (4).

3.—The regulation of the traffic. (5).

4.—The ferries and the fares to be collected on same. (6).

5.—The maintenance and the location of the winter roads. (7).

When a settlement wanted a new road, a bridge or a culvert to be built, or when a complaint arose as to the bad condition of the road, etc., an inquiry was held at once by the "Grand Voyer" or one of his "députés." He got into touch with the interested parties, discussed with them, gave the alignment of the new road, determined the settlers who had to contribute to their construction or maintenance as well as the share of each of them. That share consisted generally in statute labor and material in the case of a construction or reconstruction and in assigning to each one a certain portion of road to maintain when a question of maintenance arose.

The officer then made to his intendant or government a written report in accordance with the provisions of which the latter issued its regulations. The enforcement of those regulations was generally entrusted to an officer of the militia. Did anybody refuse to comply with them, another person was engaged to do the work and the expense incurred paid by the defaulter (8).

The same policy existed in France in the seventeenth century and at the beginning of the eighteenth, when it was replaced by statute labor. (9).

A—Bill of 1796

In 1796 a bill entitled "Bill for the construction, repairs and relocation of roads and bridges in the province" was passed by the Legislative Assembly of the Lower Canada. This bill confirmed the state of things that had been existing since the early days of the colony. It stated among other things that all the king's roads and the public bridges were to be built and repaired under the supervision of the Grand Voyer or his assistants in each district of the province.

That law received but a few modifications of little importance, and remained in force until 1841.

B—Special Committee of 1827 and first government contributions

In 1827, a special committee of the Legislative Assembly was instituted to investigate the conditions of trunk roads and other internal communications, and advise as to the best means of building and repairing same. The committee made reports in 1828 and 1829. In one of its reports it was suggested that the control of the roads should be transferred from the "Grand Voyer" to the inhabitants, but not before the formation of the new counties. (11).

Among the reasons set forth in this report for this change was that the system then existing did not favor the opening of new roads often badly needed, on account of the settlers having to defray the expenses of the Grand Voyer which they could not afford to do. (11).

It was also suggested that financial aid be granted by the government for the construction and repairs of the most needed main roads in order to provide easier intercourse between the most important settlements, which up to that time had remained more or less isolated. Contribution by the Government was also suggested towards the betterment of the market roads leading to the city of Quebec, Montreal and Three-Rivers.

The year 1832 was the first in which a certain substantial financial aid was given from the public treasury as an aid to the improvement of the roads in our province. The work done was of a rather general character, widening, grading, improvement of the drain-

(1) "Bulletin de recherches historiques," [illegible], P. 12.
(2) "Edits et ordonnances", Vol. II, P. [illegible].
(3) "Edits et ordonnances", Vol. II, P. [illegible].
(4) "Edits et ordonnances", Vol. II, P. 341 to 388.
(5) "Edits et ordonnances", Vol. II, P. [illegible].
(6) "Edits et ordonnances", Vol. II, P. 336.
(7) "Edits et ordonnances", Vol. II.
(8) "Edits et ordonnances", Vol. II. P. 342.
(9) "L'Évolution des moyens de transport", Vte Georges d'Avenel.
(10) Journaux de la Chambre d'Assemblée, Bas-Canada, Appendice (P.p.) 1828-29.
(11) Journaux de la Chambre d'Assemblée, Bas-Canada, Appendice (P.P.) 1828-29.

Read at the General Professional Meeting, [illegible].

age, paving with corduroy of the soft spots, a little of gravelling and macadamizing (12). The total amount of money so contributed from 1833 to 1867 in the Province of Quebec was about $1,433,220.98 on the main roads and $1,353,713.88 on the toll roads. The total mileage improved was as follows: 1168.64 miles of general improvement of which 1141.86 miles on the main roads and 26.78 on the toll roads; 182.96 miles were macadamized of which 30.75 miles on the main roads and 152.21 miles on the toll roads, 38.5 miles were covered with corduroy of which 37.50 miles on the main roads and 1.00 on the toll roads. (13).

2—*Creation of the municipal councils:*

In 1840 were created the municipal authorities. (14) The transfer of the authority from the Grand Voyer to the municipal councils was about the only change of any importance that this new organization brought about with regard to the roads administration.

3—*Comparative study of the different systems of road administration:*

The old system prevailing under the direction of the Grand Voyer continued to be practically the same under the direction of the municipal authorities. It consisted generally with regard to the front roads (les chemins de front) in assigning to each property owner the maintenance of that piece of road running between the limits of his property, and with regard to the by-roads (les routes) the maintenance of a length in proportion to the area of the property of all of those most interested in said road. This system is still in force in about five hundred municipalities of the province, the others having adopted the money tax system.

There was an exception to this general system of road maintenance by individual portion in the English settlements. The settlers of English descent brought with them a system that was in favor in their mother country, the Statute Labor System. It was maintained under the Grand Voyer and under the municipal authority and it is still in force in a few municipalities of our Province, those which have not yet adopted the money tax system.

A.—*Maintenance by individual portions:*

1.—*Advantages:* It permits to each farmer, by his personal attention and work on his portion, to gain his share of the cost of the maintenance.

2.—*Disadvantages:*

a) Lack of maintenance of many sections through the negligence of many farmers or through their being too far away from their own portions.

b) Lack of proper maintenance through the ignorance of the best means and of the best time to do it.

c) Lack of uniformity, as a result of work being done by too many individuals without proper supervision and direction.

d) Lack of equity. As a matter of fact, through this system it often happens that a farmer has a portion of road of a natural good gravelly and solid soil, which requires almost no maintenance to be kept in very good condition, when another may have his portions in a heavy clay soil which requires a great deal of work to be properly maintained.

B.—*The statute labor system:*

1.—*Advantages:*

As in the previous system it permits to each farmer to be able to gain his share of the cost of the maintenance.

2.—*Disadvantages:*

a).—The difficulty of having the roads properly maintained at the right time specially during those periods of the season when the work on the farm requires all the farmer's activity.

b).—Difficulty in having good men at work, the superintendent not having the liberty to choose the best, apart from that not having the proper authority over them, the work cannot progress in a satisfactory manner.

C.—*The money tax system:*

1.—*Advantages:*

a).—More facility for carrying out the work on a business basis.

b).—Better workmanship.

c).—More uniform and better maintenance.

d).—More complete equity to every one concerned.

2.—*Disadvantages:* It has none.

The only complaint that we hear is from the municipalities that have tried it for a short time only. The rate-payers complain about the excessive cost to them. They then accuse the system, when the real cause is a lack of organization, or the great amount of work necessary at the start to put all the roads in proper shape after they have been more or less neglected under the old system.

– II –

Quebec Government Roads Policy and Progress of its Public Roads Improvement during the last Fifteen Years

The individual section and the statute labor systems of maintaining and improving roads were the only two in force in the Province up to the year 1907. For the reasons given above, neither system could bring about any real good results and as a consequence the roads were generally bad. The situation was accepted as an unavoidable fact on account of the lack of financial means to do the necessary improvements, and apart from that the ideas and conditions then existing, good roads were not so much needed as they are at the present time. But the progress and the present needs of agriculture, commerce and industry, the rapid growth of luxury among all classes of society have changed the conditions of our social and economic life. The necessity for the farmers to go every day to the butter or cheese factory, the necessity for him to go on the roads with his heavy and varied agricultural implements, the neces-

(12) Documents de la session, Vol. 5, 1867-8, P. 162 to 183.
(13) Documents de la session, Vol. 5, 1867-8, P. 162 to 183.
(14) Statuts du Canada, 14, Ordonnances, 4 Vict. 1840-41, P. 50.

ity for him to draw his produce to the market or the railroad station at the most convenient time when he can obtain the best price for it, the progress of education with a better understanding of the need of better schools and of a more regular attendance, the growing necessity of bettering our rural life to stem the move of the rural populations towards the cities, the advent and the rapid development of the automobile, truck and bus traffic and of auto tourism, in short the rapid advance and change of all the economic and social activities during the last part of the nineteenth and the beginning of the twentieth century, have brought to the forefront at the Government most the necessity of the improvement of the rural roads.

1.—*The Act of 1907.*—

The Quebec Provincial Government, well aware of these facts, passed its first road Act which was given the Royal assent on March 14th 1907.

The Government in passing this act, as well as all the following acts and amendments had two main objects in view:

a).—To grant substantial financial aid towards the maintenance and improvements of roads.

b).—To induce the different municipalities to do away with the old individual portion system and the old statute labor system of maintaining the roads and to adopt the money tax system.

The Act of 1907 provided for a grant of $400.00 to each municipality for the improvement and maintenance of their roads on the conditions that said municipality spent an equal amount and provided that the municipal council "passed a by-law ordering that all the municipal roads at the charge of the rate-payers of the said municipality shall be made, improved and maintained at its expense, with moneys levied by direct taxation upon all taxable property of the municipality".

Only two municipalities in each county could benefit by the subsidy in any one year.

2.—*The amendments of 1908.*—

The two main provisions in these amendments of the act of 1907 assented to April 25th 1908 provide that:

a.—The $800.00 allotted to each county could be distributed amongst all the municipalities of the county on the following basis: Three eighths of the total amount were to be distributed among all the municipalities of the county which had spent at least $200.00 in maintenance and construction, and the rest divided in proportion of the amount spent by each of them.

b.—If one municipality had done improvements on its roads for an amount in excess of $800.00 with the money tax system, besides the subsidy mentioned above, it could profit by a grant of half the excess, but this subsidy could never be more than $500.00.

3.—*The amendments of 1909.*—

These amendments brought no change in the amounts of the subsidies.

4.—*The amendments of 1911.*—

Summarized they are as follows:

a).—For the improvement and maintenance with the money tax system: half the expenses, but the subsidy cannot exceed $[illegible]. The two first municipalities in a county that pass a by-law ordering the money tax system, are entitled to a subsidy of three quarters of the expenses incurred instead of the half, but the subsidy for the first municipality cannot exceed $[illegible] and for the second one $[illegible].

b).—*For the macadamizing and gravelling of [illegible] roads.*—

If a municipality has done work for an amount exceeding $[illegible] with the money tax system and has done some macadamizing or gravelling, it is entitled to a subsidy equal to half the amount spent in excess, but that subsidy cannot exceed $1000.00 for a macadam road and $[illegible] for a gravel road.

c).—*For the macadamizing and gravelling of main roads.*—

A rural municipality that has done work for an amount exceeding $800.00 for maintenance and improvement under the money tax system and has done some macadamizing or gravelling on its main road, "may receive from the Minister of Roads out of the appropriation placed at his disposal, a special subsidy in addition to that mentioned above".

This Act which is commonly known in our Province as the Act of 1911 or the 50% Act is still in force.

5.—*The good roads Act of 1912 and amendments.*—

1.—*Local roads.*—The act that has the most contributed towards the advancement of the roads improvement in our Province is the Good Roads Act of 1912.

According to this Act and its amendments, a municipality to benefit by it shall:

"a).—Pass a by-law which shall come into force on the date mentioned ordering the macadamizing, stoning or gravelling of the roads therein described;

b).—Thereafter apply to the Government, by resolution, after a previous understanding with the Roads Department as to the amount thereof, for the sums necessary for the making or improvement of the roads described in the by-law passed in virtue of paragraph *a* of this section.

Such resolution shall authorize the mayor and the secretary treasurer or clerk to sign in favor of the Provincial Treasurer, as soon as the Government is ready to supply the necessary money, forty one coupons containing a promise on the part of the municipality to pay annually, at the time fixed by the Provincial treasurer and mentioned on each coupon, three per cent interest on the sum mentioned in the resolution.

The resolution shall also provide by means of a special tax or otherwise for the payment of the three per cent interest on the sum which may be supplied by the Government."

The Lieutenant Governor in Council may authorize the Provincial Treasurer to contract, from time to time, such loans as may be thought necessary to carry out this act, but the said loans shall not exceed in the aggregate either under this act or under the act George V, chapter 23, section 1, the sum of twenty million dollars.

B.—*Provincial Roads:*—

"19.—The Lieutenant-Governor in Council may also authorize the Minister of Roads to cause to be made or reconstructed, with such material as may be thought proper, new roads or roads already existing in the Province, to connect central points of importance.

The payments required for this work shall be made by the Provincial Treasurer upon a certificate of the Minister of Roads or of the Deputy Minister of Roads.

20.— 1.—When the Lieutenant-Governor in Council decides to make a new road or to restore an old one, he may:—

a).—Fix the place thereof and do all the preliminary work therefor;

b).—Take possession of any road whether subject or not to municipal authority;

c).—Acquire any land that may be necessary in accordance with the law of the Province of Quebec relating to railways and, in default of an understanding with the proprietors or their representatives, expropriate the same in accordance with the provisions of the said law, mutatis mutandis, at the instance of the Minister of Roads, but the judge of the district where the land is situated may always, on such conditions as he thinks just, grant immediate possession;

d).—Fix for each municipality crossed by the said road its share for each mile or part of mile, built or restored within its limits and payable after the completion of the work, provided such share has been determined by resolution of the municipality, and such resolution shall not thereafter be changed, except with the consent of the Lieutenant-Governor in Council;

e).—Settle what the work of building or restoration shall be, and what ought to be classified as part of the cost of such building or restoration;

f).—Determine and change the direction, width, outline and level of such road, the site, dimensions, materials and manner of construction of the roadway, embankments, bridges, drains, guard rails and other road work forming part thereof; deviate and alter water-courses and ditches crossing or paralleling such road; for the drainage of such road, direct and dig water-courses and ditches, lay drains and sewage canals across and along such road and across all lands; remove all posts and conduits;

g).—Approve any agreement that may be made, by way of resolution, by the council of any municipality, with the Minister of Roads, for the construction of the section of the road running through such municipality.

2.—When the resolution mentioned in sub-paragraph *d* or *g* of paragraph 1 or in paragraph 3 of this section has been passed by the municipality and approved by the Lieutenant-Governor in Council, the secretary-treasurer or clerk of the municipality shall provide, at the time of the preparation of the general tax collection roll, if such roll is made within the three months following the approval of the resolution by the Lieutenant-Governor in Council, and otherwise by a special collection roll, for the collection of the moneys necessary to meet, in whole or in part as mentioned in the resolution the payments of the contributions or of the loans occasioned by such contributions.

3.—All resolutions passed before the coming into force of this act, providing for a contribution by municipalities for their share in the improvement of their roads shall be valid, as soon as approved by the Lieutenant-Governor in Council, and cannot thereafter be changed without his consent.

6.—*The Maintenance Act of 1916:*—

The work of maintenance of our improved roads, whether gravel, stone or built in any manner considered permanent is becoming more and more important in our Department. The Provincial government in deciding to spend great sums of money for the improvement of roads in the province, not only took the necessary step in view of the work being done with wisdom and economy but had also in its mind that the money so spent should be considered as a good investment, and as a consequence foresaw the necessity of aiding the municipality in taking proper care of the work done with the sums invested.

As a consequence, in order that the improved roads shall be properly taken care of it passed the Maintenance Act of 1916.

There are two main provisions in the Act.

A.—*The provincial roads:*—

It provides that "out of the sums put at his disposal, each year, by the Legislature, for the improvement and maintenance of roads, the Minister of Roads may, at any time, in the manner he deems suitable, have the work done that is necessary for the improvement and maintenance of the provincial roads.

He may also fix the amount of the contribution that may be exacted from the municipalities traversed by such roads for the work so done, provided that such contribution shall not, for any municipality, be more than fifty per cent of the cost of the work done within its boundaries. Such contribution may be recovered by the Provincial Treasurer, by action in his name, as soon as the Minister of Roads has fixed the amount. The certificate of the Minister shall be final and shall establish beyond dispute that such debt is exigible from the municipality in question.

B.—*Local Roads:*—

"Out of the sums put at his disposal, each year, by the Legislature, for the improvement and maintenance of roads, the Minister of Roads may, each year, grant to any rural, local, village or county municipality, a subsidy of not more than fifty per cent of the expenses incurred by such municipality for the improvement, repair and maintenance of its roads, whether gravel, stone or built in any manner considered permanent; provided that such subsidy shall not exceed, in any year, the sum of four hundred dollars.

After having made an advance estimate of the cost of the work of improvement, repair and maintenance, the Minister of Roads shall communicate such estimated cost to the municipality interested, by notice, by registered letter, addressed to the mayor of such corporation. He shall at the same time indicate the method to follow in the performance of the work, as well as the delay within which it must be commenced, and that within which it must be finished.

Upon receipt of the notice above mentioned, it shall be the duty of the mayor to summon immediately, for the earliest possible date, a special sitting of the council of the municipal corporation, to take into consideration the communication of the Minister, unless a general sitting of the council is to be held at an earlier date.

In the seven days following the special or general sitting, as the case may be, it shall be the duty of the secretary-treasurer of the municipal corporation to forward to the Minister of Roads, by registered letter, a certified copy of the resolution passed by its council at the said sitting. If the municipality decides to itself perform the work directed by the Minister, its resolution must mention the date at which the work will be begun; the said resolution shall be the only formality necessary to order the performance of the said work.

If such date is deemed by the Minister to be too far distant, or if the resolution is not forwarded within the delay fixed in the notice, or if the municipality, having decided to do the prescribed work itself, neglects to commence at the date decided upon, or, having commenced, does not proceed therewith with satisfactory diligence, or again if, by the resolution, the Minister of Roads is requested to have the work done himself, he may, without further notice, take the necessary steps to have the same done at the expense of the corporation interested.

In the case mentioned in paragraph *c*, the cost of the work may be recovered by the Provincial Treasurer, by an ordinary action taken in his name, as soon as the Minister of Roads informs him of the amount.

The certificate of the Minister of Roads shall be final, and shall establish beyond dispute that such debt is exigible from the municipality in question.

As soon as the Provincial Treasurer has informed him of the amount due by a municipality for work done by the Minister of Roads under paragraph *c* of this section, the secretary-treasurer of such municipality must immediately, in accordance with the provisions of the Municipal Code, prepare a special collection roll, and collect the amount claimed, either from the whole municipality, or only from the properties liable for the maintenance of the road where the work was done, according as the road by-laws in force in the municipality provide."

The Act of 1907 with its amendments of 1908, 1909 and 1911, commonly known as the Act of 1911 or the 50% Act; the Act of 1912 known also under the name of the Act of 3%, and the Maintenance Act of 1916 are the three now in force in the Province.

What is given above is only a summary of the main provisions.

7.—*How these Acts were received by the public.*—

It is generally recognised that all peaceful reactions, even the most commendable, leading to the destruction of very ancient practices have always had to proceed at the beginning with a respectful wisdom and a smooth slowness on account of the obstacles of all kinds met. This truth had to apply more specially to the Province of Quebec, to the French Canadian race, one of the most estimable qualities of which is to be an extremely respectful of its traditions.

As stated above, at the date of the passing of the first act to come into aid to the municipalities towards the betterment of their roads, there still existed in the Province the two old systems of road administration: the individual portion system (ou porte de route) and the statute labor system, the latter existing only in a few municipalities of the Eastern Townships. The difference between the individual portion system and the money tax system was evidently greater than between the latter and the statute labor. Besides that, the individual portion having always been in use since the beginning of the Colony, not a few farmers firmly believed their road sections were their own private properties. However, in 1911, when the government decided to vigorously carry on its good roads policy, it started an education campaign to get the people perfectly acquainted with the Good Roads Acts by sending a few lecturers all over the province. This campaign lasted only one year. The people very quickly understood the advantages offered by the government and the necessity of changing their mind. Suffice to say that the progress has been so satisfactory that for many years, instead of the government going to the municipalities to offer its proposition as in 1911, it is the municipalities that come to the Government.

8.—*Financial aids granted by the Provincial Government towards the improvement of Roads.*

A.—*Earth roads.*—

In conformity with the Act of 1907 and the amendments of 1908, 1909 and 1911, the Government has given in aid towards the ordinary improvement and maintenance of earth roads from 1908 to 1919 inclusive the total sum of $743,352.02.

The earth roads still constitute over 90 per cent of all the roads of the Province and will for many years to come remain a large proportion of the total mileage. It is for this reason that the government has given to this question its serious consideration.

As the municipalities, to profit by the government aid, has to spend at least an equal amount, I can state that at least one million and a half dollars have been spent for the improvement and maintenance of our earth roads from 1908 to 1919, or an average of about $1[illegible].00 per year. To profit by the grant the earth roads must be properly graded, well drained and perfectly maintained. Besides that the expense incurred by the municipality has to be paid out of moneys levied by direct taxation. There are now 589 municipalities or a little over half of the total that have done away with the old system of maintenance and construction to adopt the money tax. There was a total of [illegible] rural municipalities in the Province in 1919.

In the course of the season of [illegible], [illegible] miles of earth roads have been permanently improved as such. In 1918, $[illegible] have been contributed by the government as an aid to the municipalities towards this work.

B.—*Gravel and other permanent roads:*—

In accordance with the Act of 1907, and its amendments of 1908, 1909 and 1911, the government has contributed the total sum of over \$262,949.57 for the gravel roads built from 1910 to date and over \$187,132.72 for macadam roads or a total of over \$450.082.23. As the municipalities have paid at least an equal amount, I can say that at least \$1,000,000 has been spent on the roads built under this Act. I did not have time to compile the exact figures, but I know that they are close enough.

In accordance with the Act of 1912 a total of \$19,378,770.14 has been spent for the construction of gravel, waterbound, bituminous macadam, asphaltic and cement concrete roads to date. So a total amount of about \$20,378,770.14 has been spent for the construction of these so called permanent roads in the Province from 1910 to date. As we have at the present time, 3008.38 miles of road so improved, the average cost per mile is about \$6774.00.

Roads built during the last season of 1919:—

Gravel roads	341.77	miles
Waterbound macadam	93.94	"
Bituminous macadam (penetration)	5.87	"
" concrete	3.07	"
Cement "	6.75	"
Total	451.40	miles

Besides the sums mentioned above for the improvement of the so called permanent roads, substantial aids have been granted by the government for permanent improvement on earth roads, the construction of concrete bridges, retaining walls, rip-rap, concrete culverts, maintenance of trunk roads, the purchase and repairs of road machinery, etc.

From the first of July 1912 to the 27th of November 1919 a total of \$23,694,681.39 has been spent for the general improvement of roads in the Province.

We have now a total mileage of trunk roads built of over 350 miles, and besides that the government has now under consideration for the future an approximate total mileage of 1700 miles.

The total mileage of all the rural roads of the Province under the municipal control and outside of the cities is about 40,000 miles. As we have 3008.38 miles of road improved with either gravel, waterbound bituminous bound macadam, asphaltic or cement concrete, about 8% of all our roads are then so improved.

It is generally admitted that about 80% of the whole traffic uses but 20% of the total mileage.

In our province, as the mileage of the roads improved which generally are the most important and the most travelled, constitute 8% of the total, we can easily state without fear of being far from the truth that 40% of over whole traffic goes over our improved roads.

9.—*Work done in conformity with the maintenance Act of 1916 on the improved roads.*

A.—*Maintenance of trunk roads:*—

The trunk roads finished to date are:—

The King Edward Highway, from Montreal to the Boundary at Rouse's Point.

The Montreal-Quebec Highway, from Montreal to Quebec on the North shore of the St-Lawrence River.

The Levis-Jackman Highway, from Levis to the Boundary of Maine, near Jackman, through the Chaudière and the Rivière-du-Loup Valley.

The Sherbrooke-Derby Line Highway, from Sherbrooke to Derby Line at the Boundary.

Montreal-Chambly Highway.

Part of Fraserville-Edmonston Highway, from Rivière-du-Loup to the Boundary of New-Brunswick.

All these trunk roads are maintained by section men under the control of a Superintendent appointed by the Department of Roads. This organization has given very satisfactory results.

B.—*Maintenance of the Macadamised or Gravelled Roads by Municipalities:*—

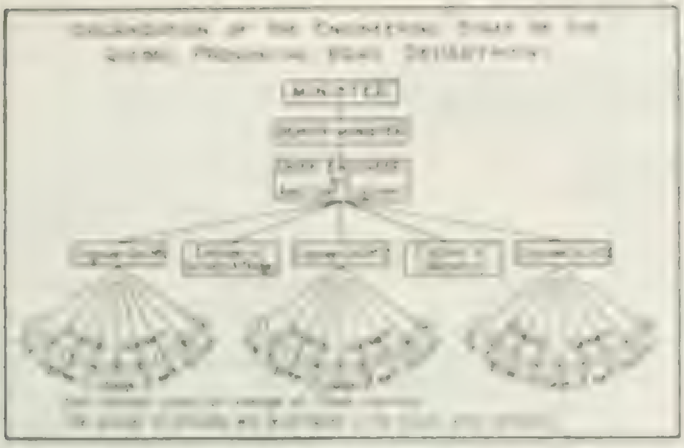
"As a rule, the corporation coming under the law followed the engineer's recommendations with good grace. I must state that if, in certain places, the necessity of maintenance was not realized at once, in others our hopes have been exceeded and our intervention has even been forestalled. We are convinced that such good dispositions will spread throughout the Province. Moreover, we are fully resolved to be firm in enforcing this law which is so necessary for the preservation of the work done in the past five or six years." (Extract from the Minister's report of 1917).

The following summary of the work done in this direction will be sufficient to show that the Minister has kept his word:

During the year 1917, the first of the putting into application of the law, instructions were given for maintaining or repairing macadamized or gravelled roads to 183 municipalities, 94 of which, or about 51% have been able to do work.

During the year 1918, instructions were given to 118 municipalities, 67 of which, or about 57% have been able to do work.

During the year 1919, instructions were given to 336 municipalities, 204 of which, or about 61% have done work on a total length of 535.57 miles of macadamized or gravelled roads. I think that those figures are sufficient to show that the increase has been satisfactory, and that the people is getting more and more convinced every year of the necessity and the economy of taking proper care of what has been done.



– III –

Present Organization of the Engineering Staff of our Provincial Roads Department and Summary of its Work

1.—*The Chief Engineer and Assistant Chief Engineer:*—

They have to prepare all the necessary standards, to look after all the plans, estimates, specifications and approve them, make personal inspections of important works going on, etc.

2.—*Three District Engineers:*—

The Province is divided into three districts with an Engineer in charge of each of them. They have charge of all work going on in their respective district, construction, maintenance and repairs with the aid of their Division Engineers. Besides that they have to prepare, with the aid of their assistants and clerks, all the estimates and specifications in conformity with the reports of the preliminary inspections done in the municipalities by their Division Engineers. Upon the receipt of the necessary information from the Division Engineers on the conditions of the improved roads in different municipalities they have to prepare the necessary specifications or instructions for the proper maintenance or repair of these macadamized or gravelled roads; they have to direct and follow the work of their Division Engineer and inspectors; make frequent inspections, etc.

3.—*The Division Engineers:*—

Each district is divided into eight or nine Divisions with an engineer in charge of each. These Division Engineers have charge of all the road construction, maintenance and repairs in their respective division each under the direction of their respective District Engineer. They have to be familiar with all the road work that is going on in their respective division, construction and maintenance by means of frequent personal inspections. They have to keep themselves perfectly informed as to the conditions of the old gravelled and macadamized roads and make the necessary reports to the respective District Engineers, they have to make the preliminary inspections of the work to be done in every municipality that wishes to profit by the government financial aid and submit a complete report to the District Engineer who has to look after the work of improvement of the earth roads and the maintenance of these earth roads in the municipalities that have adopted the money tax system and wishes to profit by the financial aid of the government, etc.

4.—*The Engineer of Bridges:*—

The Engineer of Bridges has to make all the standard plans, plans of culverts and bridges, retaining walls, etc.

5.—*The Laboratory Engineer:*—

Our Department has its own laboratory in charge of an Engineer.

In our laboratory are made the tests of nearly all the materials that are used on our roads construction.

Suffice to say in order to give an idea of the activities of the laboratory that during the year 1919 the following tests have been made on:

248	samples	of stone
73	"	of sand for concrete
837	"	of gravel for gravel roads
52	"	of gravel for concrete
16	"	of cement
2	"	of culvert concrete
10	"	of bituminous materials

As it is, the organization of our engineering staff, it may be possible to improve but so far it has given very satisfactory results, and all the road work done with government financial aid adequately controlled.

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As Others See Us.

Adherence to the strict traditions of the profession in Canada would prevent repeating any comments of a favorable nature made regarding the work of *The Institute.* But, inasmuch as modesty of an extreme variety has been a curse to the profession, it seems high time that we should, as President Ross stated at the annual banquet, do a little blowing on our own account. At the moment, however, this seems unnecessary, since we have received at the hands of one whose official position, expert knowledge and intimate contact with the entire range of engineering society activity, place him in a unique position to pass judgment, a high measure of favourable comment. We refer to E. J. Mehren, Editor of the Engineering News Record, who was kind enough to come to Montreal and who attended every session of the annual and general professional meetings.

In the issue of the Engineering News Record, February twelfth, page three hundred and eighteen, under the caption "Impressions Here and There," Mr. Mehren comments on the meeting held in Montreal, and in a manner calculated to give every member of this organization a greater pride in *The Institute,* although every active member from Sydney to Victoria knows that there is still much to be done. In a comparison between the advancement made by *The Institute* as a result of the changed conditions of the past three years, Mr. Mehren advocates the adoption of similar measures by the American Society of Civil Engineers since the tangible and evident results of the changes made by *The Institute* have in every way justified such action.

He remarks favorably on the part that the young men are taking in the affairs of *The Institute,* and expresses satisfaction with the nature of the meeting being a combination of business and professional.

Continuing, Mr. Mehren says, "As to the conduct of the meeting as a whole we can well take a leaf from our Canadian friends' book. From the convening of the business meeting on Tuesday morning, to the singing of "God Save the King" at the close of the concert-smoker Thursday night, the proceedings went with a snap that left nothing to be desired. The serious parts of the programme were relieved by entertainment, both frequent and varied, resulting in a sustained interest and spirit that are difficult to describe without suspicion of exaggeration. There were luncheons Tuesday and Wednesday noon, a reception and dance Tuesday night, a banquet Wednesday night and the concert-smoker Thursday night.

The last event, the concert-smoker, we might particularly copy. The room was amply large, and, mercy of mercies, chairs were provided, gathered suggestively around tables. By contrast, we are still suffering from flat-foot from standing all evening at the Am.Soc.C.E. smoker. And on the tables were bottled goods that cheered—now banished from these arid states. The entertainers were first-class—both professionals and amateurs—led by Wilkie Bard, the famous English comedian, who was playing in the city at the time. Added to it all was a spirit of fellowship that made the company one—from the contingent of men of French descent who sang the praises of Laval, to the last son of McGill or the University of Toronto or Queen's who added his voice in the deafening volume of his university yell. We are sure that everyone went away with the feeling that *The Institute* was a very real thing—something that helped him to come close to his brother engineer and to work with him for common objects.

Before we left we fished an invitation to come next year. We do not see how Toronto, where the next annual meeting is likely to be held, can possible excel the hospitality and enthusiasm of Montreal, but the Toronto men somehow, we well wager, will do it as well. But whatever the programme, if the good Lord spares us, we mean to be there."

Biographies of Engineers

Is it not possible for *The Engineering Institute of Canada*, now that its future and prosperity are quite well assured, to do something to encourage the preparation and publication of memoirs of those engineers who have been prominently identified with Canada's major engineering undertakings? In Canadian biographical history so far as the writer has observed, the work of engineers whose vision and industry have had something to do with Canada's present day status, is for the most part only indirectly recorded. When one considers that the publication of the thirty-two volume historical series, "Chronicles of Canada" was undertaken as a commercial enterprise without endowment of any kind and has proved itself a profitable venture, the present proposal does not seem to be beset with insurmountable difficulties.

In the first place such biographies would be a distinct contribution to Canadian History. In this country where distances are immense, physical features formidable and climate rigorous, the problems of exploration, transportation and development were beset with special difficulties. The men of both nationalities who have overcome these difficulties were in a very real sense makers of Canada, much of the history of whose achievements is the essence of romance. Much of the required information can be obtained from government and other reports, much of it from private correspondence, some of it from personal recollection.

In the second place there would be in a series of well-written memoirs a real inspiration for young Canadians. Who can read the charming biographies of British engineers by the late Samuel Smiles without being touched by the faithful portrayal of human strength and weakness? Who can read without a thrill the story of the optimism, the disappointment, the final success and withal the uncompromising integrity of the late William Hamilton Merritt in the promotion and construction of the first Welland Canal; or the finished diction of the gifted Fleming as found even in his reports on the location and construction of the Canadian Pacific Railway, without admiring the genius, the versatility and the humanity of the man? Then there are Keefer, Robinson, Ross, Dawson, Robb, to mention only a few. They are the men who explored the wilderness, bored the mountains, harnessed the cataracts, developed the national waterways. They are the men, who, disregarding precedent, attempted the impossible. As such they are worthy prototypes for young Canadians, especially those who are more concerned with the character of the service they render than with the immediate reward that service may bring. The recital of their contribution to the nation's development will have served its purpose if, in the words of the biographer of the late George Westinghouse, "it conveys to the young man of today a sense that his career will depend for success less on the splendor of its start than on the spirit in which he pursues it; far less on capital than on courage, on worry than on watchfulness, on 'pull' than on persistence."

In the third place, *The Institute*, by making available these narratives would be vindicating that fine sentiment appearing monthly on the cover page of this *Journal* wherein its policy is declared to be "to enhance the usefulness of the Profession to the public."

Such biographical work should preferably be undertaken by sympathetic workers of the same craft, that is by engineers. The writer believes that there are men in the Profession in Canada who possess enough of the historian's patience and the biographer's artistry and sufficient of the discriminating faculty to qualify them for undertaking what to many would seem a doubtful though rewarding work.

Peter Gillespie, M.E.I.C.

Engineers and Engineering

The matter of professional status is just now seriously engaging the attention of engineers, not only throughout Canada, but in Great Britain and the United States.

In the former, the Institution of Civil Engineers, the leading, largest and most conservative organization of engineers in the world, has at last awakened to the extraordinary fact that even at the end of the second decade of the Twentieth Century *Engineering* has not been recognized as a *Profession*, and at the insistence of a large majority of members the Council of the Institution will introduce a Bill at the next session of the Imperial Parliament to correct this peculiar condition of affairs.

In the United States, within the past couple of years, Acts have been passed in the legislatures of nearly a quarter of the total number of States of the Union compelling engineers to submit to examination of their qualification or their credentials and to register before having a legal right to practice.

In many other States the movement in the same direction has reached various stages and it is anticipated by the American Society of Civil Engineers, which is watching the campaign with the greatest interest, that within a very short time engineering throughout the whole Union will be placed on the same footing, as to status and responsibilities, with other professions.

Some twenty-six years ago the question came up before the Canadian Society of Civil Engineers (now *The Engineering Institute of Canada*, with a membership of over 3,500, in every branch of the profession and every Province of the Dominion), and it was thoroughly discussed in all its bearings.

It was felt that though an engineer was just as useful a member of society as a doctor or a lawyer or a member of any other profession; while he had to go through just as thorough and severe a training, it was a "sad" and an anomaly that he had no recognized legal status. While a man who had no medical training could not lawfully call himself a doctor, nor a man without legal knowledge advertise himself as a barrister, any man was free to call himself an engineer without let or hindrance. There was no authority to question his right to the title or to demand evidence as to his training, experience and capability. His profession had no place or recognition in the laws and statutes of this or any other country.

Every member of the Society was consulted by circular letter and expressions of opinion sought from men whose opinions were valuable. While some members thought that the time was inopportune and while it was realized that the difficulties in the way of legislation were very great, the Society was practically unanimous as to the desirability of some statutory recognition of the profession with the ultimate objects, not only of protecting the individual engineer, but of raising the standard of qualification and of protecting the public from unqualified men and quacks.

The net result of all that discussion and deliberation was a Bill drafted under the advice of the best legal and Parliamentary talent in the country, for presentation in the different Provincial Legislatures of the Dominion. This was necessary because, under the *British North America Act*, Federal Legislation on these lines would be ultra vires in the Provinces.

The measure became law in Manitoba and Quebec and there is little doubt that it will be embodied in the Statutes of every other Province in the near future.

The Bill was introduced in the Legislature of Nova Scotia in February, 1897. It was pretty thoroughly discussed in the Committee of the House of Assembly and it passed that House without a dissentient vote, but for some unknown reason it was "deferred" by the Legislative Council.

For various reasons no further attempt to secure Legislation in Nova Scotia has been made since 1897.

The whole question is now again very much to the fore.

In April, 1919, a Committee of fourteen engineers, representing all branches of the profession, and all Provinces of the Dominion, met in Montreal under the auspices, and at the expense of, *The Engineering Institute of Canada*, and after a week's strenuous labours, and with the best legal advice, they drafted a new Bill.

Its most conspicuous and important feature, which differentiates it from the Bill of 1897, is that Engineers are to be recognized, licensed, registered and given legal status by the several Provincial Legislatures by and through the agency of an Association of Engineers to be created in each Province quite independently of all existing Societies and Organizations of Engineers.

This Association of Engineers will be framed on parallel lines to those of the several Provincial Medical and Bar Societies and clothed with corresponding powers and functions in the admission, and examination of candidates for admission to the Profession. The principle of an entirely independent regulating body was adopted as a basis of the Bill, with the object of eliminating or forestalling opposition that might develop in individual Societies or Organized Bodies of Engineers, of which there are several in the different branches of the Profession throughout the Dominion.

Engineers in all Provinces are now lining up for a vigorous and concerted campaign to introduce the Bill as nearly simultaneously as possible into their respective Legislatures.

To one who gives the matter any consideration it seems strange—even an anomaly—that engineering the world over is not legally, or by legislative enactment and statute, recognized and established as a profession.

To the question "Is engineering a profession or not?" there can surely be none other than an affirmative answer. If, therefore, it be a profession a further question suggests itself. "Why is it not on all fours with other learned professions, e. g., Law and Medicine?" And to this question the answer is not so easy to find. In the first place it must probably be sought in, or associated with, the fact that it is not only the newest of the professions, but its scope is very much wider than that of others and it is more difficult to discriminate between an enginer and a layman than between a doctor or a lawyer and a layman. This difficulty, however, is almost wholly due to the main fact that the engineer is not recognized as a professional man.

The newness of the profession, however, does not consist in the novelty or unprecedented character of the works designed and constructed by engineers, for the pyramids of Egypt were built several thousand years ago; the wonderful aqueducts found in those parts of Europe that were once the Roman Empire—some of them indeed still in use—were built many centuries ago. All these great works, involving prodigious expenditure of time, labour and cleverness, bear eloquent testimony to the fact that engineering skill is no modern or recently discovered faculty. The men who designed and built the pyramids and the aqueducts may not have been called engineers and they may not have belonged to any guild or association of arts and crafts, but they certainly were possessed of some, at least, of the highest qualities and attributes of the most eminent, up-to-date practitioners. Especially will this be apparent when we further consider that in those ancient days neither steam nor electricity had been discovered—at least we believe not—and the builders of those mighty works had not—so far as we know—the advantages of the methods, arts, tools and appliances now regarded as indispensable to the construction of great Engineering works.

Engineers consider theirs to be not merely the noblest, but, so far as utility and modern material development are concerned, the most important Profession. They claim that the qualities that go to make the skilful and successful engineer are of a higher order than those possessed by the successful representative of other professions; that the education, training and general ability indispensable to a successful career as an engineer are at least equal to those demanded by success in other professions. And these claims cannot be called either arrogant or baseless. The civilized world ha ever been and is to day more than ever and still ever increasingly dependent, to an utterly unrealized extent, on the work of the engineer. He is the creator of our roads, railways, canals, docks, harbours, bridges, water works and drainage systems, power developments, engines and machinery of endless variety; the getter and converter to useful purposes of the riches of the mine and the quarry; the designer and builder of ships and aeroplanes. Without the engineer the world would stand still, figuratively and literally.

There is more justice than is generally admitted in his claim to have been largely instrumental in bringing about a triumphant issue to the war. In this great job the function of the military engineer and the civil engineer over-lapped and merged. In a narrow sense the works of the military engineer are confined to the design, construction and destruction of fortifications, guns and other things of a strictly warlike character, but in the recent Armageddon he added his talents and energies to those of his unmilitary colleague in the construction of roads, railways, bridges and other essentials to transportation.

It may here be remarked that the adjective "Civil" as applied to engineers was adopted, or applied, about a century ago to differentiate the nonmilitary from the military engineer, and while it has lost its original distinctive meaning it is still in common use or misuse. The term civil engineer is nowadays very generally and quite inappropriately applied to the men engaged in the design and construction of roads, railways, bridges, harbours, water and drainage works, etc. The builder of works, machinery and appliances for electrical development is called an electrical engineer. He who as a trained and scientific expert conducts mining operations is called a mining engineer. The man who designs engines and machinery a mechanical engineer, and so on, but all these men are civil engineers, because they are not military engineers and the modern tendency is to delete the word civil and substitute for it the word professional, to distinguish the man of high scientific training and knowledge, capable of designing and supervising the construction of engineering works of all kinds, from the mechanic, mechanicien, or skilled artificer whose function is primarily or mainly the *operation* of engines and other machinery. In common parlance the man that drives a locomotive or operates an engine of any size, from a two or three horse power motor for actuating a gasoline boat, to the engine of many thousands of horse power that drives an "Olympic" at thirty knots, is an engineer, and many men in the higher grades of these activities are engineers or professional engineers, beacuse they have undergone long and thorough scientific training and are capable, and often engaged in the design and construction of costly hgh-powered machinery. On the other hand the majority of them are not, properly speaking, engineers, or at least they are not professional engineers and the general public has yet to be educated to discriminate and draw the line between the mere mechanic and the super mechanic or the engineer *par excellence*.

The specializing of engineering is strikingly paralleled in the other leading profession . There are lawyers who devote their talents and energies exclusively to parliamentary and constitutional matters, others to corporation affairs, others to criminal procedure, others to conveyancing and so on. Similarly in medicine, a medical man who makes obstetrics a specialy would not undertake to remove a cataract from an eye, nor would an oculist undertake a midwifery case, and a specialist who devoted his attention to the ear and nose would not amputate a limb, nor could a dentist pretend to advise in a case of cancer or tuberculosis—if they were honest men.

In engineering the specializing is carried to an even greater degree. An engineer making railway building his specialy would not undertake to design and install an electric plant. An engineer who designs and superintends mines and mining machinery would not undertake to design or construct a dry dock. One that made the design of engines a specialty would not advise on a scheme of harbour or river improvements. The electrical engineer would not be consulted in a case of water supply or sewage disposal and the bridge expert would not be called in to advise on a piece of difficult tunnel work. But all these specialists are engineers, unvisersally recognized as such, because they all "direct the great sources of power in nature for the use and convenience of man" (from the charter of the Institute of Civil Engineers of Great Britain founded a century ago and today having a membership of about 10,000, representing every branch of the profession and every country in the civilized world.)

In furtherance of the movement for increased status a general meeting of nearly fifty engineers was held in the Rooms of the Board of Trade, Halifax, on Wednesday evening, the 7th inst.

After an earnest and thorough discussion of the matter it was unanimously and enthusiastically decided to proceed with the campaign as energetically as possible and the Committee that was appointed last October was re-elected and empowered to take the necessary steps to introduce their Bill at the next session of the Provincial Legislature. The decision of the meeting was fortified by the receipt of letters from about forty engineers in various parts of the Province outside Halifax cordially endorsing the movement.

In view of the tenor and objects of the Bill, which are not merely to raise the standard and qualifications of engineers and to elevate engineering to the proper status as a legal, recognized and properly constituted profession, but to protect governments, corporations, capitalists and all other employers of engineers from ignorant and unqualified practitioners and to place upon the shoulders of individual engineers a due and proper responsibility for their acts and works, it seems to be, to the ordinary layman, at any rate, difficult to adduce valid reasons why their efforts should not be crowned by success.

C. E. W. DODWELL, M.E.I.C.

Engineering Legislation in Quebec

The Quebec Act which has been operative under the Canadian Society of Civil Engineers has been transferred to the Association of Professional Engineers of Quebec formed recently of the corporate members of *The Institute*.

Inasmuch as the Quebec Act as such is a provincial measure giving powers to an organization operating under federal charter it has been considered by eminent legal authority that the federal body could not carry out the provisions of the Act. Following the formation of the Association of Professional Engineers in Quebec the approval of the Council was given for the transfer of the operation of this act to the new body. On Saturday, February fourteenth, the Legislative Assembly of the province of Quebec sanctioned Bill number one hundred and sixty seven being "An act to amend the Revised Statutes, nineteen hundred and nine, respecting civil engineers" as follows:—

"His Majesty, with the advice and consent of the Legislative Council and of the Legislative Assembly of Quebec, enacts as follows:

1. Article [illegible] of the Revised Statutes, 1909, is amended:

a. By replacing paragraph [illegible] thereof by the following:

"a. The expression "the Corporation" means the corporation of professional engineers of Quebec.""

b. by replacing the word " society," in the second line of paragraph *b* thereof, by the word " corporation;"

c. by replacing the word " society," in the second line of paragraph *c* thereof, by the word " corporation."

2. The following articles are inserted in the Revised Statutes, 1909, after article 5116 thereof:

5116*a*. The present members of *The Engineering Institute of Canada* formerly " The Canadian Society of Civil Engineers," domiciled and practising in the Province of Quebec, and all other persons whom they may in the future, join to them according to the provisions of this section, shall form a corporation under the name of " The Corporation of Professional Engineers of Quebec " with all the rights and privileges granted by law to ordinary corporations.

5116*b*. 1. Its affairs shall be administered by a council composed of eight members elected in the manner provided by the by-laws of the corporation.

2. It shall have the right to adopt by-laws for the proper administartion of its affairs; to fix the annual contribution of its members; for the election of the members of the Council; for the guidance, the honour and the dignity of its members ; for the admission to study and practice of the profession, in conformity with the provisions of articles 5119, 5120 and 5121; for establishing fees for professional services; for the admission to practice of persons who are members of *The Engineering Institute of Canada,* domiciled outside of the Province of Quebec; for its affiliation to *The Engineering Institute of Canada,* and for all other objects necessary for the proper working of the corporation.

The tariffs of fees hereinabove mentioned shall not come into force until approved by the Lieutenant-Governor in Council and published in the *Quebec Official Gazette.*

" **5116*c*.** The seat of the Corporation shall be in Montreal.

" **5116*d*.** The members of the Executive Committee of the Provincial Division of Quebec of *The Engineering Institute of Canada,* shall form the provisional council of the corporation; they shall, before the first day of June 1920, by a notice signed by the secretary, and addressed, by registered letter, fifteen days in advance, to each of the members, call the first general meeting of the corporation for the purposes of adopting the by-laws thereof, and also to provide for the regular election of the council of the corporation."

3. Article 5117 of the Revised Statutes, 1909, is amended:

a. by replacing the word: " society " in the fourth line thereof, by the word: " corporation;"

b. by replacing the word " society " in the third line of paragraph *c* thereof by the word " corporation;"

4. Article 5118 of the Revised Statutes, 1909, is amended:

a. by replacing the word " society " at the end of paragraph *a* thereof, by the word " corporation;"

b. by replacing the word " society " in the fourth line of paragraph *b* thereof, by the word " corporation;"

c. by replacing the word " society " in the third line of paragraph *c* thereof by the word " corporation;"

d. by replacing the word " society " in the sixth and in the twelfth line of paragraph *d* thereof, by the word " corporation;"

5. Article 5120 of the Revised Statutes, 1920, is amended by replacing the word " society " in the first line of paragraph *a* thereof, by the word " corporation."

6. Article 5121 of the Revised Statutes, 1909, is amended:

a. by replacing the word " sociétě " in the second line of subparagraph *a* of paragraph 1 of the French version thereof, by the word " corporation;"

b. by replacing the word " society " in the third line of paragraph 2 thereof by the word " corporation."

7. Article 5123 of the Revised Statutes, 1909, is amended by replacing the word " society," in the second line thereof, by the word " corporation."

8. This act shall come into force on the day of its sanction.

Completing Honour Roll.

A glance at the Honour Roll published in the List of Members 1919, commencing on page two hundred and nineteen, will reveal the fact that there are many instances where more complete record is required.

The Council of *The Institute* has decided that the List shall include the names of all who served with the allied armies and whose membership or application for membership antedates Armistice Day, that is the eleventh of November, nineteen hundred and eighteen. It is hoped that we may be able to complete the Honour Roll list this year and be enabled to have a permanent Roll of Honour for the hall of the headquarters building.

Status of Engineers

Provisional Council Appointed in Nova Scotia

At a meeting of the Nova Scotia Society of Civil Engineers, C. E. W. Dodwell, M.E.I.C., presiding, a provisional council, with president and vice-president, were selected to take office, after the passage by the Nova Scotia Legislature of the uniform bill fixing the status of the engineering profession in the province, the council to carry on for not more than six months. This bill was drafted at a conference of fourteen engineers, representing all the provinces of the Dominion, held in Montreal, and is already in force in provinces of the West.

The provincial officers and council elected are:—

President, C. E. W. Dodwell, M.E.I.C., Halifax; vice-president, D. H. McDougall, M.E.I.C., New Glasgow; Council, J. L. Allan, M.E.I.C., Dartmouth; T. J. Brown, M.E.I.C., Sydney Mines; F. A. Bowman, M.E.I.C., Halifax; F. W. Doane, M.E.I.C., Halifax; A. F. Dyer, A.M.E.I.C., Halifax; F. R. Faulkner, M.E.I.C., Halifax; I. P. MacNab, M.E.I.C., Halifax; W. G. Matheson, M.E.I.C., New Glasgow; W. P. Morrison, M.E.I.C., Halifax; C. M. Odell, M.E.I.C., Glace Bay; A. G. Robb, M.E.I.C., Amherst; J. W. Roland, M.E.I.C., Halifax; P. P. Buxton, Halifax; K. H. Smith, A.M.E.I.C., Halifax; L. H. Wheaton, A.M.E.I.C.

Halifax. If the bill is passed a new and permanent Council will be appointed within six months.

ROBERT ALEXANDER ROSS, M.E.I.C.

PRESIDENT

The Engineering Institute of Canada

Robert Alexander Ross, the newly-elected President of *The Engineering Institute of Canada*, has for many years occupied a leading position in the ranks of engineering particularly in the electrical field of Canada. Two years ago at the earnest solicitation of his friends and as evidence of a public-spirited sense [illegible], he gave up his active engineering practice to become a member of the Administrative Commission of Montreal, a body formed by the Provincial Government to save the City from financial chaos. As the one practical man on that Commission of five his work has been of immense value.

When the Honorary Advisory Council for Scientific and Industrial Research was established about four years ago by the Dominion Government to promote and encourage research in connection with the development of the natural resources of Canada and to assist manufacturers with their problems, Mr. Ross was made a member of that body.

As an evidence of the position he occupies on the Research Council, the active management of its most important undertaking, the establishment of the Lignite Utilization Board, was placed with Mr. Ross, who as the Chairman of that Board has carried on investigations and has arrived at the point where commercial plants will be established in western Canada, during the coming year whereby tremendous lignite deposits of that part of Canada will be made available for the citizens of the north-west.

Mr. Ross is a Canadian of Scotch Presbyterian ancestry, having been born at Woodstock, Ont., on August 26th, 1865 and was educated in the public and high schools of his native town and in 1893 graduated from the School of Practical Science of the University of Toronto. Before going to the University he served his full time as apprentice as machinist with Robert Whitelaw, engine builder, Woodstock, Ont. Following graduation for three years he was engineer in charge of the engineering department of the Canadian General Electric Company at Sherbrooke. In 1893 he was appointed chief electrical and mechanical engineer of the Royal Electric Company of Montreal in charge of all engineering [illegible]. Since 1903 Mr. Ross has been engaged in consulting engineering practice and has been responsible for the design of many important electrical and power installations including the West Kootenay Power and Light plant at Bonnington Falls, B.C.; the [illegible] Company's plant and Dock of the [illegible] Copper Company of [illegible]; Canadian Pacific Railway Angus Shops; [illegible]; West India Electric Company, Jamaica; [illegible] Power plant, [illegible]; Convocation Hall, University of Toronto; Toronto [illegible] Light and [illegible] Company, Montreal [illegible] water supply and electrical distribution and many others.

At various times he has acted as consultant on the following bodies: the Hydro Electric Power Commission of Ontario, The Canadian Pacific Railway, the Hydro Electric Power Commission of Toronto and the great majority of the large cities and municipalities throughout the Dominion. His engineering work in addition to his engagements in Canada has been carried on in China, India, Straits Settlements, Russia, Finland, Scotland, Australia, Jamaica and the United States.

A few years ago when the City of Montreal became involved in what is known as the "[illegible]" Mr. Ross took a leading part in [illegible] of the City, [illegible] saving the City several million dollars.

Mr. Ross for a number of years was lecturer at McGill University and is author of "Engineering Economics". He is a Fellow of the American Institute of Electrical Engineers, a Member of the American Water Works Association, and for many years an active officer of *The Engineering Institute of Canada* as Councillor and Vice-President. He is a member of the University Club of Montreal and Montreal Clubs and for years has been commodore of the Royal St. Lawrence Yacht Club. He has been one of the leading spirits in sailing in which he is a well known expert and which is his chief recreation.

CORRESPONDENCE

An Appreciation

Editor, *Journal:*

I have received with much pleasure the two volumes of transactions on the Quebec Bridge.

To know that membership in the E.I.C. makes available for one, information on works of such magnitude in the detail with which these volumes are presented, makes one feel that the E.I.C. is second to none among the engineering societies the world over.

Yours very truly,
R. LAURENCE WELDON.

Ontario Legislation

Ottawa, January 22, 1920.

Editor, *Journal.*

In response to your suggestion for a statement from the Ontario Provincial Division respecting an open letter to *The Journal* signed by "an Ontario member", I beg to submit the following:—

At a meeting of the Ontario Provincial Division Committee in Toronto in November last, the question of legislation to define the status of the engineer in the Province of Ontario was given very careful and lengthy consideration. At that time the legislative proposals of the J.C.T.O. referred to were not fully known, but sufficient information was available to indicate in a general way the trend of their proposals. It was unanimously agreed that the recent efforts of the J.C.T.O. should be given full and sympathetic consideration, and it was felt that inasmuch as the J.C.T.O. scheme was radically different from that proposed by *The Engineering Institute,* it would very profitably form the basis of consideration along with the E.I.C. Bill, by some general committee which could go into the whole question thoroughly and report as to what would be the best scheme of legislation and the most desirable method of achieving it so far as the Province of Ontario is concerned.

The Provincial Division decided that the most practicable, generally acceptable means of securing the considered judgment of all the professional engineers in Ontario would be through the medium of an Advisory Conference Committee, which would consist of two representatives from those existing organized technical bodies in Ontario, the majority of whose members were professional engineers.

It was accordingly agreed that the Provincial Division should suggest immediately to the following proposed constituent bodies that they appoint two representatives each to such an Advisory Conference Committee:—American Society of Mechanical Engineers; American Institute of Electrical Engineers; Canadian Mining Institute; Canadian Institute of Chemical Engineers; Ontario Association of Architects; *Engineering Institute of Canada.*

Early in December an appropriate letter was forwarded to each of the bodies mentioned above, and satisfactory replies have been received from all of them. While there has been unavoidable delay in securing the official and formal appointment of two representatives from each of these bodies, it is confidently expected that it will be possible to convene the Advisory Conference Committee in Toronto, immediately after the Annual Meeting of *The Engineering Institute,* which will be held the last week in January.

Yours faithfully,
J. B. CHALLIES,
Chairman, Ontario Provincial Division.

REPORT OF COUNCIL MEETING

Since the last issue of *The Journal* three meetings of Council have been held: one on January 26th, one on January 29th and one on February 17th, at all of which a considerable amount of business was transacted.

Approving the reports of committees and branch reports, the agenda of the Annual Meeting and the programme of the Professional Meeting, together with the opening of a ballot, were the main features of the meeting on January 26th.

On January 29th the meeting was held at the Mount Royal Club, Montreal, at which were present: President R. A. Ross, in the chair; Past Presidents Leonard and H. H. Vaughan; Vice-President, H. E. T. Haultain; Councillors, Messrs. W. A. McLean, Alex. Gray, G. Gordon Gale, John Murphy, Julian C. Smith, J. B. Challies, J. E. Gibault, J. M. Robertson, Arthur Surveyer, Frederick B. Brown, Peter Gillespie, Ernest Brown. There were also present Past Presidents Phelps Johnson, Sir John Kennedy, G. H. Duggan, Col. W. P. Anderson and retiring Councillor James White. At this meeting the auditors, the treasurer and secretary, were all re-appointed. Resolutions of thanks were passed to those who had provided papers and entertained the members during the Professional Meeting. The suggestion of the Finance Committee was adopted and it was decided that all members would be asked for a voluntary contribution of two dollars to *The Journal.*

The meeting of February 17th, discussed and transacted a large amount of routine business. The chairmen of the standing committees of Council were nominated, as was a representative to the Canadian Engineering Standards Association, and the Editorial Committee was re-appointed. The question of the appointment of regular committees was left in abeyance pending a decision regarding the status of the committees of the Engineering Standards Ass'n in relation to *The Institute.* A committee consisting of Councillors Gale, Murphy, and Challies, was appointed to consider and report on the classification of applicants mentioned in correspondence with the Ottawa Branch. It was decided that the final date for the addition of names to the Honour Roll would be November 11th, 1918. That is, those who were members on that date or whose applications were of a previous date. A committee was appointed to consider the entire matter of publicity in connection with Institute affairs, papers and addresses presented at branch and other meetings and recommend regulations to the Council for adoption by The Institute in this connection. Routine business consisting of a large amount of correspondence to be noted and giving consideration to all other matters on the agenda completed the business of the evening.

On January 20th the following admissions and transfers were effected:

Members.

Nathaniel Child Mills, B.Sc., C.E., E.E., (Tufts Coll.), of Montreal, P.Q., vice-president and general manager, Montreal Armature Works, Limited; Albert Irving Payne, C. E. (Princeton Univ.), of Calgary, Alta., designing and supervising engr., P. Burns & Co., Ltd.; Wilfred Arthur Winfield, of Halifax, N.S., general superintendent of plant, Maritime Telephone & Telegraph Co., Ltd.; Archibald Edward Wright, of Copper Mountain, B.C., i/c of Canadian Copper Corpn.

Associate Members.

Cecil Henry Biddell, Lieut., D.L.S., of Regina, Sask., draftsman & plan-checker, Surveys Branch, Dept. of Highways; James Andrew Coombs, B.A.Sc. (Univ. of Tor.), of Toronto, Ont., i/c surveys, Nipigon project, Hydro Electric Power Commission; Cecil McGregor Crooks, of Bedford, N.S., i/c office engineering work, Telephone Company of Prince Edward Island; William Oswald Cudworth, of North Bay, Ont., draftsman, Dist. Engr's. Office, C.P.R.; William Andrew Gilmour, M.A.B.Sc., (Edinburgh Univ.), of Montreal, P.Q., assistant engr., Montreal Water & Power Co.; Kenneth Gordon, of Moncton, N.B., signal inspector, C.N.R.; William Arthur Grafftey, B.Sc. (McGill Univ.), of Westmount, P.Q., engr., wood dept., Riordon Pulp & Paper Co., Ltd.; Philip Stancliffe Gregory, B.A., (Bishops Coll.), B.Sc. (McGill Univ.), of Montreal, P.Q., elec. engr., subsidiary distribution companies, Shawinigan Water & Power Co.; Harold Wilson Harkness, B.A., B.Sc., (Queen's Univ.), of Tsinanfu, China, teacher of physics and res. engr. for Shantung Christian University; Henry Francis Hebert, of Toronto, Ont., Hydro Electric Power Commission; Charles Edward Herd, of Montreal, P. Q., design & estimate dept., Dominion Bridge Co., Ltd.; Henry Buell Hicks, Major, of Cranbrook, B.C., dist. engr., Water Rights Branch, Dept. of Lands; Ernest Hodgson Jupp, Lieut., B.A.Sc. (Univ. of Tor.), of Orillia, Ont., asst. engr., McIntyre Gold Mines; Ralph Evans MacVicar, Capt., B. Sc. (McGill Univ.), of Montreal, P.Q., sales engr., Babcock & Wilcocks, Ltd.; C. K. S. Macdonell, Capt., of Barrie, Ont., town engr.; Leslie Briggs McCurdy, Capt., C.E. (N.S. Tech. Coll.), of Truro, N.S., industrial surveyer, D.S.C.R., Halifax; William Gordon McGhie, Major, B.A.Sc. (Univ. of Tor.), of St. Catharines, Ont., sales engr., Canadian Crocker-Wheeler Co. Ltd.; Joseph Starr Mills, of New Glasgow, N.S., asst. engr. on maintenance, C.N.R.; George Charles Perkins, of Lachine, P.Q., 3 yrs. W.A.A., recently demobilized, at present on contract work; Ernest Leslie Pettingill, B.Sc. (Queen's Univ.), of Copper Cliff, Ont., representative on erection of [illegible] dam, International Nickel Comp.; Wesley [illegible] Redfern, B.A.Sc. (Univ. of Tor.), of Toronto, Ont., with F. A. James Co., Ltd.; Arthur Smith, of Hamilton, Ont., private practice, consult. engr.; John James Traill, B.A.Sc., C.E., (Univ. of Tor.), of Toronto, Ont., asst. prof. of hydraulics, Univ. of Toronto; Lewis S. Tuck, B.Sc. (Univ. of Maine), of Kenogami, P.Q., engr., Price Bros. & Co., Ltd.; John Edwin Archibald Wigmore, B.Sc. (McGill Univ.), of Cape Madeleine, P.Q., asst. engr. i/c plant design, St. Maurice Paper Co., Ltd.; Edmund Sprague Winslow, B.Sc., (M.I.T.) (McGill Univ.), of Westmount, P.Q., asst. to gen. mgr., Canadian Ingersoll-Rand and Jenckes Machine Co.; Sylvester Geoffrey Wales, B.S. (Mass. Inst. of Tech.), of Montreal, P.Q., engr. i/c design, Lockwood, Greene & Co. of Canada, Ltd.

Juniors.

Clyde F. Camber, of Minto, N.B., engr. i/c mining operation, Grand Lake Coal Co., Ltd.; George Vibert Douglas, Capt., of Montreal, P.Q., attending McGill University; Bruce Henry Johnston, Lieut., of Toronto, Ont., at present attending University of Toronto; Merle Franklin Ker, B.Sc. (Queen's Univ.), of Niagara Falls, Ont., field draftsman, Hydro Electric Power Commission; Ewen MacEwen, of Montreal, P.Q., 3½ yrs. W.A.A., at present in fourth year, civil engr., McGill University; Donald Henry Macfarlane, Capt., M.C., of Montreal, P.Q., 4 yrs. W.A.A., at present third year Mechanical engr., McGill University; James Harold McFarlane, of St. John, N.B., asst. engr. on construction, Courtenay Bay Drydock and breakwater; Robert Melrose, of St. John, N.B., deputy land surveyor, Prov. of N.B.; Edgar Penney, of Montreal, P.Q., 3 yrs. W.A.A., at present attending McGill University; William Douglas Proctor, Lieut., of Toronto, Ont., 3 yrs. W.A.A., at present attending University of Toronto; Gordon Hamilton Rochester, Capt., of Montreal, P.Q., 4 yrs. W.A.A., at present third year chemical engr., McGill University; George Henry Thurber, of Chatham, N.B., asst. engr., Department of Public Works.

Transferred from the Class of Associate Member to that of Member.

Joseph Aimé Godefroy Coulis, M.E. (McGill Univ. & Ecole Poly.), of Peterboro, Ont., mech. engr., Canadian General Electric Co.; George Grant Hare, B.A.Sc. (C.E.) (McGill Univ.), city engr.; Charles Conyers Kirby, of St. John, N.B., dist. engr., N.B. district, C.P.R.; Francis Fielding Longley, Col., D.S.M., O.B.E., of New York, N.Y., member of firm Hazen, Whipple & Fuller, consult. engrs.; William Lindsay Malcolm, Lt.-Col., M.A., B.Sc. (Queen's Univ.), O.L.S., D.L.S., professor, municipal engineering, Queen's University, Kingston, Ont.

Transferred from the Class of Junior to that of Associate Member.

Timothy Dwight Ruggles, Captain, B.Sc. (Univ. of N.B.), of Kenora, Ont., div. engr., C.P.R.; Harold Sprenger, of Winnipeg, Man., Carter-Halls-Aldinger Co.

Transferred from the Class of Student to that of Associate Member.

James Archibald Knight, Capt., M.C., B.A.Sc. (Univ. of Tor.), of Toronto, Ont., hydraulic design, Hydro Electric Power Commission.

Transferred from the Class of Student to that of Junior.

Frank Douglas Austin, B.A.Sc., (Univ. of Tor.), of Sault Ste. Marie, Ont., asst. to city engr.; William Earle Longworthy, Lieut., M.C., B.A.Sc. (Univ. of Tor.), of Regina, Sask., asst. engr. on sewage; Donald Stuart McPhail, Capt., of Montreal, 4 yrs., civil engineering, McGill University; Harold Morton Roscoe, B.Sc. (McGill Univ.), of Anyox, B.C., asst. mining engr., Hidden Creek Mine, Granby Consolid. Mining, Smelting and Power Co.; Eugene Levering Schellens, B.Sc. (McGill Univ.), of Montreal, P.Q., mechanical representative, Franklin Railway Supply Co. of Canada, Ltd.

* * *

The following Students were admitted, February 17th:—

R. W. Beckett, G. W. Beecroft, P. G. A. Brault, W. R. Bunting, F. C. Carley, J. D. Conover, R. H. B. Cook, A. L. Dobson, P. R. Drummond, M. G. Evans, T. E. J. Flynn, R. B. Glave, J. H. Hickey, J. G. Johnston, H. L. Kennedy, G. E. Kerr, H. T. Kirkpatrick, J. A. Macdonald, T. M. MacIntyre, W. A. Messenger, L. J. Murtha, W. M. Pfeiffer, J. T. Quinlan, W. M. Reynolds, F. H. Schultz, D. J. Shrimpton, J. M. Smith, H. J. Stevenson, L. F. Stokes, L. D. Tatley.

BRANCH NEWS

Victoria Branch

H. M. Bigwood, A.M.E.I.C., Sec.-Treas.

At the meeting of the Victoria Branch of *The Engineering Institute of Canada* held on Wednesday evening, Jan. 14th, in the Provincial Library, a paper was read by D. O. Lewis M.E.I.C. on "The Development of Railways".

To illustrate his address the reader had a large number of excellent photographs showing all types of Railway Locomotives and Carriages from the earliest horse-drawn style which ran on a prepared track, to the Rocket, the famous engine with which George Stephenson won the prize of 500 pounds offered by the Liverpool and Manchester Railway in 1829.

The paper, which is to be followed by a review of the period from the time of the Rocket to the 460 ton locomotive, at some future date, was enjoyed by those present, and a hearty vote of thanks was tendered the lecturer.

The question of vital importance which is occupying the minds of all members at the present time is the probable fate of the Professional Engineers Bill, which goes to the Private Bills Committee for its first consideration, at 10 a.m. on Thursday the 19th inst.

The social activities of the branch are to be curtailed on account of the prevalence of influenza, and the committee has cancelled the reception which should have been held on the 23rd of the month.

On Wednesday, the 11th, a lecture by W. F. Best on the Geology of Mines was attended by a small but very interested audience. Mr. Best had some very interesting sketches and diagrams to illustrate his remarks. The paper was much appreciated by those able to attend, and considerable interest was evinced. Col. A. W. R. Wilby, the vice-chairman of the branch, presided.

WINTER PROGRAMME 1920

Jan. 14—Regular Meeting in Provincial Library.
Paper by D. O. LEWIS, M.E.I.C., "Development of Railways" part II

Jan. 26—Informal Reception in K. of C. Hall.
Fort Street.

Feb. 11—Regular Meeting in Provincial Library.
Paper by W. F. BEST, "Geology of Coal Mines."

Feb. 23—Informal Reception in K. of C. Hall.

Mar. 10—Regular Meeting in Provincial Library.
Paper by Prof. E.G. MATHESON, M.E.I.C. "Sub-Aqueous Foundations."

Mar. 22—Informal Reception in K. of C. Hall.

Apr. 14—Regular Meeting in Provincial Library.
Paper by E. P. GIRDWOOD, M.E.I.C. River Protection, Roads and Bridges.

Apr. 26—Informal Reception in K. of C. Hall.

Vancouver Branch

J. N. Anderson, A.M.E.I.C., Sec.-Treas.

A general meeting of the Vancouver Branch was held on Monday, January 5th, at the Board of Trade Building, at which a very interesting paper entitled "Sunlight Engineering in Relation to Housing and Town Planning" was read by H. L. Seymour, A.M.E.I.C. Mr. Seymour is an authority on Town Planning, and the paper was heard with great interest by all present. Following Mr. Seymour's paper, A. C. Dalzell, M.E.I.C. gave a short talk on "Town Planning Legislation." A general meeting of the Vancouver Branch was held on Tuesday February 3rd, at which a very interesting and thorough paper was read by H. M. Burwell, M.E.I.C., on "The Reclamation of the Northerly Part of Pitt Meadows, B.C.".

Winnipeg Branch

Geo. L. Guy, M.E.I.C., Sec.-Treas.

Regular meetings of the Winnipeg Branch have been held on January 2nd, 21st, and February 5th. At the meeting held on January 2nd, Col. R. H. Mulock, A.M.E.I.C., read a very interesting paper on the "History of Aviation," illustrated by lantern slides, at that on January 21st, Thos. R. Deacon, M.E.I.C., addressed the members on the subject, "Some Considerations in the Use of Powdered Fuels," and on February 5th, Frank H. Martin, chief engineer of the Winnipeg River Power Company presented a paper on the "Economics of Water Wheel Design." Mr. Martin discussed the characteristics which determine their economics with reference to various conditions of head. This address was also well illustrated by lantern slides. At the same meeting the report of the delegates to the Annual Meeting of *The Institute* was received, and a nominating committee was appointed to draft a slate of officers for the ensuing year.

Sault Ste. Marie Branch

Newton L. Somers, A.M.E.I.C., Sec.-Treas.

After an existence of twelve months, the Sault Ste Marie Branch begins its second year, that of 1920, with renewed energy and a resolve on the part of the Executive and the members themselves to increase the use of the Branch to its members, to *The Institute* and to Engineering. As a beginning a Committee consisting of Messrs L. R. Brown, A.M.E.I.C. and Geo. Kohl, A.M.E.I.C. was chosen to act with the Secretary to this end. The first endeavour is to make the meetings of the utmost value to the resident members due to the diversified interests of individual members, it has been decided to keep as far as possible away from highly technical subjects. These, while of great value in themselves and of considerable interest in larger Branches are, in our case, of interest to probably only two or three causing thereby, a gradual falling off of attendance at the meetings. To offset this, talks and papers on subjects of general interest as economic subjects, local problems, engineering history etc. will be given. Our hope is, in this way to interest all the members and at the same time give that class of information in our meetings which we all, as ordinary practising engineers, so woefully lack ie. and appreciation of the broad principles of economics and finance.

Our new policy was launched at the regular monthly meeting on the evening of January 29 by a talk on the "Economics of Mechanical Engineering" given by A. W. Sinnamon, Assistant Chief Engineer of the Algoma Steel Corporation. During the course of the talk, Mr. Sinnamon cited instances of failures of projects due solely to the lack of the necessary knowledge of economics on the part of the engineer in charge; also on the other hand were instances of brilliant success brought about by broad gauge engineers, as efficient in the use of the implements of the financier as of the Engineer. The speaker drew attention to the lack of this particular branch of instruction in our Schools of Engineering and to the efforts and success of Mr. Bond with a course on this sort at McGill. In concluding, the advice of the speaker to the Engineering Profession as a whole was to pay more attention to this important phase of our mental equipment.

The address was very enthusiastically received by those present and as a tribute to the speaker and the popularity of his subject, the Executive was asked to try and induce Mr. Sinnamon to go further into the subject at a future meeting.

Niagara Peninsula Branch

R. P. Johnson, A.M.E.I.C., Secretary.

A meeting of the Branch was held on Feb. 6th, at the Thorold Engineers Club for the purpose of listening to an address on "Recent Theories in Proportioning Concrete" by R. B. Young, A.M.E.I.C., asst. laboratory engineer, Hydro Electric Power Commission of Ontario.

The speaker dealt with theories and practical discoveries which have been made by investigators in the United States and Canada and with his own research work and results in the Hydro laboratories, and showed by means of lantern slide charts and diagrams the great importance of the water content of concrete. The method of obtaining constant strength concrete of different degrees of consistency or workableness by working to a definite ratio of water to cement was described in full.

The speaker described how he had developed Edwards' surface area theory as applied to sand to the course aggregate and the analogy between Abram's fineneness modulus and the surface area principle.

The results of the application of new principles developed in the Hydro laboratories to actual concrete construction work were shown to be of a very satisfactory nature.

The Branch Executive Committee held a meeting on Feb. 3rd and transacted a large amount of business of which the following items are of interest to the membership generally:—

The Chairman has appointed H. L. Bucke, M.E.I.C., as Branch representative on The Institute Nominating Committee for 1920. This appointment has been ratified by the Executive Committee.

The Branch By-Laws as approved by a general meeting of the Branch on Nov. 25th, 1919, have been approved by Council.

In view of the fact that there are, from time to time, appointments to public positions and commissions made by the Provincial Government and that, in the best interests of the public these positions frequently call for the appointment of an engineer:—

Be it resolved:—

That the Executive Committee of the Niagara Peninsula Branch strongly urge upon the Executive Committee of the Ontario Provincial Division the necessity of setting up machinery for bringing these matters promptly to the attention of the Provincial premier at the time they come up for consideraton. It is the opinion of the Niagara Peninsula Branch Executive that a committee of members resident in Toronto should be formed whose duty it would be to interview the government as occasion arises and to follow this up with publicity in the form of write-ups for the Associated Press.

Moved by R. P. Johnson,
Seconded by W. P. Near.

The resolution carried and copies have been sent to the Ontario Provincial Division and to Headquarters for further action.

The question was introduced as to whether the Executive would take any further action in making use of the salary schedule adopted by the Branch on Nov. 25th last. The action of the Toronto Branch in having their schedule printed and distributed was noted. The secretary was instructed to communicate with the Ontario Provincial Division and advise that this Branch Executive is of the opinion that the Provincial Division should take steps to prepare a salary schedule along the lines of those of the Toronto and Niagara Peninsula Branches and that this schedule should be printed and copies sent, to each Branch in the Province with instructions to distribute them to all employers of engineers within the respective Branch radii.

The matter of appointing a Branch Legislation Committee was discussed. On account of the special nature of this subject and the large amount of printed matter requiring perusal and study, it was thought that particular care should be taken in appointing this committee. The Officers were instructed to suggest names for such a committee to the Executive.

The Council and Executive of the Ontario Provincial Division have approved the request of the Branch to hold the 1920 Professional Meeting at Niagara Falls under the auspices of the Branch. The Professional Meeting Committee have held two meetings up to Feb. 3rd and appointed convenors of sub-committees for attending to finance, entertainment, papers and publicity. The convenors of the sub-committees have received instructions to appoint their own committees but suggestions as to personnel in each case have been, made by the general Committee.

The Secretary of the Professional Meeting Committee has been in direct correspondence with the Secretary of the American Institute of Chemical Engineers in connection with holding a joint professional meetings and has ascertained that this will not be feasible as the A.I.C.E. wish to hold their meeting at Montreal.

The dates for the Professional Meeting have been set for September 16th, 17th and 18th.

The attention of members is called to an oversight in the Branch Salary Schedule as published in *The Journal* of December. The signatures of Messrs. N. R. Gibson and D. T. Black should have been shown along with those of the other members of the Salary Committee, Messrs. Lazier, Gisborne and Frost. Mr. Gibson and Mr. Black approved the Salary Committee report but were not present at the meeting at which it was signed and submitted to the Branch.

Border Cities Branch

J. E. Porter, A.M.E.I.C., Sec.-Treas.

The first meeting of the Branch for the New Year was held Monday evening, January 19th, in the Auditorium of the Chamber of Commerce. There were present fifteen members and several friends of the speaker for the evening.

The Branch business at meeting was made very brief, first the election of A. T. Riddell as representative on *The Institute* Nominating Committee, second the matter of the delegate to the Annual Convention at Montreal. This matter was left in the hands of the executive, who later appointed our Chairman, Mr. Craig.

The main feature of the evening was an address by Col. H. J. Lamb, D.S.O., M.E.I.C., who served with distinction with the Canadian Overseas Forces from the outbreak of war in 1914 until 1917 when he was seconded to the Imperials, where, until the spring of 1919, he acted as Assistant Director of Field Works and Fortifications. Col. Lamb had been District Engineer for Department of Public Works in this district, and his remarks were very interesting to all, especially his former business and personal friends present.

The speaker selected for his talk the Second Battle of Ypres and the preparations on the attack on Vimy Ridge. In spite of the fact that Col. Lamb had not prepared a formal paper, his address was listened to with particular interest and pleasure.

A hearty vote of tanks was tendered Col. Lamb and several of the guests of the evening spoke appreciation of his remarks and of his record both overseas and with the Department of Public Works.

The meeting was adjourned at 10.10 p.m.

Peterborough Branch

R. L. Dobbin, M.E.I.C., Secretary.

The regular January meeting of the Peterborough Branch was held on Thursday the 8th, when Mr. Jas. Mackintosh gave a digest of recent proposed legislation in the interests of engineers in Ontario. Mr. Mackintosh gave the history of the various attempts that have been made along this line, and considerable discussion took place among the members present. The merits of the different types of legislation which have been proposed by various bodies were investigated, but no decision was arrived at. The meeting was adjourned until Saturday evening Jan. 24th, when the discussion will be continued.

The Committee appointed to draft a set of By-Laws for the Branch, brought in a report, and after considerable discussion the matter was left over for further consideration.

A special meeting of the Branch was held on Saturday, January 24th, in the Board of Trade Rooms, at 8.00 P.M. The draft of proposed Branch By-Laws were adopted as read, after discussion, were ordered to be sent to the Council for its approval.

P. P. Westbye was appointed to represent the Branch on the Nominating Committee at the Annual Meeting at Montreal.

The discussion on the Proposed Legislation for Engineers was resumed from last meeting, and the discussion was led by Jas. Mackintosh, the chairman of the Special Legislation Committee. The different points of the two drafts now before the Ontario engineers were clarified. The following resolution was passed, "That the Peterborough Branch is in favor of some form of legislation in the interests of the Engineers of the Province."

On Thursday, February 19th, 1920, the Branch entertained J. Grove Smith, Dominion Fire Commissioner, of the Department of Insurance at Ottawa. Mr. Smith spoke to a combined meeting of the Board of Trade and the Branch, on the Economical Significance of Canada's Fire Waste. Mr. Smith used three reels of moving pictures to illustrate his subject.

During the afternoon Mr. Smith was taken around the City and inspected the fire fighting facilities, and the Waterworks Department.

Toronto Branch

H. A. Goldman, A.M.E.I.C., Secretary.

A regular meeting of the Branch was held at the Mining Building of the University of Toronto on Thursday, February 12th, 1920 at 8.15 P.M.

The Chairman (R. O. Wynne-Roberts) presided.

The minutes of the previous meeting were read and approved.

The Chairman read several notices of open engineering positions in Ontario for which applicants were sought.

The Chairman then called upon the first speaker of the evening, Capt. F. A. Dallyn, to speak on conditions in Siberia.

Capt. Dallyn opened his remarks with the statement that "Unhappily very little favorable could be said about the efficiency or ability of the Kolchak Government." He then proceeded to tell a tale of unhappiness, misery, disease and filth that existed there. He told of hospitals where the patients numbered double the capacity of the rooms, and therefore, half of them had no beds and had to lie on the floor. He told of large camps where the majority of the inmates were suffering from typhoid fever, and in such condition were lying in cold damp places, no covering, no heat and not a single doctor to attend to them. There was not the least possible chance, Capt. Dallyn said, for any one of them to recover because no human organism could resist such conditions. He further told of refugees being packed in box cars and sent forth back and from station to station, thus increasing considerably the time required in reaching a certain destination. Sometimes these cars were not opened for several days in succession when no provisions were available. Many of these unfortunate ones were afflicted with sickness and disease, many of them died on the road and were thrown out of the cars. Looking through one of the windows of these box cars, Capt. Dallyn said, those inside did not at all appear to resemble human beings any more, they looked more like animals of the lower type.

Such and similar pictures of conditions in Siberia were described by Capt. Dallyn.

Major Hertzberg, who spoke after Capt. Dallyn, confined himself chiefly to his military experiences and duties that he had to perform in Siberia. These duties consisted in building, fitting out and constructing barracks for the troops which arrived at Vladivostock.

Major Adams, who followed Major Hertzberg, spoke on the lack of proper law and order under the Siberian Government. "Why," he said, "the people there thought less of killing a man than we do of killing a rat. The idea prevailing that if you won't kill the other fellow he will kill you."

He said that when the Government had suspicion of certain individuals who were not quite in sympathy with the Omsk Government, these individuals would be arrested as political offenders, would be sent away from the city and on the journey would be shot on the pretense that they attempted to escape. This practice was carried on to such an extent that the Allied representatives became really alarmed, fearing that the thing was going too far. Reports came in of the execution of such offenders on the excuse of attempting to escape when the evidences were such that there could not be even any possibility of intention to escape. Pressure was therefore brought on the Government to have such offenders brought back and tried by a proper court. There were eight such offenders at that time, and the result was that every one of them was released.

A number of slides were shown on the screen throughout the evening, illustrating the talks and making them so much more impressive and instructive.

List of Subject for Discussion

Every Thursday, at 8.15 p.m., at Engineers' Club.

Feb. 5—Romance of Heat.
By E. METCALF-SHAW.

Feb. 12—Siberia.
Captain F. A. DALLYN and Major C. S. L. HERTZBERG.

Feb. 19—Experimental Roads.
By BRUCE ALDRICH.

Feb. 26—York Township Sewerage Scheme.
By J. M. M. GREIG.

Mar. 4—Debate on "Should Engineers Unionize?"
Positive side By W. SNAITH. Negative side by Prof. P. GILLESPIE.

Mar. 11—Toronto Harbor Works.
By GEO. T. CLARK.

Mar. 18—Automatic Telephones.
By F. A. BANKS. At Physics Building, University.

Mar. 25—Concerning Bridges.
By FRANK BARBER.

Apr. 1—Town Planning and the Canadian Engineer.
By A. V. HALL.

Apr. 8—Chemistry and Engineering.
By T. LINSAY CROSSLEY.

Apr. 15—Sarnia Intake.
By F. W. THOROLD.
Reinforced Concrete Pipes.
By H. W. HEYWOOD.

Apr. 22—Application of the Venturi Principles.
By E. DEAN WILKES.

Apr. 29—Dredging.
By W. E. M. BONN.

May 6—Ontario Highway Policy.
By W. A. McLEAN.

Partial List of Papers Promised for the Autumn Session

Chippewa Hydro Electric Power Scheme.
By H. G. ACRES.

Geology in Relation to Engineering.
By C. W. KNIGHT.

Hydro Radials.
By F. A. GABY.

General Refining Practice.
By C. E. DEAN.

Progress and Development in Design of Centrifugal Pumps.
By T. M. JONES and A. T. CLARK.

New Toronto Union Station.
By J. R. W. AMBROSE.

Design of Sewage Treatment Works.
By W. R. WORTHINGTON.

Pumps and Power.
By JAMES MILNE.

Reinforced Concrete.
By J. C. KRUMM.

Mesopotamia.
Captain L. WYNNE-ROBERTS, R.E.

Engineers in Relation to Contractors.
By W. E. DOUGLAS.

Forms for Concrete Work.
By T. T. BLACK.

Steel Forging and Heat Treating Furnaces.
By R. R. KNIGHT.

Purchase of Fuel on B.t.u. Basis.
By Prof. L. M. ARKLEY.

Street Paving.
By MURRAY A. STEWART.

Toronto Gas Works.
By A. HEWITT.

Hydro Electric Power.
By T. H. HOGG.

Concrete.
By R. B. YOUNG.

Kingston Branch

W. P. Wilgar, A.M.E.I.C., Sec.-Treas.

An open meeting of the Branch was held in Fleming Hall, Queen's University at 8.00 p.m. Tuesday January 20th 1920.

The minutes of the previous meeting were read and approved.

J. M. Campbell read a very interesting and instructive paper on the Electrical Power Plant at Kingston Mills.

The paper was discussed by Prof. Alexander Macphail, C.M.G. and Prof. W. P. Wilgar.

A hearty vote of thanks was tendered by the chairman to the speaker.

The meeting adjourned at 10 p.m.

Ottawa Branch

M. F. Cochrane, A.M.E.I.C., Sec.-Treas.

The first Branch Luncheon for the year was held on February 12th, when J. A. Wilson, A.M.E.I.C., Assistant Deputy Minister of the Naval Service, addressed a large gathering of the members on "Progress in Aviation."

Mr. Wilson has recently visited England in his capacity as Member of the Canadian Air Board, and, while there, inspected many of the air stations under the control of the Air Ministry and the factories of the principal aricraft manufacturers.

Mr. Wilson gave a very able and interesting address covering a wide field. His address will be published in a later number of *The Journal.*

The members of the branch executive have felt for some time that it would be a great advantage to have closer working arrangements with the other technical and scientific associations in Ottawa, so as to avoid overlapping of meetings, to arrange for joint meetings, and to co-operate in securing speakers, etc.

The success of the recent joint meeting with the Architects and Town Planners led to an arrangement by which three members of the branch should meet with an equal number of representatives from each of the ten other principal technical associations in Ottawa, to discuss means of co-operation. This meeting was held on February 6th, but it was soon evident that the delegates from the other associations wished to make use of this opportunity to discuss more ambitious aims, and, after receiving the views of the members of the Ottawa Branch, it was decided that advantage should be taken of this representative meeting to decide what steps would be most effective in protecting the interest of all the scientific and technical officiers in the Federal Civil Service. Since that time other meetings have been held, and an Institute of Professional Civil Servants has been organized. This, of course, has no connection with *The Engineering Institute* except that it will probably contain many members in common with *The Institute.*

At the recent Annual Convention of the Dominion Land Surveyors two papers were read by members of the branch. One by Major Nelles, on Standard Topographical Maps, showing how the standard rules laid down by the International Map Committee which met in London in 1909 could be most usefully applied in Canada, the other was by Mr. Lambart, on the latest developments in Aerial Photography as applied to surveying.

Montreal Branch

Frederick B. Brown, M.E.I.C., Sec.-Treas.

"Thursday evening at 8.15" is once more the slogan, and the regular meetings of the spring programme well under way.

The first regular meeting of the new session was held on Thursday evening February 12th, Mr. Walter J. Francis, in the chair, when John Murphy, M.E.I.C., delivered an address on the formation of frazil and anchor ice. The lecture was illustrated with moving picture films and the attendance was one of the largest of the present winter season, the hall at Headquarters being crowded to capacity.

The pictures were the result of a series of experiments carried out in the Chateau Laurier, Ottawa. They were taken by the photographers and staff of the Canadian Department of Trade and Commerce under the direction of Mr. Murphy. The apparatus used included a number of large water bottles, distilled water, and a moving picture camera with microscopic lens. The pictures showed in detail the formation of the ice in the bottles, in shadowy flakes, which gradually became clearer, until they formed in groups and massed into a coalescent body, either at the top or bottom of the container. It was the first time that these pictures have been displayed, but it was stated that a number of films had been made, and that these would be available for the use of other branches of *The Institute*.

In the course of his lecture Mr. Murphy explained that the motive of the pictures was to show on graphic form the manner of the formation of frazil and anchor ice, and the way in which it interfered with water power machinery. As a result of twenty years' study, much of it with Prof. Barnes of McGill, it had been established that a difference of 1-1000 degree in temperature made all the difference between clogging of machinery by frazil ice, or clear working of the machinery. If the metal parts were a thousandth of a degree above the freezing point they would have no trouble; if a thousandth part of a degree below they would attract the frazil, and in an incredibly short time become clogged.

To avert this expensive danger to water power machinery, Mr. Murphy argued that easy and cheap methods could be used to raise the temperature of the machinery or water to a point where danger from frazil or anchor ice would be avoided. In the films a bottle was shown where frazil was forming with two steel rods immersed. One was just above freezing point, the other just below, the former remained clear as the frazil formed, but within a few moments the latter was covered with growing masses of ice.

Mr. Murphy showed some slides of a river near Dixon, Illinois, and read some correspondence with the companies concerned, in connection with a famous lawsuit brought by an ice harvesting company against an industrial plant upstream. It was shown that the plant upstream discharged eight cubic feet per second of warm exhaust water (at about 50° F.) into the stream flowing about 1000 C. F. S. This amount, [illegible] of the stream flow at 32° (about freezing), was sufficient to prevent the formation of ice for nearly two miles downstream, keeping the river actually open all winter and causing the lawsuit, which ran for five years through a dozen courts. In other words, if the whole volume of a river could be warmed a small fraction of one degree there would be no formation of ice for long distances downstream. Mr. Murphy put forward the suggestion seriously that many rivers, possibly including the St. Lawrence, could be so treated by a method of scientifically applying a small quantity of heat, that ice troubles and consequent flooding damages might be entirely eliminated.

A regular meeting of the Branch was held on the evening of February 19th, Chairman J. H. Hunter, at which Lieut. C. C. Brooks, M.C., gave an illustrated lecture on "Aerial Photography in the War." Lieut. Brooks traced the remarkable development of aerial photography during the war and showed a number of interesting slides made from actual aeroplane photographs taken at the front, the majority of these showing Vimy Ridge and vicinity. Lieut. Brooks pointed out in the course of his lecture that one of the most striking developments had been that of stereoscopic photography, which was found to be of great value in showing up special features in a landscape, such as gun emplacements, etc. He pointed out the value of aeroplane photographs in topographic survey, and indicated the possibilities in this direction.

During the intermission an opportunity was given to members present to examine a number of aeroplane photographies taken on the Canadian front. A short discussion followed, during which Brig. Gen. C. J. Armstrong spoke briefly on the value of aerial photography in war time and testified to the accuracy of Lieut. Brooks' work. A number of members contributed to the discussion.

PROGRAMME OF MEETINGS

February to April 1920

Always at 8.15 p.m. sharp.
Always on Thursday evening.

Feb. 12—Ice Formation.
Illustrated by Moving Pictures. By JOHN MURPHY, M.E.I.C.
Chairman: Mr. Francis.

Feb. 19—Aerial Photography in War.
By Lieut. C. C. BROOKS, M.C.
Chairman—Mr. Hunter.

Feb. 26—Electro Metallurgical Demonstration.
By ALFRED STANSFIELD, D.Sc., F.R.S.C., M.E.I.C., & CLARENCE V. CHRISTIE, B.Sc., M.A., M.E.I.C.
Chairman: [illegible]
(Postponed.)

Mar. 4—Industrial Relations.
By J. S. CAMERON, A.M.E.I.C.
Chairman—Mr. Rutherford.

Mar. 11—Steam Turbines; Manufacture & Testing.
By G. E. NEWELL.
Chairman—Mr. G. K. McDougall.

Mar. 18—The Utilization of Lignite.
By R. de L. FRENCH, M.E.I.C.
Chairman—Mr. MacLeod.
Moving Pictures will be shown Illustrating the Peat Industry.
By E. V. Moore, M.E.I.C.

Mar. 25—Replanning Montreal & District.
By JAMES EWING, M.E.I.C.
Chairman—Mr. Lefebvre.

Apr. 1—No meeting—Easter vacation.

Apr. 8—St. Maurice River Regulation: the Gouin Dam.
By O. LEFEBVRE, M.E.I.C.
Chairman—Mr. Surveyer.

Apr. 15—Naval Gunnery.
By LORD CONGLETON, J.E.I.C.
Chairman—Mr. Farmer.

Apr. 22—Cotton Rope for Power Transmission.
By J. MELVILLE ALLISON.
Chairman—Mr. Newell.

Apr. 29—The Engineering Features of Tramway Operation.
By D. E. BLAIR, A.M.E.I.C.
Chairman—Mr. Burnett.

St. John Branch

A. R. Crookshank, M.E.I.C., Secretary.

How best to protect St. John harbor from heavy seas, great tides and undertow, formed a live topic of discussion at a meeting of the St. John branch of the Canadian Engineering Institute in the old post office building on January 22. F. W. Holt, C.E., read an interesting paper on the subject. He also proposed the development of the outer section of the west side from Sheldon's Point to Negro Point, the reclaimed land to be used for manufacturing purposes and for docks and terminals. Instead of a continuation of the Negro Point breakwater to Partridge Island, he proposed the construction of a breakwater 2500 eventually 10,200 feet long to the westward of the island and extending towords Sheldon's Point, leaving the passage between the island and the mainland open. He believed in building a breakwater side-on to the seas and not bow-on. He admitted that the development of the locality he mentioned and the construction of a long breakwater would cost a very large sum, but thought it would be financially possible and profitable as well. He mentioned the fact the $25,000,000 had been spent in developing Halifax harbor.

City and town planning and engineering problems were considered at a joint public meeting ofthe St. John branch of *The Engineering Institute of Canada*, the housing committees of the Commercial Club and Board of Trade, held at the Board of Trade rooms. C. C. Kirby, C.E., presided, and A. R. Crookshank flashed numerous views on the screen. Among those present were Mayor Hayes, R. W. Wigmore, M.P., commissioners Thornton and Fisher.

W. F. Burditt, chairman of the St. John town planning and city expansion committee, read a very interesting paper on "Town Planning and Engineering Problems," and H. L. Syemour, A.M.E.I.C., engineer assistant to the dominion housing and town planning adviser at Ottawa, spoke of "Some of the General Principles of city Planning with Application to St. John."

Mr. Burditt called attention to the fact that town planning was essentially an engineering problem and suggested two leading principles, adaptation to purpose and adaptation to site. These were the main ideas to be kept in mind. It was obvious that the streets of a city could not be planned without considering the purposes they are to serve. In laying out streets in the past, future plans had been largely disregarded, as many of them were laid out merely to sell land. When a man plans a home he usually provide, for every convenience he can afford.

Cities should be planned as is the modern factory. Streets should not be laid out without due provision for traffic, as they have been in the past. In some American cities it has been estimated that ten per cent of the people's time is lost by the poorly laid out streets. Views of cities having the radial system of street planning were showed on the screen. The rectangular plan, Mr. Burditt said, was the least advantageous from an architectural standpoint.

Mr. Burditt also spoke of other developments comtemplated, including the erection of a new Union Station. He suggested a viaduct for the relief of traffic, and that a new street be built from the corner of Charlotte and Union Streets to the General Public Hospital, with the widening of Charlotte and Union Streets.

Mr. Burditt spoke of the excellent opportunities for a system of parks and scenic drives in the wild, rock country which lies to the northward of the city. He thought that now was the time to reserve land while it was cheap. Proper roads would open up part of that district. By way of illustration, views of parks in Boston and elsewhere were shown. Mr. Burditt said that the beauties of the wilds of St. John were not excelled by eastern parks anywhere. He also said that St. John had thirty miles of waterfront which could be improved and beautified as had been done by cities elsewhere, some no larger than St. John.

Mr. Seymour spoke of visiting the wilds of St. John with which he was duly impressed. He said that legislation was an important matter as it was necessary to make town planning effective. In the absence of legislation the best laid out town might become a poorly managed lace. The zone system, backed by law, prevented the building of stables and other objectionable buildings. All but two provinces had town planning legislation and many countries had either adopted it or were considering it. Accurate topographical maps were also necessary.

A union depot, said Mr. Seymour, should be as near to the business centre as possible. Regarding bridge building he said architects were as necessary as engineers. Factories should be located on the side of a city from which the wind does not blow generally. From figures furnished by D. L. Hutchinson of the St. John Observatory, he learned that the prevailing directions from which the wind blew here were northwest, west and south. Sunshine was an important factor when considering the height of buildings in relation to the width of streets. He was surprised to find that St. John had 1,800 hours of sunlight in 1918, or 40 per cent of the possible. Fredericton had only eighty-two hours more. Toronto had twenty-six hours less sunlight than St. John in winter, but 310 more in summer. When high buildings are too close the light is shut out of offices and the buildings become less profitable. Tall buildings were not profitable. Buildings in St. John should be, on Prince William and parallel streets, eighty-nine feet, and on the south of King and Broad streets, forty-one feet high. On the south side of Princess street they should only be twenty and one-half feet high.

Halifax Branch

F. R. Faulkner, M.E.I.C., Sec.-Treas.

The activities of the Halifax Branch during the month of January were largely confined to committee work. At the regular meeting held in December, as the result of an open discussion on the proposed bridge between Halifax and Dartmouth, a committee was appointed to investigate this question with special reference to the technical points involved. The commercial organizations of Halifax and Dartmouth have organized a general committee, consisting of one member each from these various bodies, and the chairman of our bridge committee, L. H. Wheaton, A.M.E.I.C., was appointed as our representative on this general committee to deal particularly with the Technical questions.

The Branch has also received a tentative offer from some business men of Halifax and Dartmouth to finance the preliminary investigations necessary, and the Branch has offered to carry on such work at cost. Such an investigation would demonstrate to the general public, most forcibly, the value of our organization to them.

The question of Legislation has been engaging the attention of the Engineers of the Province. In October a meeting in the city elected a temporary committee to take this matter in hand. That committee compiled a list of Engineers in the Province to whom notices were sent calling for a general meeting early in January. At that meeting the above committee was continued in office with power to add to the number and the meeting unanimously approved of the idea of securing legislation and resolved to devote their best efforts to secure it.

A copy of the proposed bill was sent to all engineers in the Province who were not already familiar with it, with a request for carefully considered criticisms of its clauses. Accompanying this was a ballot to be used for the election of the provisional council. Another meeting was held on Feb. 12th at which the provisional council were elected.

The Engineers of Nova Scotia are particularly fortunate in having as chairman of this committee, C. E. W. Dodwell, M.E.I.C., who may be said to be the father of legislation in this Province. About twenty years ago Mr. Dodwell was one of the leaders in a movement to obtain legal recognition and protection for the Engineering Profession in Nova Scotia and such legislation was defeated at the time. Mr. Dodwell was again on the firing line when the question was revived about a year ago. He was our representative on the general committee in Montreal last April and was elected chairman of that body. At the meeting held on February 12th he was elected President of the Provisional Council. The secretary of the local committee is W. P. Morrison, M.E.I.C., who can be reached at the Customs Building, Halifax.

A special meeting of the Branch was held in the Assembly Hall of the Nova Scotia Technical College on Monday, February 16th. This meeting was an open meeting to which we invited students of the Engineering Society of Dalhousie, the students of the Nova Scotia Technical College, and a number of others in the city who were interested in the subject of this meeting.

Professor Spencer, A.M.E.I.C., of Dalhousie had procured a two reel film from the Kopper's Manufacturing Company, showing a modern By-product Coke Plant.

Running off the film occupied nearly half an hour and was watched with interest by every one present, every seat in the Assembly Hall being filled. The film showed the various stages in the production of coke from the time the coal was fed into the oven until it was withdrawn, quenched, screened and loaded for shipment. The various appliances used in the collection and treatment of the by-products were also shown.

After the film was finished, the chairman, F. A. Bowman, took charge of the meeting and called for a discussion. Mr. Hamilton of the Nova Scotia Tramways and Power Company spoke for some minutes, drawing the attention of the meeting to various points in the pictures and particularly to the large amount of mechanical appliances that were used. Professor Spencer, in explaining the film in general, noted particularly the growth of plants of this type during a comparatively short period.

C. E. W. Dodwell, M.E.I.C., read some extracts from articles of his own on the Natural Resources of Canada, dealing particularly with the production of Coke and its by-products. He particularly emphasized the wastefulness of the Bee Hive type of oven and predicted that before long no ovens of that type would be allowed to operate. He urged the increasing use of by-product ovens, not only to conserve our coal resources, but to enable us to compete successfully with other countries in manufacturing articles into which these by-products enter.

PERSONALS

C. A. Joulton, Jr., E.I.C., is now with E. G. M. Cape Company, Limited, Montreal, and is at present stationed in Sherbrooke, P.Q.

*

Baron Gustave de Coriolis, A.M.E.I.C., is once more leaving Canada for Paris, where he expects to remain for several years.

*

Arthur Fournier, A.M.E.I.C., has joined the firm of Primeau and Co. Ltd., Builders Supplies, Quebec city, as Vice-President and Sales Manager.

*

T. W. Lesage, M.E.I.C., superintendent of the waterworks of the city, is retiring from the service of Montreal after his long service.

*

H. M. Campbell, J.E.I.C., has resigned from the Welland Ship Canal staff and is now Production Engineer at the works of Whitman-Barnes, St. Catharines.

*

R. R. Knight, M.E.I.C., has recently accepted a position as Toronto engineer and manager of Francis Hankin & Co., Limited, with headquarters at 609 Temple Building, Toronto.

*

W. B. MacDonald, M.E.I.C., has resigned as Mechanical Engineer of the Welland Ship Canal and is now Superintendent of the Electric Steel and Metal Companies' plant at Welland.

*

Lieut. Col. George W. MacLeod, D.S.O., A.M.E.I.C. of Edmonton, Alta was elected president of the Alberta Land Surveyer's Asso. at a meeting of that body held in Edmonton on January 20th.

*

J. N. Aggiman, A.M.E.I.C., has just left on a four month's tour to Eastern Europe to investigate and report on engineering prospects for Anerican interests. His present address is Helvig Han, No. 28 Pera, Constantinople, Turkey.

*

Frank O'B. Nehin, A.M.E.I.C., formerly assistant engineer for the Mount Royal Tunnel and Terminal Company has transferred his business connections and is now field engineer for the Beaver Board Company, Buffalo, N.Y.

*

G. M. Hamilton, M.C., A.M.E.I.C., has resigned from the Welland Ship Canal staff and started in business for himself at Niagara Falls as agent for the Willard Battery Service. His place of business is in the Clifton Hotel building.

*

Capt. N. J. Wallis, A.M.E.I.C., who was overseas with the Canadian Engineers, returned to Canada in November last, and is at present District Engineer, Reclamation Branch, Public Works of Manitoba, Winnipeg, Man.

Stanley A. Neilson, B.Sc., J.E.I.C., was married on January 28th, 1920 to Hazel Jean, daughter of Mrs. John John Allan. Mr. Neilson is a son of the late Matthew Neilson, C.E. who was one of the old time members of the E.I.C., when it was known as the Canadian Society of Civil Engineers.

*

Major A. S. Dawes, A.M.E.I.C., enlisted with the 21st Battery, C.F.A. in February 1915. He arrived in France in May 1915 and was posted to the 2nd Brigade C.F.A. He was twice wounded and in October 1917 was awarded the Military Cross. He returned to Canada and was demobilized in April 1919.

*

H. H. Charles, Esq., A.M.E.I.C. enlisted as a sapper in the C.O.R.C.C. in March 1915, and went to France in August 1915. He rose to the rank of Acting Major, and on becoming a casualty reverted to Captain which rank he retained. He returned to Canada in April 1919, and was demobilized in September 1919.

*

M. L. D. McFarlane, S.E.I.C., enlisted in 1914 with the Middlesex Regiment, going to France the same year, where he was transferred to the R.F.C. and subsequently served with that unit. He is now about to be invalided on account of wounds received while on active service.

*

G. P. Morse, A.M.E.I.C., since returning from overseas is located in Winnipeg as Assistant Engineer, Public Works of Canada. Besides service with the 10th Battalion, C.E. during the 1918 campaign, he was specially employed by the War Office in Ireland and elsewhere, in charge of aerodrome construction.

*

E. E. Down, Jr., E.I.C., has joined the field engineering staff of the Hydro-Electric Power Commission on Niagara Power Development at Niagara Falls, and has identified himself actively with the Niagara Peninsula Branch of *The Institute*. Mr. Down was demobilized in May 1919 from "A" Company, 2nd Battallon, Canadian Engineers.

*

Howard Kelley, M.E.I.C., President of the Grand Trunk Railway has been nominated as the Chairman of the Dominion Railway Board which will manage the Grand Trunk Railway and the Grand Trunk Pacific Railway, pending their absorption in the Canadian National System. S. J. Hungerford, M.E.I.C., has been mentioned as a probable addition to this Board.

*

K. H. Smith, A.M.E.I.C., Chief Engineer of the Nova Scotia Power Commission addressed the Commercial Club of St. John, N.B. on February 13th, his subject being; "Liquid Assets of the Maritime Provinces." Mr. Smith dealt with the proposed hydro-electric developments with particular reference to those under actual construction and those contemplated for the immediate future.

*

E. J. Owens, Jr. E.I.C., office engineer of the St. John & Quebec Ry. has been appointed office engineer of the Dept. of Public Works, Highway Division, reporting directly to Barton M. Hill, M.E.I.C., the Provincial Road Engineer. Mr. Owen is still acting as office engineer of the railway under the control of C. O. Foss, M.E.I.C., chief engineer, whose services have been retained by the Government in a consulting capacity.

A. W. Haddow, B.A.Sc., A.M.E.I.C., City Engineer, Edmonton, Alta. has just been appointed City Commissioner of Public Works. The Commission Board now consists of the Mayor and two permanent appointees. Mr. Haddow took his degree at Queen's University and entered the City Engineering Dept. in 1909, was appointed Acting City Engineer in 1916, and City Engineer in 1919. He will still continue his duties as City Engineer.

E. C. Gaines, M.E.I.C., who for the last three years has been engineer in charge of the crane and conveying machinery departments for the Dominion Bridge Company has severed his connection with the above firm, and will return to the United States. He has accepted a position with the Mead Morrison Mfg. Company and will be located at their Chicago office. The latter Company specializes on coal handling and hoisting machinery equipment.

Capt. C. S. Walley, M.C., Jr., E.I.C., enlisted as a trooper in the 2nd Field Company Canadian Engineers in April 1915. He was transferred to the 44th Battalion, C.E.F. as a private, and received his commission as Lieutenant in October 1915. He was awarded the Military Cross in January 1918, and in May 1918 was gazetted Captain to the 9th Battalion, Canadian Engineers. He returned to Canada and was demobilized in April 1919.

H. E. M. Kensit, M.E.I.C., enlisted in September 1915 with the Canadian Engineers, and served in France as a sapper with the 2nd Field Company. He was severely wounded at Vimy Ridge in April 1917, and on leaving hospital was transferred to the Ministry of Munitions of War, England as Dilution officer. He was engaged in the inspection and organization of munitions works and national factories till January 1919.

Lieut. H. Sprenger, Jr., E.I.C., enlisted in the 100th Regiment Winnipeg Grenadiers in December 1915, went overseas in November 1916 and was transferred to the Canadian Engineers in February 1917. In May 1918 he was appointed engineering officer to Canadian Corps Heavy Artillery and was in charge of all engineering work in connection with heavy artillery positions, bridges, camouflage, etc. He left France in March 1919 and was demobilized in Canada in August 1919.

Lieut. Arthur C. Oxley, D.C.M., M.C., A.M.E.I.C., enlisted in September 1914 as a sapper with the 2nd Field Company, Canadian Engineers. In November 1916 he was appointed to commissioned rank in C.E.T.D. and served in Canada, England and France with the 2nd F.C.C.E., 124 Pioneer Battalion, and the 10th Battalion, Canadian Engineers. He was awarded the D.C.M., and M.C., and was mentioned in Sir. Douglas Haig's despatches. Lieut. Oxley was demobilized in June 1919.

J. A. Symes, A.M.E.I.C., received his commission in April 1915 in the 38th Ottawa Battalion. He left for overseas in March 1916, was musketry and bombing officer with the 6th Reserve Brigade during the early part of 1917, and was later with the Canadian Corps Troops in France engaged in tramway construction, tunnelling and surveying, and construction of trench systems etc. He was invalided to England in August 1918 and is now resident in Ottawa.

Capt. Wilfred E. Hobbs, A.M.E.I.C., enlisted in February 1916, with the Canadian Engineers, was camp engineer at Camp Hughes from June to November 1916, when he was transferred to the Canadian Forestry Corps, and was adjutant of the 116th Company C.F.C. He was promoted to 2nd in command of the 13th Aerodrome Company, C.F.C., B.E.F. He was later promoted to O.C. of the 10th Aerodrome Company, and returned to Canada in July 1919.

James White, M.E.I.C., Deputy Head of the Commission of Conservation, addressed the National Conference on the Fur Industry and Wild Life Protection at the Windsor Hotel, Montreal, on Thursday, February 19th, the subject being "What the Fur Industry Convention may accomplish." This Convention which was held under the joint auspices of the Commission of Conservation and the Advisory Board on Wild Life Protection, and which was the first of its kind to be held Canada, was a great success.

R. S. Lea, M.E.I.C., & W. S. Lea, M.E.I.C., Consulting Engineers have prepared a report for the City of Montreal on the aqueduct project for a larger water supply. Three schemes have been presented, the first to use the aqueduct as a water supply only, the other two to use the aqueduct partly for power and partly for water. It is recommended that the aqueduct be completed for water supply purposes only at a cost of $[illegible], that a new motor driven power plant be provided, and that the capacity of the filtration plant be increased.

Lieut. F. Alport, M.C., A.M.E.I.C., enlisted in November 1914, going to England in April 1915 as sergeant No. 6 Field Company, 2nd Canadian Division, and to France in September 1915. He was wounded in October 1915, getting his commission in December 1916. In April 1918 he was adjutant 4th Canadian Division Engineers, and in May 1918 he was staff captain of the 4th Bde. C.E. Lieut. Alport was awarded the Military Cross in October 1918. He returned to Canada in July 1919, and now resides in Orillia, Ont.

About 50 officials and employees of Morris Knowles, Inc. of Pittsburg, Pa., were entertained recently at the University Club, on the occasion of the annual dinner of the company. At the dinner, Morris Knowles, M.E.I.C. made the announcement that the organization had been consolidated with that of the late Wallace Pratt of Cleveland, and that the Cleveland office would continue to be operated. The work of the combined organizations would continue along the lines already developed in connection with hydraulic engineering, town planning, industrial housing, etc.

Howard W. Tye, M.C., A.M.E.I.C., enlisted as Lieutenant with the 195th Battalion in January 1916, going overseas in November 1916. On arrival in England the 195th Battalion was broken up and Lieutenant Tye was transferred to the 78th Battalion, serving with that unit in France from December 1916 till May 1918, taking part in the actions at Vimy Ridge, Courcellette, Avion, and Passchendaele. In May 1918 he was invalided to England with trench fever and influenza. Lieut Tye was awarded the Military Cross for services at Passchendaele. He returned to Canada in the early part of 1919.

*

Lieut. W. H. Richardson, M.C., S.E.I.C., enlisted with the Canadian Engineers in November 1914, and was transferred to the 2nd Division Signal Company on the formation of the 2nd Division. He went to France in September 1915 and was commissioned in November 1915 in the 8th Battalion of the London Regiment. In June 1917 he was awarded the Military Cross and in September 1917 was given a Bar to the M.C. He was wounded in action on September 20, 1917 and was transferred to the Territorial Reserve Force in November 1918.

*

Major A. P. Linton, A.M.E.I.C., was commissioned a Lieut. with the 68th Battalion in July 1916. After arrival in England he was transferred to the 1st Battalion, Canadian Pioneers, and served with them in France and Belgium. From June 1917 till September 1918, Lieut. Linton was with the 9th Battalion, Canadian Railway Troops, and was later commanding officer of the 1st Bridging Company, Canadian Railway Troops, serving in Palestine and Syria with the Egyptian Expeditionary Force. He was granted the O.B.E. in 1919. In 1916 he was promoted to Captain, and in 1917 promoted to Major.

*

Capt. Henry C. McMordie, Jr., E.I.C., enlisted in Winnipeg in October 1914 with the Cameron Highlanders of Canada, and arrived in England in May 1915. From October 1915 till September 1916 he was assistant instructer in engineering at Canadian Military School, Shorncliffe. He served in France with the 42nd Field Co., Canadian Engineers (later 42nd Battalion, C.E.) from September 1916 till November 1918, when he was invalided to England. He was for five months at Canadian Headquarters, Rhyl. Wales as railway transport officer, and was demobilized from the C.E.F. in July 1919.

*

Major C. Flint, A.M.E.I.C., enlisted in April 1915 with the Canadian Overseas Railway Construction Corps, serving as lieutenant in Belgium and France until February 1917, when he was transferred as major to the 4th Battalion C.R.T. He was seconded to Royal Naval Seige Guns (on Flanders Coast, Nieuport) from April 1917 till January 1919 when he was engaged in mounting and transportation of heavy naval guns and construction of concrete emplacements. He was awarded the D.S.O. in June 1918, the Croix de Guerre (France) in Dec. 1918, and was mentioned in despatches in Dec. 1918.

Lt. Col. Ibbotson Leonard, D.S.O., A.M.E.I.C., enlisted in the 24th Battalion in October 1914 and was given command of the 7th Canadian Mounted Rifles in January 1915. He went to France in September 1915 as O.C. Mounted Troops 2nd Canadian Division until all Canadian Divisional Cavalry was formed into Canadian Light Horse in the Field in May 1916. He commanded the C.L.H. from March 1917 until the armistice was signed, serving continuously in France and participating in all the engagements of the Canadian Corps from the time of its formation. Lt.-Col. Leonard was twice mentioned in despatches, and was awarded the D.S.O. for distinguished services in the field.

*

H. C. Kennedy, A.M.E.I.C., enlisted with the 24th Battalion, V.R. in May 1915, and was with that Battalion from May to November 1915 in both England and France. In November 1915 he was invalided to England, and in January 1916 was attached to the 39th Battalion and promoted to Captain. In July 1916 he was transferred to the Canadian Army Corps, and in August 1917 was seconded to the War Office and was resident engineer on Aerodrome Construction from August 1917 to May 1918. In May 1918 he reverted to the rank of lieutenant to transfer to the Canadian Engineers and served with the 3rd Battalion C.E. in France until February 1919, returning to Canada in May 1919.

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Dr. Frank D. Adams, Acting Principal of McGill University, and Honorary Member of *The Institute* delivered an address at a meeting of the Commission of Conservation in Montreal on February 18th, regarding the output of mines in Canada. In the course of his address Dr. Adams stated that there had been a marked decrease in the coal output, the production having been 2,000,000 tons lower than that of 1918. As regards metal production, the total value of the mine output for Canada in 1919 had declined from $211,301,897. in 1918 to $167,000,000. This falling off was chiefly in coal, steel, silver, copper, and nickel, while there was a gain in the output of gold.

*

Capt. E. Victor Deverall, S.E.I.C., was commissioned in the 10th Regiment, Royal Grenadiers, Toronto on March 28th, 1916, and after qualifying as lieutenant at Camp Borden was appointed to the 204th Battalion, C.E.F. in September 1916. He qualified as captain in November 1916 and was transferred to the Royal Engineers, and trained at Newark, England, being gazetted as 2nd lieut. in April 1917. Captain Deverall was wounded at Sanctuary Wood in October 1917, and was later awarded the Military Cross for a trench raid at Itencourt. For building a bridge across River Lys to enable the infantry to attack enemy entrenched on the east bank, he was awarded a bar to the Military Cross in October 1918. Captain Deverall was demobilized in July 1919 and granted the permanent rank of captain in the Royal Engineers.

Lieut.-Col. A. C. Garner, D.S.O., M.E.I.C.

Lieut.-Col. A. C. Garner, D.S.O., M.E.I.C., was appointed capt. and adjutant with the 32nd Battalion C.E.F. in November 1914, was later promoted to major and appointed Assistant Director of supply and transport Overseas Canadians. In England further promotion was granted to rank of lieut.-col. and in 1916 he was appointed to recruit and organize the 195th Battalion, and was later appointed to organize the 2nd Canadian Labour Battalion. In October 1916, Col. Garner was placed in command of the 12th Battalion, Canadian Railway Troops. Lieut. Col. Garner was placed on the Active List, Reserve of Officers, in 1919, with the rank of Lieut.-Col. In January 1919, he was awarded the D.S.O.

OBITUARIES

George Herbert Baird, A.M.E.I.C.

Through the publication of the missing membership list, word has been received of the death at Winnipeg, Man., on July [illegible] 1919, of George H. Baird, A.M.E.I.C. Mr. Baird was born in Brucefield, Ont., February 21st, 1897. His father, George Baird, was a school teacher. His mother's maiden name was Catherine McKenzie. Mr. Baird started his railroad carreer as clerk for the G.N.R. in 18[illegible] at St. Paul, Minn. He returned to Canada about 19[illegible] and started surveying and engineering with C.P.R. in northern Ontario and then went West to work on the G.T.P.R. about 1906 and was resident engineer on construction from 1907 to 1911 From 1911 to 1914 Mr. Baird was in private business in Winnipeg. He started with the Provincial Department of Public Works, Winnipeg, in 1914 and was chief draftsman at the time of his death. Mr. Baird leaves a widow and one young son. Mr. Walter S. Baird of Collingwood, [illegible], is a brother.

The late Mr. Baird had a number of friends, not only in Winnipeg but all over the West and was well and popularly known to [illegible]. He was a great lover of all sport, and followed the game, was a keen enthusiast over hockey, lacrosse and baseball. Mr. Baird was of an inventive turn and at the time of his death he had several patents pending.

Colonel Henry W. Hodge, M.E.I.C.

From his partner, Howard C. Baird, word has been received of the death of Col. Henry W. Hodge on December 21st, 1919, concerning which reported particulars have not been received. The late Col. Hodge was born at Washington, D.C., April 10th, 18[illegible] and was graduated from the Rensselaer Polytechnic Institute in 18[illegible], with the degree of C.E. Following graduation, his first years were spent as assistant engineer with the Phoenix Bridge Company, transferring to the Union Iron Works of New York as chief engineer. In 18[illegible] Col. Hodge engaged in private practice and acted as consulting engineer on various important bridge undertakings throughout the country, including consulting to the original Board of Engineers of the Quebec Bridge. At the time of his death Col. Hodge was a member of the firm, Hodge and Baird, consulting engineers, 115 Broadway, New York.

Captain David Kyle, M.C., M.E.I.C.

The death occurred at Sault Ste. Marie on Saturday, February 7th, of Capt. David Kyle, M.C., M.E.I.C., from pneumonia. The late Capt. Kyle joined *The Institute* as a member only last year following the establistment of the Sault Ste. Marie Branch in which he was a prominent member. He was born at [illegible], Scotland, on January [illegible], 18[illegible] and was an associate in mechanical engineering of the Royal Technical College, Glasgow, Scotland, 1906. In 1907 he qualified for associate membership in the Institution of Civil Engineers, London, coming to Canada in 1910 when he had charge of construction of part of the plant of the Algoma Steel Corporation and later was placed in charge of maintenance, following which he became general superintendent. In the early days of the war he went overseas, where he served with distinction winning the Military Cross, returning to Canada in 1917 on account of the requirements of the steel industry in this country. On his return he was made vice president of the Company and placed in charge of operations, which position he occupied at the time of his death.

John Patrick O'Donnell, M.E.I.C.

John Patrick O'Donnell, M.E.I.C., of Walter Lodge, [illegible], Surrey, and 11 New [illegible] Street, London, W.1, [illegible] of Palace Chambers, Bridge Street, Westminster, S.W., whose sudden death we briefly recorded last month, was born in Dublin, Ireland, in 18[illegible]. He was articled with Saxby and Farmer, railway signalling engineers, London and Glasgow, 18[illegible], and served with them until 18[illegible], when he was appointed assistant signal superintendent, Lanchashire and Yorkshire Railway. From 1885 to 1901, Mr. O'Donnell followed his profession as a signalling engineer in which he was particularly successful. In 1901 he formed the British Pneumatic Railway Signal Company of which he was chairman and managing director until his death. Mr. O'Donnell started the first works for the manufacture of pneumatic tools on a large scale in England and was a pioneer in power signalling. At the time of his death, Mr. O'Donnell held the following positions: managing director of the Superheater Corporation, Ltd.; managing director of the British Power Railway Signal Company Ltd.; managing director of the Economical Boiler Washing Co., Ltd. He was a member of the Institution of Civil Engineers, the American Society of Civil Engineers, Institution of Mechanical Engineers, Railway Signal Association, Institution of Railway Signal Engineers, a Fellow of the Chartered Institute of Patent Agents, as well as *The Engineering Institute of Canada*, which he joined in February 8th, 1895.

Hugh Cossart Baker, B.Sc. (McGill) A.M.E.I.C.

On Christmas day, Hugh C. Baker, who had gone to Arizona owing to poor health, died at the St. Luke's Home in Phœnix. The late Mr. Baker graduated in 1895 with the degree of B.Sc., from McGill having taken his course in mechanical engineering. For ten years following his graduation he was engaged in various capacities with a number of mines in Ontario and British Columbia. Later he became engaged in railway engineering followed by building and construction.

The late Mr. Baker was born at Morrisburg, Ontario, in June 4th, 1865. In 1895 he became a Student Member and in 1909 was transferred to Associate Member. He leaves to mourn his loss a wife and three small children.

EMPLOYMENT BUREAU

Situations Vacant

Instrument Man

Instrument man who can lay out construction work with pulp and paper company in Ontario, Salary $200. per month. Board supplied by the company at $40. per month. Apply Box No. 81.

Engineer for Construction

Experienced engineer in construction work, with experience in estimating for pulp and paper company in Ontario. Salary $250. per month. Board $40. per month, or quarters for a married man can be secured. Apply Box 82.

Structural Draftsman

Wanted a structural draftsman on bridge work. Box No. 83.

Railway Engineers

Railway corporation desires three railway engineers who have had experience in maintenance, capable of holding responsible positions. Box No. 84.

Civil Engineer for Pulp and Paper Company

Civil engineer with general pulp and paper mill experience wanted for paper company in Quebec. Experience in drafting, maintenance and construction work desirable. Salary $150. to $200. per month. Apply Box No. 85.

Town Engineer

Town engineer wanted for a town in Nova Scotia. Applicants to state qualifications, experience and salary wanted. Apply Box No. 86.

Town Engineer

Town engineer wanted for a town in Nova Scotia. Applicants to state qualifications, experience and salary wanted. Apply Box No. 87.

Electrical Engineer

Technical graduate in electrical engineering, with one or two years practical experience, for position in engineering department of large electrical manufacturing concern. First class opportunities for advancement. Apply Box No. 88..

Instrument Men and Rodmen

Large paper company requires for the end of March several Instrument men and Rodmen. Good opportunities for Student members. Box 92.

A Highway Engineer

852. A Highway Engineer for the Highways Branch of the Department of Railways and Canals, at an initial salary of $4,000 per annum and up, dependent upon an appraisal of the successful applicant's value in the position.

Applicants must have education equivalent to graduation from a university of recognized standing and have had much experience in and thorough knowledge of all phases of highway engineering work.

The successful applicant will be required to perform the following duties: To engage in the inspection and investigation of road building materials, the inspection and review of specifications and plans for the construction and improvement of various types of roads; to superintend the construction and improvement of such roads, and to perform other related work as provided in the Canada Highways Act.

Applicants should preferably be not more than 45 years of age.

Applicants are to understand that they may be called upon to undergo an oral examination or interview and shall submit in addition to the application, stating their education, experience and engineering training, a brief sketch suggesting a practical method for standardizing the qualifications of men actually engaged in all classes of highway work throughout Canada and for encouraging the maintenance of uniformly high standards of efficiency.

Aeronautical Intelligence Officer

[illegible]. An Aeronautical Intelligence Officer for the Air Board, at an initial salary of $2,400 per annum, which will be increased on recommendation for efficient service at the rate of $[illegible] per annum until a maximum of $[illegible] has been reached. This initial salary is supplemented by whatever bonus may be provided by law.

NOTE.—If board, lodging, or ordinary clothing is supplied the value thereof shall be deducted from the above compensation.

Qualifications.—Education equivalent to graduation from a university of recognized standing; at least two years of experience in the collection and distribution of publicity material or experience of equivalent character and standard, and a high degree of specialized knowledge of aeronautical subjects, administrative ability, tact and good judgment.

Duties.—Under direction, to gather and distribute information relative to aviation, aeronautical science, aeroplane production, and all related subjects; to supervise the preparation and editing of the Aeronautical Year Book; to assist the Secretary, Air Board, in the administration of the office, as assigned, and to act for him in his absence, and to perform other related work as required.

Candidates for this position will be examined in the following subjects, which have the relative weights indicated: Education, Training and Experience, 300; Oral Interview, if necessary in the opinion of the Commission, 100.

Selections for eligible lists of applicants qualified to fill similar vacancies which may occur in future may be made from the applications for these positions.

According to law preference is given to persons who have been on active service overseas on the military or naval forces of His Majecty, or any of the Allies of His Majecty, during the late war. The age limit does not apply to persons who have seen active service overseas, but returned soldiers must furnish a certified copy of their discharge certificates, or in the case of commissioned officiers, a certified statement of their military service.

Application forms properly filled in must be filed in the office of the Civil Service Commission not later than March 4. Application forms may be obtained from the office of the Employment Service of Canada, or from the Secretary of the Civil Service Commission, Ottawa.

By order of the Commission.

W. FORAN,
Secretary.

Young Graduate for Photographic Work

Large paper company wants young graduate to be employed on large hydro-electric construction work. Work will be photographing, checking levels etc. Excellent opportunities for working up to good permanent position. Apply Box [illegible].

Draughtsmen

Three technical graduates for draughting and estimating. One of the largest industrial organizations in Montreal offers good prospects for three young men with technical training and some draughting experience. Apply Box [illegible].

Engineer for Dry Dock Design

Wanted at an early date engineer qualified to design work in connection with building of dry docks. An immediate opening for the right man. Apply Box [illegible].

* * *

Situations Wanted

Civil Engineer

A.M.E.I.C., 37 years of age, seventeen years experience on design and construction sewerage, waterworks, etc. Competent to take full charge of office. Available middle of February, Box No. 13-P.

Civil Engineer

Graduate engineer, S.E.I.C. desires change five years experience civil engineering, good experience in reinforced concrete construction, surveying. Can produce best references. Apply Box No. 14-P.

Mechanical Engineer

Mechanical engineer at present with large pulp and paper company wishes to make a change. Four years experience in general plant engineering, maintenance and construction, heating and ventilating, special experimental work etc. B.Sc. McGill. Salary $3000. Address Box No. 15-P.

Civil Engineer

Jr. E.I.C., recently demobilized civil engineering experience on construction survey work, hydrographic survey, speaks French fluently. Full particulars of experience on request. Apply Box 16-P.

Municipal Engineer

Engineer, A.M.E.I.C., now employed in West, wants change to Toronto or vicinity. Accustomed to river flow control, design and construction of municipal and hydro-electric projects. Prefer industrial or contracting opening. Box 17-P

Air Compressor and Boiler for Sale

The City of Saint-Boniface, Man., offers for sale.

1 only Ingersoll-Rand Cross Compound Motor-driven Air Compressor complete with 100 HP. Fairbanks Motor 550 V. 3 ph. 60 cycle 720 RPM slip ring type with switch board. Piston displacement per minute at normal speed 534 cubic feet.

1 only Robb Mumford Boiler 70 HP.

All in first class condition. Good as new.

For further particulars apply: J. A. Meindl, City Engineer.

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Preliminary Notice

of Applications for Admission and for Transfer

[illegible] February, 1920

[illegible]

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in March, 1920.

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:—

[illegible]

[illegible]

FOR ADMISSION

[illegible]

References: H. G. [illegible], M. V. [illegible], H. H. Smith.

[illegible]

CARTER—HILTON PERCIVAL MACKAY, of Montreal. Born at Cowansville, P.Q., Feb. 13th, 1892. Educ., Assoc. in Arts, McGill Univ. 1909; 1 season mech. eng. course, Montreal Tech. High School; mech. eng. course I.C.S. 7 yrs. with Robt. Mitchell Co.; March 1916 to date, with Northern Elec. Co., as cable engr. in charge of design and inspection of all rubber covered and miscellaneous wires and cables; at present in charge of technical dept. of wire and cable shop, supervision of mfg. methods and development work.

References: J. B. Briggs, J. S. Cameron, J. Duchastel, T. Eardley-Wilmot, A. J. Lawrence.

CHRISTOPHERSON—WILLIAM WALLACE, of Orillia, Ont. Born at Grand Lac, P.Q. Sept. 30th, 1887. Educ., public and 2 yrs. high school, Mattawa, Ont. 1905-06, draftsman, N.T.C.Ry.; 1906-07, rodman, C.N.R.; 1907-10, res. engr. on constrn., C.N.R., reporting to Wpg. office; 1910-12, res. engr., C.N.R., reporting to Edmonton; 1912-13, supt. of constrn., McMillan Bros., ry. contractors, H.B.Ry., The Pas; 1913-16, res. engr., H.B.Ry., Dept. Rys. & Canals, grading, track work, concrete and bridge work; 1917-18, Ry. Troops attached to Mesopotamian Rys. on pile bridging, lieut. in Can. Forces, rank of acting captain while attached to Imperial Forces; at present, industrial surveyor, D.S.C.R., Orillia dist.

References: W. Burns, D. McMillan, C. M. McKenzie, W. J. D. Reed-Lewis, T. Turnbull.

CHUBB—THOMAS ALFORD, of Ste. Anne de Bellevue, P.Q. Born at London, Eng., June 6th, 1883. Educ., army and engr. class, Kings School; evening classes, Finsbury Inst., England. 1901-06, with Central London Ry., apprentice, later junior asst.; 1906-07, shop machine tool maintenance, G.T.Ry.; 1907, mechanic in erecting shop, C.P.R., Angus shops; 1908-15, bridge dept., C.P.R.; 1915-16, Montreal Ammunition Co., machine design, inspection trips, etc.; Nov. 1916 to date, Dominion Bridge Co., machine design and gen. drawing, office work, etc.; at present in mech. dept., with special charge of elec. work.

References: G. H. Duggan, J. T. Farmer, P. B. Motley, F. Newell, H. H. Vaughan.

CONWAY—GILBERT SYDNEY, Lieut., of Victoria, B.C. Born at Carlisle, England, Aug. 9th, 1886. Educ., private school, 2 yrs., Grammar school; 2 yrs., Armstrong Tech. Coll. 1902-05, pupil with L. H. Armour, C.E. and architect, Gateshead-on-Tyne; 1905-06, engr. and bldg. supt., N. P. G. Herdman & Co., on layout of bldg. estates, roads, sewers, etc.; 1906-08, in private business, same class of work, also quantity surveying, Gateshead-on-Tyne; 1908, survey work, constrn., municipal telephone lines, Manitoba; 1909-10, field draftsman on location, w. lines, C.P.R.; 1910-11, same duties, C.N.R.; 1911 (6 mos.) transitman on location, Kettle Valley Ry.; 1911-14, res. engr. on constrn., Courtenay branch, E. & N.Ry., Vancouver Island; 1914-16, engr. and constrn. supt., Daylor Bros., Vancouver, erecting reinforced concrete bridges, etc.; 1916-17, contractors engr. with C. Hoard, conslt. engr., Victoria, design, quantities, supervision, etc.; Feb. 1917, enlisted in Can. Engrs. obtained comm. as lieut., demobilized Mar. 1919; Apr. 1919 to date, res. engr. on constrn., Okanagan branch, C.N.Ry.

References: R. A. Bainbridge, C. Hoard, R. W. MacIntyre, W. M. Stokes, W. G. Swan.

DANAIS—PIERRE, of Baie Saint Paul, P.Q. Born at Baie Saint Paul, April 25th, 1890. Educ., B.Sc. (C.E.) Queens Univ. 1917; B.Sc., Laval Univ. Summer 1916, rodman, transitman, etc., Baie St. Paul; 1917, levelman, North American Pulp Co., under E. Lavoie; 1918, worked in connection with drainage and drawing, Jos. Tremblay, also railroad work, with Jos. Gariepy, Baie St. Paul; 1919, various surveys; at present, on installation of water power plant, with Robt. Fortin, and preparing a plan for a retaining wall, Pointe au Pic.

References: S. Bourgoing, J. Claveau, S. Desmeules, D. S. Ellis, E. Lavoie, J. Tremblay, H. Warren.

DANIEL—NORMAN HOYLES, Major, of Toronto. Born at Port Hope, Ont., Apr. 28th, 1893. Educ., B.A.Sc., Univ. of Tor. 1915. 1910-11, A. C. & H.B.Ry.; May-Sept. 1912, inst'man, London div., C.P.R.; May-Sept. 1913, inst'man; May-Sept. 1914, draftsman, waterworks dept., Toronto; enlisted 1915, 3½ yrs. in France, returned as major in charge of 5th Battery, C.F.A., Apr. 1919; at present, draftsman, Toronto Harbor Comm.

References: G. T. Clark, J. R. Cockburn, P. Gillespie, H. A. Goldman, W. S. Harvey, I. F. Willsie, N. D. Wilson, C. R. Young.

DARRELL—FRANKLIN L., of Kenogami, P.Q. Born at Brooklyn, N.Y., July 20th, 1888. Educ., B.Sc. (C.E.) Univ. of Maine, 1912. Surveying with U.S. Geological Survey; inst'man, dam site location; June-Sept. 1912, inst'man, pulp and paper mill site; 3 yrs., engr. and draftsman, maintenance and constrn., Eastern Mfg. Co., pulp and paper mills; 6 mos., mfg. works Penobscot Chemical Fibre Co.; 6 mos., chief draftsman, maintenance and constrn. work, Union Bag & Paper Co.; 1 yr., draftsman, pulp and paper mill design, H. S. Ferguson, conslt. engr.; 3 yrs. to date, asst. to res. engr., Price Bros. & Co. Ltd., Kenogami, pulp and paper mills, maintenance and constrn. work.

References: J. S. Bates, E. A. Evans, J. T. Farmer, H. S. Ferguson, J. F. Grenon, I. J. Tait, F. O. White.

DAVIES—DAVID CECIL MINES, of Regina, Sask. Born at London, Eng., April 4th, 1892. Educ., 1906-08, mech. eng. course, Paddington Tech. Coll., London; 1908-12, mech. eng. course, London Polytech. Inst. (evening classes). 1908-12, in drawing office of Sir Geo. Marks, conslt. engr., London, Eng.; 1912-16, inspector of Public Works, reinforced concrete, steel, etc., prov. govt. of Sask.; 1916-19, on active service, artillery observer; 1919 to date, inspector of Public Works, prov. of Sask.

References: H. S. Carpenter, A. P. Linton, E. G. W. Montgomery, J. McD. Patton, F. H. Small.

DETHLOFF—WILLIAM L., of Coniston, Ont. Born at Buffalo, N.Y., Oct. 30th, 1875. Eng. apprentice, connected with J. T. Noye Mfg. Co., Buffalo; 1900-10, designing of mill and smelters in eng. dept., Allis Chalmers Mfg. Co., Milwaukee; since July 1910 with Mond Nickel Co., 1910-13, designing engr., July 1913 to date, as chief engr.

References: H. W. D. Armstrong, C. V. Corless, C. LeB. Miles, J. F. Robertson, F. S. Small.

DEVENNY—NEIL SCOTT, of Kamloops, B.C. Born at Buckingham, Que., Jan. 16th, 1894. Educ., public school; private study. 1912-15, rodman, inspector and inst'man on grading, tracklaying, concrete work, etc., C.N.O. Ry., Montreal-Port Arthur line; Jan. 1916-June 1919, overseas; June 1919 to date, rodman, Okanagan branch, C.N.R.

References: W. E. Bonn, C. Ewart, J. G. MacLachlan, R. C. MacLachlan, G. P. MacLaren, W. G. Swan.

DOBSON—WILLIAM PERCY, of Toronto, Ont. Born at Ballinafad, Ont., Aug. 28th, 1885. Educ., B.A.Sc.; M.A.Sc., Univ. of Tor. 1911. 2½ yrs. public school teacher in Ont. and Sask.; vacation 1905, drafting dept., Olds Motor Works; 1909, drafting dept., Buick Motor Co.; 1911-12, inspector, estimator and testing engr., Toronto Hydro Elec. System; 1912-14 (18 mos.) Alumni Research Fellow in Eng'g, Univ. of Tor.; July 1914 to date, laboratory engr., Hydro Elec. Power Comm., in responsible charge of testing and research work.

References: H. G. Acres, A. C. D. Blanchard, E. T. J. Brandon, W. A. Bucke, T. H. Hogg, M. V. Sauer.

DOUPE—JACOB LONSDALE, of Winnipeg. Born at Toronto, Sept. 14th, 1867. Educ., M.A., Univ. of Man., B.A., 1887; D., M., S., A. & B.C.L.S. Asst. on various govt. and right of way surveys; 1888, transitman on location, 1899, res. on constrn., N.P. & M.Ry.; 1890, transitman on location and res. on constrn., C.P.R., Souris branch; 1890-1900, surveyor, C.P.R., right of way and townsites; 1900-12, asst. land comm'r, C.P.R., in charge location of sidings and townsites, etc.; 1912 to date, chief surveyor, w. lines, C.P.R., principally right of way.

References: G. C. Dunn, J. M. R. Fairbairn, F. P. Gutelius, W. A. James, F. Lee, J. G. Sullivan, W. F. Tye, T. H. White.

DUNPHY—KENNETH AUSTIN, of Souris, Man. Born at Fredericton, N.B., Apr. 30th, 1886. Educ., B.Sc., Univ. of N.B., 1907. 1905, instrument, water supply, Glace Bay; 1906, filtration plant and sewage system, Fredericton; 1907-08, transitman, location, I.N.Ry.; 1909 to date, with C.P.R., as follows: 1909-13, rod and transitman, maintenance, Medecine Hat and Calgary; 1909-14, res. engr., Calgary; Feb-Apr. 1914, res. engr., Saskatoon; Apr.-Aug. 1914, same at Vancouver Terminals; Aug. 1914 to date, div. engr., and bridge and bldg. master at Souris, (1907-08, acted as chief of party during absence of chief engr.)

References: F. W. Alexander, J. C. Holden, T. Lees, J. R. C. Macredie, H. W. McLeod.

EASTMAN—RICHARD CLAIR, of Capreol, Ont. Born at Sutton, Que., Nov. 22nd, 1893. Educ., junior matric. 1909; railroad eng. I.C.S. 1911-12, rodman, etc., C.P.R. maintenance of way; 1912, constrn. inspector, municipal improvements, Saskatoon; 1913-14, inst'man and draftsman, harbor improvements, F. K. Gettins, C. E., Marshfield, Oregon; 1915-16, inst'man and inspector, constrn. work, Southern Pac. R.R.; Jan. 1917, enlisted in R.N.C.V.R. as ord. seaman, passed as skipper (trawler section) 1918, discharged Mar. 1919; June-Aug. 1918, inst'man on m't'ce of way work, C.N.R.; Aug. 1918 to date, res. engr., m't'ce of way, C.N.R.

References: W. A. Ewing, H. T. Hazen, J. R. Mackenzie, G. P. MacLaren, A. F. Stewart.

ELLIOT—HARRY MACINTIRE, Major General, of Ottawa. Born at Bangalore, India, Dec. 3rd, 1867. Educ., Royal Military Academy, Woolwich, obtaining commission in Royal Artillery 1888; 1st class certificate with honors, long course, School of Gunnery, England, 1898. 1902-05, gunnery instructor, 1st class, in England; 1905-09, sent to Canada, research work and various branches of mfr. of artillery armaments; 1911-13, Director of Artillery, Militia Headqrs., Ottawa; 1915 to date, Master General of Ordnance, in addition to technical duties of artillery, responsible for administration and supervision of engr. services in Canada, etc.

References: Sir Alex. Bertram, A. P. Deroche, B. H. Fraser, F. M. Gaudet, R. W. Leonard.

FARRELL—JAMES WARDROPE DICK, of Calgary, Alta. Born at Smiths Falls, Ont., Sept. 20th, 1890. Educ., B.A. 1912; B.Sc. 1915, Queens Univ. Summers 1913-15, asst. to dist. surveyor and engr., Saskatoon, Dept. Highways; 2½ yrs. with Can. Engrs., C.E.F., 2 yrs., as pilot, Royal Flying Corps and Royal Air Force; Aug. 1919 to date, draftsman, irrigation div., Dept. Interior.

References: H. S. Carpenter, D. S. Ellis, A. Macphail, W. L. Malcolm, D. A. R. McCannel, V. A. Newhall, F. H. Peters, B. Russell.

FOSS—CARROLL LUND, of Enniskillen, N.B. Born at Oscola, Iowa, June 2nd, 1882. Educ., N.S. High School, 1901. 1904-07, rodman, Halifax & Southwestern surveys, odd work during vacation with C. O. Foss and Archibald Foster, N.T.Ry.; 1907-08, inst'man under Howard Ryan, res. 5 and 6, N.T.C.Ry.; 1908-11, res. engr. No. 13, N.T.C.; 1912-13, office engr., dist. engr's office, St. John, N.B.; Jan.-Aug. 1913, div. draftsman, St. J. & Que. Ry.; 1917-19, res. engr., St. J. & Que.Ry.

References: M. W. Black, R. H. Cushing, G. C. Dunn, C. O. Foss, H. Longley, C. A. MacNearney, H. Phillips.

KANE—CHARLES STANISLAUS, of Outremont. Born at Kingston, Ont., May 7th, 1892. Educ., eng. course, I.C.S. 1908-09, draftsman, Hart-Otis Car Co. Ltd.; 1909-12, draftsman, Dominion Bridge Co.; 1912-Dec. 1919, in charge designing and estimating dept., Montreal office, same firm, in addition (since May 1917) also acted as sales engr.; at present, sales engr. in contracting dept., Dom. Bridge Co., asst'g and advising in consulting capacity, etc.

References: A. F. Byers, A. W. K. Massey, E. S. Mattice, M. J. Rutledge, D. C. Tennant.

KEIGHTLEY—WILLIAM JAMES, of Quebec, P.Q. Born at Devonport, England, April 19th, 1864. Educ., Devonport National Schools, 1878; 1st class Army School certificate, 2nd and 1st class advanced certificates, South Kensington, Science & Arts, machine constrn., etc.; apprenticeship, marine engr., Royal Dockyard, Devonport, 1 yr. Ordnance eng. course, Royal Arsenal, Woolwich, and Royal Small Arms Factory, Enfield; in 1884 appointed to Ordnance Dept., taking machinery charge of engines, boilers and elec. lighting of Dover Turret; 5 yrs. later appointed to take charge of guns, engines, boilers and hydraulic mach'y, then being erected at Malta; after 5 yrs. appointed to take charge of Army Ordnance Depot workshops at Leith and Edinburgh (Scottish Command); after 3 yrs. transferred to Ordnance Machinery charge of the Spithead Forts at Portsmouth; after 2 yrs. appointed by War Office to Halifax, N.S., as inspector of Ordnance mach'y undertaking and completing the re-armament of all forts forming the defences of Halifax; after 5 yrs. at Halifax, appointed to Stirling (Scottish Command) to take charge of Ordnance workshop, etc.; 2 yrs. later appointed to inspection dept., Woolwich, on staff of chief inspector, 1 yr. on inspection of guns and steel, 3 yrs. of submarine mines, 3 yrs. inspection of miscellaneous stores, Aug. 1914 appointed chief inspector of munitions, Ontario dist., later chief inspector of Artillery and eng. stores, Militia & Defence, Ottawa, on staff of Master General of Ordnance, organized an inspection dept.; June 1919 to date, chief inspector of Arms and Ammunition, Militia & Defence, Quebec.

References: Sir Alex. Bertram, A. P. Deroche, R. J. Durley, R. W. Leonard, H. H. Vaughan.

KEYT—WARREN EARNSCLIFFE, of Chase, B.C. Born at Colombo, Ceylon, Dec. 15th, 1885. Educ., Glasgow Tech. Coll. (Scotland); Westminster Tech. Inst., London, Eng., certificates in surveying, levelling, rys., roads. Served 3 yrs. C. E. articles as follows: 1906-08, with Chas. D. Barker, conslt. engr., Glasgow; 1908-09, with Wm. Fairley, conslt. engr., London, Eng.; 1909-10, asst. to Wm. Fairley, London, on sewage disposal works, surveys, office work, etc.; 1910-12, asst. to city engr., Kamloops, B.C., transitman on prov. govt. surveys, charge of laying out, supervising constrn. of sidewalks, sewers, etc.; 1912 to date, with Public Works Canada, asst. engr. on hydrographic survey of Columbia River, design, constrn. of wharves, etc.; Aug. 1914-Apr. 1919, overseas, Infantry and Engineers, C.E.F.; at present resumed with Public Works.

References: P. E. Doncaster, H. Earle, C. H. Mathewson, G. C. P. Montizambert W. F. Richardson.

KLEIN—EDWARD, of Westmount. Born at New York, N.Y., Sept. 1st, 1887. Educ., E.E., Columbia Univ. 1909; A.B., College of City of N.Y., 1906. Summers 1906-09, Hotel Astor power plant and N.Y. Edison Co., testing dept.; 1909-10, tester, in Bergmann Electrical Works, Berlin, Germany; 1910-14, manager, P. H. Klein Jr. Co., importers of elec. mfrs.; 1914 to date, manager, Dominion Lamp Co., mfrs. elec. incandescent lamps.

References: F. B. Brown, J. A. Burnett, J. E. Daubney, J. A. DeCew, G. M. Hudson, F. S. Keith.

LAMSON—BENJAMIN FRANKLIN, of St. Catharines, Ont. Born at Vermontville, N.Y., Feb. 12th, 1889. Educ., B.Sc., Queens Univ. 1912. Apr.-Oct. 1910, topog. and land surveys, Saranac Lake, N.Y.; Apr.-Oct. 1911, topog. surveys, Dept. Interior, Ottawa; Apr.-Dec. 1912, charge of prov'l and D.L.S., Montgomery & Morrier, Prince Albert, Sask.; Mar.-Sept. 1913, O.L.S., F.N. Rutherford, St. Catharines, Ont.; 1913-14, inst'man, Welland Ship Canal; 1914-19, asst. on Welland Canal, in charge of gen. canal maintenance work, roadways, bridges, etc., Apr. 1919 to date, asst. city engr., St. Catharines.

References: R. P. Johnson, J. C. Moyer, W. P. Near, F. N. Rutherford, W. H. Sullivan.

LEBLANC—C. JOSEPH, of Montreal. Born at Montreal, Apr. 26th, 1888. Educ., B.A.Sc., C.E., Ecole Poly 1910; Q.L.S. Asst. engr. city of Maisonneuve, 1910-12, municipal eng.; 1912-14, asst. engr., in charge northern div., pavements and sidewalks, Montreal; 1915-17, asst. engr. in charge of sewers, n. div.; 1917-18, asst. engr. of surveys and designs; 1919 to date, engr. in charge contract works, road dept., Montreal.

References: A. E. Doucet, S. J. Fortin, E. Fusey, F. C. Laberge, G. R. MacLeod, J. H. Valiquette.

LEMAY—TRACY DEARIN, of Toronto. Born at Paddock Wood, Eng., June 5th, 1884. Educ., prelim., prof. assoc. and Fellowship exams, Inst. of Surveyors, London, Eng.; O.L.S., vice-pres. O.L.S. 1907-10, with Speight & Van Nostrand, on city, township and base-line surveys; Nov. 1910 to date, city surveyor, Toronto.

References: H. G. Acres, J. R. W. Ambrose, E. G. Hewson, J. Milne, G. G. Powell.

LEWIS—JAMES WENTWORTH, of Montreal. Born at St. John, N.B., July 5th, 1896. Educ., eng. certificate, Acadia Univ. 1919. 1914-17, on eng. staff, P.W.D., St-John, N.B.; summer 1918, with Grant & Horne, McAvity munition plant constrn., St. John.; at present, in 3rd year civil eng., McGill Univ.

References: E. Brown, A. R. Crookshank, A. Gray, G. N. Hatfield, C. M. McKergow.

LINDSAY—WILLIAM BETHUNE, Major General, C.B., C.M.G., D.S.O., R.C.E., of Strathroy, Ont. Born at Strathroy, Nov. 3rd, 1880. Educ., grad. R. M.C., 1900; Coll. Inst. 1900-04, asst. engr. in chief engr's office, Dept. of Marine & Fisheries, part of period on design of aids to navigation and in charge of constrn. work; 1904-05, dist. engr., Mil. Dist. 3 and 4; 1905-07, engr. officer in charge of harbor forts and constrn., Halifax Fortress; 1907-10, command engr., western Ont., Mil. Dist. 1 and 2; 1910-12, commanding Royal Can. Engrs., M.D. No. 11 and the Yukon; 1912-14, C.R.C.E., Mil. Dist. 10 and 13, including full charge of new constrn. and repair and maintenance of drill halls, armouries, etc.; Aug. 1914-Sept. 1915, O.C., 2nd Field Coy., C.E., C.E.F.; 1915-16, C.R.E., 1st Can. Div.; 1916-18, chief engr., Can. Army Corps; Aug. 1918 to date, G.O.C., Can. Engrs. and chief engr., Can. Corps, full charge of all eng. work, including defences, roads, water supply, light rys., etc.

References: C. J. Armstrong, R. F. Armstrong, J. B. Cochrane, B. H. Fraser, C. S. L. Hertzberg, C. L. Hervey, R. W. Leonard, C. H. Mitchell, C. W. P. Ramsey, F. A. Wilkin.

MACANDREW—WILLIAM MACKAY, of Vancouver, B.C. Born at Renfrew, Ont., Nov. 28th, 1887. Educ., B.A.Sc., Toronto Univ. 1912; St-Andrews Coll. and Coll. Inst. Summers 1909-11, shop work, Can. Allis Chalmers Bullock Co., Rockfield, P.Q.; 1912, constrn. engr., same firm, Vancouver; 1913, sales engr., Allis Chalmers Bullock; 1914, contracting engr., Brodner & MacAndrew, Vancouver; 1915-16, elec. engr., Roucher de Boule Mining Co., Skeena Crossing, B.C.; 1917, elec. engr., for Renfrew, Ont.; 1918, lieut., Can. Engrs.; at present, member of firm MacAndrew-Jamieson Eng. Co.

References: C. T. Hamilton, R. F. Hayward, E. A. Jamieson, W. G. Swan, J. A. Walker.

MACLACHLAN—WILLS, of Toronto, Ont. Born at Toronto, Aug. 3rd, 1885. Educ., B.A.Sc., Toronto Univ. 1907; member and vice-pres., A.I.E.E. 1907, apprentice, Westinghouse E. & M. Co.; 1908, constrn. engr., Can. Westinghouse Co.; 1909-10, elec. supt., Port Colborne Elevator, Dept. Rys. & Canals; 1910, inspector, substation constrn., H.E.P.C.; 1911-13, local manager, Trenton Elec. & Water Co., Belleville; 1913-15, engr. in charge, Elec. Power Co., Toronto; 1915, inspector, Elec. Employers Assoc. of Ont.; 1917, in charge Employees Relations Dept., H.E.P.C.; also Accident Prevention, Toronto Hydro Elec. Systems; at present, Consultant, Industrial Relations.

References: H. G. Acres, A. C. D. Blanchard, J. B. Challies, T. H. Hogg, G. A. McCarthy.

MACPHERSON—JOHN CHARLES ROSS, of Woodstock, Ont. Born at Woodstock, May 9th, 1888. Educ., B.Sc., Queens Univ. 1912. Summers 1906-08, asst. on geodetic survey, Dom. Govt.; 1909-11, inst'man, N.T.C.Ry.; 1912-13, asst. engr. in Cochrane terminal yard, N.T.C., including 6 mos., as res. engr.; Sept. 1917-Jan. 1919, coy. engr., in charge of bridge constrn., France, with 2nd Batt., Can. Ry. Troops; Apr.-July 1919, lecturer in civil eng., Queens Univ.; at present, asst. on Hydro Elec. Power Comm., ry. location party.

References: E. T. Agate, F. F. Clarke, T. U. Fairlie, F. B. Goedike, G. F. Hanning, P. A. Laing, A. Macphail.

MATTHEWS—FRANK EVERETT, of Winnipeg, Man. Born at Moncton, N.B., June 25th, 1881. Educ., Moncton schools. 1905-14, tapeman, rodman, levelman and transitman, location and constrn. G.T.P.; 1908, bridge inspector; 1912, res. engr., G.T.P.; 1915-16, res. engr., H.B.Ry.; 1917-19, topog. work, Manitoba prov. govt.; at present topog. work, estimates.

References: C. H. Blanchard, H. A. Bowman, G. C. Dunn, F. A. W. MacLean, A. McGillivray.

McEVOY—JAMES, of Toronto, Ont. Born at Bowesville, Ont., Feb. 7th, 1862. Educ., B.A.Sc., McGill Univ. 1883. B.C.L.S. 16 yrs. Geological Survey of Canada; 7 yrs. with Crow's Nest Pass Coal Co. Ltd., as land commissioner, geologist and chief engr.; gen'l supt., M.F. & M.Ry., Fernie and Morrissey, B.C., responsible for cost of operation and maintenance and in full charge; examining, reporting on and developing mining properties in Canada, U.S., Mexico and S. America, etc.; at present conslt. mining engr. and geologist.

References: H. G. Acres, H. E. T. Haultain, J. H. Larmonth, R. W. Leonard, J. White.

McGARRY—PATRICK JOSEPH, of Merritton, Ont. Born at Merritton, Dec. 12th, 1889. Educ., honor grad. in civil eng., Univ. of Tor. 1910; D. and O.L.S. Season 1908, on prelim. surveys, Welland Ship Canal; 1909, on constrn. work R. Weddell & Co., at western harbor entrance, Toronto; 1910, articled pupil on D.L.S. work in Alta.; 1911-13, on eng. work, city of Toronto, sewers, roads, etc.; 1914, D.L.S. asst. in B.C., on party of Jas. Gibbon; seasons 1915-19, in charge of party on survey of Dom. Lands; at present, D.L.S. with Dom. Govt.

References: G. C. Cowper, G. B. Dodge, J. F. Fredette, G. H. Herriot, C. Rinfret.

McGOWN—JAMES, of Vancouver, B.C. Born at Glasgow, Scotland, June 13th, 1863. Educ., Shaw St. Coll., Liverpool; member, Inst. of Naval Architects. Jas. Jack & Co., Cunard Line, Liverpool, chief engr., Empress China and S.S. Atkinian; 1902 to date, supt. engr., C.P.O.S. Lines and B.C. Coast Service, C.P.R. Vancouver

References: F. F. Busteed, H. J. Cambie, C. E. Cartwright, F. L. Macpherson, H. Rindal, H. B. Walkem, C. C. Worsfold, N. A. Yarrow.

RAMSAY—WILLIAM, of Nelson, B.C. Born at Lintrathen, Scotland, Sept. 26th, 1881. Educ., eng. course, Dundee Univ.; 8 sessions, Dundee Tech Coll., 14 certificates in various eng. subjects and Armitstead prize in eng. 1895-1900, apprenticeship under Geo. Baxter, M.I.C.E., Dundee and 2 yrs. as chief asst.; 2 yrs. in charge of waterworks design and constrn., city of Dundee; 1906-07, res. engr. with D. J. Stuart & Co., Glasgow, Scotland, on 6 mile waterwork contract; 1912-17, city engr., Fernie, B.C., in charge of gen. municipal undertakings; 1917-18, asst. engr. in Fernie Electoral Dist., under prov'l D.P.W., supervising constrn. and maintenance of road and truss bridges; 1918 to date, dist. engr., west Kootenay, in charge of all road, trail and bridge constrn. in that dist.

References: W. J. E. Biker, A. Cummings, J. G. Cummings, J. P. Forde, A. E. Foreman, F. L. Macpherson, A. L. McCulloch.

RAYNER—GEORGE JABEZ, of Victoria, B.C. Born at Teynham, Eng., Sept. 19th, 1884. Educ., public school; private tuition. 1904-1906, rodman, topog. N.T.C., Lake Abitibi; fall 1906, Santa Fe Ry., Calif., gen. survey and eng. work; 1907-08, with W. A. Bauer, C.E., Vancouver; 1909, full charge, survey party, W. A. Bauer, chiefly land and mineral surveys; 1910-12, full charge, parties on land and mineral surveys, K. L. Burnet, C.E., Vancouver; fall 1912, in charge of survey party M. L. Gordon; 1913-15, in partnership with W. S Earle, Vancouver, surveys and eng., logging operations, etc.; 1915-18, in same business alone, located and constructed several logging rlys.; Sept. 1918 to date, with Canadian Puget Sound Lumber Co., Victoria in charge of all eng. work.

References: G. H. Dawson, P. E. Doncaster, W. A. E. Grim, C. Hoard, E. N. Horsey, F. Moberly, W. M. Stokes.

RAYNER—GEORGE WILLIAM, of Toronto, Ont. Born at Clare Bury, England, Sept. 28th, 1883. Educ., grad., civil eng., Toronto Univ. 1905; postgrad. work in mining to 1908. 2 yrs. with Col. R. W. Leonard, as constrn. engr. at Cataract Power Co. and Kaministiqua Power Co.; 5 yrs., prospecting, etc., mining properties in N. Ont., Que. and B.C., with Col. R. W. Leonard, occasional work on ry surveys; in 1911, associated with Prof. A. R. Wilnott; founded Ontario Rock Co. Ltd.; at present, vice-pres. and manager, Ontario Rock Co. Ltd.; engr. to Geo. H. Gillespie Co., talc producers; engr. for Canadian Sulphur Ore Co., Madoc, Ont.; engr., Hanover Portland Cement Co.; engr. and manager of Electro Metals Quarries Ltd., Welland, Ont.

References: H. G. Acres, E. L. Cousins, H. E. T. Haultain, E. A. James, R. W. Leonard, E. W. Oliver, G. G. Powell, J. M. Wilson.

RICHARDSON—JOCELYN JOHNSTON, of Quebec, P.Q. Born at St. Catharines, Ont., July 8th, 1873. Educ., public and high schools; passed prelim. and final exams. for O.L.S. Till 1899 on various surveys in vicinity of St. Catharines, including prelim. surveys for power canal; 1900-01, mining in Washington and Wyoming; 1902, entered eng. dept., maintenance of way, Penna. R.R., Elmira, N.Y., transferred to York, Pa., was leveller and transitman on survey party for change in line and grade between Baltimore, Md. and Lemoyne, Pa.; transferred to Baltimore, March. 1903, on gen. ry. eng., preparing estimates, plans, etc. and in charges of gen. work under div engr., with P.R.R. till Dec. 1910; 1911-13, engr., Maryland Meter Co., Baltimore; 1913-15, asst. engr. in chief engr's office, C.N.R., Moncton, N.B.; May 1915 to date, asst. dist. engr., C.N.R., Quebec.

References: R. A. Black, C. B. Brown, Jr., C. H. N. Connell, W. A. Duff, L. C. Dupuis, E. Gardiner, J. E. Gibault, C. H. Mitchell, F. B. Tapley.

RIDOUT—GEORGE LAWTON, Major, of Toronto, Ont. Born at Toronto, in 1888. Educ., honor diploma, R.M.C. 1907; private schooling. 1907-10, steel ry. bridge constrn. bridges dept., Canada Foundry Co.; 1910, transmission line constrn. on Hydro Elec. Comm. line in Ont.; 1910-11, div. engr. and supt. of constrn., Div. A., Shaw. Water & Power Co.; 1912-14, engr. and supt. of constrn., Norman McLeod Ltd., engrs. and contractors; 1914, comm. in Can. Engrs.; 1915, Royal Engrs.; 1915-19, responsible charge of eng. works in France for 2nd Army; at present, engr., Norman McLeod Ltd.

References: T. T. Black, W. J. Francis, N. M. McLeod, C. W. P. Ramsey, A. F. Stewart.

RIMMINGTON—HARRY STANLEY, of Winnipeg. Born at Toronto, Dec. 7th, 1890. Educ., B.C.E., Univ. of Man. 1911: Coll. Inst., Toronto. Summers: 1907, rodman, C.N.R.; 1909, asst. city analyst's dept., Winnipeg; 1910-11, draftsman, eng. dept., C.N.R.; 1911, asst. engr., C.N.R., western lines, constrn. of bridges, Rossburn and Grosse Isle extensions; 1912 to date, designing engr. and asst. to bridge engr., C.N.R., design and supervision of constrn. of all timber span and trestle bridges, etc., latterly also making surveys, inspections and reports.

References: W. Burns, H. A. Dixon, F. A. Moore, T. Turnbull, W. Walkden, T. W. White.

ROBERTSON—ALEXANDER ROSS, of Toronto. Born at Glencoe, Ont., May 22nd, 1888. Educ., B.A.Sc., Toronto Univ. 1909. Vacations till 1908, with Jas. Robertson, O.L.S., Glencoe; May-Nov. 1909, roadway dept., Toronto; 1909-12, drafting and designing, bridge dept., Canada Foundry Co.; Dec. 1912 to date (except for period with C.E.F. Nov. 1915-June 1919) sales engr., McGregor., McGregor & McIntyre Ltd., structural steel works, bldgs. and bridges.

References: P. Gillespie, A. H. Harkness, T. H. Hogg, E. M. Proctor, C. R. Young.

ROSS—JOHN RODERICK, of Winnipeg. Born at Ottawa, July 2nd, 1893. Educ., leading to B.C.E., Univ. of Man.; enlisted in 4th year; various courses in Royal Naval Air Service. Summer 1915, topog. survey, Dept. of Mines; Sept. 1919 to date, asst. to municipal engr., Rockwood, Man.

References: E. Brydone-Jack, W. E. Davis, G. C. Dunn, E. P. Fetherstonhaugh, J. G. Legrand, J. A. H. O'Reilly.

RUSSELL—JOHN HARTLEY, of Peterboro, Ont. Born at Quebec, P.Q., Jan. 26th, 1888. Educ., Victoria Schools; Commercial Academy; high school; Wallace Coll., Quebec; special course in maths. and designing; civil eng., I.C.S. 1908-09, apprentice, chief engr's office Que. Ry., Light & Power Co.; 1909-10, draftsman and inst'man, same firm, on extension of ry. lines, designing of stations, etc.; 1911-12, chief draftsman and inst'man, and asst. to engrs. of maintenance of way and engr. of rys., gas dept., elec. engr., Que. Ry., Light, Heat & Power Co.; Jan.-Nov. 1912, Que. Sag. Ry., inst'man, draftsman and estimate work on constrn., later in charge of bridge foundation, constrn. etc.; 1912-13, gen. asst. to D. S. Barton, conslt. engr., Que. Ry., Light & Power Co., on reconstrn., surveying, designing, etc.; Jan.-July 1913, gen. asst. on final constrn. of Dorchester Elec. Power plant; 1913-14, asst. to E. A. Evans, conslt. engr., surveys and designing of dams, wharves, etc.; 1914-17, asst. engr., to E. A. Forward, chief engr., Quinlan & Robertson Ltd., contractors, St. Charles River improvement work, designing, laying out, etc.; Oct. 1917, overseas with C.F.C., transferred to Can. Engrs., sent to Imperial School of Petrol Elec. Eng., graduated and rec'd certificate; with Royal Engrs. to survey and plot ry. line, plans, estimates, etc., discharged Apr. 1919; Apr.-June 1919, asst. to E. A. Evans, on re-design of dam, Megantic, P.Q., etc.; July 1919 to date, with Russell-Townsend Co., contractors, Peterboro, designing of concrete forms, etc.

References: F. Barber, D. S. Barton, M. J. Butler, E. A. Evans, E. A. Forward, C. J. H. Townsend.

RUTHERFORD—ARCHIBALD BOWMAN, Lieut., M.M., of Westmount. Born at Montreal, June 23rd, 1895. Educ., in 4th year mech. eng., McGill Univ. 3½ yrs. in France, with 2nd and 3rd Signal Coys., Can. Engrs., as sgt. and lieut., awarded M.M. and mentioned in despatches; at present, attending McGill Univ.

References: E. Brown, C. M. McKergow, J. B. Porter, A. R. Roberts, S. F. Rutherford.

SCANLAN—CHARLES EDWARD, of Vancouver, B.C. Born at Bournemouth, Eng., Apr. 15th, 1888. Educ., matric. London Univ. 1905; 18 mos., private tuition for intermediate science. 1913-15, with P.G.E.Ry., field draftsman, rodman, inst'man, acting res. engr. on location and constrn.; May-Aug. 1916, rodman, etc., C.N.R.; Aug. 1916 to date, in charge of party on maintenance, including laying out and supervising, track revisions, etc., C.N.R.

References: C. R. Crysdale, H. A. Dixon, St. J. Munroe, T. H. White, R. P. Wilson.

SCARBOROUGH—CHARLES MORTON, of Strathcona, Alta. Born at Hanover, Ont., Sept. 29th, 1890. Educ., 3 yrs. eng., Univ. of Tor.; teachers certificate, prov. of Alta.; 1911-12, surveyor and draftsman, Cummings & Day; first asst. on D.L.S. contract, in charge of work on city subdiv. survey, Alta.; previous to war held principal-ship of Czar School, teaching mathematics; 1916 went overseas, 2 yrs. mech'l draftsman on war work; practical experience on lathe work, hydraulic presses, etc., also designing and bldg. of petrol locomotives, etc.; returned Spring of 1919; at present, draftsman, Alta. Govt. Telephones.

References: E. W. Bowness, A. L. Cumming, R. H. Douglas, G. L. Law, F. C. Mechin.

SCOTT—HEW MARTIN, of Montreal. Born at Patua, Ayrshire, Scotland, Mar. 25th, 1887. Educ., public school; 5 yrs. evening classes at Ayr Academy. 1903-08, apprentice with J. & H. V. Eaglesham, C.E. and architects, Ayr.; 1908-09. chief draftsman with N. Hanson Greene, P.L.S., Montreal; May-Sept. 1909, engr., Mt. Royal Cemetery Co.; Sept. 1909 to date with P. Lyall & Sons Constrn. Co. Ltd. as follows: 1909-11, laying out work, quantity surveying, estimating and acting as asst. supt. on various contracts; May 1911 appointed supt. on constrn. of bldg.; 1912-13, Toronto manager; 1913-14, western manager; 1914-15, supt. of constrn., Ottawa; July 1915-19, manager of munitions dept.; at present, manager of mech'l dept., P. Lyall & Sons Constrn. Co.

References: F. B. Brown, W. J. Francis, J. A. Grant, H. M. Jaquays, H. H. Vaughan.

SCOTT—WILLIAM BEVERLY, Lieut., of Montreal. Born at Dalhousie, N.B., Oct. 26th, 1895. Educ., in 4th year mech. eng., McGill Univ. 2 summers with Can. Govt. Rys., Moncton, N.B., one summer in shops and one in drafting office; 37 mos. in C.E.F., as gunner, corporal, sergeant, sgt. major and lieut., in Siege Artillery; at present, completing mech. eng. course at McGill Univ.

References: C. Batho, E. Brown, C. M. McKergow, A. A. Putnam, A. R. Rôberts

SISE—PAUL FLEETFORD, of Montreal. Born at Boston, Mass., Nov. 10th, 1879 Educ., B.Sc., McGill Univ. 1901; eng. apprentice, Westinghouse Elec. & Mfg. Co., Pittsburg; 1904-10, sec.-treas., Northern Elec. & Mfg. Co. Ltd.; 1910-14, managing director of same; 1914-19, vice-pres. and gen. manager, Northern Electric Co., and at present, President.

References: L. A. Herdt, G. R. MacLeod, R. A. Ross, K. B. Thornton, H. H. Vaughan.

STEEL—FRANCIS MACDONALD, Lt.-Col., D.S.O., of Pincher Creek, Alta. Born at Blaenavon, England, Mar. 9th, 1878. Educ., private tuition; Tredegar Grammer; Cowbridge School. 1895-96, apprentice, Blaenavon Iron & Coal Co. Ltd.; 1896, articled to Wm. Thomas, mining engr., and attached to Lancashire Steam Coal Collieries Ltd.; 1898-99, asst. engr. and surveyor, Blaenavon Iron & Coal Co., in charge of water supply, reservoir constrn., mineral surveys, Blaenavon Estate; Feb. 1900, South African War, trooper and lieut.; May 1900, seconded for service with S. African Constabulary; 1902-04, 1904-05, asst. engr. and surveyor, Blaenavon Co. Ltd.; 1905-07, res. engr. on constrn. of water supply systems, Pincher Creek, Cowley, Claresholm Municipal Water & Light Co. Ltd.; 1908-14, in partnership with J. E. Woods, A.M.E.I.C. under style Woods & Steel, engrs. and surveyors, Pincher Creek, Alta.; military service: Nov. 1914 enlisted, adjutant with rank captain; Apr. 1916, promoted major; 1917, deputy asst. Adj. Gen., 2nd Can. Div.; 1917-18, deputy asst. Quartermaster-Gen.; 1918-19, asst. Quartermaster-General; July 1919, lieut. col., 1917, awarded D.S.O., 1917 and 1918 mentioned in despatches; at present, member of firm Woods & Steel, Pincher Creek, Alta.

References: R. J. Gordon, A. W. P. Lowrie, C. C. Richards, P. M. Sauder, D. Whittaker, J. E. Woods.

MITCHELL—PERCIVAL H., of Toronto Born at Harriston, Ont., Jan. 13th, 1883. Educ., E.E., Univ. of Tor 1903; apprentice course, Westinghouse Elec. & Mfg. Co. Pittsburgh 1903-05, asst engr in civil and elec depts, Ontario Power Co., Niagara Falls; Jan.-Nov 1906, designer in switchboard and power plant, Westinghouse Elec. & Mfg. Co., Pittsburgh; 1906-07, asst. elec. engr, city of Winnipeg, Point du Bois Hydro Elec. Development; 1907-08, elec. engr. on same; 1908-09, conslt. engr., Toronto; Jan. 1909 to date, partner in firm C. H. & P. H. Mitchell, conslt. engrs., Toronto

References: J. B. Challies, W. Chipman, F. A. Gaby, P. Gillespie, J. G. G. Kerry, R. A. Ross

NEWMAN—JOHN JAMES, of Windsor, Ont. Born at Leamington, Ont., Mar. 10th, 1872. Educ., S.P.S.; O.L.S 1894-98, apprentice with Wm. Newman, gen surveying and eng. practice 1900-05, in partnership with Wm. Newman, in charge of surveys and gen. municipal work; eng. work for Windsor, Sandwich, etc.; 1906 to date, private practice, gen. eng. and surveying, 1905-07-1910-11, charge of surveys in northern Ontario for Govt, also local eng work for various municipalities; town engr. for Leamington, charge of all Essex County paving under Good Roads System, and engr. for five townships under drainage laws.

References: J. A. Bell, M. E. Brian, H. B. R. Craig, C. R. McColl, G. A. McCubbin, J. L. Morris.

ROCCHETTI—JOSEPH, of Winnipeg, Man. Born at Fermo, Italy, Aug. 5th, 1879. Educ., E. E., Liege Univ. (Belgium) 1905; M E., Tech. High School, Fermo, Italy. 1905-10, elec. engr., Société Auxiliaire d'Electricité, Bruxelles; 1910-12, chief engr., Société A.P.I.C.E.A., Paris, France; 1913-15, elec. engr, G.T.P.Ry.; 1916-18, designing engr. and asst. to prov. elec. engr, Manitoba Public Works; May 1918 to date, chief engr., Man. Power Comm., in charge of all sub. depts.

References: E. V. Caton, G. C. Dunn, F. H. Farmer, G. L. Guy, J. M. Leamy, J. G. Legrand.

SULLIVAN—WILLIAM HENRY, of St. Catharines, Ont. Born at Kingston, Ont., Aug 23rd, 1871. Educ., grad. R.M.C. 1892. Sept 1892-Sept 1900, with Ontario-St. Lawrence Canals as follows: 1892-93, rodman, enlargement: 1893-96, inst'man; 1896-1900, asst engr., enlargement; 1900-04, principal asst. engr., and 1904-05, engr. in charge constrn., Hillsboro Bridge and M.H. branch, P.E.I.Ry.; 1905-12, asst. supt. engr. and 1912-13, supt'g engr., Welland Canal; Nov. 1913 to date, principal asst. engr., Welland Ship Canal, Constrn. (May 1917-Jan. 1919, acting engr. in charge.)

References: A. J. Grant, R. W. Leonard, W. P. Near, C. D. Sargent, J. L. Weller.

TEMPEST—JOHN SUGDEN, of Ottawa Born at Keighley, England, Jan. 11th, 1864. Educ., Keighley Grammar and South Kensington School of Science, England; several years previous to 1900 with H.W & A. Sugden, architects and surveyers, Keighley; 1900-02, transitman, topog'r. draftsman and field engr, A.C Ry., Sault Ste. Marie; 1902-04, in charge ry. location and constrn., Pacific Elec. Ry, Los Angeles; 1904-05, in charge ry location, G T.P.Ry, North Bay; 1905-07, in charge ry location, T.C.Ry., Nipigon, Ont.; 1907-08, in charge ry. constrn., G.T.P., Fort William; 1908-10, inspecting engr, irrigation branch, Dept Interior, Calgary; 1910-11, in charge of exploration work, Hudsons Bay, A.C.Ry., Sault Ste Marie; 1911-13, in charge ry. location, E.D. & B.C.Ry., Edmonton; 1913-19, hydrometric and inspecting engr., irrigation branch, Dept Interior, Calgary; 1919 to date, supervising hydraulic engr., Reclamation Service, Ottawa.

References: G. R. Balloch, R. J. Burley, R. S. McCormick, F. H. Peters, S. G. Porter, T. Turnbull.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

AFFLECK—GARNET, of Winnipeg. Born at Middleville, Ont., March 21st, 1884. Educ., public and high school; eng. course, Amer School of Corr. 1905-13, with N T.C.Ry Dist. F. as follows: 1905-06, rodman to topog'r; 1906-07, topog'r and leveller; 1907-08, leveller and transitman, all on prelim. and location surveys; 1908-10, inst'man on constrn.; 1910-13, res engr. in charge of constrn, N T C.; 1913-15, res. engr. in charge constrn., Kettle Valley Ry., Coquahalla div.; May 1916 to date, dist. engr. in charge of drainage and roads, Reclamation branch, P.W.D.

References: H. A Bowman, H. L. Bucke, L. B. Copeland, A. H. Corbett, F. A. W MacLean, A. McCulloch.

BROWN—JAMES CARLETON, Lt.-Col., of Constantinople, Turkey Born at St. Stephen, N B, Oct. 3rd, 1888. Educ., Rumford Falls (Maine) High School; special eng. course, Univ. of N B May-Oct. 1903 & 1904, rodman, Phillips & Rangley Ry., Maine; May-Oct. 1905, rodman, Portland & Rumford Falls Ry.; May-Aug. 1906, draftsman, Oxford Paper Co.;1906-10, Internat. Ry., of N.B., draftsman, level and transitman on location, inst'man on constrn., res engr. in 1910, tracklaying, ballasting, station houses, etc.; 1911-12 draftsman, Alta. Central Ry, Red Deer; 1913, Atlantic div., C P.R. St. John, N.B.; 1914, joined Can. Army, transferred to Corps of Royal Engrs., went to France as 2nd in command of a ry. constrn. coy., R. E.; sent to Salonika in command of a similar coy; 3 yrs in Salonika, attaining rank of Lieut.-Col., with title of Ry. Constrn. Engr., No. 1 British Salonika Force, in command of 4 constrn. companies; Mar. 1919 left Salonika, since then doing constrn. work in Transcaucasia; during part of summer was with British Military Mission in South Russia as ry. adviser; at present, chief engr., Anatolian Rys. in Asia Minor.

References A. K. Grimmer, W. S. Lea, J. G. MacGregor, D. F. Maxwell, J. D. McBeath.

CHILDERHOSE—ERWIN ALFRED, of Winnipeg. Born at St. Thomas, N. Dakota., Apr 14th, 1891. Educ., B.E.E. Univ. of Man. 1917. 1911, Can Westinghouse generating station installation, Point du Bois; 1912-12, Wpg Light & Power dept., draftsman; 1914-16, substation installation, maintenance and operation; 1917, Wpg Light & Power dept., 6 mos. in charge of alterations to switchboard in generating station; 1917-19, asst. to chief engr. same dept. Wpg., responsible for design and erection of substation, selection and installation of apparatus, etc.; Sept. 1919 to date, elec. engr., Manitoba Power Comm., in charge of all elec. design and constrn.

References: E. E. Brydone-Jack, E. V. Caton, G. C. Dunn, F. H. Farmer, A. W Lamont, J. M. Leamy, J. Rocchetti

DOWN—ENOS EDGAR, of Niagara Falls, Ont. Born at Exeter, Ont., Oct. 31st, 1882. Educ., 4 yrs. civil eng. Univ. of Michigan. 1908 (4 mos.) on Detroit River Channel as inspector; 1909-10, rodman, etc., on R.R. constrn.; 1910-11, topog'r and 1½ yrs. draftsman, R.R. constrn. and location; 1912-13, inst'man, R.R. constrn. all with C.P.R. western lines: overseas, surveyor A Coy. 2nd Can Engr. Batt.; 1919 (3 mos.) inst'man, in charge constrn., C.P.R.; at present draftsman on canal constrn., Hydro Elec. Power Comm., Niagara Falls.

References: C. L. Bates, W. B. Crombie, C. Flint, W. A. James, C. H. McDougal.

DUNCAN—ERSKINE, Major, of Galt, Ont. Born at Glasgow, Scotland, Aug. 15th, 1881. Educ., Coll. Inst.; Glasgow High School; Glasgow Tech. Coll. 4 yrs., 3 mos. apprentice, Simpson & Wilson, civil and mining engrs., Glasgow; 1910, asst. engr. on prelim. and location, C. P.R.; 1910-14, dist. engr. in charge 30-40 miles constrn., C.P.R.; 1914-15, chief engr., Glengarry & Stormont Ry; 1915-19, military service, enlisted Mar 1915, commissioned as lieut., promoted captain Nov. 1915, major Dec. 1916, mentioned in despatches; on surveys and constrn. of strategic rys., etc.; Apr-Aug. 1919, in charge of prelim. and location, C.P.R.; at present, locating engr., Hydro Elec. Power Comm.

References: J. M. R. Fairbairn, C. L. Hervey, D. Hillman, C. Luscombe, C. W. P. Ramsey.

DYNES—WILLIAM WARREN, of Winnipeg, Man. Born at Winnipeg, Dec. 6th, 1890. Educ., B.C.E. Univ. of Man 1911. Summers: 1908-09, rod and inst'man, special city survey, Winnipeg; 1910, draftsman, G.T P.Ry.; 1911-12, draftsman and detailer on yard layout work. G.T.P.; 1912-14, bridge draftsman, C.N.R., on design and detailing of bridge substructures, subways, etc.; 1914-16, asst. engr., city of Wpg. on traffic and bridge inspection work; 1916-17, in charge of traffic dept. and bridge and subway maintenance; Feb. 1917-June 1919, overseas service, C.E.F.; June 1919 to date asst. engr., Winnipeg, on bridge and concrete design.

References: W. Aldridge, W. P. Brereton, J. A. H. O'Reilly, A. W. Smith, W. Walkden.

EASTON—LEONARD IDELL, Capt., M.C., of Winnipeg. Born at Guelph, Ont., Aug. 2nd, 1889. Educ., B.C.E., Univ. of Man. 1912. Summers: 1909, rodman, C.N.R.; 1910, field draftsman, G.T P.; 1911, transitman on location, Yellowhead Pass, G.T.P.; 1912-13 (16 mos.) chief inst'man, harbor survey, Port Nelson; 1913-14 (9 mos.) designing, bridge dept., C.N.R.; 1914 (4 mos.) designing, Winnipeg River Power Co., 1914-15 (3 mos.) surveying and testifying in connection with law-suits; 1915 (9 mos.) res. engr., H.B.Ry.; 1915-16 (5 mos.) designing, bridge dept., C.N.R.; Apr 1916-May 1919, lieut. and captain, Can. Engrs., awarded M C.; June 1919 to date, designing, bridge dept., C.N.R.

References: J. V Dillabough, C. N. Mitchell, J. W. Porter, R. C. Robinson, A. W. Smith, A. J. Taunton, W. Walkden T. W. White.

ESTRUP—HECTOR FREDERIK JANSEN, of Welland, Ont. Born at Horsens, Denmark, Mar. 2nd, 1886. Educ., passed exam., Polytech. Coll., Copenhagen; grad. in artium, 1904; gen. test in philosophy, 1906. Mar Nov. 1910, service in Royal Engrs of Danish Army; 1911-12, draftsman and designer, bridge dept., C.P.R.; Jan.-May 1912, draftsman and designer, N.T.C.Ry.; 1912-17, bridge and lock gate engr., Welland Ship Canal; 1917 to date, director and president, British American Shipbuilding Co. Ltd., (steel steamers) in charge of design and layout of plant, cranes, docks, etc.

References: R. W. Leonard, C. N. Monsarrat, P. B. Motley, W. H. Sullivan, J. L. Weller.

FYFE—HERBERT DIXON, of North Vancouver, B.C. Born at Acton, Ont., Aug. 17th, 1886. Educ, S.P.S. 1911. Summer 1910, inst'man, C.P.R., Hardisty, Alta.; 1911-18, draftsman, designer and estimator, C.N.P.Ry. Vancouver; 1918 to date, structural engr., J. Coughlan & Sons, Vancouver.

References: J. A. Brown, G. P. Stirret, R. G. Swan, S. H. Sykes, T. H. White.

McPHERSON—DAVID EWEN, of Winnipeg Man. Born at Winnipeg, Sept 13th, 1891 Educ., B.C.E., Univ of Man. 1916. 1909 (4 mos.) with C.N.R., Maryfield extension; 1910 (5 mos.) rodman, C.N.R., Greenway extension; 1911 (6 mos.) C.P R., leveller on location; 1912 (6 mos.) inst'man on constrn., C.P.R.; 1913 (2 mos.) rodman, International Joint Comm., Lake of the Woods survey; 3 mos., leveller, topog., McColl Bros.; 3 mos., inst'man on constrn., C.P.R.; 1914 (4 mos.) res engr., E.D. & B.C.Ry.; 1915 (4 mos.) res engr., Manitoba Good Roads Comm., Wpg. and Virden; 1916 (2 mos.) transitman, C N.R.; 1916-18, asst. engr., Wpg. Aqueduct Constrn. Co.; 1918 (1 mo.) asst. engr., Great Lakes Dredging Co., Ojibway; Nov. 1918-Apr 1919, draftsman, C.N.R., Winnipeg; Apr-Dec. 1919, res. engr., C.N. R., Eston, Sask.; at present, draftsman, C.N.R.

References: E. E. Brydone-Jack, W. Burns, J. A. H. O'Reilly, W. Smaill, A. W. Smith

MORTON—KENNETH WILLIAM, of New Westminster, B.C. Born at Perth, Scotland, Nov. 12th, 1888. Educ., 2 yrs. eng. at Univ. Coll., Dundee; A. M I.C.E. 1906-10, apprentice on sewerage and sewage disposal, waterworks, surveying and levelling; 1911 (3 mos) asst'g city engr., Cowdenbeath, Scotland, on new water filter installation, street improvements, etc., Apr.-Oct. 1911, bridge and structural design, G.T.R. Montreal; 1911-12, same duties, C N R, Toronto; June-July 1912, with Dutcher, Maxwell & Co., Vancouver, preparing schemes of water power, sewerage, etc. for city of Duncans; Sept. 1912 to date, with Public Works, Canada, New Westminster, at present as asst engr. on design and superintendence of constrn. in charge of dredging, hydrographical surveys, etc.; July 1918-Feb. 1919, lieut., with 7th Batt., Can. Engrs.

References: R. A. Baldwin, P. E. Doncaster, H. K. Dutcher, A. F. Stewart, A. D. Swan, C. C. Worsfold.

FRASER—CHRISTOPHER EDWIN, Capt. of Finch, Ont. Born at Brock- [illegible]

[illegible]

W. F. Wright

PATTERSON—THOMAS ROY, of Goderich, Ont. Born at Auburn, Ont., Aug. 12th, 1893. Educ., B.Sc. (hons.) Queens Univ. 1918. Summers 1907-09, asst., D. Patterson, Huron County engr.; 1912, on G.T.P. railroad survey; 1915, on eng. staff, Trent Valley Canal; summer 1916 and 1917, asst. engr., B.C. Hydrographic survey in charge of Nelson and Cranbrook dists.; 1918, asst. to D. Patterson in charge of bridge design, erection and road surveys; 1919 to date, Huron Co. engr., in charge of all constrn. and repair on 420 miles of county and prov'l county roads, also engr. for townships of East Wawanosh, Stanley, etc. and towns of Seaforth, Exeter, etc.

References: G. Hogarth, J. A. P. Marshall, T. S. Scott, E. A. Stone, R. G. Swan.

ROUNTHWAITE—FRANCIS GEORGE, Lieut., of Montreal. Born at Collingwood, Ont. Apr. 3rd, 1892. Educ., B.Sc. (C.E.) McGill Univ., 1916. 1909-10, rodman, J. S. Metcalf Co. Ltd., on constrn. of C.P.R. elevator and wharves at Port McNicol; summers 1913-14, rod and inst'man, respectively, on constrn. of A.C. & H.B.Ry. between C.P.R. and C.T.C.Ry; May-1916-Apr. 1919, lieut., Can. Garrison Artillery, O.M.F.C.; Apr.-Aug. 1919, asst. engr., Magwood & Stidwell, Cornwall, Ont.; Aug.-Dec. 1919, cost clerk and timekeeper, and at present, asst. to constrn. engr., Atlas Constrn. Co. Ltd.

References: Sir John Kennedy, H. M. MacKay, W. H. Magwood, J. B. Porter, F. Stidwill, J. H. Trimingham.

URIE—HARRY ROY, Major, of Winnipeg. Born at Deloraine, Man., Dec. 29th, 1890. Educ., B.C.E., Univ. of Man. 1913. May-Oct. 1911, rodman on constrn., C.N.R.; May-Oct. 1912, rodman and leveller, C.P.R., constrn. and location, Kaslo, B.C.; May-Oct. 1913, transitman, P.W.D., hydrographic survey, N. Sask. River; 1913-14, in charge hydrographic survey, P.W.D., Fairford and Red Rivers; Aug. 1914-Apr. 1919, Can. Engrs., B.E.F., rank from sapper to major; Apr. 1919 to date, dist. engr., Good Roads Board.

References: E. Brydone-Jack, E. P. Fetherstonhaugh, W. H. Hunt, M. A. Lyons, A. J. Stevens.

VERMETTE—NARCISSE J. A., of Verdun, P.Q. Born at Montreal, July 23rd, 1892. Educ., civil and elec. eng., Laval Univ. 1915. 5 yrs. to date, chief engr. in charge of all eng. work, Ouimet & LeSage, designing and supervising sewerage systems, pavements, roads, etc., in various parts of Quebec prov.

References: F. C. Laberge, R. LeSage, S. Ouimet, A. Surveyer, A. Vincent.

WHITE—JAMES ALEXANDER GORDON, Bge.-Major, D.S.O., M.C., of Nipigon, Ont. Born at Woodstock, Ont., Aug. 28th, 1888. Educ., B.Sc. (mining) McGill Univ. 1911. Summers, 1907-09, asst. to city engr., Woodstock; 1910, sampler, Consol. Mining & Smelting Co., B.C.; 1911-13, asst. to mines manager, Mond Nickel Co., surveys, in charge of diamond drilling, location, constrn. of rock house, etc.; May-Sept. 1913, efficiency engr., Robt. Grace Contracting Co., Pittsburgh, reports on plants, etc.; 1913-14, foreman in charge concrete placing, Campbell & Lattimer, Toronto; 1913-15, asst. engr., Hydro Elec. Power Comm. on Eugenia Falls power development, in charge of H.E.P.C. interests, etc.; Feb. 1915 enlisted as subaltern; Dec. 1916, learner, C.I.B., then staff captain, June 1917 awarded M.C.; 1918, D.S.O., 31st Can. Div.; June 1918, brigade major, awarded D.S.O., peace honors, returned May 1919; at present, asst. engr., H.E.P.C. on Nipigon development in charge of power house, etc.

References: H. G. Acres, T. H. Hogg, C. H. Mitchell, J. N. Stanley, F. J. Ure.

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VOLUME III MONTREAL, APRIL 1920 NUMBER [illegible]

Good Roads in Ontario

W. A. McLean, M.E.I.C., Deputy Minister of Highways, Province of Ontario

The more I know of the highway problems of other countries, states and provinces the more I am impressed with the general similarity which pertains to all. We have heard of the influence of the Quebec farmer through the labor tax levied upon him; of the growth of highway improvement through municipal organization; and later, the influence of the central government upon the work. That is the story of practically every country in the world that has attained good roads.

Attending conferences in Canada at which roads are a chief topic, when the roads of Ontario are compared with those of other provinces, one is led to believe from the trend of discussion that money is not the root of all evil, but rather that the roads of Ontario are the routes of all evil.

That, however, is not quite a true estimate of the situation in Ontario. Ontario has developed an excellent municipal organization, through which large annual expenditures have been going on and are increasing. We have about 55,000 miles of highway, of which about 42,000 miles are well graded and in use, and 22,000 miles, or over half, are superior to earth roads. While they are not always of marked excellence they are surfaced with gravel, broken stone, concrete, bituminous macadam, and many miles are oiled annually. They are superior to earth roads. That is a record which is rarely equalled on this continent.

Read at General Professional Meeting, Montreal, Jan. [illegible], 1920.

In certain states we find excellent systems of state highways. New York has a splendid system of state highways and we are apt to compare Canadian road conditions with those of New York. That State has had a source of income, the City of New York, through which they are practically able to take toll for highway construction, from the whole of the United States.

These state and county highways are constructed through direct levy on assessment, so that cities pay uniformly with the country districts for main highway construction. When we in Ontario have such a system of distributing the cost, it is quite evident that our expenditures can be much increased. But unfortunately at the present time, cities do not contribute so substantially.

However, present plans contemplate a policy of [illegible]. We estimate that this year, on the country roads of Ontario, we will spend [illegible] millions of dollars, which will be continued annually for at least a period of five years, and I expect that thereafter the annual expenditure will be increased.

An expenditure of [illegible] millions in five years, if properly applied, should make an improvement in Ontario highways, but we do not expect to wait until the end of that period to be able to see these roads with a good deal of satisfaction.

The Value of Good Foundations

The engineer and the layman regard roads from different standpoints. The user of the road considers surface conditions only. The builder must first think of many other factors such as location, alignment, grading, foundation, bridges, drainages and a multitude of preliminary details. Our efforts in Ontario at the present time are largely with respect to foundations and primary construction, with a surface merely to meet immediate needs. When we get the traffic going over roads so built, we know that the high-class surface will take care of itself in accordance with the demands of traffic.

It is useless to put a high-class surface on a poor, inadequate and insufficient foundation. The truth was emphasized by Mr. James in his address at the opening of this annual meeting. It has cost the United States enormous sums of money to re-discover this old and elemental fact. It is to be hoped that Canada will benefit by the experience that has been so expensively acquired in the United States.

I have said that we have 55,000 miles of highway in Ontario, with about 42,000 miles in use, over half of which has some class of surface. These surfaces are under improvement, the foundations are being improved and they are each year receiving more systematic upkeep and repair, which is so much needed.

Work for 1920

That sixteen or eighteen hundred miles we hope to get into passable shape quickly by an average expenditure of over ten thousand dollars a mile. This construction will involve some cement-concrete, asphaltic-concrete and bituminous macadam; and a considerable extent, as in every other country, will have to be gravel construction and broken stone; or these surfaces treated with tar and asphaltic oil.

We expect, if our plans can be put into execution, by the end of the current year, to have between the Quebec boundary and Windsor a highway 500 miles in length that is reasonably passable at every point, and at least superior to an earth road, a road which can be used throughout in spite of any weather conditions, and as fast as a car can travel. Many portions will be of a finished and high-class type.

When that main highway is in good condition, you will find as you come through Ontario that our past substantial expenditures have constructed branch roads from this main artery into all parts of the province.

You will find an excellent system of market roads, macadam, gravel, concrete and other forms, all attainable by means of this one main artery which, to the present time, we have not been able to construct owing to the scattered nature of the population of Ontario.

Some years ago, speaking in this city, I said that perhaps French should be declared by us the "official language" of good roads. I spoke of that because I had a short time before gone over the roads of England, France, Scotland, Switzerland and Belgium, and in no country did I find construction, primary construction, equal to the roads of France.

Other countries have perhaps maintained their roads by higher expenditure, but in primary construction I have not seen roads equal to those of France. In laying out the system in Ontario, I have had before me the general design of the French highway, and we have applied in Ontario a considerable part of the elements of French organization to our administration. In that way, I hope that sometime in the future Ontario will stand in the forefront of those portions of this continent which have good roads.

Concrete Mixtures in Alkali Soils

By C. J. Mackenzie, A.M.E.I.C., Prof. Civil Engineering, University of Sask.

Known Facts Regarding Effect of Alkali Waters on Concrete.

Briefly, the known facts concerning the effect of alkali waters' on cement and concrete mixtures, are as follows:—

1. By laboratory experiment it has been conclusively proved that magnesium and sodium sulphates, which are the predominating salts in our so-called alkali waters, will attack cement chemically and under certain conditions of intimate mixture completely disintegrate the same, (see Montana Agricultural College Bulletin No. 81.)

2. In laboratories it has also been proved that if a porous concrete be saturated and dried alternately, using a solution of soluble salts found in our alkali soils, that the process of crystallization will exert a force which will cause a splitting of the concrete. (Bureau of Standards Paper No. 12.)

3. In practice many cases have been observed where structures of concrete as well as those of chemically inert and porous materials, such as brick, sandstone, etc., where exposed to alkali waters, have been disintegrated, suggesting that the mechanical force of crystallization is the action obtained.

4. Also numerous cases have been observed where the concrete exposed has became soft, pasty and bulged, with the total loss of its cementing value, suggesting a chemical action on the binding material.

Read before the Annual Meeting, Sask. Branch, Jan. 8th, 1920.

3. In practice also we find structures of apparently the same grade of concrete exposed to the same conditions, one of which may be badly attacked with pitting and disintegration, while another appears unaffected.

Two Theories—Mechanical and Chemical

According, therefore, to their personal experiences there are those who hold that the action is entirely mechanical, due to the crystallization of the salts of the alkali water and that, therefore, all required is a dense concrete. There are engineers and chemists who are attacking the problem from the purely chemical side. (See Feret and Montreal Bulletin.) There are also a few engineers who hold that there is no effect from the alkali waters at all; that the trouble is entirely due to poor concrete and the disintegration found in our Western areas of alkali waters would have occurred similarly in the East, and been accredited there to the action of the weather, etc., on a poorly fabricated concrete.

It follows then, that accepting the facts above stated, we may say that while cement can be disintegrated by intimate action of alkali solutions, in laboratories, and also that concrete of porous character can be disintegrated by the mechanical forces of crystallization under ideal laboratory conditions of saturating and drying, these ideal conditions will seldom, if ever, be found in practice and consequently deductions from laboratory experiments must be interpreted with a great deal of caution.

In practice the alkali water is not permitted the intimate contact with cement; nor do we find the rapid saturating and drying, and in addition we have the extremely important problem of what effect the surface coating may have.

It would seem then that the most feasible method of attacking this problem is by actual field tests of concrete in the form of and under conditions found in practice. It is my opinion, and we have outlined our own experiments on this basis, that the proper way to approach the problem for the present is to subject, not a few mixtures to numerous varieties of water, but a number of widely different mixtures to conditions where disintegration is known to have taken place, and in this way we may hope to get some idea as to which mixtures will stand the action of alkali waters and which will not. If we could establish even a danger zone, we would have accomplished something practical, and later the determination of just what chemical or mechanical action takes place when concrete fails, could be undertaken.

Field Tests by the Bureau of Standard

The only published records of field tests of this nature being conducted at present, with which I am familiar, are those of the Bureau of Standards, Washington. Their experiments were initiated in an endeavour to determine the action of sea water on concrete, which we now know is of a similar nature to that of alkali action. Their first published report in 1912 covered an account of experiments conducted in the laboratory and a few field tests in the sea.

This report proved only the theory of mechanical action by crystallization under laboratory conditions.

The second report published in 1917 is devoted to an account of the field tests made on various reclamation projects in the American West, to determine the effect of alkali waters on concrete. The major part of the work covered by this report deals with cement pipe, but there are also the results of a year's experiments on block concrete. The results show pending conclusions. The tile pipes were taken up and crushed, and from their installation in 1913 till 1916 it may be stated generally that all pipes showed increase in strength in alkali waters. Although there were some cases of total failure of individual tiles, and even some of the tiles showing increase in strength were slightly pitted and attacked. It is very possible, however, that the future may yet show the effect of the alkali action.

The only conclusions drawn are that richness of mixture alone will not prevent disintegration and that poor tamping in several rich mixtures showed up much worse than lean mixtures in a well made concrete.

The blocks were only in one year before inspection and, with the exception of two cases, there was no effect noticed other than a slight pitting. The failure of two of the projects indicates that material and proper workmanship are of the greatest importance, but no conclusions of far reaching effect are drawn at the present.

In 1916 I investigated this problem for Chief Engineer, C. D. Howe of the Grain Commissioners of Canada, and the above conclusions were reached at that time. These conclusions, I think, are sound and have been shared for several years by most engineers interested in this problem, and at the same time there was the feeling that we really knew very little about the matter and that there were no very great indications of immediate light ahead.

The only difference in the outlook today, to my mind, is not due to any of the results of direct experiments along this line, but to the great steps in the understanding aand interpretation of concrete mixtures, which have taken place within the past year and a half.

The question that concerns us chiefly as engineers today is, let me repeat, "which mixtures, if any, will successfully withstand the action of the alkali waters as found in our Western Provinces?" The answer demands that we must first have an intimate and complete knowledge of mixtures, and then investigate the action of alkali on a wide range of mixtures and determine, if possible, which are suitable and which are unsuitable for our conditions.

The Science of Mixing Concrete.

I firmly believe that the principal reason we have obtained no clear conclusions up to the present is due to the fact that for the past years we have known practically nothing about the science of the design of concrete mixtures. How could we expect to obtain any definite information as to which mixtures would be suitable and which would not, when we know nothing more about the results of our mixtures, than that they were mixed in the proportions of 1.2.4 or 1.3.5 as the case might be, without any definite knowledge as to the final results of the concrete made?

A mix of, say 1-6, as is common with us, tells absolutely nothing about the finished concrete. The strength and character may vary several hundred per cent on the same job, to say nothing of the variation in mixtures on different jobs using different materials and mixed by different men and different methods. (I make this statement advisedly as the result of actual tests made from concrete poured on various jobs).

For years we have simply mixing concrete with our technical eyes shut. Certainly some engineers and some firms have been making concrete of the very best quality, while others working to the same specifications and with the same materials, have been making concrete of an altogether different character. The thing that has troubled most of us is, I think, the fact that if we were given the ingredients in any case including cement, sand, gravel and water, we could not calculate the strength of the finished product with any degree of assurance, although many men of mature judgment and wide experience could form a very good opinion.

Personally I have done what was called sand and gravel analyses for several years, I have plotted the results on properly ruled paper along with Fuller's Ideal Crow, handed the results to clients and even charged good money for it, but I tell you truthfully, the analysis never meant anything vital to me, and I am absolutely sure that it meant nothing to most of those to whom I sent it. All the time I prayed that someone would do something to clear up the meaning of gravel analyses.

Concrete Mixing Research, by Professor Abrams and Captain Edwards

During the years 1918-1919 two independent experimentors accomplished what I consider to be the biggest step towards placing the mixing of concrete on a scientific basis, that has been made for years. The names of the experimentors, Professor Abrams of the Lewis Institute of Chicago and Captain Edwards, until recently of the Department of Works of the City of Toronto, are familiar no doubt to all of you, and I understand that Professor Abrams attended the meeting held in Saskatoon in 1918, and is known personally as well to many members.

At the risk of covering ground familiar to you, I wish to mention these methods, as we have mixed all our concrete for experimental purposes on these theories, and we have tested their value out on various jobs in Saskatoon during the year and have found them very satisfactory and enlightening.

Professor Abrams proved from the results of about 50,000 tests that the strength of concrete depends only on the ratio of water to cement for all ordinary workable mixtures. The aggregate functions only in determining how much water must be used to make the mix workable. He worked out a method of stating this property of aggregate in terms of a concrete number which he calls "the fineness modulus" and which is readily obtained from a screen analysis. Thus, if we observe the amount of water being used per bag of cement on any job, it is always a simple matter to calculate the strength of the resulting concrete. Or if we are given an aggregate and we obtain its fineness modulus, we can calculate how much water will be necessary for any mix and what the strength will be, or if we wish to make concrete of a certain strength out of a certain aggregate, we can easily calculate the amount of cement required and the necessary water. By this method we have a means of comparing in actual figures of strength and also dollars and cents, the value of different aggregates.

Captain Edwards, on the other hand, attacked the problem from an altogether different viewpoint and concluded that, always providing the concrete mixture is of normal consistency or workability, the strength of concrete depends on the ratio of cement to the surface area of the aggregate. He worked out tables which when applied to the mechanical analysis of any aggregate, will give the surface area per pound of the aggregate. And by this method also mixtures may be analysed and designed as above.

While these two methods on the surface seem quite different and even contradictory they are identical in practical results and have both been found to give satisfaction on practical work.

The scope of this paper does not permit of a thorough discussion of these methods but if there are any members here today who are not familiar with these theories I would strongly urge a serious study of them.

Experiments in Saskatchewan

In outlining the experiments carried out in conjunction with the Committee on Concrete of the Saskatchewan Branch of *The Engineering Institute of Canada*, it would be well to state that we recognized that the problem was a very large one and that with the funds and facilities available at present it would be better to confine our work to one particular district, and if results of any value are obtained, further grants might be secured for a complete survey of the province, and test blocks placed in all the different localities where conditions of ground water, soil and available concrete aggregate differ.

We started with the premises as set forth in the opening paragraphs of this paper and accordingly decided to undertake our work under three divisions:—

(a) Field Tests.

(b) Observation of buildings under construction in areas known to be troublesome.

(c) Laboratory tests both chemical and physical.

(a) *Field Tests.*

For the present we are devoting the major part of our time to the Field Tests and to date we have placed in the ground specimens representing about 39 different concrete mixtures.

It was decided, in view of the fact that the pressing problem, in Saskatoon at least, is in connection with foundations and walls and not with tile, to make up our test blocks in cubes with sides of twelve (12) inches, thus approximating the conditions of walls. Each block is moulded in our laboratories and a wrought iron rod with anchor plate is inserted, the portion protruding forms a loop for handling and has enclosing it a brass identification disc.

The site for placing the test blocks was selected after a thorough investigation of the City and is in the centre of the most troublesome area being surrounded by buildings which have been affected.

Contiguous buildings were inspected to ascertain at what depth the most serious disintegration occurs, and we found that this was at a depth of six feet where a small gravel seam, about two inches in thickness runs through the clay. This depth was used for our blocks.

The test blocks made to date are in six series as follows:—

Plate "A"

Series A.

This series consists of thirteen blocks, ranging from a very strong, well graded, dense concrete to a very weak mixture, of poor pit run gravel, so weak that it was impossible to even handle without knocking the corners off as shown in Photo "A."

Blocks No. 1—No. 5, were made with an aggregate of washed gravel and crushed stone. This aggregate is a good approximation of Fuller's Curve. Its fineness Modulus (according to Abram's method) is 5.5 and the surface area per gr. (calculated by Capt. Edward's Tables) is 2.44.

Mixtures by volume of 1:2.5;—1:3.7—1:5.0—1:6.2. and 1:7.5 were used.

The ratio vol. water/ vol. cement runs from: .62 to 1.31, while the grs. of cement per sq. in. of surface area of aggregate varies from 7.3 to 22.

Blocks No. 6—No. 10 were mixed with a pit run gravel as aggregate, the fineness modulus of which was 3.8 and the surface area per gr. 3.9 sq. in.

The same mixes were used as in blocks No. 1—No. 5 but the ratio vol. water/ cement varied from .82 to 2.4 and the grs. of cement to surface area from 11.7 to 35.1.

Blocks No. 28—No. 30 were mixed with a pit run gravel of a better grade, the fineness modulus being 4.8. The surface area 2.51 sq. in. per gr.

The water/cement ratio varies from [illegible] to [illegible]. The grs. of cement per sq. in. surface area from [illegible]—[illegible].

Thus we have in this series concrete from the best to the worst practicable. A well graded aggregate and a poorly graded aggregate of average quality. A range in water ratio from .62 to 2.4. And a variation from 1 gr. of cement to 7.3 square inches of surface area to 1 gr. to 35.1 sq. inches, which gives a range in crushing strength from [illegible] lbs. sq. in. to 300 lbs. sq. in.

Complete records of the analyses of the cement, aggregate, mixing water have been kept, while from a test hole at the site, a log of the ground water level with the corresponding chemical analyses of the water is being recorded. The weights of the various ingredients as well as the moisture content of the gravel were, of course, kept, and it might be interesting to note that the best Block, No. 1, weighed 147 lbs. per cubic foot while No. [illegible] the poorest, only weighed 131 lbs. per cubic foot.

Before placing in the ground, a photograph was taken of the blocks, and it is proposed that each time the blocks are dug up for inspection, photographs will be taken for comparison and record.

It is believed that from this preliminary series we shall be able to obtain at least the danger zone of mixtures for this particular locality and thus cut down the range for future experiments and indicate the value of the different factors in combating disintegration in this locality.

Plate "B"

Blocks No. 11.—No. 19; No. [illegible]—No. [illegible]; No. [illegible]—No. [illegible] (15 blocks in all).

This series was designed for the purpose of testing a few commercial waterproofing and alkali proof products. Each compound was applied according to the manufacturer's specifications to each of the three blocks corresponding exactly to either blocks Nos. 11-12-13 or Nos. 28-29-30, in constituents, mix and consistency.

Four general types were used; an integral powder mixed with the cement; a compound mixed with the water; an alkali proof paint applied on the surface and tar applied to surface.

Blocks Nos. 20-22.

These blocks were made of the same aggregate and mix as No.11—No.12—No.13 but the consistency was made as wet as possible in order to see if the excess water decreases the resistance of a concrete to alkali just as decreases its strength.

Series D.

The purpose of this series is to check our assumption that the maximum disintegration takes place at a depth of 6 feet. These specimens were made 6″ x 6″ x 6′ and are placed upright so that one end is exposed to the air while the other is well under the ground water level.

If we find that the six ft. level is not the woost we shall be able to change the position of the other blocks and make all future tests accordingly.

Plate "C"

Series E. Blocks No. 34—No. 36.

In this series the pit run gravel was first screened and divided at the No. 4 screen and then re-mixed. The mixtures by volume corresponding to No. 28, No. 29, No. 30. This series was designed to ascertain the economy if any, of screening and remixing the Gravels for concrete aggregate.

Series F. Blocks No. 37, No. 39.

The blocks in this series are of the same mix as No. 28, No. 29 and No. 30, but the mixing water was the alkali water taken from the ground where blocks are placed.

At the time of making up all blocks of the series, small blocks for compression tests were made up for testing after twenty-eight days in water in order to check, if possible, the alkali resisting properties of concrete against its strength.

With blocks No. 25—No. 39, nine compression blocks at each mixture were also buried to be tested three per year.

(b) *Observations of Buildings.*

This phase of the work consisted of an inspection of all known cases of disintegration in the city for the main purpose of defining the troublesome areas, and gathering all the information and evidence possible. Added to that we have outlined a scheme for inspecting all buildings being erected in these areas and personally observing the concrete being put in, the mix, consistency and aggregate, etc.

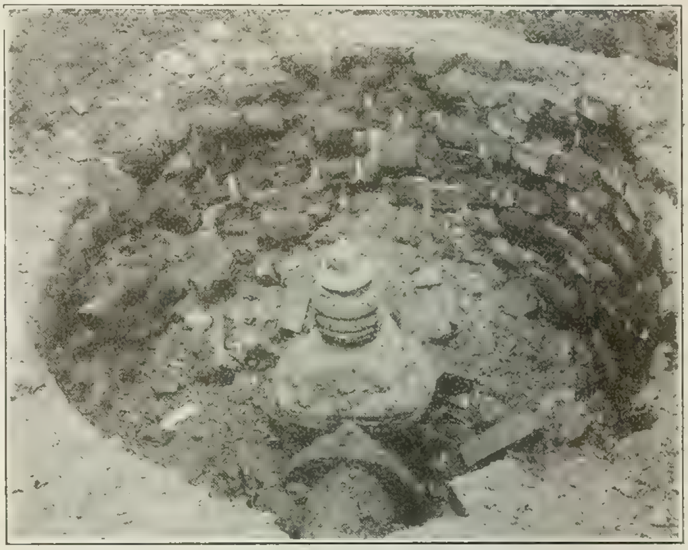

Plate "D"

Our inspection shows that the down town section of about ten city blocks contains the greatest amount of affected concrete, and information gathered from a reliable source indicates that before the city was built this area was what is known as an "alkali slough." Accordingly this section was selected for our tests and observations.

Plate "E"

On new buildings we take records of the conditions of the excavation, including an analysis of the ground water, a mechanical analysis of the aggregate and data as to the mix and water used. On several buildings we got permission to put in a section of the wall of a very much stronger mix than was used for the rest of the work and it is our desire to get a wall poured with about six different mixes, but up to the present time we have not succeeded.

On one old wall which was uncovered when extensions were being made a very interesting thing was observed. Two distinct layers of disintegration were noted, the ordinary one at the six foot level and the other at the ground level, suggesting that perhaps we have here disintegration by crystallization at the surface and direct chemical action at the six foot level.

(c) *Laboratory Tests.*

The laboratory tests are being conducted as an aid to, and for the purpose of throwing light on the results of the field tests, and not as primary tests themselves, as it is felt that conclusions drawn from laboratory tests are not always correct when applied to field conditions.

For the present the chemical work consists of a survey of ground waters, analyses of the mixing waters, aggregate, etc. As we get results from our field tests, the need for laboratory tests to clear up certain points will no doubt be necessary.

Conclusion.

The above is a summary of the work done during the past summer and while a great deal of actual labor has been done, we are, of course, unable to present any conclusions at present, although we hope that even by next summer's meeting we may be able to report at least some indications.

We intend extending the field of the survey next summer and adding [illegible] from time to time [illegible] at 6 ft. level, application of gases to surface, etc.

Effect of Vibration, Jigging and Pressure on Fresh Concrete

By Duff A. Abrams

Presented in part before General Professional Meeting at Rochester.

Introduction

An experimental study of the effect of vibration and pressure on fresh concrete on its strength and other properties is of interest in view of the frequent use of such devices as hand-hammering of forms, or air-hammering, jigging or vibration as an aid in placing concrete. Such methods are particularly applicable to the construction of reinforced-concrete ships and houses, where thin sections and a multiplicity of reinforcing members are of common occurrence. Jigging or vibrating machines are frequently used in concrete products plants. The effect of pressure on fresh concrete is of interest in certain problems of concrete design.

The tests included in this report were made as a part of the experimental studies of concrete and concrete materials being carried out through the co-operation of Lewis Institute and the Portland Cement Association.

Outline of Tests

The tests included in this report cover the following topics:

1. Different methods of hand-moulding of test cylinders.
   - (a) Puddling with 5/8-in. round steel bar (varying number of strokes).
   - (b) Tamping (tampers of different size).
   - (c) Tapping metal forms after puddling.
2. Effect of vibrating fresh concrete (small electric motor, Fig. 1.).
   - (a) Time of vibration varied up to 1 min.
3. Effect of jigging fresh concrete (using machine shown in Fig. 2).
   - (a) Concrete of different mixes (1:7 to 1:2).
   - (b) Concrete of different consistencies (0.90 to 1.20).
   - (c) Using aggregate of different grading (fineness modulus 4.00 to 6.50).
   - (d) Using aggregate of different sizes (0-28 sand to 0-1½-in. concrete aggregate).
   - (e) Using coarse aggregate of different shape (pebbles and crushed stone).
   - (f) Effect of rate of jigging (0 to 150 r. p. m.).
   - (g) Effect of height of drop (0 to 0.50 in.).
   - (h) Effect of length of time jigged (up to 4 min.).
   - (i) Effect of age of concrete before jigging (up to 6 hr.).
   - (j) Jigged with 30-lb. weight on top of fresh concrete.
   - (k) Hand puddling on jigging machine while in operation.
4. Effect of pressure on fresh concrete (method of applying the higher pressures shown in Fig. 3).
   - (a) Using different pressures (0 to 300 lb. per sq. in.).
   - (b) Effect of duration of pressure ([illegible]).
   - (c) Effect of removal of water by pressure.

This series included [illegible] compression tests of 6 by 12-in. concrete cylinders at the age of 28 days. All specimens were made from the same materials at the same time, consequently direct comparisons may be made between any two sets of tests.

Test Pieces

All test pieces consisted of 6 x 12-in. cylinders which were stored in damp sand for 28 days. The concrete for each specimen was proportioned separately and mixed by hand with a bricklayer's trowel in a shallow metal pan. The forms consisted of 12-in. lengths of cold-drawn steel tubing, split along one element. Each form stood on a machined cast-iron base plate. A smooth top was formed by means of neat cement and plate glass.

Unless otherwise noted, the specimens were moulded by the "standard" hand-puddling method before subjecting them to vibration, jigging or pressure. This method consists of puddling the fresh concrete in the metal form in 4-in. layers by means of 25 strokes with a 5/8-in. round steel bar and leveling off with a trowel. This method has been in use for several years in our research work and has been found to give uniform results for different operators. The strength of the concrete produced by this method of moulding is used as a basis for comparison (100 per cent.) for all other methods of treatment included in this investigation.

The mixture is expressed as one volume of cement to a given number of volumes of mixed aggregate. A 1:5 mix expressed in this manner is about the same as the ordinary 1:2:4 mix. The exact equivalent of the latter will vary with the size and grading of the aggregates.

The water content of the concrete is expressed in terms of the relative consistency and the "water-ratio." A relative consistency of 1.00 (normal consistency) is of such plasticity that the concrete of usual mixes will slump ½ to 1 in. if the metal form is withdrawn by a steady upward pull immediately after moulding the cylinder by the standard method. A relative consistency of 1.10 contains 10 per cent more water than normal consistency. The water-ratio is the ratio of volume of water to volume of cement in the batch. The weight of cement was assumed as 94 lb. per cu. ft. For one mix and given concrete materials the relative consistency and water-ratio may be used interchangeably.

In the hand-moulded specimens the method of placing the concrete was varied by changing the number of strokes of the puddling bar, using layers of different thickness, etc. Hand-tampers 2 in. and 5 in. in diameter were also used. In one set of tests the form was struck with a steel bar after moulding by the standard puddling method.

In the vibration tests the cylinder mould was bolted to a light timber table and the concrete specimen moulded by the standard hand-puddling method described above.

Violent vibration was produced by holding an electric motor frame against the side of the steel form as shown in Fig. 1. The motor carried an eccentric flywheel, weighed 12 lb. and ran about 1000 r. p. m. The time of vibration varied from 5 sec. to 1 min.

Fig. 1.—Electric Vibrator.

Shows set-up for vibration tests given in Table 3. Motor weighed 12 lb., ran about 1000 r. p. m.

The jigging tests were made on the machine shown in Fig. 2. The machine consisted of a framework carrying a metal table about 4 ft. wide and 8 ft. long weighing about 700 lb. The table was raised by means of belt-driven cams on two longitudinal shafts. The rate and height of drop could be varied over a wide range. In most of the tests the machine was run for 20 sec. at 100 drops per min., 0.1-in. drop; however, each of these factors were varied with the other two constant.

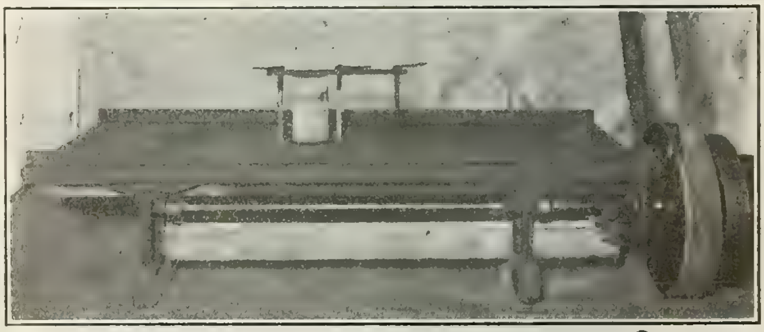

Fig. 2.—Jigging Machine.

Steel table 4 x 8 ft.; weight 700 lb. Table raised by means of cams; rate and height of drop can be varied over wide rangs.

All specimens were moulded by the standard hand-puddling method before pressure was applied. Pressures up to 30 lb. per sq. in. were applied by piling weights on top of a loose-fitting cover plate. Pressures of 75 and 50 lb. per sq. in. were applied by weighted levers. Pressures of 100 to 500 lb. per sq. in. were obtained by placing the freshly moulded specimen in a testing machine, as shown in Fig. 3. The spring facilitated maintaining a constant pressure. For all pressures the times of application varied from 15 min. to 16 hr.

Test Data and Discussion

The diagrams in Figs. 4 to 16 give the data in graphical form.

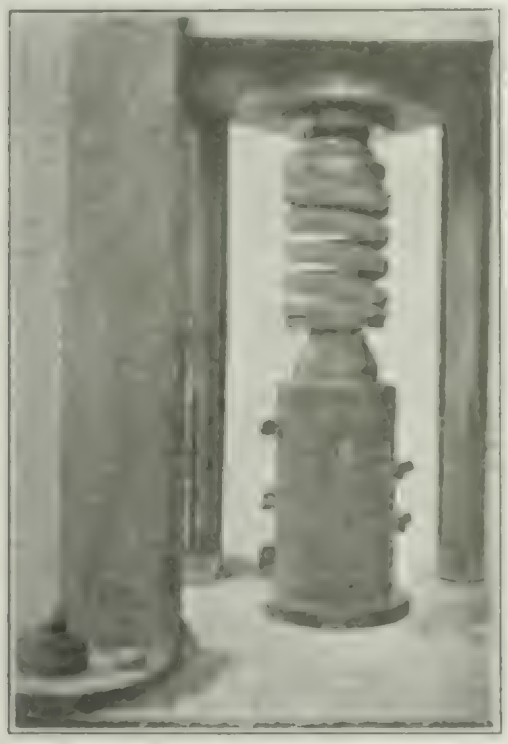

Fig. 3.—Method of Applying Pressure to Fresh Concrete.

The higher pressures were applied by means of a testing machine. The spring facilitated maintaining a constant pressure. The plate in contact with fresh concrete was loose fitting. The water expelled from concrete was collected by means of sponges and weighed.

The effect of vibration with electric vibrator is shown in Fig. 4. Vibrating for about 30 seconds caused no appreciable effect on the strength of concrete which had been puddled in place by hand. The tests indicate that hand-puddling (if thoroughly done) is just as effective as vibration in placing concrete. In other words, concrete which completely fills the form is not improved by vibration. This should not be construed as meaning that vibration is not effective in causing concrete to finds its way into intricate form work and around the reinforcing bars.

The effect of jigging is shown in Figs. 5 to 11. The jigging method used was one which would be applicable in concrete products plants. The tests show that in general jigging of concrete which has been placed by puddling is injurious to the strength. The improvement for the small-sized aggregates is probably due to the fact that the puddling method is not so satisfactory for this condition.

The tests of concrete setting under pressure are of interest in that they reveal the reason for increased strength due to this treatment. The concrete strength is increased due to the fact that some of the original mixing water is forced out. The higher the pressure, the more water is removed, hence the higher the strength.

Attention is called to the unusual uniformity of the results of the tests in this series, as illustrated by the fact that in the diagrams the points fall on smooth curves. There are only a few instances in which there is any appreciable deviation from this rule.

Summary and Conclusions

The tests give conclusive results on many phases of the effect of vibration, jigging and pressure. In some instances the effect is entirely different from what accepted opinion would suggest. Following is a brief summary of the tests:

Effect of Vibration with Electric Motor

Method of vibrating shown in Fig. 1.
Compression tests of 6 x 12-in. cylinders.
Results of tests are platted in Fig. 4.
Age at test 28 days; stored in damp sand; tested damp.
Aggregate—Sand and pebbles from Elgin, Ill., graded 0-1½ in.
Each value is the average of 5 tests made on different days.

Fig. 4.—Effect of Vibration on the Strength of Concrete.

Vibration produced by electric motor shown in Fig. 1. Compression tests of 6 x 12-in. cylinders. Age 28 days. Data from Table [illegible].

TABLE 1.—EFFECT OF METHOD OF MOULDING CONCRETE SPECIMENS.

Compression tests of 6 x 12-in. cylinders.
Age at test 28 days; stored in damp sand; tested damp.
Aggregate—Sand and pebbles from Elgin, Ill., graded 0-1½ in.
Each value is the average of 5 tests made on different days.

Ref. No.	Mix by Volume.	F. M. of Aggregate.	Relative Consistency.	Water-Ratio to Volume of Cement.	Compressive Strength		Treatment of Concrete
					lb. per sq. in.	Per cent of Standard	
1	1:5	5.75	1.00	0.875	2680	96	12 strokes around perimeter of form for each 4-in. layer of concrete using 5/8-in. steel bar.
31	....	....	....	....	2800	100	25 strokes distributed over section for each 4-in. layer using 5/8-in. steel bar. (Standard method).
51	....	....	....	....	2710		
84	....	....	....	....	2840		
					2780*		
2	....	....	....	....	2810	101	50 strokes distributed over section for each 4-in. layer using 5/8-in. bar.
147	....	....	....	....	2690	97	12 strokes on each 3-in. layer using 2-lb. tamper 2 in. in diameter.
148	....	....	....	....	2420	87	12 strokes on each 6-in. layer, using 2-lb. 2-in. tamper.
149	....	....	....	....	2430	87	12 strokes on first 3-in. layer using 2-lb. 2-in. tamper, forms then filled before tamping again with 12 strokes.
150	....	....	....	....	2500	90	12 strokes on first 3-in. layer, using 2-lb. 2-in. tamper, remaining concrete settled by tapping form lightly.
3	....	....	....	....	2800	101	25 strokes distributed over section for each 4-in. layer with 2-lb. 2-in. tamper.
4	....	....	....	....	2570	92	25 strokes distributed over section for each 4-in. layer with 2-lb. 5-in. tamper.
5	....	....	....	....	2740	98	Standard method of moulding, except form struck 3 light blows with steel bar after puddling each 4-in. layer.

*Average of 15 tests made on different days. This value is used as a basis for comparison in Tables.

Effect of Jigging on the Strength of Concrete.

(Using aggregates of different size and grading.)

Values from tests plotted in Figs. 7 and 8.

All cylinders were moulded by the standard method before placing on machine shown in Fig. 2. (100 r.p.m.; 0.1-in. drop; jigged 20 sec.)

Compression tests of 6 x 12-in. cylinders.

Actual tests (28 days; stored in damp sand; tested damp).

Aggregates—Sand and pebbles from Elgin, Ill., except where otherwise noted.

Each value is the average of 3 tests made on different days.

Variation in grading in last two groups was produced by mixing different percentages of sand and coarse aggregate.

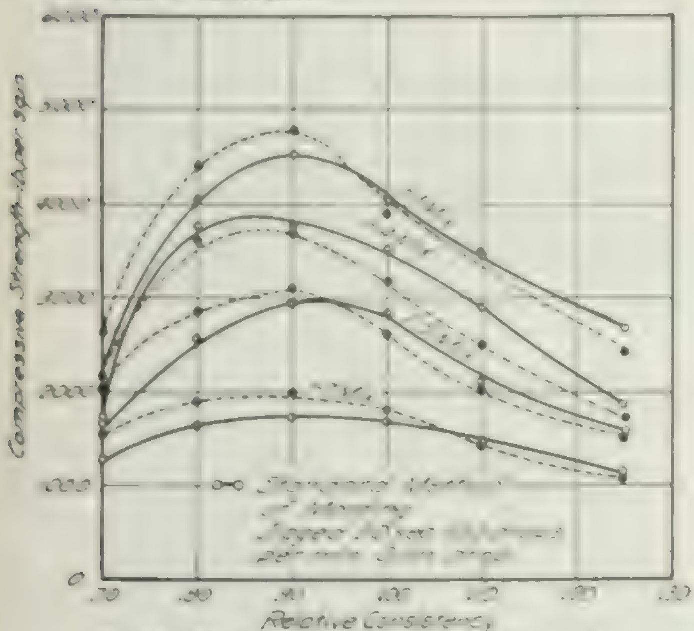

Fig. 5—Effect of Consistency on the Strength of Jigged Concrete.

Specimens moulded by standard method and parallel sets jigged on machine shown in Fig. 2. Compression tests of 6 x 12-in. cylinders. Age 28 days. Data from Table 4.

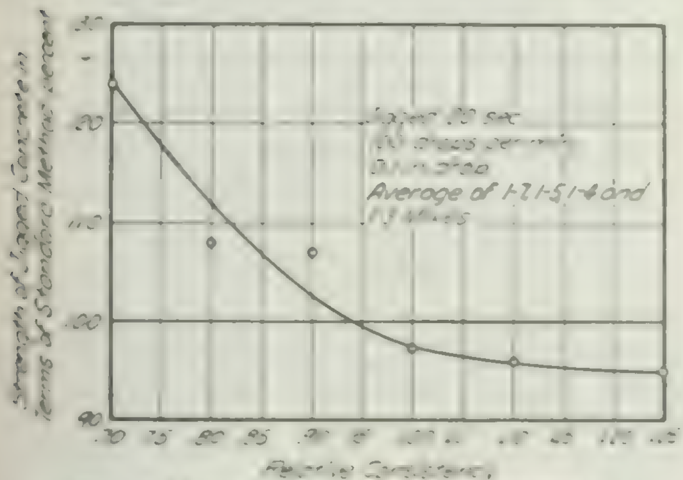

Fig. 6—Effect of Consistency on the Strength of Jigged Concrete.

Each value is the average of 20 tests; 5 each from 4 different mixes.

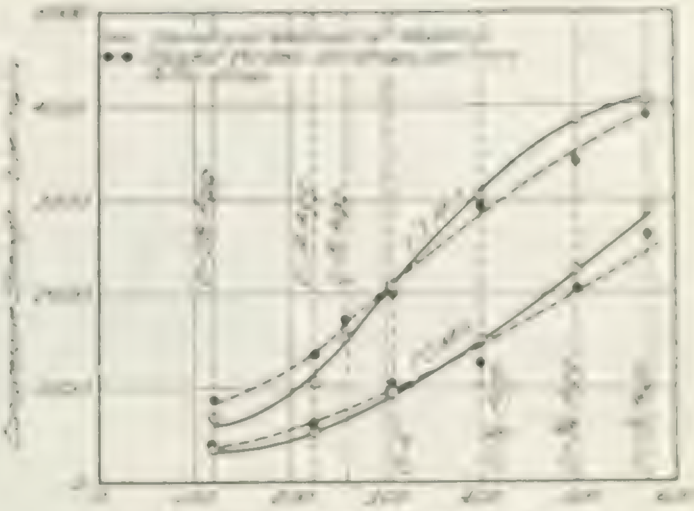

Fig. 7—Effect of Size of Aggregate on the Strength of Jigged Concrete.

Compression tests of 6 x 12-in. cylinders. Age 28 days.

Effect of Puddling and Tamping (Table 1)

1. Varying the number of strokes from 12 to 50 on each 4-in. layer in the standard method of puddling cylinders with a 5/8-in. bar had little influence on the compressive strength of ordinary plastic concrete.

2. In general, the tamping methods used gave lower strengths than hand puddling.

3. A tamper of large diameter for a given weight was less effective than one of small diameter.

4. Increasing the thickness of the layer from 4 to 8 in. caused a falling-off in strength of about [illegible] per cent for tamped concrete.

5. Tamping or puddling the first 4-in. layer only caused a falling off in strength of 10 to 12 per cent.

6. Striking the metal form with a steel bar after the completion of moulding by standard method had no effect on the strength of concrete.

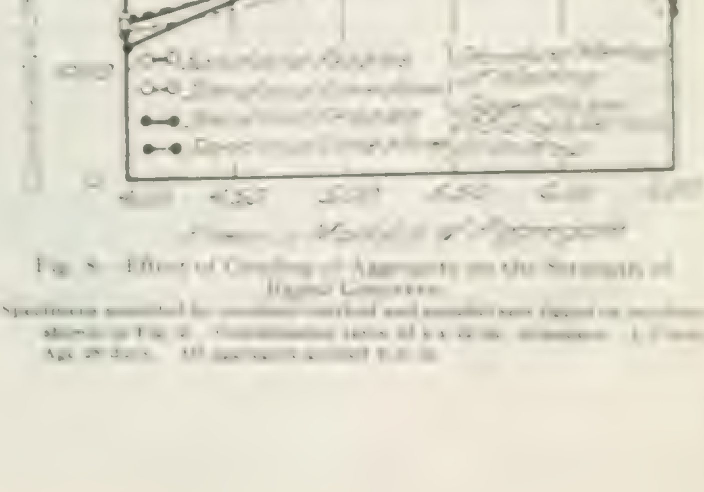

Fig. 8—Effect of Grading of Aggregate on the Strength of Jigged Concrete.

Specimens moulded by standard method and parallel sets jigged on machine shown in Fig. 2. Compression tests of 6 x 12-in. cylinders. Age 28 days. [illegible]

7. The "standard" method of hand-puddling using 25 strokes with a 5/8-in. steel bar for each 4-in. layer of concrete in a 6 x 12-in. cylinder is recommended for laboratory tests of concrete.

Effect of Vibration with Electric Hammer.

8. Vibration of the specimen after moulding by means of an electric hammer running at 1000 r.p.m. had little influence on the strength of the puddled concrete up to a period of about 30 seconds. If continued, there was a steading falling off in strength; after 45 to 60 seconds the strength was only 90 per cent. of that produced by the standard method of puddling. (Fig. 4.)

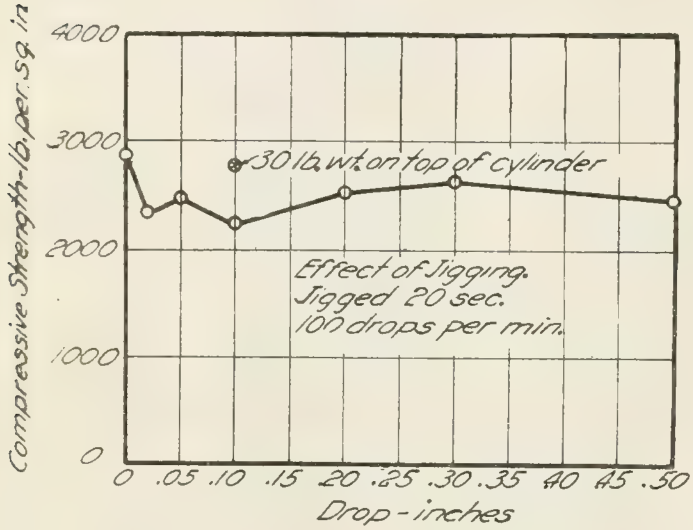

Fig. 9.—Effect of Height of Drop in Jigging Tests.

Compression Tests of 6 x 12-in. cylinders. Age 28 days.

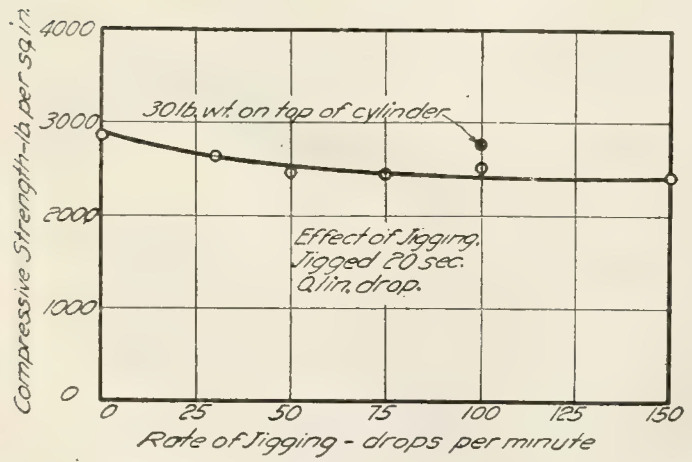

Fig 10. — Effect of Rate of Jigging on the Strength of Concrete.

Compression tests of 6 x 12-in. cylinders. 1: 5 mix. Age 28 days.

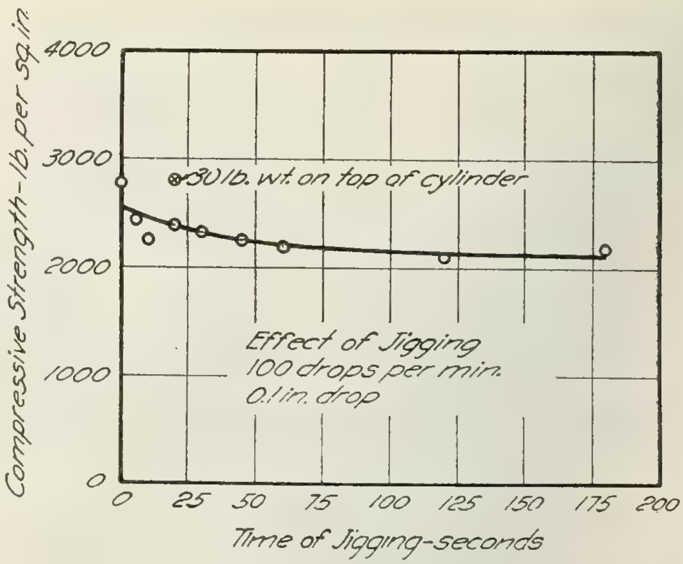

Fig. 11.—Effect of Duration of Jigging on the Strength of Concrete.

Compression tests of 6 x 12-in. cylinders. 1:5 mix. Age 28 days.

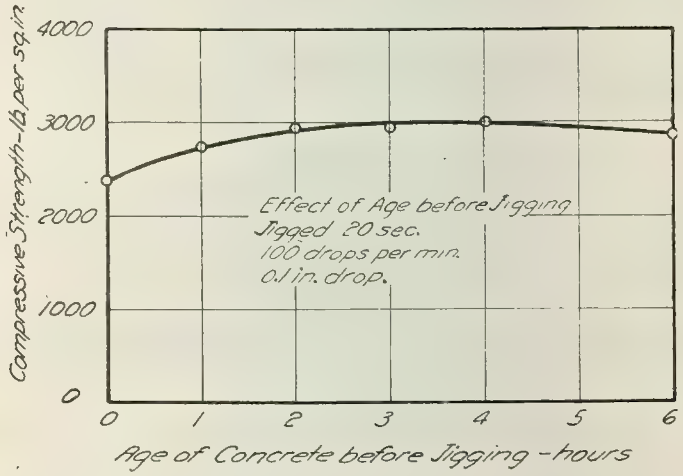

Fig. 12.—Effect of Age of Concrete before Jigging.

Compression tests of 6 x 12-in. cylinders. 1:5 mix. Age 28 days.

Effect of Jigging.

9. In general, jigging in any manner with the apparatus used reduced the compressive strength of the concrete regardless of the height of drop, rate of duration of treatment. Exceptions were found in the dry mixes and those made of aggregates of the smaller sizes. (Figs. 5 to 12.)

10. There was little difference in the effect of jigging due to the quantity of cement used. (Fig. 5.)

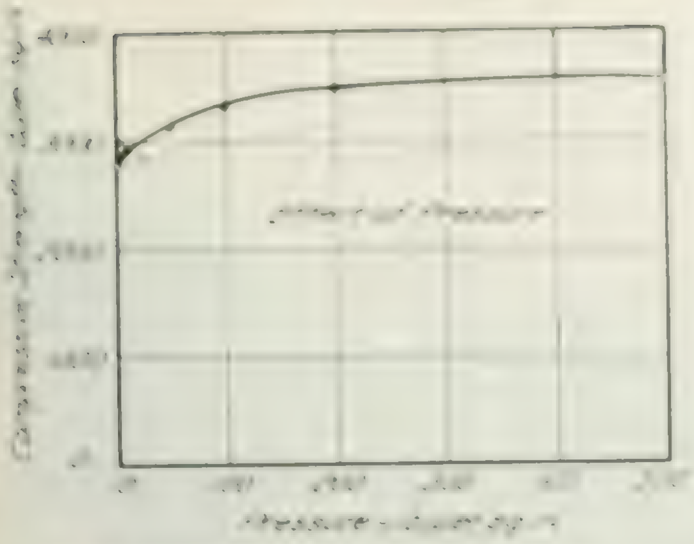

Fig. 13. Effect of Pressure on the Strength of Concrete.

Compression tests of 6 x 12-in. cylinders. 1:5 mix. Age 28 days. Pressure applied immediately after moulding. Each point represents the average of 20 tests, 5 each from 4 different times of application of pressure ranging from 15 min. to 16 hr. Data from Table 7.

11. In the very dry mixes the strength, due to jigging for 20 seconds, was increased about 25 per cent. (Figs. 5 and 6.)

12. The wetter mixes (relative consistency 1.10 to 1.25) were reduced in strength 3 to 6 per cent by jigging. (Figs. 5 and 6.)

13. Pebbles and crushed limestone as coarse aggregate gave essentially the same results in the jigging tests. (Fig. 8.)

14. The concretes from the finer aggregates showed a material increase in strength with jigging in both 1:5 and 1:3 mixes. (Fig. 7.)

15. For aggregate coarser than about 3/8 in., jigging reduced the strength from 3 to 10 per cent. (Fig. 7.)

16. The grading of the aggregates (for a given maximum size) had little influence on the effect of jigging. (Fig. 8.)

17. The greater the drop the greater the reduction in strength for 1:5 concrete. For a drop of ½ in. the strength was reduced 12 per cent. (Fig. 9.)

18. The faster the rate of jigging the lower the strength of 1:5 concrete. Using 1½-in. aggregate at 150 r. p. m. the strength was reduced about 13 per cent. (Fig. 10.)

19. The strength of 1:5 concrete fell off rapidly with the duration of jigging. After 2 to 3 minutes jigging the strength was reduced about 20 per cent. as compared with standard method of hand-puddling. (Fig. 11.)

20. Allowing the concrete to stand for a period of time before jigging, increased the strength to a light extent. The maximum increase was found at 2 to 4 hr. (Fig. 12.)

21. The application of a pressure of 2 lb. per sq. in. during the jigging process (equivalent to a head of 1 ft. of fresh concrete) gave the same strength as standard hand-puddling. (Figs. 9, 10 and 11.)

22. Moulding the cylinders by the standard method on the jigging table while it was in motion, gave the same strength as standard hand-puddling without jigging.

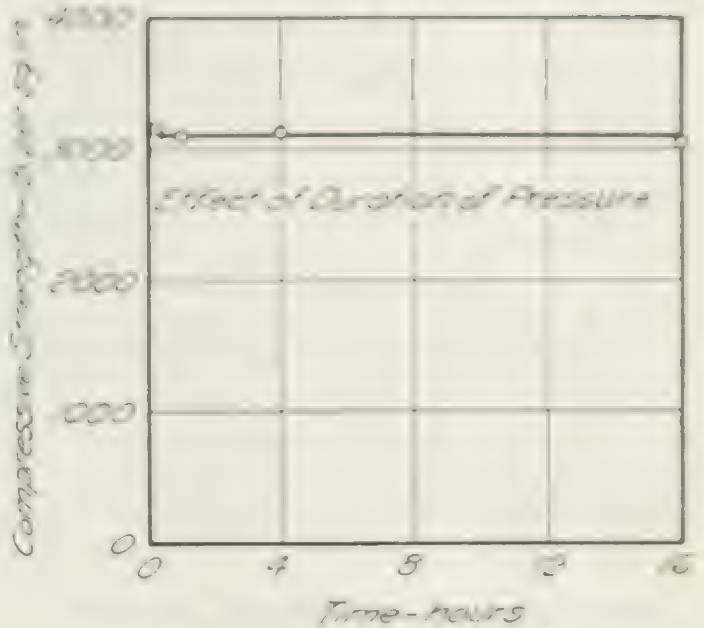

Fig. 14. Effect of Duration of Pressure on the Strength of Concrete.

Compression tests of 6 x 12-in. cylinders. 1:5 mix. Age 28 days. Pressure applied immediately after moulding specimens. Each point represents the average of 45 tests, 5 each from 9 different pressures ranging from 2 to 500 lb. per sq. in. Data from Table 8.

Effect of Pressure

23. The compressive strength of concrete was increased by pressure applied immediately after moulding. For pressure of 300 to 500 lb. per sq. in. the increase was 20 to 35 per cent. (Fig. 13.)

24. The duration of pressure of between 15 min. and 16 hr. produced no difference in strength. (Fig. 14.)

25. There was a steady reduction in the water-ratio of the concrete with the application of pressure. (Fig. 16.)

26. The application of pressure increased the strength of concrete in accordance with the quantity of mixing water expelled. (Fig. 16.)

27. The tests of concrete subjected to pressure showed the usual relation between compressive strength and water-ratio. The strength is increased because the water is expelled. In other words, pressure produces a drier concrete, and consequently gives higher strength.* This makes it clear why the duration of pressure has no influence on the result.

*[illegible] Proceedings, American Concrete Institute, 1918.

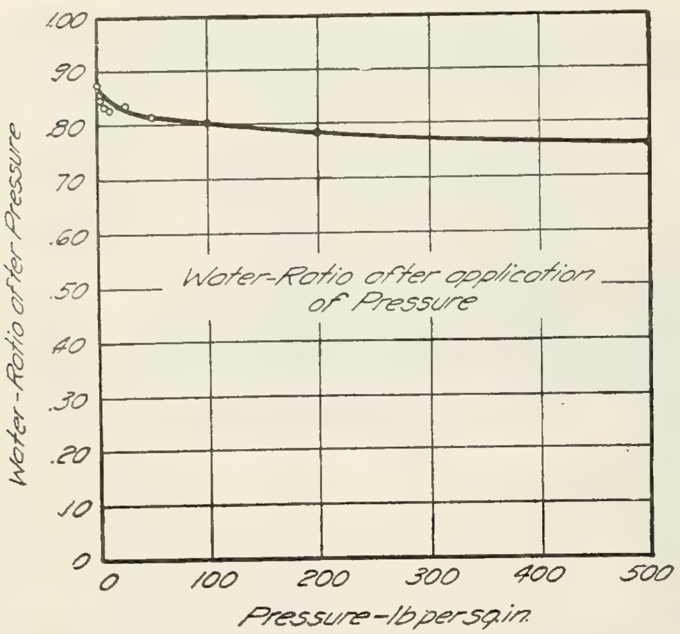

Fig. 15.—Water-Ratio of Concrete after Pressure.

Each point represents the average of 20 tests, 5 each from 4 different times of application of pressure. Data from grand average values in Table 7.

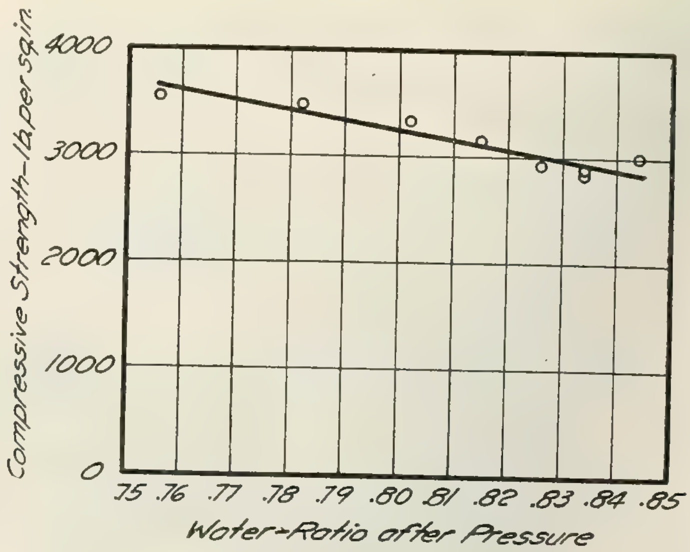

Fig. 16.—Effect of Quantity of Mixing Water on the Strength of Concrete.

Compression tests of 6 x 12-in. cylinders. Age 28 days. Water-ratio determined after application of pressure. Each point represents the average of 45 tests, 5 each from 9 different pressures. Data from grand average values in Table 7. The narrow range in water-ratio gives a straight line relation for these tests. The water-strength relation is represented by a curved line as shown in Bulletin 1, Structural Materials Research Laboratory.

Further Discussion of Vibration, Jigging and Pressure Tests

The indications of the vibrations and jigging tests should not be misinterpreted. The tests show that *after the concrete is properly placed* these methods of treatment do no good and may be harmful if too severe or too long continued. However, there can be no doubt of the value of such methods *for getting concrete into place* in intricate forms and around reinforcing bars. The tests are of value in showing that this is the only desirable function of such treatments. The tests under Ref. No. 149 (Table 1) show the ill effects of lack of compactness in the concrete. Here the strength was reduced 13 per cent due to failure to tamp or puddle the top 9 in. of the cylinder. It is impracticable to duplicate in a compression test piece the performance of air hammers and other similar methods of vibrating when used on reinforced concrete work.

The tests show that with jigging high strength may be secured with drier mixes than would be feasible otherwise. It is a matter of common experience that concrete of drier consistency (and consequently higher strength) can be placed by means of jigging or vibration than would be possible by the usual methods.

The roller method of finishing concrete roads, walks and floors is an interesting example of a combination of slight vibration and pressure accompanied by the removal of excess water. Transverse tests on concrete made in this laboratory showed a marked increase in strength of the rolled slabs as compared with similar slabs without rolling.*

It is clear from these tests that if tamping, vibration or pressure on fresh concrete are to be effective in increasing the strength three factors must be kept in mind:

(1) We must take advantage of the fact that with these methods the concrete can be placed and finished dryer than with ordinary methods.

(2) Excess water which is brought to the surface must be removed.

(3) We must take advantage of the fact that aggregate of a coarser grading may be used when such methods are employed than would be practicable otherwise.

The advantages to be gained under (3) are due to the fact that up to a certain point a plastic mix can be secured with a smaller quantity of water if the aggregate is as coarse as practicable. Unless these precautions are taken, tamping and vibration are of doubtful value.

*See paper of A. N. Johnson, Pro. Am. Soc. Testing Materials, 1917, Part II, p. 378.

The Policy of the Air Board in Canada

Colonel O. M. Biggar, [illegible] K.C., Vice-Chairman of the Air Board of Canada

Development of Aviation

The development of air transportation proceeded extraordinarily slowly for a good many centuries and has proceeded with extraordinary rapidity during the last century or thereabouts. The development of the internal combustion engine has really made possible the development of air navigation during a comparatively short time. In 1914 we turned our whole attention, so far as air navigation was concerned, to the development not of a machine for developing the civil social life of the world but a machine of destruction, and these last five years have given an extraordinary impetus and at the same time an extraordinary change in direction to the development of air navigation.

Effect of the War

During these five years war urgency really had two favourable effects. In the first place the money available for air navigation became practically unlimited. Whatever it seemed well to do the money was available to carry out. No considerations of finance intervened to prevent the undertaking of any experiment which promised useful results, and no money lacked for the actual construction of machines which looked as though they had a military value. The situation also had this result, that so far as advertising went the public became completely familiar with the possibility of transport by air. It probably became more familiar in those five years with that possibility than it would have done in a quarter of a century of peace. These two results of the intervention of the war at the time that it did intervene in the development of air navigation had probably a greater effect in the two directions of supplying money and of advertisement than could have been obtained in five times five years of peace. But the war also had another result which was not quite so favourable, although this by no means balanced the advantages to which I have referred. It had this effect, that the Government having been during the war the only employer of air personnel, the only purchaser of aircraft, the public at large after the war was left under the impression that the whole matter of air navigation was a subject for action by the Government and the Government alone. The expenses have now, however, in peace time become a matter of very much more considerable importance and the probability is — I might almost say the certainty is, — that hereafter we shall find that it is much more profitable from the point of view of society generally that the Government's relation to the development of air navigation should be rather that of generating a little current only to serve to throw the proper switches of the local generating stations, which must be supplied with power by individuals and by groups of individuals acting independently altogether of the Government activities.

There is another thing that the war has had its bearing upon air navigation during the war and that is the air navigation being a matter of purely military importance. There grew up in every belligerent country a tremendous military interest in air navigation, and curiously enough, having regard to the extent to which aviation had developed before the war, there was after the war in existence in every country a military air organization but no civil air organization. If you just think a moment you will remember that the Air Ministry in England came into existence only through the war and, at the time of its inception, only for the purposes of the war. In France the whole question of aviation was under the direction of the War Department. In the United States even to-day the whole interest in aviation, the main interest in aviation, is centered in the Departments of War and the Navy. There is not any civil air organization. In England, on the other hand there came into existence after the war a civil air organization, but it came into existence as a sort of an excrescence on the Military Air Ministry. In France I think the situation is still that the air administration is under the War Department.

Generally speaking, the situation common to all the belligerent countries was that the military organization which came into existence for the purpose of the war continued to deal with aviation after the war either directly or through some small auxiliary organization.

Civil Aviation after the War

Canada was in a completely different position from any other belligerent in that respect. Canada came out of the war without any air organization in Canada at all. The only air organization that there was that was Canadian in character consisted of two squadrons which formed part of the Canadian Expeditionary Force. These squadrons were in England; they were administered by the Department of Overseas Military Forces of Canada, and they had no counterpart as far as organization went in Canada. I am speaking about that because there was a widespread misunderstanding to the effect that these squadrons were not Canadian organizations at all, but were two squadrons of the Royal Air Force that were formed from Canadian personnel. That is not the case. The fact was that these two squadrons were exclusively Canadian in character, were organized by the Canadian Overseas Department, paid for by Canada and had an exclusively Canadian character. Then in May last year it was proposed to bring these squadrons back to Canada to form the nucleus of an air organization here. The Government decided against that, and the result was that these squadrons were demobilized in England just as the rest of the Canadian Expeditionary Force was demobilized. None of the squadrons came back as formed organizations. Instead of bringing them back

Read at the General Professional Meeting, Montreal, Jan. [illegible], 1920.

the Government decided to create a new civil organization. to set up a completely new body which would deal with all air matters.

Formation of the Air Board in Canada

The result was the formation of the Air Board, which in effect constitutes a new department of Government, at the head of which is one of the Ministers of the Crown. The personnel of the Air Board was selected from among men who were already in the public service in various departments for the purpose of getting something done, of getting an air administration which could carry on and do the preliminary work of organization. It is probable that the re-organization of the Air Board on a permanent footing will take place before very long.

The work that has been done is of an important character and it is of three different kinds. Different from every other air organization, the air organization thus formed was given control of the air in all its aspects. There is no other department of the Government that is interested in anything above the earth; the whole atmosphere comes under the direction, so far as it can be directed, of the Air Board. The Board has exclusive jurisdiction to form a military air force; it has exclusive jurisdiction over the administration and regulation of civil flying of all kinds; it has exclusive jurisdiction to operate such air services as are necessary to be operated for any government purposes, and in this respect has to some extent the character of a taxicab company.

Work of the Air Board

Now, something has been done by the Air Board along each of these three lines. In the first place, it has put forward a scheme for the organization of a military air force. This scheme is still under consideration. It is not known yet whether it will be found possible to adopt it. The question of finance, of course, enters very largely into any decision that is now arrived at, and these questions and other connected questions are under consideration by the Government. It will depend on the decision that will be arrived at on these questions what form the military air organization will ultimately take.

In the second place plans have been made for quite wide spread flying operations. For these it is proposed to use British machines no longer needed for war. The British Air Ministry on the demobilization of the British Air Forces has treated Canada with extraordinary generosity, and arrangements have been made to send to Canada one hundred heavier than air flying machines as a straight gift. In addition there are sixteen or eighteen flying machines which were presented to the Canadian forces from time to time during the war and are being replaced by the Air Ministry, so that there are about one hundred and twenty heavier than air machines that are coming from England. In addition the Air Ministry is presenting to us some eighteen airships (lighter than air craft), of different types, and a considerable amount of specialized motor transport, the whole running into very large figures, probably some five or six millions dollars. So that we shall be extraordinarily well equipped in the circumstances, not only to train military airmen when authority is given for that purpose but also to carry on our taxicab service for other departments of the Government as soon as the plans for this have been sufficiently developed.

The Work Ahead

I think perhaps I might diverge for a moment here to tell you some results that we have arrived at in connection with the cost of those operations, and which may be interesting to you as engineers. We have made very careful calculations of the probable expense of flying and the results that we have arrived at are somewhat remarkable. The aircraft — I am speaking particularly of the heavier than air craft, because it is those to which we have been directing our attention — the aircraft of to day is a machine with a somewhat uncertain engine in it, not as certain at all events as we would like to have it, and is built up of wood and wire and cloth, with the result that the chance of breakdown and depreciation is very high. The best figures that we have been able to arrive at indicate that, out of the total expense of a given series of air operations, somewhat between sixty and eighty per cent is to be put down to depreciation and insurance against accident. An enormous proportion, as you will agree. It is true that the experience we have to guide us is almost exclusively a war experience, but every allowance has been made for that, and, making those allowances, we have come to the conclusion that the probable rate of depreciation for obsolescence alone is three per cent per month, and that so far as flying is concerned the rate of insurance against accident for which we must allow is pretty nearly one-quarter, perhaps one-fifth, but probably nearer one-quarter per cent for every hour of flying; so if you take a ten thousand dollar machine, you have somewhat about twenty to twenty-five dollars an hour to set aside to meet the chance of that machine breaking down either wholly or partly. Finally we have come to the conclusion that the allowance that must be made for actual deterioration due to flying, not from accident but from ordinary use, runs from one-quarter down to one-sixth of one per cent for every hour of flying, so that you see it is not difficult to get up to between sixty and eighty per cent of the total expense of given operations to cover those extremely heavy charges.

It follows very clearly that the development of flying at the moment depends almost wholly upon the engineer; at all events it depends to a proportion of sixty to eighty per cent on the engineer if the figures I have given are correct, and I have every reason to believe they are. We must develope an engine to show a factor of safety so high that we can reduce that enormous charge for insurance against accidents. We must also develope a machine which is not subject to that very high deterioration in flying. Those are both purely engineering problems, and upon their proper solution I think there is no doubt the future of flying almost wholly depends, I mean, flying for civil purposes.

There is just this further to be said in fairness. All the machines that have been developed up to the present time have been machines that were to be exposed to war risks. Consequently a construction which resisted a deterioration was not of the first importance and as war risks were to be undertaken by the personnel, the construction which gave a high factor of security against accidents was not of the first importance. Now these two things have become of the first importance, and the solution of the problems of the increase of safety, and the extended life of the craft are of very great moment indeed.

Regulation of Civil Aviation

The third thing to which the Air Board has directed its attention, and at which it has been working for some time, is the performance of its third duty, that of regulating flying of all kinds, or regulating civil flying. There was published recently in the Canada Gazette what are known as "Air Regulations, 1920," which are published in book form with the Air Board Act, with all the forms which it is proposed to use under the regulations, and with the provisions of the Convention relating the International Air Navigation, which were discussed and settled in Paris at the same time as, though not as part of, the Peace Treaty. The Commission which drafted the Convention was part of the Peace Conference organization, although the Convention itself was not a necessary part of the peace negotiations.

To give you an outline of the character of the provisions of the Regulations, arrangements are made for registering every aircraft that goes into the air except for the purpose of test or experiment. Only aircraft registered, either in Canada, or in some country with which Canada has a convention, or in some other of His Majesty's Dominions have the right to fly over any part of Canada.

The Air Board has laid down certain fixed specifications for airharbours of all kinds and it is hoped airharbours will be established widely, and that they will be very numerous because upon their number really depends the future of flying. The airharbours used for any commercial purposes are required to be registered, although those that are only used by private persons for their private aircraft do not require registration. Then provision is made for the licensing of all the personnel that goes into the air, not only pilots of all kinds, pilots of flying machines and pilots of airships and balloons, but also navigators and engineers. Then there are provisions for the enforcement of customs laws. There are provisions with regard to the rules of the roads, both in the air and on the ground, and with regard to lights and signals, these being taken from the International Convention, and being therefore likely to be the same throughout the world. There are also certain general provisions for returns and so on, but the result of the whole is that a complete record will be kept under the regulations of all the aircraft and flying personnel in Canada. Speaking generally the regulations follow the International Convention, which is presumably to be world-wide although it has not yet been ratified by Canada.

Aerodromes

With regard to the aerodromes, two possible policies have been suggested. One is the policy of dealing with airharbours in exactly the same way as harbours for watercraft; that is by the provision of these throughout Canada by the Government. The possibility of adopting that policy has been rejected. There are comparatively few places situated on water that require the development of harbours, I mean proportionately to the total number of such places, and it is not altogether unreasonable for the Dominion Government to assume the duty with regard to water harbours. To assume this duty, however, with regard to airharbours would create a situation that would be absolutely impossible. Every city, every town, possibly every village is a possible terminal or way station for aircraft and if the Dominion Government was to undertake to provide each of these places with an airharbour, the result would be that the development would be very very slow, money would be lacking, and favouritism would have to be shown, or more probably nothing would be done either by the localities concerned or by the Government. So that it has been definitely decided that municipalities will not be provided with airharbours, and that the intervention of the Government in the direction of providing airharbours will be confined to the provision of emergency landing grounds between municipalities on recognized air routes where the municipalities themselves have provided airharbours but are too far apart to make the route safe without the provision of emergency landing grounds. I am quite ready to give as much publicity as possible to that decision, because I think that only if this is definitely understood can we look forward to that absolutely necessary development without which we shall not have any considerable amount of flying.

The Problems of Engineering Education

Frank D. Adams, Hon. M.E., LL.D.,
Acting Principal McGill University.

It gives me much pleasure to take part in this discussion and I would first like to make a reference to the allusion, which was made by one of the speakers who has preceded me, to the association of Professor Eve and myself. In one respect this is correct, for this meeting, while a most charming and successful one, could scarcely be said to re-produce even remotely the environment of the Gardens in which our original parents started life. We must, however, allow that the Council and the Committee have been quite up to date in that, if Adam and Eve had to come upon the scene, they should put Eve first. In these days the "ladies" always come first. I remember a little incident which was a matter of gossip about London last winter, which illustrates the same point, and which has reference to a certain modern English poet who was engaged in writing a poem and was finding some difficulties in expression. He woke up one night and shook his wife and said: "Jane, get up and light the light. I have thought of a good word." She said: "John, get up and light it yourself. I have thought of a bad one."

Read at the General Professional Meeting, January 28th, 1920.

In taking part in this discussion, as I have been asked to do, it would seem that a more useful purpose could be subserved if I cover a somewhat wider ground than the other speakers and consider the general question of Engineering Education and the problems which are presented by it in our Engineering Schools in Canada, and which for that matter, are essentially indentical with those in the Engineering Schools of the great Republic to the south. I would like to set before you some of the difficulties which present themselves both to the staff of instructors and to the students, and will hope that we may obtain the benefit of your wisdom and experience in making this educational work more efficient.

Our Raw Material

Let us consider the material we have to work on in the education of engineers. We have one hundred, two hundred, three hundred, four hundred it may be, young men coming to us in the Faculty of Applied Science of each university from the schools each year. These young men are of excellent material. I think there is very little human material which is better than that which comes to the Faculties of Applied Science from the schools in Canada. Now, when they enter these young men find themselves with but the rudiments of an education. I agree with Prof. Eve. We have all agreed with him that with us the great thing to do is to get the schools to carry on their curriculum further than they do at present. There is only one difficulty and that is we cannot get them to do it.

School Education in Canada

Now, if *The Engineering Institute* can do anything to galvanize Canadians into a sense of the necessity of raising the school grade of education it will help the universities along immensely. At McGill we have been continually endeavouring to get the schools to do this by putting on higher mathematics for our matriculation and in many cases men have not been able to come to the university from the country schools because they could not get the education which they required to enter. If we raise our demands to the standard of the second year there are not two schools in the Province of Quebec that could train students for the university. We are continually endeavouring to bring the schools up, but the process is a very slow one. President Falconer, speaking the other day of the difficult position in which the universities find themselves on account of the rise in the cost of living, said that one source of relief would be to unload some of this burden on to the schools and make them do the first year of university work, and whenever that is accomplished no one will be more grateful than the universities.

The Problems of the Student

The young man comes with this comparatively low grade of educational attainment to the university. He passes the matriculation examination, and then he finds himself in the first year. It is a situation which is trying to most young men and no one appreciates that more than the professors in the Faculty of Applied Science. These young men have to enter upon a very stiff course. The shadow of the school-master has been removed. They have to set to work on their own initiative; they also have to learn that it is necessary for them when they work to work, and work hard, and when they play to play hard. In the university there is no time for dawdlers. We have to encourage that idea by the university atmosphere which we throw around them, and many young men fail under those requirements, although I may state that at McGill University we have been endeavouring to inculcate this doctrine for years and now the young men when they go into the first year I think recognize they have come to work and not to idle away their time.

They then, having entered upon their course, must in the first two years acquire a body of information which is quite fundamentally elementary to the proper practice of their profession. Another lion in the path is that these students do not fully recognize the fact that it is necessary for them to learn many things which do not seem to have a very direct bearing upon professional life. We have to instill into them that these are just as important as the actual engineering subjects which come later in the course and which are built upon them.

Essentials of Training

The men must thus in the first place get a good thorough knowledge of mathematics up to calculus. They must not only "see" these subjects as they say in French, but they must get such command of them that they may be able to use and apply to engineering problems. They have in addition to gain a good substantial knowledge of physics and chemistry. They must also acquire a facility in certain arts, such as freehand drawing and mechanical drawing. If they are civil engineers they have to learn the elements of surveying; if metallurgical engineers, the art of assaying. This requires a good deal of time. Having laid in the first two years the foundation stones of engineering knowledge, they proceed in the third year to acquire a broad general knowledge of engineering in its widest terms and here we find there is a diversity of usage in different universities. The question is as to whether you shall endeavour to give every engineer a good sound knowledge of engineering without endeavouring to specialize, or whether you shall start specialization earlier and turn out a man who knows more about, (say), civil engineering and nothing about other branches of the engineering profession.

At McGill our feeling has been that the right thing is to give a man a good broad knowledge of general engineering, and leave the finer specialization to him to acquire when he gets out in practice. The detail of practice in any branch of engineering advances so rapidly from year to year that much which a man might learn in college, two or three or four or five years later would be obsolete. The man must learn the higher specialties of his own profession after graduation.

At the end of three years the student will have acquired a general knowledge of mechanical and electrical engineering and their accessory sciences. In the fourth year he proceeds to branch out into one or other of eight or ten divisions of engineering and endeavour to get a closer acquaintance with some special branch of his profession. All that has to be accomplished in four academic years. How long is an academic year? In the universities which have the longest academic year it consists of eight months; in others of seven months. Take the universities with the longest course: four times eight is thirty-two months. That is, in about two and one-half years of actual study the man is to be transformed from a schoolboy into a young engineer. He certainly is not a thoroughly qualified engineer as yet, but nevertheless he is an engineer in embryo, in the [illegible] one who is able to take his position on the lower rungs of the ladder and work up to any height to which his innate capacity may lead him.

Vacation Work

For a number of years past in my own university we have obtained returns from the students when they come back after the vacation with reference to their work, whether they worked at all, if so how many months they worked and the character of the work upon which they were engaged. We find from these returns for several years before the war, that eighty-six per cent of our men worked all summer. The men having completed the work of the first academic year went out and got work in some line of engineering. They came back to the university and at the end of the session went out again and worked all summer. When the men graduate they had had four academic years of study in the principles, and to a certain extent in the practice of their profession, and four summers of experience of actual manufacturing processes or engineering work, which they see being carried out under conditions of actual practice which gives then an additional grasp of engineering work.

Subjects for the Curriculum

We find in the universities that the tendency is for our courses to become crowded. Some years ago we sent out a questionnaire to a number of engineers in Canada asking in their opinion whether certain subjects should be entered in the course of engineering or whether they should not, and found there was a great diversity of opinion. About fifty per cent of those distinguished engineers were of one mind and the other fifty per cent were of a directly opposite mind. It becomes difficult to decide what should be done under those conditions. Many of them said they were scarcely qualified to judge because it was not possible to put everything in the course, and they were in doubt as to which were the more important subjects to include. This is the problem which faces all those who are called upon to plan out the courses of instruction, in engineering schools. How can the student occupy the limited time he has at his disposal to the best advantage? We find as a result of the greater demands continually made upon engineers, the tendency in all professional faculties is to lengthen out the course. The course of law has been lengthened from three to four years, and the course of medicine is now six years or even more. So the proposal is continually before us as to whether it would not be well in order to provide the young engineer with a knowledge of the greater number of subjects which are required at the present time, to extend the course from four to five years. It is certain that if the student could give more time to his work, [illegible] He may continue to study for four years but give a greater number of months each year, the academic year being lengthened to nine or ten months or he may study for five instead of for four years.

Reasons For and Against the Five-Year Course

Under the conditions which obtain in Canada most of our young men can get summer work which is of advantage to them both educationally and in that they thus earn a certain amount of money which helps to put them through college. We find that most of the young men coming to the universities are in need of this assistance, and it seems a pity to cut it off and to lengthen the course unless we feel that some substantial corresponding benefit can be secured.

It would seem that for the next few years and as long as men can get the summer work in various industries it would be disadvantageous to cut them off from it; but nevertheless it looks quite likely that within the next few years a fifth year will have to be added to the course, and that fifth year might be taken up in part by work in factories, as has already been outlined by Dr. [illegible], although we must remember that the Massachusetts Institute of Technology plan has not been thoroughly tested as yet. These are problems before us. The universities have been gradually feeling their way forward and adopting such methods as are consistent with changing conditions and adapting their courses to those conditions as time goes on. When I think of the course as it existed when I graduated and as it now is the change is immense.

[illegible] to give a course on engineering economics, or the business side of engineering, at my university. It was an excellent series of lectures and is now being given by Mr. Frederick B. Brown. It has proved of great value in introducing the young engineer to the commercial side of his profession. Also we have introduced a similar course on engineering law, and other courses will undoubtedly have to be added as time goes on.

What are the Conditions which will Face the Engineer in the Future?

It is difficult for us to look forward and know this in advance. We did so when Dr. [illegible] was asked to establish a course in chemical engineering several years ago, but for some time there was relatively little work for the men who graduated in this branch. Now the demand has arisen, the [illegible] of such a course is shown to have been a wise one. Probably there are other lines which will open out and for which the engineering colleges will be called upon to train men.

If any members of The [illegible] Institute as a body can help the universities by their advice, this I can assure you will be cordially welcomed by all those who are engaged in training engineers in Canada at the present time.

The Work of the Ecole Polytechnique, Montreal

Arthur Surveyer, M.E.I.C.,
Member of the Board of Directors, Ecole Polytechnique, Montreal.

First I wish to explain that I am not, as gloriously announced on our programme, a member of the Board of Governors of Montreal University, but merely a member of the Board of Directors of Polytechnique, which is affiliated to what used to be Laval University but is now being transformed, at Quebec, into the Montreal University.

History of the Ecole Polytechnique

In order to get a good perspective of our problems it is necessary to briefly outline the history of the Ecole Polytechnique. This institution has the honour of being the only engineering school in North America where tuition is given in French. It was founded in 1874 by the combined efforts of a French general, veteran of 1870, an Alsatian chemist and a French-Canadian architect.

From the first our institution had a very hard road to travel: it was beset with difficulties both of an intellectual and of a financial order. The barrier which the conquest had raised between France and this province had only been partly lowered as the result of the cooperation of the two mother countries during the Crimean war. French engineering text books were at a premium, professors were scarce and the new school depended solely upon the pupils' fees. We did not receive donations and it is only in the last twenty years or so that financial help has come to us in the form of one gift and a yearly subsidy from the province. The professorial staff of Polytechnique is still recruited, I am pleased to say, throughout the French-speaking world, in France, in Belgium and in Quebec. The French-Canadian professors are, of course, all graduates of Polytechnique but the majority of them have taken postgraduate courses either in France or in the United States.

The founders of the "Ecole Polytechnique de Montréal" did not attempt to copy the "Ecole Polytechnique de Paris", which is a pure science faculty rather than an applied science school, but they had taken as model, the "Ecole Centrale des Arts et Manufactures", de Paris, which was even then noted for its encyclopedian teaching. Now that we have advanced far enough to look back and examine the products which we have turned out from Polytechnique, we find that they do not quite correspond to the ideal of the founders of the School. The lack of funds has paralyzed the development of our laboratories and we have unwittingly been led to give more importance to the branches of engineering which do not require expensive laboratories and which lend themselves better to the abstract of theoretical method of teaching.

Type of Training given

Engineers can be divided into two great classes according to the relative importance of the part played by Art and Science in the exercise of their profession. The building engineers and administrators of certain classes of utilities constitute the first group. This class includes the architectural engineer, the structural engineer, the public works engineer and the engineer builder or operator of canals, harbours, railways and tramways. These technicians apply, in their practice, some of the principles of science, but they also, and this probably to a greater extent, apply empirical rules based upon the experience of others and constituting the art of the preceding generations.

The second group is composed of the industrial or manufacturing engineers. Their field of action is very wide; it includes the fabrication of all engines and machinery, all the application of chemistry, such as metallurgy, electro-chemistry, electro-metallurgy and the series of industries dealing with the transformation of materials such as dyeworks, pulp and paper manufactures, tanneries, sugar refineries, glass works, potteries, gas plants, etc. It also embraces all the applications of physics to the compressed gas, cold and liquid air industries and the ever increasing number of applications of electricity to the construction of electrical machinery and wireless telegraphy. This group of engineers utilize science to a greater extent than art and their formation requires more laboratory work and less *ex cathedra* teaching.

The financial handicap with which we are laboring has led Polytechnique to develop chiefly engineers of the first group. Very few of our graduates can be classed as industrial engineers and this has had a marked effect on their average income. The building industry is probably the most sensitive industry to the fluctuations of the money market. Public works, new plants or extensions to existing plants can always be delayed and the building engineer is sure to be an intermittent producer. The periods of intensive activity do not come often enough to compensate for the long periods of stoppage. The industrial engineer also suffers from these variations but his opportunities to rise are greater and, besides, the manufacturing industries never come to a standstill comparable to the inactivity which we have experienced in Canada, since the beginning of the war, both in public works and in railway construction.

During the last three years, the Ecole Polytechnique has inaugurated a course in industrial chemistry and, in my opinion, we should try to develop our teaching so as to cover a larger proportion of the industrial field.

The Importance of Teaching the best Methods of Study

There is one particular subject, however, which I believe should be taught to all students of all faculties and it is a question upon which I am rapidly becoming somewhat of a crank, I refer to the importance of teaching to the students the best methods of intellectual work. It seems illogical to me to take the trouble to initiate the

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students in the principles of the different sciences with an abundant use of language and a great display of apparatus, to compel them afterwards to pass severe examinations in these various sciences, and, yet, not to consider it worth while to instruct them in the art of cerebral work. We seem to take for granted that the students know, by intuition, the best methods of study while it has been demonstrated that they invariably adopt the worst ones because they are less painful and do not make the same demands upon their powers of attention or concentration. Students unconsciously drift into bad intellectual habits, and only realize their mistakes when it is very difficult to adopt new methods. "You cannot teach an old dog new tricks" is an old saying and William James considers that men fall into the "old dog" class at twenty five. The eminent psychologist declares that few men change their habits of thought and action to any marked extent after they have passed the middle twenties. It is easy to imagine that professor James either married in his early twenties or died a bachelor. Those of us who married after we had passed thirty can vouch for the fact that habits can be modified after that age, but we will probably also admit that our road to perfection would have been made easier if the way had been pointed out to us when we were in our early twenties. Psychologists also tell us that relatively few people acquire new habits of their own volition. Habits are for the most part inherited or imposed upon us by external authority and it seems to me that in order to spare to the student that reversal of intellectual method long after his graduation, correct habits of the right kinds should be imposed upon him, at the very beginning of his college career, through the institution of a course on "How to use the mind."

Breadth of View in Engineering Training

Prof. Chas. F. Scott, Professor of Electrical Engineering, Yale University.

A few years ago, before I got into my present relations to engineering teaching, when I was a mere engineer, I was invited to a little round table conference at the Massachusetts Institute of Technology Professor D. C. Jackson had been there a year or so, and he called in some of their graduates and others for a conference.

Just as we were about to begin somebody asked Prof. Jackson this question: "Before you tell us how you are going to do it wouldn't it be well to ask what it is you are trying to do? What kind of a man are you trying to turn out?" And he replied "That is a good question," and turning to Mr. Fish and asked: "When you get a graduate what kind of a man do you want?" Mr. Fish, then president of the American Telephone and Telegraph Company, a director of the General Electric Company, one of the overseers of Harvard and I think one of the Trustees of The Institute, leaned back and thought for a moment. "Well, I would like to have a young man who can take up anything and put it through."

We have had this morning two papers. The first on chemical engineering treated of the very much needed important factor, the specialist, and even the super-specialist in chemical engineering. The next presented the relation of the engineer to physics, suggesting possibly that the art of engineering is the application of physics. But here you are, gentlemen, *The Engineering Institute of Canada*. How many of you are super-specialists in any way corresponding to these chemical engineers? How many of you are dealing directly in the application of physics? With how many of you is engineering merely applied physics? Are not the engineers of the world doing something else and something more? Important as is this technical specialization, the great bulk of men who consider themselves engineers are doing something else, another kind of something. We got used to thinking in a certain way about engineers a generation or so ago. Engineering then was largely technical. The problems in electrical and mechanical engineering were pretty largely to get an engine that would run and get a dynamo or motor that would work and keep working. It was a problem of technical design, but in the last generation we passed away beyond that, but when we come to think about education and work of engineers as a class we are apt to think of them along the old lines.

Read at the General Professional Meeting, Montreal, Jan. 28th, 1925.

Variety of Engineering Work.

There are many kinds of engineers! I have a friend who is chief engineer of one of the large power companies at Niagara. He finds it necessary to cross the border frequently and has the regular questionnaire put to him: "Occupation?" "Engineer." "Stationary or marine?"

Engineering has been described as really a method of thinking. It is a way of dealing with problems, many of which are the new problems that come up in the development which has followed in the wake of the pioneer engineer. It is a method of thinking, of dealing with things constructively, a scientific method of getting data, analyzing it, of drawing conclusions and then of applying these conclusions and carrying them through to a useful end. It has been emphasized and well emphasized by some of the former speakers that a sound work in mathematics and physics is essential to engineering but mathematical teaching and physical teaching do not necessarily lead to the engineering point of view. It is the application of mathematics and its use in solving problems, it is the application of physics to the solution of problems which makes them of advantage to the engineer.

I hardly need say to you that the engineer is getting into many fields, and is managing and directing things in a much larger way than formerly. What kind of education and training is best going to develope the broad engineer? It is hard to say. We have young men coming to us, usually of fine quality, with all types of education and training and natural ability. We expect to find them ten years later in a very great variety of fields, doing many kinds of engineering and related work and yet we have a sort of a fixed and rigid course of training by which all kinds of boys are to be developed into all kinds of men.

How the Extended Engineering Course at Yale was Arranged.

A rather interesting point in our engineering educational work at Yale: we have had in the Sheffield Scientific School in the past a three year course. It has recently been changed to a four year course. The first thought was that there was going to be a splendid opportunity increasing our purely engineering work. But our faculty in going over the matter decided on general principles to give our students a little more time for extra-curriculum work,—for athletics, and for entering into the student activities which have a very excellent broadening influence on the students and are one of the valuable things of college life.

We made a careful study of our fundamental subjects by having men from each of our engineering departments, Civil, Mechanical, Mining and Electrical confer with the Physics, Chemistry, Mathematics and English departments and go over in details just what should be included in the several courses. We added more English; we added economics and allied subjects and when we took what was left for engineering we did not have very much beyond what we had before, but we concluded we were doing better for the general group of men by giving a broader training than by increasing the more specialized subjects. If we can give our men the principles and the intellectual power they can acquire the other things afterwards.

We have had some experience such as was spoken of in which the student who spends the first two years in learning mathematics and other fundamental subjects, as a basis of engineering has mighty little engineering atmosphere about him. He gets rather disconsolate; the things which he does not see how to apply do not interest him; it is a pretty hard road to hoe. Many never get to the end of it.

Giving the Engineering Viewpoint to the Freshman.

This year we have introduced something new, new to us: it is a Freshman engineering course. Our Freshmen spend one afternoon a week in this work. They have had considerable variety. Each one of the heads of the engineering departments and a few other have given addresses or talks, explaining in a broad way the particular field. Prof. Breckenridge spoke on mechanical engineering. Other speakers indicated the fields of the different classes of engineering, so that the student can select his particular engineering course intelligently. On other days he has gone into the different departments. For example, one day he went to the electrical department. On another afternoon we gave him a course in illumination, starting right in at the beginning, so that the engineer will know what is good lighting and what is not. On another day he had a little description of the telephone, and went down to the telephone exchange. They have also gone to the mechanical laboratory, to the mining laboratory and to the civil engineering department and in the same way have been given a view of these different kinds of engineering. We have made it a special point to show that there was a necessity for a knowledge of mathematics and physics in order that they could handle the engineering subjects later on alone.

The Engineer as a Factor in Public Life

One other point. I have been making a little investigation into Yale's statistics and find that up to 1916, in the previous dozen years the undergraduate departments of Yale the academic and scientific school had turned out a certain number of graduates. This does not include the professional schools and the graduate schools. Of these ordinary graduates twenty-five per cent came from the engineering courses. Examination of the alumni record of the occupations of all the men who graduated during the same period shows that twenty-two per cent were engaged in engineering, eighteen per cent were in manufacturing, closely allied, making a total of forty per cent for whom an engineering training would have been specially advantageous. Added to that were fourteen per cent engaged in finance and a like number in mercantile pursuits, and these are professions which are wanting more and more technical graduates, because their fundamental operations are based on natural laws. They are connected with industry or transportation or other industries which involve engineering matters.

Hence an examination of the occupations into which our graduates have gone in a dozen years shows that about half of the graduates are in occupations for which engineering would have been a direct and valuable training. And that means that the call for technically trained men in the activities of the world to-day is for many positions beside the specialist and the super-specialist.

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Executive, [illegible]
[illegible]
G. N. HOUSTON
Wm. PEARCE
C. W. CRAIG

VANCOUVER
Chairman, E. G. MATHESON
Sec.-Treas., [illegible]
[illegible], Vancouver, B.C.
Executive, [illegible]
[illegible]
[illegible]
WILLIAM [illegible]

VICTORIA
Chairman, A. E. FOREMAN
Vice-Chair, Col. A. W. R. WILBY
Secretary, [illegible]
[illegible], Victoria, B.C.
Treasurer, [illegible]
Executive, [illegible]
[illegible]
Capt. W. M. [illegible]
R. W. MACINTYRE

ONTARIO PROVINCIAL DIVISION

Chairman, H. B. R. CRAIG
Vice-Chair, [illegible]

EX-OFFICIO MEMBERS
Lt.-Col. R. W. LEONARD
Major-Gen. C. H. MITCHELL
JOHN MURPHY
[illegible]
J. B. CHALLIES
P. GILLESPIE
[illegible]
E. R. GRAY
[illegible]

REPRESENTATIVES OF BRANCHES
A. C. D. BLANCHARD, Niagara Peninsula Branch
[illegible], Border Cities Branch
E. R. GRAY, Hamilton Branch
A. H. HARKNESS, Toronto Branch
A. B. LAMBE, Ottawa Branch
Lt.-Col. A. MACPHAIL, Kingston Branch
[illegible], Peterborough Branch
[illegible], Sault Ste. Marie Branch

REPRESENTATIVES OF NON-RESIDENT MEMBERS
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
Sec.-Treas., A. B. LAMBE, Ottawa, Ont.

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOL. III. April 1920 No. 4

Remuneration of Engineers

Engineering remuneration formed the subject of a lengthy discussion at the meeting of Council held on March 23rd, with a view to arriving at conclusions that would tend to ameliorate conditions and advance the material interests of the members of the profession. It was resolved that a committee of the Council, called the committee on the remuneration of engineers be appointed consisting of John Murphy, M.E.I.C., Chairman, E. R. Gray, M.E.I.C., Frederick B. Brown, M.E.I.C., and A. R. Decary, M.E.I.C., with power to add thereto, to consider the whole question of the remuneration of all engineers and matters relating thereto, to co-ordinate efforts of the Branches in this connection, to make recommendations and report the recommendations to the Council for action. The committee has important duties to perform and it is obvious that it will have the support of the Branches and the membership at large in fulfilling the function for which it has been appointed. The salary report of the Toronto Branch was noted by Council and referred to this committee.

At the same meeting of Council the committee of Civil Service Classification consisting of Lt.-Col. R. W. Leonard, M.E.I.C., J. M. R. Fairbairn, M.E.I.C., H. H. Vaughan, M.E.I.C., W. F. Tye, M.E.I.C., G. Gordon Gale, M.E.I.C., and President Ross was continued. The work which this committee did last year in the interests of the engineers employed in the Federal Civil Service is not fully appreciated, and had the recommendations of this committee to the experts of the commission been adopted, as they were given to understand would be the case, the salaries of many of the engineers employed by the Dominion Government would be appreciably greater. The Council supported the present Civil Service Classification because it was understood from the commission that should the Bill not pass there was every evidence that the commission might be done away with and the patronage system adopted again. In fact an attempt to bring this about was made by a number of members of parliament. At the present time this committee is ready to take up the case of the civil service engineers of Ottawa and is awaiting a brief from the special committee of the Ottawa Branch giving full information in order that the members may intelligently present the claims of the various engineers where better conditions are desirable. A letter suggesting that *The Institute* Committee cite cases to the Civil Service Commission where Government engineers are receiving less than engineers carrying similar responsibilities employed by private corporations and municipal bodies was presented to Council and referred to the Civil Service Classifications Committee with the suggestion that the recommendation contained in this letter be acted upon.

Good Roads in Canada

The Engineering Institute of Canada has reason to be proud of the part being played by its members in the development of good roads in the Dominion. At the recent meetings of the Ontario Good Roads Association and the Road Superintendents and Engineers of Ontario *The Institute* was well represented. A. W. Campbell, M.E.I.C., Dominion Highway Commissioner, and W. A. McLean, M.E.I.C., Deputy Minister of Highways, both of whom delivered notable addresses on the future of good roads in the Province. Geo. Hogarth, M.E.I.C., is chief engineer of the Department of Highways, Ontario, and was responsible for the carrying out of the ambitious programme announced at these meetings.

The meeting of the Good Roads Association was the largest ever held, and one of the most enthusiastic. A comprehensive programme of construction and maintenance was announced for the Province of Ontario which will provide in five years a network of provincial highways of 1800 miles fed by county and township improved roads in all parts of the province. Important features of the addresses at these meetings were the insistence on the importance of proper maintenance, and the importance of providing adequate funds by equitable distribution of the cost of the improved roads. The tendency both in this country and the United States has been towards the building of magnificent trunk highways with a certain neglect of the minor but none the less important county and township highways, and up to the present the distribution of the taxation for improved roads has not always been according to the best principles. The policy announced for Ontario in these particulars reflects the general trend of opinion throughout the Dominion, and is a healthy sign.

International Engineering Congress

At the annual meeting of *The Institute* held in Ottawa last year an international congress of engineers was proposed by Dr. Ira N. Hollis, President of the Worcester Polytechnic Institute. The Secretary was instructed to take the matter up with the Institution of Civil Engineers and other technical associations in Europe, and the matter is now under way as shown in the following letter from Dr. Hollis. There is little doubt that such an International Congress would be of great benefit, only to the engineering profession of the world.

Worcester, Mass., Feb. 18th, 1920.

Fraser S. Keith, Esq.,
Secretary,
The Engineering Institute of Canada,
176 Mansfield Street,
Montreal, P.Q.

My dear Mr. Keith:—

I have your letter of the 13th, enclosing a communication from Mr. Tadsbery. At the first opportunity I shall take up this whole matter of a great meeting of engineers with our Engineering Council.

It seems to me that the time is ripe for a better understanding amongst all engineering societies, and it would be more than interesting to have a large meeting within easy reach of the battlefields of France. I will write you if anything comes out of it.

Good luck to you.

Yours very truly,

Signed: IRA N. HOLLIS

Scientific Management

At the end of the war the popular theory was that prices would immediately drop, and that a period of depression and low prices would inevitably set in. Whatever the reason may be—the increase in currency and means of exchange, the general restlessness of labor, the continued lack of supplied from Europe—prices have shown no tendency to fall, demand in most lines continues to exceed supply, ever-mounting labor costs continue to prevent any drop in commodity prices, and the problem of keeping manufacturing costs within bounds is more difficult that ever. The obvious lesson is, then, that any method which tends to lower production costs is worthy of attention, and "Scientific Management" should not be lightly dismissed.

"Scientific Management" of the Taylor-Gantt-Emerson School has been developed so quickly, and the knowledge gained is in the hands of so few men, that it has not yet reached the position of being recognized in any University as a separate course, although it plays a highly important part in modern engineering of all kinds. Unfortunately scientific management has become associated in the minds of many with "experts" who produce an array of charts, figures, demand a large clerical staff, and who in produce their personnel only add complications to an already good system, and merely add expense. To others scientific management suggests "immaturity", specialization of functions to machine-shops, and a general soullessness and grinding down of the workman.

As a matter of fact, however, both of these conceptions are misleading. In the earlier days of scientific management, for instance at the time of Taylor's "The Art of Cutting Metals" great emphasis was laid on the time-study part of the scheme, and the earlier and rigid Taylor system is open to the objection of being rather impersonal in its treatment of the machine-operator. However in the past few years scientific management has developed largely along other lines, the reduction of production costs by improving co-operation of departments, simplified cost methods, centralizing control of manufacture, and the supplying of accurate and up-to-the-minute information to the heads of departments.

Modern production, as a matter of fact, is not so revolutionary as many suppose, few entirely new things are done; there are records of time-study, for instance, over forty years ago; the main difference between the improved methods of supervision are in the centralizing of control, and certain detail improvements in methods of obtaining and using production information.

The whole edifice of modern production management is built around the "schedule". The idea of "scheduling is not new; every foreman must have a plan of work even if it is only carried in the mind; the whole force of the modern scheduling is that one system is in force for a whole plant, and the planning for the whole output is done in one office, much in the same way as the "fire-control" station of a battleship controls the firing of a broadside in action. Scheduling of output can be based on records of previous performance, estimates, or accurate study of individual operations; and in the majority of plants all three methods are in use. The whole function of the modern production department is to maintain these schedules in operation, to see that they are correct, and that they are kept up. It is often suggested that scientific management is complicated and the appearance of a busy production department office would seem to confirm this, but the fact is that the production department is now doing a great deal of work which the foreman in the shop formerly had to do to the detriment of their ordinary supervision work, such as "chasing" material, checking up tool requisitions, making requisitions for repairs, etc. Without accurate knowledge such as is readily available to the modern production department delays are bound to occur through material or information being held up at some point. It was well said at a recent meeting of the Canadian Railway Club in Montreal that piece work reduces time on the job, while scheduling reduces delays between jobs.

Enough has been said to indicate the advantages of a carefully worked schedule that is really maintained. Branching out from this central fact there are, however, many other important features, of modern scientific management. It used to be thought that scientific management was in such a hurry to secure "production" that quality was secondary. This, like many other hasty impressions, is entirely untrue. What the production engineer desires is not so much quantity production as low production costs. The customer is the final arbiter of the quality; very few manufacturers depend mainly on first sales, and it is literally true that honesty is the best policy and that it pays to give quality. An inspection system is thus rendered necessary, and it will generally be worth while in cold cash to have a fairly elaborate inspection system with special attention to the use of "limits" for various operations, so that the operator has definite instructions, and does not need to waste his time on accuracy where it is not needed. A good system of inspection will frequently save money by detecting flaws in castings, etc. before many machining operations have been performed. While, of course, thorough inspection is not claimed to be a discovery of scientific management, the "limit" system has been largely developed by modern production management.

A valuable feature of modern methods in shop control in connection with the determination of costs is the pinning down of that elusive term "overhead expense". The difference between successful operation and failure quite frequently depends on whether the overhead expense has been accurately determined. The writer was once asked to secure the labor costs of the parts of a new machine with a view to setting a price list. Having secured the labor figures costs from the cost sheets, the writer asked for instructions with regard to the overhead, "Oh, add 200% to the labor costs", when this was done the powers-that-were gave instructions to change the overhead percentage on labor cost to 300%, and later to 400%—and this incident occurred in a modern plant with an organized cost system. There can be no doubt that scientific management whatever else it may or may not do, supplies much more accurate cost figures, both direct labor costs, and "overhead". The up-to-date shop system has information as to the percentage of time machines lie idle; (very few shops succeed in improving on the figure of 25% idle time)—and the gathering of the information regarding the actual working time of machine-tool equipment can be done with very little extra clerical work. If a machine-shop production system has no other effect than the reduction of the time machines stand idle in the shop from delays in arrival of material, or poor planning, then the system is justified.

"Machine-rate" is a much debated method of arriving at the "overhead"; undoubtedly the putting into force of machine-rate involves a considerable amount of clerical work, and the cost of this additional office expense may more than counterbalance the saving due to better knowledge. However, it is not always necessary to put into force machine-rate for individual machines; with a good production department staff and an efficient cost department it is, however, generally possible to subdivide a shop into cost groups, heavy planers, heavy milling machines, turret lathes, engine lathes, etc. and apply the machine-rate method of arriving at the overhead cost to the machine groups without a great deal of labor.

The work of the production manager is distinctly that of the engineer; all the great leaders in scientific management: Taylor, Barth, Gantt, etc., have been engineers. But costs rule the production world, and the production engineer is concerned with engineering in reference to costs. Where scientific management is in force there is a production manager and his little office staff. A good many cost departments supply a great deal of information, but this information does not trickle through the numerous forms until some time after the product is manufactured, shipped and paid for. With a little ingenuity, and with real co-operation between cost and production departments it is usually possible, if not to obtain current costs, at least to have accurate figures within two days after any operation has taken place in the shop, and here is another place where a good production department can easily pay its way by checking at the source extra expenses and any sudden increases which may take place.

Scientific management is an immense subject, and there exists a large selection of excellent and very practical text-books a large number of which have been issued within the past five years. No attempt has been made here to give any details as to the working out of any particular phase of scientific management. There are, for instance, a number of bulky volumes on the cost-keeping phase alone, but it should be realized that scientific management is by no means a theorist's dream, the number of large and successful corporations using various schemes: Canadian Pacific Railway at the Angus Shops, Northern Electric, etc. is a sufficient proof of this fact. Neither is scientific management a cold-blooded inhuman process of grinding the maximum possible out of the workman; where a sound scheme is put into force the co-operation of the foreman and workmen is not as a rule difficult to secure.

To sum up,—scientific management supplies accurate information with reference to work ahead, the quantity of work, when it will be finished, and the best means of doing the work. It also gives information regarding the probable cost, in reference to work on hand, exactly how far the work has progressed the causes for delays, if any, the best means of doing the work, and the current cost. With scientific management control is centrallized and the planning is not left to the tender mercies of the individual foreman.

S.

Special Conference Called

In view of the approaching professional meeting at Niagara Falls and in order to give an opportunity of discussing other matters of intimate interest to the members of the profession in Ontario, it has been decided to call a special conference of all members of Council from Ontario, the Chairman of the Toronto Branch, the Chairman and Secretary of the Ontario Provincial Division, together with the other members of Council, to be held in Montreal at a date most satisfactory to the Ontario members.

Additional Division Created

The vote to amend the By-laws to permit an additional division of The Institute in Ontario was almost unanimously in favor of the creation of such a division. The report of the scrutineers was presented at the last meeting of Council. As a result Ontario now comprises three divisions instead of two as formerly. Inasmuch as the By-laws allow three councillors for each division, the creation of the new division left three vacancies in Council. The By-laws further provide for the appointment by Council to fill such vacancies. For the vacancy in the central Ontario district, A. H. Harkness, M.E.I.C., of Toronto was appointed, and for the two in western Ontario district H. B. R. Craig, M.E.I.C., of Windsor and A. C. D. Blanchard, M.E.I.C., Niagara Falls.

The Development of the St. Lawrence

For many years past a waterway clear up the St. Lawrence to the head of the Lakes, and of such dimensions as would carry ocean-going boats of at least [illegible] ft. draught, has been the dream of many and the special hope of those deeply interested in certain enterprises which it is expected would be particularly benefited by such a development. As opposed to this however there are those who confidently claim that the general principle that no ocean-going boat can economically navigate any interior water way applies to this proposition also, notwithstanding the fact that in many ways it is inherently different from, and serves a much larger and more diversified territory and population than the usual canal or canalized river.

However, the question is now to be authoritatively investigated, as the Canadian and United States Governments have asked the International Joint Commission to go into the matter and report as to both the cost of navigational improvement and power development, and the economic results and financial returns that may reasonably be expected therefrom. This reference comes partly from a short clause which Senator Lenroot of Wisconsin succeeded in getting into the U.S. Rivers and Harbors Appropriation Bill of 1918, but more largely from the growing realization that the fuel power situation both in the States and Canada is not such as can be allowed to go on as it is very much longer. Moreover, the recent tremendous demands on both the Canadian and United States railways, the peaks of which they have not been able to satisfactorily meet any more than any other individual or community enterprise meets extraordinary crests, has made the transportation question a live one, particularly to the central Western States.

The Commission held its first public meeting on the question in Buffalo on March 1st, the proceedings being of course preliminary only, and consequently more or less informal. It was evident from the start that fairly serious opposition is going to be offered to the scheme, or at least the navigational part of it, by those authorities of New York State who are interested in the New York State Barge Canal. This Canal by the way has cost about one hundred and fifty million dollars, besides which according to the most recent and reliable estimates over twenty-five millions more are needed to provide transportation and loading facilities at the two main terminals, Buffalo and New York. Even then, so the New York State authorities seem to say, the enterprise is never going to be of any substantial use due to the fact that railroads have now developed to such a point that they are able to quote rates which, combined with the superior service inherent to a railroad, keep canal traffic down to an insignificant amount, and will always do so. In other words, their argument is that even if the terminal requirements be provided, together with a great many boats or barges and power boats for towing the same, none of which are yet available, the history of artificial waterway transportation the world over shows that the Canal can never develop a traffic that will amount to any appreciable total. The Canal people, when confronted with the question as to whether or no they were opposed to the power developments that would of course be contingent with the navigational improvements, stated that they were not prepared to give an offhand answer, as they had not considered that side of the question.

It had been stated that certain of the railroads, particularly those specially interested in coal and its transportation, would also offer objections to the scheme, as would various other United States interests, on the plea that that country would be spending its money for the benefit of another state, but neither of these features developed at the hearing. It has also been said that the lake navigation associations would also strongly object, but to the surprise of many, they did not, in fact one supported the proposition. Perhaps they see that their territory and industry are securely guarded by natural and economic laws, notwithstanding what facilities may be provided for the entrance of a competing vessel of the ocean going type.

Whether or no the proposed navigational improvements are gone on with in the near future, undoubtedly the hydro-electric power of the river will very shortly be developed, at least to a very much greater extent than it is at present. This is due of course to the great demand for power from both Ontario and New York State, the former needing it particularly on account of her fuel situation, and the latter desiring to bring it down to her large industrial centres in the eastern and central parts of the State, and the neighboring territory, for which purpose a [illegible] volt transmission line has been suggested, and in fact designed in more or less detail. In round figures there is 2,000,000 h.p., available on the river, of which roughly speaking half is international, divisible equally between the province of Ontario and the state of New York, and half lies wholly within the province of Quebec.

The Commission expects to start a more formal series of hearings shortly after the 1st of May, sitting perhaps first at Detroit and from there going through the central and western states as far as [illegible], then up to Saskatoon, from which latter point they will go eastward through the various Canadian points interested, the last hearings being held later on in the year at the larger Canadian and U.S. eastern cities more particularly concerned. There were [illegible] or more delegates at the Buffalo meeting, of whom quite a proportion were Canadians, the main cities from Ottawa to Windsor all being represented.

LIBRARY NOTES

Since the publication of the last Library Notes the following have been added to Headquarters Library:—

Quebec Bridge Government Report

2 vols. Published by the Department of Railways and Canals. $6.00 pet set of two volumes

A most valuable addition of the library has been presented by the Department of Railways and Canals in the final report on the Quebec Bridge. Volume 1 includes description of the bridge, stress calculations, etc., and the smaller plates; volume 2 includes the larger plates. Both volumes are printed on heavy coated paper, and are cloth bound.

Concrete Engineers' Handbook

By Hool and Johnson. Published by McGraw-Hill Company, New York.

This handbook was first published in 1918, and has now reached its third edition. It contains the latest information available on reinforced construction and is an excellent addition to the concrete construction section of the library. The handbook contains 870 pages and is arranged in the following general sections: Materials, General Methods of Construction, Construction Plant, Concrete Floors and Floor Surface, Sidewalks and Roadways, Properties of Mortar and Plain Concrete, General Properties of Reinforced Concrete. Beams and Slabs, Columns, Bending and Direct Stress, Buildings, Retaining Walls, Slab and Girder Bridges, Concrete Floors and Abutments for Steel Bridges, Arches, Hydraulic Structures, Miscellaneous Structures, Estimating, Standard specifications and tests for Portland Cement, Working Stresses, Rulings pertaining to Flat-slab construction, Concrete barges and ships.

Proportioning Concrete by the Method of Surface Area of Aggregates

By R. B. Young, A.M.E.I.C., reprinted from the Proceeding of the American Society of Testing Materials

Research along the lines indicated in the papers by C. J. Mackenzie and Duff. A. Abrams, printed in this issue of *The Journal.*

The Coal Consumption of Power Plants

By Robert H. Parsons, M.E.I.C., reprinted from The Electrical Review, London, England

24 pages booklet; gives standard charts of coal consumption per working shift for different classes coal, and outlines a system of bonus for coal saving.

Estimating Concrete Buildings

By Clayton W. Mayers. Published by the Aberthaw Construction Company

This is a useful little book on "scaling" concrete buildings, but is not intended to be a complete exposition. 52 pages. Will be supplied free to members of *The Institute.*

The Joint Committee on Standard Specifications for Concrete and Reinforced Concrete

The Joint Committee on Standard Specifications for Concrete and Reinforced Concrete has just been organized. The Committee consists of five representatives from each of the following organizations:

American Society of Civil Engineers
American Society for Testing Materials
American Railway Engineering Association
Portland Cement Association
American Concrete Institute

The purpose of the Committee is to make a thorough study of all available data on the subject of concrete, concrete materials and reinforced concrete, and to incorporate the most modern information and experience into a general specification which may serve as a pattern for detailed specifications covering specific types of concrete construction.

The new "Joint Committee" may be considered as the successor of the "Joint Committee on Concrete and Reinforced Concrete" which was organized in 1904, through the cooperation of the same engineering and technical societies. The original Joint Committee presented its final report to the parent organizations in 1916.

The organization meeting of the Committee was held at the Engineers' Club, Philadelphia on February 11, 1920. The following officers were elected:

R. L. Humphrey, Chairman, Philadelphia,
J. J. Yates, Vice-Chairman, New York City,
D. A. Abrams, Secretary-Treasurer, Chicago.

The following committees, consisting of five to seven members each, have been organized:

Committee 1—Concrete Materials,
" 2—Metal Reinforcing,
" 3—Proportioning and Mixing,
" 4—Forms and Placing,
" 5—Design,
" 6—Details of Construction,
" 7—Waterproofing and Protective Treatment.
" 8—Surface Finish,
" 9—Form of Specification.

A number of the Committees have organized and are actively engaged in the preparation of their preliminary reports. The next meeting of the Committee will probably be held at Asbury Park, N. J., about June 22, during the annual convention of the American Society for Testing Materials.

CORRESPONDENCE

Trades Unionism and Engineers

Montreal, March 19th, 1920

Editor, *Journal*:

Dear Sir:

The subject of whether or not an engineer should join a trades union is so widely discussed in the profession at this time that it seems to me it would be well if our Council gave the subject some special attention in the near future, possibly appointing a committee to investigate and report with recommendations for relieving the causes for the present "unrest" among engineers and other technical men.

We are a Trades Union: I suppose all of our members are agreed that an engineer should join a trades union, for otherwise we would not be members of *The Engineering Institute of Canada.* I see no difference in principle between our organization and that of the bricklayers and plumbers, though there are at present decided differences in tactics. Many of the practices of the bricklayers and plumbers may be objectionable, while some of ours are very unbecoming to engineers for the reason that they are inefficient. A craft, a trade or a profession; they are all the same general thing, subject to the same general natural and economic laws.

A Question of Tactics: The main question seems to be as regards the practices: whether or not engineers should do some of those things which the bricklayers, plumbers and others claim that necessity has justified their doing, or whether we should be satisfied to continue as at present despite the rapidly declining rate of exchange for "professional" engineering services with those of the sometimes less dignified but now relatively better paid "trade" or "craft" services of the bricklayers and plumbers.

Revaluation Necessary: For my part, I think we can learn much from our friends, the bricklayers and plumbers, whom necessity has driven as hard in past years as it now drives some of the engineering rank and file. Whether or not we should affiliate with such an organization as The American Federation of Labor is an open question; but I feel certain that as a class we need to make a revaluation of our position in industrial society, squeeze out some of the water and bring down to par the stock that too many of us were taking in ourselves. We should at least hold out the hand of common interest, in rocognition of working class equality, to those whose labor happens to contain more of the physical and less of the intellectual element than does ours.

Responsibilities Ahead: Our organization should be put in the best possible order and strengthened at this time for two reasons: first, our members and their families are not all securing the necessary amount of food, clothing and shelter required to maintain an engineer in good working order; and second, in the crisis that is now upon the world—though Canada has not yet been seriously affected as compared to other parts—we must be organized and prepared to cooperate with the other branches of labor in carrying on the industrial processes necessary to sustain life and to protect civilization from the chaos into which it is now, or has already had to pass through in some parts of Europe. The first reason is primarily personal; the second, primarily social. We have heavy responsibilities directly ahead of us, and should prepare to shoulder them as becomes men trained to correct thinking and acting.

Fraternally yours,

CHARLES A. [illegible], A.M.E.I.C.

* * *

Thomas A. Edison's 73rd Birthday

The Laboratory of Thomas A. Edison

Orange, N.J., March 22, 1920

Engineering Institute of Canada,
Montreal, Canada.

Dear Sirs:

Owing to a regrettable oversight, no previous acknowledgement has been made of the felicitations you so kindly sent to Mr. Edison on his 73d birthday. The numerous letters and telegrams were sent up to his house so that he and Mrs. Edison might read them leisurely.

This will explain the delayed expression of Mr. Edison's sincere appreciation of your cordial brithday message and of his thanks to you for the good wishes so kindly extended to him.

Yours very truly,

WM. H. MEADOWCROFT,
Assistant to Mr. Edison.

* * *

(Telegram)

Bill Passes B.C. Legislature

Victoria, B.C., March [illegible], 1920

Professional Engineers Bill of British Columbia passed third reading this afternoon.

D. O. LEWIS, M.E.I.C.,
Vice-President, E.I.C.

REPORT OF COUNCIL MEETING

The Engineering Institute of Canada

The regular meeting of the Council was held at the rooms of *The Institute*, 176 Mansfield Street, on Tuesday, March 23rd, at 8 P.M.

Institute Committees: Committees of *The Institute* were appointed as follows:—

Finance Committee: H. H. Vaughan, Chairman, R. A. Ross, Sir Alex. Bertram, Geo. K. McDougall, Geo. E. Bell.

Library and House Committee: Sir Alex. Bertram, Chairman, R. DeL. French, S. F. Rutherford, Colin Kemp, P. L. Pratley.

Publications Committee: Prof. Ernest Brown, Chairman, A. W. Swan, Secretary, J. A. Duchastel, E. Stansfield, J. S. Cameron, F. P. Shearwood.

By-Laws Committee: Arthur Surveyer, Chairman.

Papers Committee: Frederick B. Brown, Chairman; Chairman of each Branch.

International Co-operation Committee: H. H. Vaughan, Chairman, John Murphy, W. F. Tye.

Roads and Pavements Committee: W. A. McLean, Chairman, W. P. Brereton, F. W. W. Doane, E. A. James, J. Duchastel, J. E. Griffith, G. Henry, A. F. Macallum, A. J. McPherson, W. P. Near, P. E. Mercier, G. G. Powell, C. H. Rust, H. S. Carpenter, A. E. Foreman.

Electro-Technical Committee: L. A. Herdt, Chairman, L. W. Gill, O. Higman, J. Kynoch, T. R. Rosebrugh, John Murphy, A. B. Lambe.

Gzowski Medal and Students' Prizes: Lt.-Col. R. W. Leonard, Chairman, H. E. T. Haultain, J. M. R. Fairbairn, Julian C. Smith, F. H. Peters.

Steam Boilers Committee: L. M. Arkley, Chairman, W. G. Chace, F. G. Clark, R. J. Durley, D. W. Robb, H. H. Vaughan, Logan M. Waterous.
The recommendation of this Committee at the Annual Meeting was adopted.

Board of Examiners and Education Committee: H. M. MacKay, Chairman, Arthur Surveyer, Secretary, Ernest Brown, J. M. Robertson, R. DeL. French, R. S. Lea, A. R. Roberts.

Canadian Engineering Standards Committee: H. H. Vaughan, (three years), Walter J. Francis, (one to retire end of 1920), W. F. Tye, (one to retire end of 1920).

Leonard Medal Committee: H. H. Vaughan, Chairman, Dr. J. B. Porter, H. E. T. Haultain, D. H. McDougall, J. C. Gwillim.

Plummer Medal Committee: H. H. Vaughan, Chairman, Dr. J. B. Porter, H. E. T. Haultain, D. H. McDougall, J. C. Gwillim.

Deterioration of Concrete in Alkali Soils: B. S. McKenzie, W. P. Brereton, J. R. C. Macredie, H. McI. Weir, A. R. Greig, W. G. Chace, J. C. Holden, E. A. Markham, R. J. Lecky, F. W. Alexander, A. S. Dawson, Prof. C. J. Mackenzie.

Legislation Committee: Arthur Surveyer, Chairman, Walter J. Francis, J. M. Robertson.

Committee on Civil Service Classification: R. A. Ross, Chairman, R. W. Leonard, W. F. Tye, J. M. R. Fairbairn, H. H. Vaughan, G. Gordon Gale.

Honour Roll Committee: Brig. Gen. C. J. Armstrong, C.M.G., C.B., Chairman, Col. A. E. Dubuc, Fraser S. Keith.

Legislation Committee of Branches: The Secretary was instructed to ask each Branch at Provincial or Dominion capital to have a committee appointed to report to Council regarding any proposed legislation affecting engineers.

Annual Meeting, 1921: It was resolved that the invitation from the Toronto Branch to hold the Annual Meeting in Toronto, be accepted and that the Toronto Branch be requested to fix the date as soon as possible.

Special Council Meeting: It was resolved that a special meeting of the Council be held at Montreal at an early date for the purpose of discussing with the Ontario Councillors, the Chairman and Secretary of the Ontario Provincial Division and the Chairman of the Toronto Branch, matters affecting that Province, the date to be one most suitable to the men from Ontario.

Report of Publicity Committee: (Committee, Frederick B. Brown, Chairman, H. H. Vaughan, J. B. Challies, P. Gillespie) Mr. Brown reported that the Committee had drawn up regulations which they were still discussing among themselves and would report at the next meeting.

It was resolved that the Canadian Engineering Standards Association be requested to adopt the standards of *The Engineering Institute of Canada* for concrete and reinforced concrete and for cast iron pipe and further that the Standards Association be requested to assume the other standards of *The Institute* for modification where necessary, including, steel highway bridge specification, steel railway bridge specification, portland cement and road ballasting. It is desired by *The Institute* that in adopting theses standards credit be given to *The Institute* by a foot-note to the effect that they are either adopted from the specification of *The Engineering Institute* or modified from the specification of *The Engineering Institute*, as the case may be. The steel bridge specification committee of *The Institute* was not reappointed.

Civil Service Classification: The resolutions of the Winnipeg, Toronto, Border Cities, Peterborough, Ontario Provincial Division, were received, the suggestions contained in the resolutions were adopted and referred to the Civil Service Classifications Committee of *The Institute* for appropriate action.

Committee on Remuneration of Engineers: The resolution of the Toronto branch regarding action in connection with engineering remuneration was presented and discussed at length. It was resolved that a committee of the Council called the Committee on the Remuneration of Engineers be appointed consisting of John Murphy, Chairman, E. R. Gray, Frederick B. Brown and A. R. Decary, with power to add to their number, to consider the whole question of the remuneration of all engineers and all matters relating thereto to coordinate the efforts of the Branches in this connection to make recommendations and report their recommendations to the Council for action.

Salaries Report of the Toronto Branch: The salaries report of the Toronto Branch was noted and referred to the Committee on the Remuneration of Engineers.

A letter suggesting that The [illegible] Committee cite cases to the Civil Service Commission where Government engineers are receiving less than engineers carrying similar responsibilities employed by private corporations and municipal bodies was referred to the Civil Service Classification Committee with the suggestion that the recommendation contained in the letter be acted upon.

Maritime Professional Meeting: The suggestion of the Halifax Branch that the Maritime Professional Meeting be held in Halifax October 13th, 14th and 15th, 1920, was approved.

Peterborough Branch By-Laws: The By-Laws of the Peterborough Branch were noted and approved.

Arrangement Regarding Transactions: A letter making definite suggestions regarding arranging with other engineering bodies to secure Transactions for our members at reduced prices by mutual arrangement, which had already been discussed, was referred to the Committee on International Co-operation, Mr. H. H. Vaughan, Chairman.

Death of G. Reid Munro: The death of G. Reid Munro, M.E.I.C., was noted, and a resolution of sympathy to the family of the late Chairman of the Peterborough Branch was passed. The Secretary was instructed to write a letter of sympathy to the deceased member's family.

Amendments to the By-Laws: The report of the Scrutineer, Professor Brown, was presented as follows showing the result of the Ballot:—

In this Ballot, total of 722 ballots were received, of which 24 were invalid for various reasons, leaving 728 valid ballots. Of these 706 voted "Aye" for all changes, leaving 22 scattered ballots. The Amendments were declared adopted.

Inasmuch as the change in the By-Laws makes an additional district and increases the number of Councillors by three, the Secretary was instructed to make the changes in the wording of the By-Laws which the amendment involved.

New Councillors: The Amendment to the [illegible] [illegible] [illegible] for one Councillor for District No. [illegible] and two Councillors for District No. [illegible]. The Council appointed for District No. [illegible], [illegible], Toronto; District No. [illegible], H. [illegible], [illegible], A. [illegible] Blanchard, Niagara Falls, [illegible] for one year.

American Institute of Chemical Engineers: The fact that the Annual Meeting of the American Institute of Chemical Engineers will be held in Montreal in June, 1920, was noted and the Secretary instructed to write the Secretary of the American Institute of Chemical Engineers offering the headquarters of The Institute for the meetings of the Convention and assuring the A.I.C.E. that we were ready to cooperate in every way to make their Convention a success.

The Ballot was canvassed and the following elections and transfers effected:—

Members

L. H. Cole, B.Sc., (McGill Univ.), of Ottawa, Ont., mining engr., [illegible] Mines Branch; [illegible], [illegible] of Calgary, Alta., [illegible] and [illegible] Alberta Flour Mills; [illegible], B.A.Sc., [illegible], M.Sc. [illegible], of Montreal, sanitary engr., Board of Health, Prov. of Quebec, [illegible] sanitary engr. [illegible] consult. engr., Housing Comm. of the Province; W. L. Mitchell, B.Sc., M.Sc., (McGill Univ.), of Montreal, investigating conditions of pulp and paper industry in foreign countries for Canada [illegible] Paper Co., Ltd.; J. Muirhead, B.Sc. [illegible] (Glasgow Univ.), of Vancouver, B.C., [illegible] Govt. of B.C.; J. L. R. Parsons, B.A. [illegible] (Univ. of Toronto), Fellow in Surveying, [illegible], president, Parsons Construction and Engineering Co., Ltd.; A. W. [illegible], of Sault Ste. Marie, Ont., asst. chief engr., Algoma Steel Corpn.; G. P. Vollmer, Capt. M.Sc. (Victoria Univ., Manchester), of St. Catharines, Ont., 4½ yrs. military service, at present, draftsman, Welland Ship Canal; A. W. Wetmore, first class diploma [illegible] in civil engr. (R.M.C.), of Fredericton, N.B., provincial engr., New Brunswick.

Associate Members

[illegible], of Toronto, Ont., [illegible] engr., [illegible] office, Asphalt Association of New York; H. M. Armstrong, Lieut., of [illegible], N.B., 4 yrs. military service, at present, div. engr., St. John and Quebec Ry.; J. H. Bond, Capt., of [illegible], B.C., [illegible] military service, at present, engr., Queen Victoria Niagara Falls Park; V. J. Borland, of Vernon, B.C., asst. to [illegible] engr., [illegible] Okanagan Branch; A. J. M. [illegible], of Montreal, [illegible] engr., [illegible]; [illegible], Lieut., B.A.Sc. (Univ. of Tor.), of Winnipeg, Man., [illegible] yrs. military service, at present, engineer, [illegible] Service [illegible]; C. [illegible], of Winnipeg, Man., [illegible] yrs. military service, at present, [illegible] supt., light and power dept., [illegible] and underground lines and cables; H. D. Dawson, B.A.Sc. (Univ. of Tor.), of Welland, Ont., [illegible] engr., British

American Shipbuilding Co., Ltd.; L. S. Daynes, capt., D.C.M., of Benyon, Alta., 5 yrs. military service, at present, res. engr. C.M.R.; H. S. Dick, B.Sc. (Queen's Univ.), of Kingston, Ont., 2 yrs. military service, at present, asst. to city engr., Kingston; R. D. Fry, of Winnipeg, Man., reconnaissance engr., Sask. & Hudson Bay Ry.; G. Harrison, of Winnipeg, Man., asst. engr., under bridge engr., C.N.R.; H. A. Ingraham, of Calgary, Alta., reinforced concrete designer, A. Ingraham; W. J. Johnston, B.Sc. (E.E.) (Univ. of N.B.), of St. John, N.B., 2 yrs. military service, at present, asst. engr., P.W.D.; Junius Jonsson, of Saskatoon, Sask., asst. city engr., Saskatoon; G. N. Ledger, of Winnipeg, Man., 2 yrs. military service, at present, chief of field party, Manitoba Drainage Commn.; Harold Lloyd, of Winnipeg, Man., bridge engr., Good Roads Board, Manitoba Govt.; G. H. McCallum, major, M.C., B.Sc. (McGill Univ.), D. & B.C.L.S., of Ottawa, Ont., 4 yrs. military service, at present, geodetic engr., Geodetic Survey of Canada; H. W. Meech, of Lethbridge, Alta., commn'r. of Public Works and city engr., also charge of bldg. inspection; R. K. Northey, B.A.Sc. (Univ. of Tor.), of Regina, Sask., 4 yrs. military service, at present, sec.-treas. Dominion Line and Coal Co., Ltd.; D. E. O'Brien, of Halifax, N.S., ch. engr., Halifax Shipyards Ltd.; P. E. Palmer, lieut., D.L.S., of Ottawa, Ont., preparation of final returns and plans, Topographical Surveys; R. E. Roe, of Edmonton, Alta., 4 yrs. military service, at present, instrumentman on maintenance of way, G.T.P.; L. N. Seaman, major, B.Sc., M.A. (Acadia Univ.), of Montreal, 5 yrs. military service, at present ch., div. of timber tests, Forest Products Laboratories; H. B. Stuart, major, B.A.Sc. (Univ. of Tor.), of Hamilton, Ont., 4 yrs. military service, at present, field engr., Hamilton Bridge Works Co.; R. M. Taylor, of Vernon, B.C., 3 yrs. military service, at present, asst. dist. engr., Upper Okanagan dist., B.C. Provincial Govt.; F. H. Whittaker, of South Vancouver, B.C., municipal engr., South Vancouver; A. G. Willson, of Calgary, Alta., res. supt. for Alta. of eng. branch, D.S.C.R.; S. F. Workman, of Kelowna, B.C., 3 yrs. military service, at present, res. engr. Okanagan Branch, C.N.R.

Juniors

C. T. Barnes, of Winnipeg, Man., engr. i/c appraisal of Wpg. Electric Ry. Co's. properties, W. M. Scott; George Clark, of Winnipeg, Man., draftsman, C.N.R.; W. H. Collins, of Kingston, Ont., 3 yrs. military service, at present, at Queen's University, final year, civil engineering; I. M. Fraser, B.Sc., (M.E.) (McGill Univ.), of Montreal, demonstrator, mechanical dept., McGill University; G. A. Goddard, B.Sc. (M.E.) (McGill Univ.), of Outremont, P.Q., organizing, Crescent Motors Limited; J. R. MacDonald, of Regina, Sask., chief clerk, Surveys Branch, Dept. of Highways Sask.; H. J. McLean, of Calgary, Alta., hydrometric engr., irrigation branch, Dept. of the Interior; R. M. Robertson, of Lachine, P.Q., 3 yrs. military service, at present, final year, civil engineering, McGill University; A. J. Sutherland, of Winnipeg, Man., draftsman, G.T.P.R.; C. F. Wilkins, of Chamberlain, Sask., 5 yrs. military service, at present, leveller on location, C.N.R.

Associate

A. H. Hill, of St. Lambert, P.Q., manager, Francks Hankin & Co., Ltd.

Transferred from Associate Member to Member

J. B. Gilliatt, B.Eng. (Dalhousie Univ.), of Wabana, Nfld., in chg. submarine surveys and surface constrn., N.S. Steel and Coal Co., Ltd.; P.J. Jennings, major, of Calgary, Alta., 3 yrs. military service, office engr., irrigation branch, Reclamation Service; D. W. McLachlan, B.Sc. (McGill Univ.), of Ottawa, Ont., engr. in chg. of harbour works, H.B.Ry.; W. P. Near, B.A., B.Sc., (Univ. of Tor.), of St. Catharines, Ont., city engr., St. Catharines; K. H. Smith, B.A. (Univ. of Tor.), of Halifax, N.S., dist. engr., Dom. Water Powers Branch, Dept. of the Int.; G. A. Walkem, major, B.Sc. (McGill Univ.), of Vancouver, B.C., managing director, Vancouver Machinery Depot, Ltd.

Transferred from Junior to Associate Member

H. F. Bennett, B.Sc. (C.E.) (Univ. of N.B.), of St. John, N.B., 3 yrs. military service, at present, asst. engr., Public Works of Canada; H. L. Bunting, lieut., M.C., of Norwood, Man., B.Sc. (Birmingham Univ.), 3 yrs. military service, at present, instructor in engr. drafting, Re-training Schools, S.C.R.; K. G. Cameron, B.Sc. (Edinburgh Univ.), of Sydney, N.S., ch. draftsman, Dominion Iron and Steel Co.; C. G. Child, major, O.M. F.C., B.Sc. (C.E.) (McGill Univ.), of Banff, Alta., ass. tres. engr., Rocky Mountains Park of Canada; J. H. Hooper, B.Sc. (McGill Univ.), of Port Arthur, Ont., asst. engr. on reconstrn. of Port Colborne grain elevator; F. A. McGiverin, of Montreal, 5 yrs. military service, in charge of track work, Canada Steel Foundries; D. R. Smith, lieut., B.A., B.Sc. (Univ. of N.B.), of River Glade, N.B., bldg. supt., D.S.C.R., St. John; C. J. Swift, major, diploma graduation, R.M.C., of St. Catharines, Ont., 4½ yrs. military service, at present, asst. res. engr., Section No. 1, Welland Ship Canal; J. P. Watson, lieut., B.A.Sc. (Univ. of Toronto), of Montreal, 1 yr. military service, at present, eng. dept., Imperial Tobacco Co., Ltd.

Transferred from Student to Associate Member

D. G. Anglin, B.Sc. (mining eng. & metallurgy), B.Sc. (C.E.), (Queen's Univ.), of Kingston, Ont., asst. engr., P.W.D.; A. H. Munro, lieut., B.A.Sc. (Univ. of Tor.), of Severn Falls, Ont., 5 yrs. military service, at present, instrumentman on Severn. Div., Trent Canal; R. L. Seaborne, B.A.Sc. (S.P.S.), of Quebec, P.Q., mgr., Laurentian Forest Protective Association; L. B. Tillson, lieut., M.C., B.A.Sc. (Univ. of Tor.), of Windsor, Ont., 4 yrs. military service, at present, instrumentman, Can. Steel Corpn.; F. L. West, lieut., B.A., M.A., (Mt. Allison Univ.), B.Sc., (C.E.) (McGill Univ.), of Sackville, N.B., 2 yrs. military service, at present, prof. of civil engr., Mt. Allison Univ.; Russell Yuill, B.Sc. (McGill Univ.), lieut., of Truro, N.S., 1 yr. military service, asst. engr., Dept. Rlys. and Canals.

Transferred from Student to Junior

H. C. Bates, B.Sc. (Queen's Univ.), of Toronto, Ont., instrumentman, Toronto to Niagara Falls location, [illegible] dept., Hydro Electric Power Comm.; R. I. Harvey, B.Sc. (C.E.) (Sask. Univ.), of Regina, Sask., with C. S. Cameron, asst. in charge of municipal engr. work; E. E. H. Hugh, B.A.Sc. (Univ. of Tor.), of Toronto, Ont., structural engr., Thos. W. Lamb; W. C. Miller, B.Sc. (Gold. in C.E.), Queen's Univ.), of St. Thomas, Ont., city engr., St. Thomas; J. T. Rose, B.A.Sc. (Univ. of Tor.), of Winnipeg, Man., junior power development engr., Hydrometric Survey of Manitoba; C. A. Wallace, B.Sc. (McGill Univ.), of Montreal, lecturer in electrical engineering, McGill University.

The meeting adjourned to the call of the President.

OBITUARIES

George Reid Munro, B.Sc., M.E.I.C.

Sudden and untimely was the death of George Reid Munro, 2nd Vice-President of the William Hamilton Company, Ltd., Peterboro', Ont. which took place Monday, March 1st at his residence in that city, after a short illness of influenza. Mr. Munro was apparently recovering from his illness when he was seized with a sudden attack of heart failure and the shock proved fatal.

The late Mr. Munro who was second son of the late George Munro, a grandson of the late Wm. Hamilton founder of the William Hamilton Co. of Peterboro', was born in that city, March 13th, 1887. He received his early education at the Peterboro Public Schools and the Collegiate Institute and later graduated from the School of Practical Science, Toronto. After graduation, he was engineer on the preliminary survey of the Hudson Bay Railway, then on the staff of Messrs. Kerry and Chase, Consulting Engineers, Toronto, and was also connected for a short time with R. S. Lea, M.E.I.C., of Montreal. In July, 1911, he returned to his native city to take the position of engineer with The William Hamilton Company, which position as well as the vice-presidency of the company he held at the time of his death. He was a member of *The Engineering Institute of Canada* and first President of the Peterboro' Branch of that Society and took an especial interest in its organization. He was also a member of the Peterboro Board of Trade and always took a deep interest in anything that pertained to the city's development and welfare.

Mr. Munro was a young man highly esteemed by all for his genial disposition, his true friendship and his upright qualities, which won for him a host of friends in all walks of life, and his death will be more than a loss, not only to the company he so well and faithfully served, but to his native city where he was always regarded with the greatest esteem by all who knew him.

As Chairman of the Peterboro Branch of The Engineering Institute of Canada and having been one of the men most instrumental in the formation of the Branch, the work of Mr. Munro on behalf of the profession has been of considerable importance and the place left vacant, will be hard to fill.

Alden Ferris Bookhout, B.E., A.M.E.I.C.

Alden Ferris Bookhout, B.E., A.M.E.I.C., died at his home in Peterboro on Saturday Feb. 14th. For the last eighteen years Mr. Bookhout was a familiar figure in Peterboro's engineering fraternity, and was one of the pioneer members of the Peterboro Engineering Club that has now become a branch of The Institute.

Mr. Bookhout was born at Walton, N.Y. in 1871 and received his engineering education at Union University, from which he graduated in 1898 with the degree of B.E. After four years experience on testing, drafting and electrical construction work, Mr. Bookhout joined the staff of the Canadian General Electric Co., Peterboro, in the capacity of chief draughtsman. For the last ten years he ably filled the position of assistant engineer in the Switchboard Eng. Dept.

Mr. Bookhout was a member of the Delta Upsilon fraternity, a prominent mason and a trustee of Trinity Methodist Church, Peterboro. He is survived by his wife and one son. His death is deeply mourned by a wide circle of friends and especially by his co-workers.

PERSONALS

H. T. Ortiz, A.M.E.I.C., has been made city manager of Grand Mere, P.Q.

L. L. Theriault, A.M.E.I.C., has been appointed Town Manager for Edmundston, N.B.

A. J. MacPherson, A.M.E.I.C., has been appointed Chairman of the [illegible] River Water Commission.

F. Howard Grose, M.E.I.C., has been appointed Superintending Civil Engineer of H. M. Dockyard, Malta.

Major John R. Cosgrove, M.C., M.E.I.C., has been appointed District Engineer, North Vancouver, B.C.

C. H. Fox, A.M.E.I.C., formerly Division Engineer C. P. Ry. in Saskatoon, has been transferred to the Chief Engineer's office at Winnipeg.

H. Spencer, Jr. E.I.C., has been appointed municipal engineer of the municipality of Dauphin, Man., under the Manitoba Good Roads Act.

F. A. Earl, A.M.E.I.C., sailed for Africa on the R. M. S. "Abinsi." He has been engaged as assistant engineer on construction of Talo Kumasi Railway.

James McGregor, A.M.E.I.C., of Glasgow, Scotland, is at present on a business trip to the Gold Coast, West Africa. He expects to be back in Scotland by May.

*

H. K. Morrison, Jr. E.I.C., has been appointed divisional engineer, Montreal Division, of the Canadian National Railways, with headquarters at Montreal.

*

E. L. Tait, Esq., A.M.E.I.C., has been promoted from acting engineer of way, of the British Columbia Electric Railway Co., Limited, to principal assistant Engineer.

*

Colonel Geo. A. Johnson, M.E.I.C., is resigning his commission in the U. S. Army on March 1st, and will once more take up his regular occupation as an engineer in civil life.

*

J. Roy Underhill, S.E.I.C., has taken a position as instrumentman with the Algoma Steel Corporation on the construction of their new combined rail and structural mill.

*

G. C. P. Montizambert, A.M.E.I.C., has accepted an appointment as officer in charge of building and repairs with the Royal Canadian Mounted Police, at Regina, Sask.

*

Arthur Fournier, A.M.E.I.C., has accepted a position as vice-president and sales manager of Primeau & Company, Limited, with headquarters at 142 St. Peter Street, Quebec.

*

G. M. Hamilton, M.C., A.M.E.I.C., formerly of the Dept. of Railways and Canals, St. Catharines, Ont. is now with the Willard Service Station, The Clifton, Niagara Falls, Ont.

*

H. B. Muckleston, M.E.I.C., formerly with the Dept. of Natural Resources, C. P. R. Calgary, is now chief engineer of the Lethbridge Northern Irrigation District, Lethbridge, Alta.

*

John Blizard, A.M.E.I.C., formerly of the Department of Mines, Ottawa, is now engaged as a fuel engineer, by the U. S. Bureau of Mines, Dept. of the Interior, with headquarters at Pittsburgh, Pa.

*

Francis F. Longley, A.M.E.I.C., is at present in Geneva, Switzerland, where he is assisting in the organization and operation of the Division of Sanitation of the League of Red Cross Societies. Mr. Longley will probably remain abroad for several years.

George Newill, whose application for membership in *The Institute* is now pending, has recently been appointed general manager of the Robb Engineering Works as a subsidiary company of the Dominion Bridge Company, Limited, with headquarters at Amherst, N.S. He will take up his new duties immediately.

*

Coleman Weriwether, A.M.E.I.C., who was the patentee of the lock joint pipe used for a portion of the Winnipeg aqueduct has recently patented a new pipe with an expansion and contraction joint in each pipe, and plans to manufacture this pipe on a large scale from twelve to ninety-six inch size.

*

W. H. Slinn, Jr., E.I.C., who was employed as assistant city engineer of Kingston, Ont., on roads and pavements, has accepted a position with the E. G. M. Cape and Company, engineers and contractors of Montreal, as assistant engineer on the construction of the Canadian Connecticut Cotton Mill at Sherbrooke, Que.

*

J. Clark Keith, B.A.Sc., A.M.E.I.C., who has for a number of years past been in the engineering department of the City of Moose Jaw as assistant engineer and road and building inspector, has accepted a position as manager of the Canadian branch of Morris Knowles, Limited, with headquarters at Windsor, Ont.

*

Frank A. Combe, A.M.E.I.C., has severed his connection as chief engineer for Canada to Babcock & Wilcox, Limited, and will practise in consulting engineering, specializing in boiler plant design and operation, generalization and utilization of steam, combustion of fuels, etc., with offices at The Southam Building, Montreal.

*

W. G. Milne, A.M.E.I.C., has recently taken charge of the factory and production work of Slater & Barnard, Limited who control the Acme Stamping & Tool Works and the Allith Manufacturing Company of Hamilton, Ont. Mr. Milne previous to accepting this position was mechanical superintendent of the Dominion Foundries & Steel Company of Hamilton.

*

C. A. Boulton, J.E.I.C., has accepted a position with the E. G. M. Cape and Company, Engineers and Contractors of Montreal, and is now at Sherbrooke, Que. as assistant engineer on the construction of Mill No. 2 for the Canadian Connecticut Cotton Mill Company. Mr. Boulton has recently returned from Saskatoon, Sask. where he was employed by Murphy and Underwood, consulting engineers.

*

D. J. Emray, S.E.I.C., enlisted with the 5th Field Co., C. E. in October 1914, sailing for England in April 1915, and to France in September 1915. In February 1916 he was transferred to the 3rd Divisional Engineers, and was awarded the Military Medal in October 1916. He was commissioned July 1917 to 6th Field Co., C.E. and in May 1918 was awarded the Military Cross. Mr. Emry returned to Canada and was demobilized in May 1919, and is now completing his second year in Queen's University.

Capt. Chas. E. Brown, S.E.I.C., enlisted with the 100th Infantry in February 1916, and on arrival in England in February 1917 he was transferred to the 8th Canadian Railway Troops. He went to France in 1917, and was awarded the Military Cross and mentioned in Despatches. He returned to Canada May 1919 when he was admitted into Hospital with a fractured ankle sustained in France. Capt. Brown received his discharge in October 1919, and is now employed as Instructor in the Dept. Soldiers Civil Re-establishment, Winnipeg, Man.

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J. B. Wilkinson, A.M.E.I.C., enlisted for overseas service in May 1916 after taking a course at the Royal School of Artillery in Kingston, and received a commission as lieutenant in the Queen's 72nd Battery. He spent the summer of 1916 in Petawawa, took a draft of the 72nd Battery overseas in March 1917, and went to France in October 1917, when he joined the First Canadian Pioneers 9th C. R. T. Battalion. While repairing the broad gauge railroad east of Cambrai in October 1918, he received a gunshot wound in the leg, and was sent to hospital in England. In July 1919 he was invalided back to Canada, and in October 1919 was demobilized.

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Capt. Newton J. Wallis, A.M.E.I.C., enlisted with the 2nd Field Troops in December 1914, recruiting and preparing drafts for overseas. In March 1916 he left Winnipeg with the 53rd Battalion for overseas, and in October 1916 he was posted to the 3rd Field Company and proceeded to France. In October 1917 he reported to the Canadian Engineer's Depot, Seaford, England for duty, and in March 1918 he was seconded to the War Office, Air Ministry for duty. Capt. Wallis, was demobilized in England in August 1919, but remained with the Air Ministry till October 1919, in order to complete the work under his charge. He is now District Engineer, Reclamation Branch, Public Works of Manitoba, Winnipeg, Man.

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Lieut.-Col. E. V. Collier, D.S.O., A.M.E.I.C., went overseas in 1915 with the 23rd Battalion, and on arrival in England attended course of instruction at the Royal Staff College, Camberley. He served in France with the 52nd Infantry Batalion at Vimy, Avion, and Lens, and was wounded at Lens during a raid, awarded the D.S.O. and mentioned in despatches. He returned to France early in 1918, and in July was transferred to the Canadian Engineers, taking part in the Amiens, Arras and Cambrai fighting. In January 1919 he was appointed to command M.D. 6 at Kimnel Park, N. Wales, and in May 1919 was transferred to Witley, Surrey. In September 1919 he joined the firm of Collier & Co., Limited, Lighthouse and Buoy Engineers, successors to the International Marine Signal Co., Ltd. Ottawa. Before going overseas Lieut.-Col. Collier was on the engineering staff of the River St. Lawrence Ship Channel.

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Capt. K. R. MacKinnon, M.C., Jr. E.I.C. enlisted with the C.E. in 1914 as a sapper, became a sergeant in the 2nd Canadian Divisional Signal Co., and went to France in September 1915. He was given a commission in June 1916 with the same unit and acted as signal officer 4th Canadian Inf. Brigade till December 1917. From December 1917 till April 1918 he was instructor at the Engineers Training Depot in England. He returned to France and rejoined the 2nd Divisional Signal Co. In June 1918 he was appointed signal officer of the 2nd Canadian Divisional Artillery, and held that appointment until demobilization. In April 1917 Capt. MacKinnon was awarded the Military Cross, and in September 1918 was given a bar to the Military Cross. Capt. MacKinnon is now with the Efficiency Dept. of the Nebraska Power Co., at Omaha, Neb.

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A. S. Fraser, electrical engineer, whose application for admission to *The Institute* is pending, has been appointed manager of the city of Kamloops. The powers and duties of the manager are as follows: To have charge of the hydro-electric, electric lighting and power plant, waterworks system, fire hall, streets, and all other departments of which the Council has or may hereafter have control, or such of the property of the corporation connected therewith and all officers, clerks, servants and employees of the corporation in the departments over which he shall be given charge. To employ and appoint all officers, clerks, servants and employees of the corporation in the departments over which he is given charge, and at his discretion to remove or suspend them. To invest such officers, clerks, servants and employees of the corporation with such powers, authorities, and discretions as he may think expedient, and to fix their salaries or emoluments.

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E. R. Gray, A.M.E.I.C., City Engineer of Hamilton and Member of Council, has been actively engaged lately in connection with the preparation of a report to the City of Hamilton on the [illegible] gas question. A report has been submitted by a special committee, with the aid of Mr. Gray and other gas experts, on the present situation regarding the supply of natural and manufactured gas. The gist of their recommendations is that the city should at once undertake the construction of an artificial gas plant, preferably of the vertical retort type, of sufficient capacity to furnish the entire present requirements of the city, with an additional water gas plant for increasing the total capacity, which would be about 5,000,000 Ft. per day. It was decided that the by-product coke oven type of plant was not economical as a producer of gas for municipal consumption, owing to the increased amount of coal required to produce the same quantity of gas.

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J. A. H. O'Reilly, A.M., E.I.C. has been appointed secretary of the research committee of the Winnipeg Board of Trade. Mr. O'Reilly's experience eminently qualifies him for this important position. He has lately been statistical engineer for the Winnipeg Electric Railway Company and before this was Associate Professor of Civil Engineering at Manitoba University. He takes with him the heartiest wishes of the branch for his success in his new position.

In spite of extreme severe climatic conditions the transmission line between Winnipeg and Portage la Prairie is now practically completed and it is expected that the power will be delivered over this line at the end of the month. Considerable extensions of transmission lines throughout the Province are expected to be made in the forthcoming year. All of this work is under the supervision of J. M. Leamy, M.E.I.C., Power Commissioner for Manitoba.

*

Bruce Aldrich, district engineer, Canadian district office of the Asphalt Association located at 95 King Street, East, Toronto, who has just been elected an Associate Member of *The Institute*, advises that the home office of the Asphalt Association, representing the producers and users of asphalt for paving purposes, has removed the head office to new quarters in the new National Association Building, 25 West 43rd Street, New York City. The Asphalt Association will continue its educational and research work along the most effective engineering and economic lines. A feature of the Association's activities is a brochure series explaining the approved methods of constructing asphalt pavements including asphalt macadam, asphaltic concrete and sheet asphalt pavements and presenting information as to asphalt specifications, the use of asphalt fillers for brick and block pavements. Lectures in universities and colleges have been given, or arranged for, in about twenty-five of the leading educational institutions of the United States and Canada.

*

The appointment of Frank S. Rutherford, B.A.Sc., A.M.E.I.C., at a salary of $3,500 a year, to the position of organizer for the industrial and technical education branch of the Department of Education, was announced by Hon. R. H. Grant, Minister of Education. He succeeds K. S. Maclachlan, who resigned.

The position was advertised and Mr. Rutherford chosen from the list of applicants who had active service during the war. Mr. Rutherford is a graduate of the School of Practical Science of the University of Toronto, and an associate member of *The Engineering Institute of Canada*. He has been a public school teacher and has had much experience as an engineer.

He enlisted in 1914 as a sapper in the Second Field Company, Canadian Engineers, and went over with the First Contingent. He returned to England as a casualty, and later to Canada, where he was given a commission on construction work for the School of Trench Warfare. In February 1919, he was discharged from the army to take up work with the Department of Soldiers' Civil Re-establishment.

*

Albert George Hill, A.M.E.I.C., sales manager of the Bawden Machine Company, Limited, Toronto, returned to Canada a few weeks ago after spending the greater part of a year in England where he made arrangements for the Canadian selling rights for Alley and MacLellan, Limited, Glasgow, Scotland, manufacturers of air compressors, valves and water works supplies, and the sole license right to manufacture and sell in Canada the products of the following English and Scotish firms: Robey and Company, Limited Lincoln, England, manufacturers of semi-Diesel oil engines, steam engines, air compressors and mining machinery; John Thompson, Limited, Wolverhampton, England, manufacturers of corrugated furnaces and water tube boilers; David Bridge and Company, Limited, Castleton, Manchester, England, friction clutch rubber and textile-working machinery, E. S. Hindley and Company, Limited, Bourton, Dorsetshire, England, makers of high-speed steam engines, Brown Bros. and Bow, MacLachlan, Limited, manufacturers of steering gears and steam-boat auxiliary machinery. The Bawden Machine Company will manufacture all parts of the English machinery and will supply repair parts.

*

Harold S. Johnston, A.M.E.I.C., late of Calgary, has recently come to Halifax to accept an appointment as hydraulic engineer of the Nova Scotia Power Commission. Mr. Johnston is a graduate of McGill University and has had extensive experience in hydro-electric work both in Ontario and in the Province of Alberta. He was engineer to the Calgary Power Co. for a period of four years covering the construction of two hydro-electric plants of 30,000 horse-power capacity as well as storage dams incidental thereto. He was also engineer for the Dominion Parks Branch, Interior Department, in connection with water supply for Banff and the Rocky Mountain National Park.

For the past eighteen months and up to the time of his appointment to the Nova Scotia Power Commission, Mr. Johnston was assistant Western District Superintendent of the Engineering Branch of the Department of Soldiers' Civil Re-establishment with jurisdiction from Winnipeg to Victoria, and covering the construction and maintenance of hospitals, vocational schools, etc. and particularly a $500,000 tuberculosis sanitarium.

While Mr. Johnston will generally assist in all the projects of the Power Commission, his immediate duties will be the preparation of designs and estimates for the Sheet Harbour project to supply the Pictou County industrial district.

*

Major General Garnet B. Hughes, C.B., D.S.O., M.E.I.C., who has been overseas continuously since September 1914, recently paid his first visit to Canada, the principal objects of his visit being to see his father, Sir Sam Hughes, and to visit his home town of Lindsay, Ont. On the occasion of his visit to Lindsay on March 11th a civic welcome was tendered to General Hughes, a large procession was formed at the C. P. R. station, headed by the citizens' band, veterans, etc., and General Hughes was escorted to the home of Sir Sam and Lady Hughes, where he was welcomed by John Carew, ex-M.P.P. and other prominent citizens.

In an interview with a representative of the Toronto Globe General Hughes spoke optimistically of conditions in Great Britain, and stated that in his opinion prospects were bright. General Hughes is returning to England ere the publication of this number of *The Journal*, and will resume his work as a partner of the firm of Sir Robert McAlpine & Sons, builders and contractors.

*

Col. J. C. Brown, who was elected a Junior Member in 1911 and whose application for transfer to a higher grade is now pending, is at present engaged as Chief of the Anatolian Railways in Asia Minor. This line is at present under British military control and forms the western section of the Bagdad Railway. Col. Brown has had an interesting career during the war. He joined the Canadian Army in 1914, was transferred to the Corps of Royal Engineers, Imperial Army after arrival in

England and went to France as 2nd in command of a Railway Construction Co., R.E. After about three months he was recalled to England and sent to Salonika in command of a similar company, where he served for about three years and attained the rank of Lieutenant Colonel with the title of Railway Construction Engineer, No. 1 British Salonika Force, at the time he had four construction companies under his command.

Since leaving Salonika in March 1919 Colonel Brown has been on construction work in Transcaucasia, and during part of the summer of 1919 was also with the British Military Mission in South Russia as Railway adviser. His present address is c/o Director of Railways, Constantinople, Army of the Black Sea, via G.P.O. London.

A. C. D. Blanchard, M.E.I.C.
Chairman Niagara Peninsula Branch

A. C. D. Blanchard, M.E.I.C., was born in Windsor, N.S. He was educated at Kings College University, and later at McGill University, graduating from McGill in 1901. After graduation Mr. Blanchard was for some time with the American Bridge Co., in Trenton, N.J., and later joined the engineering staff of the Canadian Niagara Power Company under the late C. B. Smith, M.E.I.C. Five years later he was engaged by Messrs. Ross & Holgate, Montreal as assistant to the resident engineer Walter J. Francis, M.E.I.C., on the construction of the 32,000 H.P. Hydro-Electric Plant of the West Kootenay Power & Light at Bonnington Falls, B.C. Upon Mr. Francis' return to Montreal he was promoted to resident engineer. The following year he joined the engineering staff of the City of Toronto, and was placed by C. H. Rust, M.E.I.C., city engineer in charge of a newly created department of special surveys and the design and construction of the main drainage system. In 1911 Mr. Blanchard accepted the position of city engineer of Lethbridge, Alta., remaining there until 1913 when he joined the engineering staff of the Greater Winnipeg Water District under W. G. Chace, M.E.I.C., and in 1911 he returned to Niagara Falls, and has from that time held the position of chief field engineer of the Niagara Development of the Hydro Electric Power Commission. Mr. Blanchard has graduated in The Engineering Institute from Student to full Member. He joined The Institute in 1901 as Student Member, was elected Associate Member in 1904, full Member in 1911 and is now the energetic chairman of the Niagara Peninsula Branch.

Important Appointment

H. R. Safford, M.E.I.C., formerly chief engineer of the Grand Trunk Railway, who has many friends in Canada, has been appointed assistant to President Hale Holden of the Chicago, Burlington and Quincy Railroad Company, the Colorado and Southern Railway Company, Fort Worth and Denver City Railway Company, The Wichita Valley Railway Company.

H. R. Safford, M.E.I.C.

Mr. Safford's elevation to this position is a further recognition of his ability and of the success which attended him in his former position. Mr. Safford has been one of the most earnest promoters of good-will between the United States and Canada. In a recent letter to the Secretary, he writes in part:

"I am sorry, of course, that this [illegible] my business association with my good Canadian friends. [illegible] characterized my connection with the Grand Trunk. However, I [illegible]"

"I hope [illegible]"

BRANCH NEWS

Victoria Branch

H. M. Bigwood, A.M.E.I.C., Secretary

The following resolutions were passed at a recent meeting of the Branch.

"Daylight Saving"

That the time is approaching when a decision upon the question of the continuance of the Daylight Saving principle must be made.

That the practice as carried out in the past years has been beneficial in its operation.

That the Victoria Branch of *The Engineering Institute of Canada* therefore endorses the principle of Daylight Saving, and suggests to the Council that steps be taken to support the movement having for its object the continuance of the practice.

"Re Purchasing Commission"

Whereas the purchase of government supplies during the war as carried out by the War Purchasing Commission, for these departments concerned under the War Measures Act, has, as stated publicly by the Premier, saved the country many millions of dollars by abolishing patronage so far as these departments are concerned, and

Whereas the purchase of all supplies by competitive tender would further increase the saving to the country, and

Whereas any system which prevents possible discrimination in favor of political friends or persons, wishing to become purveyers to the Government, is much preferred by all technical men;

Therefore the Victoria Branch of *The Engineering Institute of Canada* is unanimously in favour of legislation to attain this end, and would place itself on record as endorsing the action of the Government insofar as the proposal to present a bill to create a permanent Purchasing Organization is concerned.

Further agreed that the Council be asked to take the necessary steps and all Branches to support them.

Vancouver Branch

By J. N. Anderson, A.M.E.I.C., Sec.-Treas.

At the March meeting of the Executive of the Vancouver Branch, it was resolved:—

That this Branch goes on record as being unalterably opposed to such amendments of the Civil Service Act as it is understood Sir Sam Hughes proposes to introduce to the present Session of Federal Parliament, tending to eliminate competitive examinations for Civil Service position, and to introduce the old evil system of patronage.

Further that the Council of *The Engineering Institute of Canada* be requested to place this resolution before the proper authorities.

Further that a copy of this resolution be sent to the various Branches of *The Engineering Institute of Canada* for their endorsation.

Saskatchewan Branch

J. N. de Stein, M.E.I.C., Sec.-Treas.

Our Branch stand in the middle of its winter activities. Unfortunately action on our proposed bill had to be deferred until the next session of the Provincial house, but we see with great satisfaction from our correspondence, that this question is being taken up in other Provinces and we certainly wish its success! As far as our Branch is concerned the matter is now in the hands of our Legislation Committee for suggestions as to the best method of ensuring the passing of a satisfactory Act.

The question of technical High School education is also engaging our attention and a special Committee has been appointed to look into this matter.

The Paper and Library Committee has prepared a detail programme for papers to be read at the monthly meetings of the Branch. For the Summer-meeting, which will likely take place at Saskatoon, a paper on the natural resources of the Province is being prepared by R. W. E. Loucks, A.M.E.I.C. Other subjects of interest, which will be dealt with the ensuing season are the Saskatchewan River Water Supply, Concrete, Fuels etc.

At the February meeting of the Branch, W. A. Begg, A.M.E.I.C., Townplanning Engineer of the Saskatchewan Government, gave an interesting address on the procedure under the new Townplanning Act, outlining in detail the methods to be adopted in the field and office in this connection. He dealt also at some length with the larger schemes in other parts of our Dominion and touched upon the subject of the devastated areas in Europe.

After the conclusion of his address, W. T. Thompson, M.E.I.C., the oldest practising engineer and surveyor in our Province, made a few remarks concerning the Hudson Bay Route. He referred to the importance of completing that route to Port Nelson, stating that grading had been finished and the steel laid to within about of ninety miles of the terminal some time ago—that the completion of the road would render the fine fisheries of the Bay available, open up some very fair agricultural land and promote the development of the great mineral resources of the north. He mentioned that large sums of money were being spent in other parts of Canada on the Welland Canal and other works, and he thought it only fair to the West that there should be no further delay in laying the remaining steel and completing the terminal at Port Nelson, especially in view of the resolutions had been passed by our Provincial Legislature urging the construction of the road.

At the March meeting it was decided to grant an annual scholarship of one hundred dollars to the Engineering faculty of the University of Saskatchewan to the most deserving student upon graduation. This to be known as "The Saskatchewan Branch E.I.C. Scholarship."

There was also a special committee appointed to deal with the question of salaries for Engineers and to draw up tentative schedules applicable to our conditions, somewhat along similar lines of the work the Committee of the Toronto Branch has so splendidly accomplished. The Chairman of this Committee to be C. W. Dill, M.E.I.C.

A paper was read by Capt. D. A. Smith, A.M.E.I.C., on "Mapping in War," which was followed by a discussion lead by R. W. E. Loucks, A.M.E.I.C.

Winnipeg Branch

Geo. L. Guy, M.E.I.C., Sec.-Treas.

February 5th, Mr. F. H. Martin gave an address on the "Economics of Water Wheel design." Mr. Martin traced the history of water wheel design from its commencement up to the present day and forecasted possible future developments. He illustrated his paper with an extremely interesting series of slides. Particular interest was taken in the graphical method of designing the runners of water wheels. He dealt at considerable length upon the necessity of giving the efficiency of the wheel its proper consideration as part of the whole installation; pointing out and illustrating by actual results in practice that the efficiency may be unduly emphasized and considerable monetary saving may be made by a slight decrease in efficiency. A very good discussion took place, particularly on the latter subject.

A report was heard from the delegates of the branch who attended the annual meeting in Montreal.

A committee was appointed to bring in nominations for officers for the ensuing season.

On February 18th, B. S. McKenzie, M.I.E.E. read a paper by Prof. J. McKenzie of the Saskatchewan Branch, on "Concrete Mixtures in Alkali Soils".

The Committee appointed to nominate officers for the ensuing season reported the names of those nominated for balloting.

Border Cities Branch

J. E. Porter, A.M.E.I.C., Secretary.

The Second Meeting of the Branch for the year was held on Friday night, Feb. 20th, in the Auditorium of the Chamber of Commerce with nine members and several friends of the Speaker for the evening present.

The main feature of the evening was an address by Major W. J. Forbes-Mitchell, D.S.O., on the different types of bombs and their respective mechanisms, on the different gases used at the Front and the methods of combatting their deadly effect, followed by some Lantern slides of interest.

A hearty vote of thanks was tendered Major Forbes-Mitchell.

Due to the unavoidable absence of the Chairman, his report on the Annual Convention was read and adopted as read.

It was decided that the appointment of the Town-planning and Membership Committees be left to the Chairman, Mr. Craig, who later appointed on the Town-planning Committee:

J. J. Newman, A. J. Riddell, C. R. McColl.

And on Membership Committee:

H. Thorne, W. J. Forbes-Mitchell, E. S. Nelles.

The Meeting adjourned at 10.45 P.M.

* * *

A Special Meeting of the Border Cities Branch was held in the Auditorium of the Chamber of Commerce March 1st, with 10 members and several visitors present.

The subject of the evening was an illustrated address to the Panama Canal while under construction and the San Francisco celebration of its completion by Mr. John Murphy, M.E.I.C.

* * *

The regular monthly meeting of the Border Cities Branch was held in the Chamber of Commerce Rooms, on the 5th instant with Fraser S. Keith, General Secretary of *The Institute*, Mr. Proctor of the Toronto Branch and sixteen members present.

Following the reading of the minutes of previous meetings Mr. Craig, in calling upon Mr. Keith for an address, traced the growth of the Canadian Society of Civil Engineers and the present *Engineering Institute of Canada*.

Mr. Keith then gave the members a very instructive and interesting address on Institute matters, dealing with Membership grades, *The Journal*, Legislation and salaries, which was closely followed and appreciated by all.

Major W. J. Forbes-Mitchell moved a hearty vote of thanks to Mr. Keith which was in like manner seconded by A. J. Riddell and heartily endorsed by all.

Mr. Proctor brought greetings from the Toronto Branch and gave the members a short account of the work of the Toronto Branch and of the inaugurated General Engineering Meeting at Toronto held week.

The meeting was then opened for discussion. Considerable discussion followed on Legislation, The *Journal* and Salaries.

The following resolution was passed, viz.

That the attention of the Council be drawn to the advisability, in the smaller branches, of permitting the Junior members of the Branch to vote on all Branch matters and to hold office, and that Council, therefore, put into effect the necessary regulation to permit all Branches, having a total membership of members, associate members, juniors and students, of less than sixty, to add a clause to their By-laws permitting of this action.

The Branch also placed itself on record in unanimously approving the resolution—Re Federal Civil Service Classification—of the Winnipeg Branch of February the 18th.

Peterborough Branch

R. L. Dobbin, M.E.I.C., Secretary.

On Thursday February 19th, the Branch was addressed by R. L. Dobbin, M.E.I.C., Waterworks Superintendent, who spoke on Water Filtration, with special reference to Peterborough's local problems. As the City has in view in the near future a 6,000,000 gallons per day filtration plant, the meeting was well attended by the citizens generally as well as the members of the Branch.

During the month the Branch was asked by the City Council to make a report on the sufficiency of the foundation for the East river pier of the new Hunter Street Bridge. As the river span of this bridge is to be the longest in Canada and one of the longest in America, much of its stability depends on the foundations.

The Branch appointed a Committee from among its members, which after making investigations reported to the Council that the foundations were suitable. This helped to set at rest many rumors that were current in the City as to the poor class of soil in the foundations, and the Branch received the thanks of the City Council for their report.

On February 29th the Branch suffered an irreparable loss in the death of the Chairman, G. Reid Munro, M.E.I.C. An account of Mr. Munro's life and achievments appears elsewhere in this issue, but it may be said here that *The Engineering Institute* in general and Peterborough Branch in particular has been robbed of one its brightest lights.

John Murphy, M.E.I.C., Electrical Engineer of the Department of Railways and Canals was to have addressed the Branch on Thursday March 4th, on the Formation of Ice, but on account of the death of the Chairman, this meeting was put off until a later date.

At the recent elections for the Council of the Local Board of Trade, three out of fifteen elected were members of the Peterboro Branch, which speaks well for the interest of engineers in the City in affairs outside their own line of work.

Niagara Peninsula Branch

R. P. Johnson, A.M.E.I.C., Secretary.

A general open meeting of the Branch was held at the Welland Hotel, St. Catharines, on the evening of Feb. 27th.

Nearly an hour was spent in partaking of an excellent dinner to which 93 members and friends sat down.

The speaker of the evening was John Murphy, M.E.I.C., of Ottawa whose subject was entitled "A Trip to the Panama Canal while the Canal was being Built and San Francisco's Celebration of the Opening of the Canal."

The speaker showed a large number of lantern slides and explained each in a very interesting manner. The slides of the Panama-Pacific Exposition were hand colored and showed vividly the beautiful lighting effects of the Exposition. The speaker was much disappointed in not having the slides which he had originally intended to bring. These had been delayed in transit from New York.

Munro Grier K.C. of Toronto was a guest of the Branch at the special request of Mr. Murphy. Some of the slides shown were loaned by the National Electric Light Association and Mr. Grier is a vice-president of this Association.

Mr. Grier spoke in an eloquent and humerous strain for a few moments at the close of Mr. Murphy's talk.

The St. Catharines Canadian Club had been invited to come after the dinner to hear the address and see the pictures, and a number availed themselves of this opportunity as well as a number of guests from the Hotel.

At 10.30 the meeting adjourned to the Grand Theatre to see some motion pictures on Ice Formation which Mr. Murphy had brought with him. These showed in a very striking manner the way in which frazil ice forms in running water and on submerged iron and steel. The speaker explained how this great difficulty in hydro-electric power plant operation may be comparatively easily overcome by the use of relatively small quantities of steam applied to headworks, penstocks and turbines, and closed with a plea for greater recognition of this fact.

* * *

A general meeting of the Branch was held Friday, March 12, at the Engineers' Club, Thorold.

The following members were elected to the Branch Nominating Committee:—

E. P. Johnson, D. T. Black, R. P. Johnson, G. H. Lowry and W. P. Near.

This meeting was the occasion of Mr. Keith's annual official visit to the Branch.

Mr. Keith complimented the Branch upon its accomplishments and record for the first year of its existence and proceeded to a brief outline of the progress and present status of legislation in the various provinces of the Dominion.

The Chairman asked Lieut.-Col. Leonard, past-president of *The Institute*, to speak to the meeting.

Col. Leonard told in an interesting way of some of the early engineering projects in the Niagara Peninsula with which he had been connected. These related to early water power developments and some of the limitations and difficulties of transmitting electrical energy over even short distances.

The Chairman explained that the speaker of the evening had been unable to come but that he himself would endeavor to show the slides and describe the building of the Winnipeg Aqueduct on account of his familiarity with this undertaking.

Mr. Blanchard explained the conditions of the water supply in Winnipeg and showed how necessary it became to secure a large supply of soft water. A board of consulting engineers had reported in 1900 upon securing a supply from the Red River at a point some 60 miles distant from the City and later, another report in 1913 provided for the supply to come from Shoal Lake, 90 miles distant. This last scheme was the one adopted and which the speaker explained, with the aid of lantern slides, in a very interesting manner. A large number of questions from those present indicated considerable interest in the subject.

The attendance at the meeting was thirty-five.

Hamilton Branch

C. F. Whitton, A.M.E.I.C., Sec.-Treas.

The first meeting of the Hamilton Branch for the 1920 season took the form of a visit to the Coke Oven Plant of the Steel Company of Canada. A summary of the equipment and operation of the plant was furnished to each visiting member, and as it has a general interest is given herewith:

By-Product Plant of the Steel Company of Canada, Limited, Hamilton Works

Coal Handling: The normal daily consumption of coal is about 1500 tons. This is unloaded into four receiving hoppers, and lifted by belt conveyor to the Breaker Building where the coal is crushed and delivered to bins, the high volatile coal to one bin, the low volatile coal to the other. From the bins the coal is delivered in certain proportions, usually 85 per cent high volatile, 5 per cent low volatile, to the Hammer Mill, where the two grades are thoroughly mixed and pulverized fine enough for 80% to pass through a 1/8" mesh screen. From the bottom of the Breaker Building the coal is conveyed by belt to the "Larry Bin"—capacity 1400 tons.

Coke Ovens. There are two batteries of ovens, consisting of 40 separate ovens, each of brick construction with iron doors. Between pairs of ovens are the combustion chambers, the ovens being heated by conduction through the intervening brick walls. Each oven is charged from above from a larry car, filled from the larry Bin. Each charge is about 13 net tons. The charge is coked for about 16 hours, the doors at the end of the oven are then opened and the oven-full of coke pushed out by a ram into the quenching car. (The coking process reduces 13 tons of coal to 9½ tons of coke.) At the quenching station the coke is deluged for about a minute by six streams of water and is then dumped out on to "coke wharf." The coke is taken by conveyor to the screening station where it is screened into—foundry sized coke, over 4", furnace sized coke, between 4" and 1½", and Breeze, under 1½". Furnace and foundry coke are shipped, part of the Breeze is kept for blast furnace consumption.

By-Products. During the coking process, large quantities of gas are given off, which accounts for the decrease in weight from coal to coke. This is collected and drawn to the "by-product" building by three "exhausters," being cooled, on the way, in the "primary coolers." During this cooling, from the ovens to the primary coolers, a mixture of tar and ammonia liquor is precipitated from the gas. This is piped to the "separating tank." From the exhausters, gas passes through "tar extractors" in which last traces of tar are removed. From here, gas passes into the "saturators," where it bubbles up through dilute sulphuric acid. The ammonia vapour in the gas combines with the sulphuric acid precipitating "ammonium sulphate." This is dried in centrifugal dryers, and wheeled into the "sulphate storage" room. Here it is bagged [illegible] and shipped as a fertilizer material. Shipped principally to Japan, South America, West Indies and Spain. The mixture of tar and ammonia liquor which went to the "separating tank" separates in that tank by gravity, the tar being pumped to the "tar storage" tank, and the ammonia liquor to the "ammonia liquor" tank. The tar is pumped to the open hearth furnaces and used as fuel. The ammonia liquor is pumped to the ammonia stills, where, by the addition of lime, the free and fixed ammonia are liberated as ammonia vapour. This goes into the saturators along with the gas from the tar extractors. About 75% of the ammonia vapour is extracted from the gas, and about 25% through the ammonia stills.

The gas, after leaving the saturators is finally scrubbed in the "final cooler." Here a certain amount of naphthalene is deposited in the "naphthalene settling basin." This is dried and barreled for sale. The gas then passes into the gas holder, which has a capacity of 20,000 cu. ft. This has a collapsible top, which provides the pressure necessary to force enough gas back to the ovens to continue the coking process. Forty per cent of the total gas produced is returned to the ovens as "fuel gas." The other sixty per cent is pumped by the "booster engine" to the open hearth furnaces, where it is used as fuel with the exception of that sent to the Boiler House and a little used in the lunchroom and the laboratory, etc.

Yields.—From 1500 tons of coal, there is obtained:

- 1100 tons of coke
  - 1000 tons foundry & furnace coke, shipped, used in blast.
  - [illegible] tons chestnut coke, shipped
  - 60 tons coke dust, shipped, used in plant
- 16000 U.S. gallons of tar—used in open hearth furnaces.
- [illegible] pounds of ammonium sulphate, shipped.
- 16,000,000 cubic feet gas
  - 6,400,000 cu. ft. returned to ovens as fuel.
  - 9,600,000 cu. ft. piped to open hearth, boiler house, etc.

This makes the yield of one ton of coal—

- ¾ ton of coke
- 11 U.S. gallons of tar
- [illegible] pounds of ammonium sulphate
- 10,[illegible] cubic feet of gas

Boiler House. Boiler equipment consists of 3 Erie City double-drum water tube boilers — each of 250 Horse Power. Steam pressure carried at 150 pounds. steam superheated 100°. Fuel used is a mixture of coke dust and by-product Gas — about 20 tons of the former and about 250,000 cu. ft. of the latter per 24 hours.

The second meeting of the Branch was held on February 10th. At this meeting Henry Harvie, A.M.E.I.C., of the Hydraulic Engineering Department of the Hydro Power Commission of Ontario read a paper on "The Extent and Value of Canadian Water Powers" in which he gave interesting statistics and information regarding the principal Hydro Electric developments in each province and district as compiled from official sources of information. Interesting lantern slides were also shown.

The next meeting was held on March 2nd at which John Murphy, M.E.I.C., Consulting Electrical Engineer of the Dept. of Railways and Canals, Ottawa, exhibited his remarkable moving pictures on Needle and Anchor Ice Formation, details of which have appeared in the press and Branch News where his lecture has been delivered. A large audience assembled in the lecture theatre of the Canadian Westinghouse Company, for the use of which the local Branch were much indebted to the company. An interesting discussion of the various phases of ice formation in connection with the Hydro Electric Power Plants followed, in which Mr. Murphy; W. G. Angus, Chief Engineer of the Dominion Power & Transmission Company, H. U. Hart, General Manager of the Canadian Westinghouse Company, and several others took part.

The enjoyment of the evening was further enhanced by the showing of a series of beautiful lantern slides of the Panama Canal and Panama Pacific Exposition, which Mr. Murphy very kindly exhibited at the request of those present.

To Mr. Murphy's kindness in affording the Hamilton Branch an opportunity of seeing these pictures and hearing of how they were taken, the local Branch are greatly indebted for one of the most enjoyable and profitable meetings that have been held this year.

The local members of *The Institute* held a well attended meeting, March 11th, at the Royal Connaught Hotel. Several out of town Members and invited guests were also present, including Fraser S. Keith, General Secretarry from Montreal, Alexander J. Grant, engineer in charge of Welland Ship Canal, Messrs. Jewett, Sternes, Plumer, and Powell, also of the engineering staff of the Welland Ship Canal, Alderman John Tope, Chairman of Civic Board of Works Committee, and also several representatives of local contracting firms.

R. K. Palmer, M.E.I.C., occupied the Chair.

Dinner was served to those present, numbering about 55, and an enjoyable musical programme was also furnished by Messrs. Collins, Presser and Carrett.

After an opening address from the Chairman dealing with general matters of business, Mr. Keith spoke on the current activities of *The Engineering Institute* and its Branches. Particular mention was made of the benefits which engineers were beginning to derive from the organization and co-operative action on behalf of their joint interests, such as in the matter of legislation, public recognition and standard of remuneration. *The Institute* has greatly increased since the War, both in numbers, activity and reputation throughout the Dominion. It is considered by American technical societies to be unique, in as much as it combines in one body all the various branches of technical and engineering professions, which are in other countries divided into separate organizations.

A paper was then read by E. H. Darling, M.E.I.C., on the subject of the necessity of an adequate building code. His paper dealt with various phases of this question, such as the regulation of building design and construction for the purpose of fire prevention and public safety. He referred to a report issued by the Commission of Conservation of Fire Waste in Canada which makes a rather startling estimate that of approximately two million buildings throughout the Dominion, less than one tenth of one percent have been built with proper consideration of fire safety.

Several recommendations were made by the speaker in connection with the adoption of standard building regulations, inspection and fire prevention. He emphasized the necessity of engineers of all branches identifying themselves with a movement for improvement along these lines. Their expert opinion and valuable experience should be freely offered for the benefit of the public at large, and especially for the framing of proper Building By-laws for their own City.

It was suggested that a committee of the Local Branch be formed to offer the co-operation of the local engineers to the Civic Committee dealing at present with the revision of the Hamilton Building By-Laws.

Toronto Branch

H. A. Goldman, A.M.E.I.C., Secretary.

A regular meeting of the Toronto Branch was held at the Engineers' Club on Thursday, February 19th, 1920, at 8.15 P. M.

The main speaker of the evening was Captain Bruce Aldrich, who delivered a lecture on "Bituminous Roads."

The lecture was well received and a very unusual, broad and lively discussion followed, which lasted about an hour and in which the following members took part: Messrs. Jupp, Hogarth, Rust, Clark, Professors Young and Gillespie and Mr. Phelps.

A regular general meeting of the Branch was held at the Engineers' Club on Thursday, February 26th, 1920 at 8 P. M.

The minutes of the previous two meetings were read and approved.

E. T. Wilkie, Chairman of the Nominating Committee, presented a report in connection with the nominations for a Secretary-Treasurer of the Branch. Geo. Phelps and H. A. Goldman have been nominated, and both have given their consent to the nomination.

As there was no other business to be considered the Chairman called upon J. M. M. Greig, A.M.E.I.C., who read a paper on "The York Township Sewerage Scheme." Mr. Greig had his paper illustrated with a number of slides, showing maps of the district in question and diagrams and tables in connection with the calculations.

A very interesting discussion followed the reading of the paper, in which the following members participated:—Messrs. Proctor, Powell, Winckler, Meadows, Phelps, Clark, Rust, Storrie, Latornell and Wynne-Roberts.

* * *

A general meeting of the Branch was held at the Engineers' Club on Thursday, March 4th, 1920 at 8.15 P. M.

The meeting was called for the purpose of having a debate on "Should Engineers Unionize."

W. Smith was the first speaker, taking the affirmative side. He pointed out that the unionizing of engineers was advisable, practical and necessary. He called attention to the fact that many engineers in the United States are already organized in unions and it has proven to be practical.

Professor Peter Gillespie, M.E.I.C., spoke against unionizing. He pointed out the position that engineers would be brought to if, for instance, engineers were called out on a sympathetic strike.

Mr. Connor who opened the discussion believed that the whole thing hinges on legislation, and that legislation would improve the condition of engineers.

Mr. Heywood pointed out that in union there is strength. There should, therefore, be some kind of a Union. He preferred an organization that could use the machinery of *The Institute* to promote its interest.

Mr. Storrie also believed that it was legislation that we should try to get.

Mr. Ambrose stated that he was in sympathy with unionism. He referred to his own organization, stating that letters are being received from the Unions asking for a certain increase from a certain date, and the request is immediately complied with, without any discussion, while an individual not belonging to a union cannot receive any increase.

Mr. Harland believed that what was necessary was legislation and publicity.

Mr. Merrick admitted that in unity is strength, but stated that the engineer has to hold up to a high position. He here pointed out that Quebec already has legislation passed.

Mr. Chipman related the history of Legislation and the progress that has been made by *The Institute.*

Mr. Winckler called attention to the necessity of having engineers represented in Parliament.

Mr. [illegible] claimed that if engineers unionize they would not have to be called out on sympathetic strikes, and that no strikes at all would be necessary. He also claimed that other unions have a code of ethics, and if engineers would unionize they would give ethics to the profession.

Professor Haultain stated that Unionism is a hard, divisive and divergent thing. He did not think legislation would help the engineer, as it does not help the teachers. He believed that it will be necessary to unionize after legislation is secured.

Mr. Powell pointed out that in case of labor, as soon as man becomes an employer he cannot belong to the union any more, while in engineering most of the engineers hope to become employers themselves one way or another.

Mr. McCarthy believed there would have to be a distinction between employer and employee.

Mr. Proctor compared engineering with other professions, pointing out that in case of doctors, for instance, the output of graduates is controlled and no over supply of doctors is allowed, while in engineering the rule seems to be the more the better.

Professor Young stated that in the case of the unions the object seems to be the least production, while engineers do not agree with that. He therefore moved the following resolution:

"That whereas by reason of inadequate compensation, salaried engineers are now working under exceptionally trying economic conditions, which in some cases amount to hardship;

"And whereas many engineers in the Toronto district are convinced that these conditions can be ameliorated only by direct organized effort and that immediate remedial measures are imperative.

"And whereas *The Engineering Institute* must either promptly face the issue and grapple with it or stand aside and permit newer and perhaps hostile associations to press the claims of the engineers of this country for economic consideration.

"Therefore be it resolved that this Branch urge Headquarters of *The Institute* forthwith to request all Branches to appoint Committees of not less than five members with power to add to their numbers to thoroughly investigate and report through the various branches to Headquarters upon the structure and constitution of an organization designed to bring into operation direct and concerted effort toward the improvement of the economic status of engineers; and that if practicable Headquarters defray the expenses of these Committees in the matter of holding hearings and obtaining stenographic reports of evidence."

Mr. Taylor seconded the resolution.

Mr. Goldman believed that the matter of holding hearings and obtaining stenographic reports was waste of time since no one denies that conditions are not satisfactory. He also pointed out that the Council, judging from the past, does not seem enthusiastic to take up the Salary question, and therefore, suggested local action.

Mr. Clark stated that the concensus of opinion seems to be that we want legislation. "Why not start now," then he asked.

Mr. Chipman explained that the matter of legislation is now in the hands of the Provincial Division.

Mr. McMaster believed that the junior engineer should have something to compare with, in order to determine what he is worth.

Professor Gillespie and Mr. Snaith then spoke, completing the debate.

Professor Young's motion was then taken to a vote and was carried unanimously.

A hearty vote of thanks to the speakers was then moved and carried.

* * *

A general meeting of the Branch was held at the Engineers' Club on Thursday, March 11th, 1920 a 8.15 p.m.

The minutes of the previous meeting were read and approved.

The Secretary read a resolution which had been adopted by the Manitoba Branch, whereby the Special Committee of the Council of *The Institute* are requested to bring their influence and acquired knowledge to bear with the Civil Service Commission to have the minimum salaries of the responsible officers of the engineering staffs made commensurate with those received by responsible officers in equivalent positions in private corporations.

Moved by Professor Gillespie, seconded by Mr. Clark: "that the Toronto Branch E.I.C., endorse the "resolution adopted by the Manitoba Branch, and the "Council of *The Institute* be notified accordingly."

Carried.

The Chairman then called upon George T. Clark, A.M.E.I.C., who delivered a most interesting lecture on the "Toronto Harbor Development."

Beginning with the history of the appointment of the Toronto Harbor Commissioners and the powers bestowed upon them, the Speaker followed through the various stages of development of the Toronto waterfront. The lecture was illustrated by a number of lantern slides, some of which showed the general plans of the proposed scheme of development, some showed pictures of the various districts taken before and after development, while others showed engineering works under construction.

At the conclusion the Speaker paid a tribute to E. L. Cousins, Chief Engineer and Manager of the Toronto Harbor Commission, to whose initiative and ability is due a good deal of the success of the Harbor development. On behalf of Mr. Cousins, Mr. Clark invited the members of the Toronto Branch to visit the Harbor works some day in the spring or summer to see in actual construction what he showed on the pictures.

The Chairman in reply expressed the appreciation of the Branch and hoped that the Branch will take advantage of the invitation.

In the discussion which followed, the following members took part:—Professor Gillespie, Messrs. Crelock, Merrick, Winckler, Gore, Baldwin Powell, Cockburn, Oxley and Harkness.

The Chairman announced the results of the ballots, that H. A. Goldman was elected Secretary-Treasurer of the Toronto Branch.

Ottawa Branch

M. F. Cochrane, A.M.E.I.C., Sec.-Treas.

Two meetings have recently been held. The first was on February 26th, when B. E. Norrish, A.M.E.I.C., Superintendent of Exhibits and Publicity Bureau of the Department of Trade and Commerce, gave a lecture on "The Development of the Motion Picture Industry."

Mr. Norrish traced the development of the projector from its early stages to the present day practice, showing how the pictures have been improved and modified to meet changing conditions, and giving illustrations of the wonderful work of which the camera is capable.

The lecturer has had much to do with the development of this industry from the Government standpoint, and pictures taken under his direction are now shown all over this Continent and in many parts of Europe as well. They have been found to be of great assistance in spreading information with regard to the Dominion Government and its many activities.

The second meeting was held on March 18th, when S. C. Ells, A.M.E.I.C. the Mining Engineer of the Department of Mines, described the Bituminous Sands of Northern Alberta.

These well known tar sands represent the largest known deposits of solid asphaltic material, and will be of immense importance in the making of good roads in Western Canada.

Mr. Ells has had charge of the exploration and the preliminary development of all these deposits. He is very sanguine of the commercial possibilities which await their development.

The lecture gave rise to an interesting discussion, in which A. W. Campbell, the Dominion Highway Commissioner and General Griesbach, M. P. for Edmonton, took part.

The second Luncheon Meeting of the Branch was held on March 4th, the speaker being Alex. Johnston, Deputy Minister of the Department of Marine, and his subject, "The Development of Canada's Mercantile Marine."

The policy of the Dominion Government with regard to shipbuilding has been much critized, and Mr. Johnston's address was looked forward to with very general interest as being the first official pronouncement on this important subject. The speaker was able to make out a very good case for the policy of his department.

His address was of great interest, and has been widely reported in the press.

Montreal Branch

Frederick B. Brown, M.E.I.C., Secretary

An interesting series of meetings has been held at Headquarters during March, the programme being unusually varied. The first meeting of the month was held on March 5th with Mr. Rutherford in the chair, at this meeting J. S. Cameron, A.M.E.I.C., spoke on "Industrial Relations." The paper, which was fully illustrated with lantern slides, dealt with the management system of a modern industrial plant—that of the Northern Electric Company, Ltd., Montreal, and discussed in detail the various aspects of the relations between employer and employee. After a preliminary sketch of the growth of Scientific Management Mr. Cameron described how the system was applied in different ways in his own company—building layout, time-study, first aid and medical service to employees, scientific examination, etc. Mr. Cameron's paper will be printed in an early number of *The Journal*.

In the course of his remarks Mr. Cameron alluded to the Department of Soldiers' Civil Re-establishment, and following his address Capt. Shanley and Capt. Morphy of the D.S.C.R. gave a brief sketch of the remarkable work being done by the Department for the disabled soldier. In the Montreal district alone some 3000 returned men who are unfitted for their former work are being trained to take up civil life, and the statistics of the Department show that these men are a success when the training is completed.

*

With G. K. McDougall in the chair the regular meeting was held on March 12th, when G. L. Shanks, A.M.E.I.C., gave his paper on "Inundation Work with the B.E.F. In the course of his lecture Mr. Shanks showed how inundation had been used as an important part of defensive warfare in the low-lying parts of the Western Front, in France and Belgium, both by the Allies and the German. The slides which illustrated the lecture showed the important part played by the Canadian Engineers in this work, demolishing canal locks, embankments, etc. Several of the slides shown were aeroplane photographs, and illustrated several of the points brought out in the interesting lecture on aeroplane photography delivered to the Branch in February by Lieut. C. C. Brooks.

*

The meeting held on March 19th, was one of the best attended this season, being a double event. Under the chairmanship of Mr. MacLeod, R. de L. French, M.E.I.C., gave an interesting address on the Utilization of Lignite. In this connection the Lignite Utilization Board, of which R. A. Ross, President of *The Engineering Institute*, is Chairman, has done a large amount of investigation. In the course of his lecture Mr. French alluded to the fact that the bulk of Canadian coal is in the form of lignite, the largest fields in Manitoba and Saskatchewan being estimated to contain nearly three billion tons. The Lignite Utilization Board has been working on the problem of making these vast stores available, making experiments on briquetting processes, etc.

Following Mr. French's paper, moving pictures of the peat industry were shown by E. V. Moore, M.E.I.C. The problem in connection with the utilization of peat is similar to that in connection with lignite, the present tendency being in the direction of briquetting processes. In this connection members are referred to the interesting paper on this subject by F. A. J. Sauer, M.E.I.C., which appeared in *The Journal*, December, 1919.

At the regular meeting of the Branch held on Thursday, March 26th, James Ewing, M.E.I.C., read a vigorous paper on "Re-planning Montreal and District." In the course of the lecture Mr. Ewing gave figures showing the enormous waste due to faulty planning, or rather lack of planning in the city of Montreal, and indicated some of the troubles in store should this policy not be righted. Among the principal defects mentioned were, lack of co-ordination in planning suburban, resulting in large expropriations for improvements, the disadvantage of having a large number of through streets instead of having main thoroughfares paved for heavy traffic and minor streets lightly paved, intended for light traffic only, lack of access to Mount Royal, etc. Mr. Ewing described the problems before the city in connection with planning as essentially for engineers, and appealed to the members of *The Institute* to help in any movement for betterment.

Following Mr. Ewing's address, Noulan Cauchon showed a number of interesting slides illustrating the progress of town-planning in other cities of the Dominion.

An interesting discussion followed. R. A. Ross, M.E.I.C., gave his hearty support to the principles outlined in Mr. Ewing's paper, but showed some of the practical difficulties in the way of putting these into effect. Mr. Ross added that the Administrative Commission of Montreal is doing its best in the face of difficulties and joined in Mr. Ewing's request to the members of *The Institute* to get to work and help."

St. John Branch

A. R. Crookshank, M.E.I.C., Secretary

The St. John Branch of *The Engineering Institute of Canada* at the regular monthly meeting, heard a very interesting paper on "The methods adopted in our location surveys in wooded country," read by Moses Burpee, M.E.I.C., Chief Engineer of the Bangor & Aroostook Railroad, of Houlton, Maine.

The paper was illustrated by lantern slides, showing the types of country in the wilds of Maine through which surveys had been made, the various apparatus used, the encampments, and the several means of transportation of outfit and supplies, etc.

Mr. Burpee described how the reconnaissance surveys were made and how on one trip [illegible] or more parties were working one after the other along the line, making the "preliminary," the "topographical" and the "location" surveys. So close was the survey timed that the crews finished work and got their boats and canoes out to civilization the day before the rivers and lake froze up for the season.

One survey paralleled rivers for most of its eighty odd miles of line, and the crews were housed in two bateaux of the type used in that country of lakes and shallow rapid rivers. These were about seventy feet long, ten feet wide, flat bottomed, scow-like boats, with fifteen or more feet of their bottom at bow and stern sloping gently upward. This allows them to ride up over obstacles and to turn readily. The bottom was strongly built and sheathed with birch boards to take the wear of the dragging over the rocks and gravel bars in the shallow places. Twelve to fifteen feet from the bow was a mast, securely guyed to the bateau, and the tow rope was led through a block at the top of this to a small winch on deck. This allowed the lifting of the tow line over any rocks or other obstructions. As there were no tow paths, the team of horses, the driver riding on the back of one of them, travelled on the most convenient bank of the stream or even in the stream itself. Where deep water occurred, when it was necessary to change from towing on one side to the other, or where quicksands were encountered, the horses were taken on board the bateau ahead of the mast and were safely carried across. Astern on the mast was the house, with the last few feet of the roof sloping downward to allow of the use of a long sweep rudder, the tiller of which came up over the stern and this slanting roof, and was operated by the steersman from that vantage point. Another man was necessary to keep the bateau from being pulled on to any rocks by the tow rope, and to see that the rope did not get foul of obstructions.

As these boats only draw from one to one and a half feet of water, they can be taken almost anywhere along the large streams.

Mr. Burpee described the Northern Maine district as rivalling New Brunswick as the sportsman's paradise, and described a splendid canoe trip taken along the Allegash River, he being one of over one thousand persons who had taken the trip during that year.

After a hearty vote of thanks to Mr. Burpee, the meeting adjourned.

G. N. Hatfield, A.M.E.I.C., Chairman of our Employment Bureau, (St. John), from time to time receives from Headquarters and from the Civil Service Commission notices of positions open in various parts of Canada. These, and others, can be seen on application.

The services of the Bureau is free to members, returned soldiers and students. The Secretary has on file, for use of members, a fairly complete set of catalogues of Engineering Government Publication, a bibliography of concrete in sea water, complete set of Canadian Ingersol-Rand Co. Catalogues, salary schedules of the other branches, etc., etc.

Halifax Branch

F. R. Faulkner, M.E.I.C., Sec.-Treas.

The regular monthly meeting of the Halifax Branch was held in the Physics Lecture Room, Science Building, Studley of Friday evening, February 27th. Fifty-one members and guests were present, the chairman of the Branch, F. A. Bowman in the chair. After the minutes of the previous meeting had been read and adopted the chairman explained that the bridge committee had been unable to collect enough data to have the meeting in January. Since that time the question had grown, and the committee was still working of plan, and profiles of several crossings (Halifax Dartmouth.)

After the appointment of Messrs. C. S. Cox and G. B. Stairs as scrutineers of the ballots on the proposed changes in By-laws the Chairman gave for the benefit of the guests present a brief synopsis of the objects of *The Engineering Institute jof Canada*, and the qualifications necessary for admission as Student Members, and as Branch Affiliates. Before the result of the ballot was announced a list was read of positions vacant and wanted which had not appeared in *The Journal*. The result of the ballot was in favor of the proposed change in the By-laws, and the proposal that the present officers of the Branch remain in office till May 1920 was carried.

The Chairman then called on K. H. Smith, A.M.E.I.C., to give a paper on the Water Powers of Nova Scotia.

Mr. Smith first gave a brief history leading up to the present organization in which the Provinces of Nova Scotia, New Brunswick and Prince Edward Island were co-operating with the department of the Interior at Ottawa, so that the one staff could do all the work required in each Province and thus gain the benefits of co-operation.

The speaker then explained the two factors entering into Water Power estimates,—the head and the quantity of water available,—the last in a constantly varying quantity and only to be obtained satisfactorily by means of observations, extending over a period of years. The methods used in gauging streams were referred to. The speaker noted particularly the unsatisfactory results that had been obtained by attempting to utilize existing rainfall records in one locality to obtain an idea of the run off in another place and cited several examples.

He then dealt with the economic side of a water power development, showing that the commercial feasibility of a site must be taken into account, and that unless the power that could be developed can find a market either immediately or in the near future, a Niagara at a man's door would be useless. He emphasized the value of small sites, particularly as they can now be interconnected and their full value utilized.

Mr. Smith then gave a list of the water power developments recently completed or under construction. He tentatively suggested 300,000 h.p. as the commercial capacity of the larger water power sites in the province A brief description of particular sites was given, including

St. Margaret's Bay, Sheet Harbor, Bear River and St. Croix in Nova Scotia and the North shore, the Fredericton district, St. John and vicinity in New Brunswick.

The question of costs was dealt with cautiously, in view of the fluctuations in material and labor, but the speaker felt that we might expect to secure Hydro-Electric Power at considerably less than the present rates. Mr. Smith emphasized repeatedly the fact that water power was not always cheaper than steam power.

Following the paper, a large number of interesting and instructive slides were shown, many of them being from photographs taken at points at which development is contemplated or now under way. Among the slides were maps showing the location of several of the more advanced projects and the proposed method of linking them up. The slides were accompanied by a detailed explanation as they were shown.

Following the slides the chairman called for a discussion. Mr. McColl and P. A. Freeman, in the course of remarks on the subject, complimented Mr. Smith on the excellence of the paper both in substance and in the manner of presentation. A vote of thanks was tendered Mr. Smith by the Chairman. In reply to a question about tidal powers, Mr. Smith read extracts from a letter he had recently written on this subject in which he started that while there was an enormous amount of tidal power, particularly around the Bay of Fundy, and that while tidal power projects should not be discouraged, he felt that any project should be handled with extreme caution.

The chairman drew the attention of the members to the proposed Annual Professional meeting in October, explaining the reasons for holding it in that month.

EMPLOYMENT BUREAU

Situations Vacant

Chief Draughtsman for Pulp & Paper Company

Chief draughtsman for power and paper company, with knowledge of paper mill work, capable of supervising all work in chief engineer's office, experience in mechanical and civil engineering desirable, should be capable of of supervising the making of drawings for installation of new equipment, and re-arranging of old equipment, and be familiar with the usual practice of design of piping system, pumps, foundations, etc. Box No. 93.

Civil Engineer for Ontario City

Civil engineers with experience in design of sewers for a large city in Ontario. Box No. 94.

Junior Engineer for Pulp & Paper Company

Large pulp and paper company requires Junior engineer with experience in instrument work. Box No. 95.

Instrument Man

Railway Company requires an instrument man. Box No. 96.

Foundry Manager

Steel Company has a vacancy for technical graduate as manager of foundry. Box No. 97.

Salesman for Steel Company

Steel Company has a vacancy for a salesman. Box 98.

Hydro Mechanical Engineer for Design

Hydro mechanical engineer having good experience in turbine and heavy power transmission machinery designing. Box 99.

Municipal Engineer

A member of The Institute, resident in Manitoba, engaged in municipal work is anxious to secure similar opening in Ontario or the East. Has had extensive experience and well qualified. Box [illegible]-P.

Structural Mechanical Engineer

Young structural mechanical engineer, age [illegible], graduate Queen's, wants work on a live Engineering Project. Good on organization and detail with all round engineering training. Hard conscientious worker. Detailed record of experience, education and references on application, available May 10th. Box [illegible]-P.

Instructor for Technical School

Science graduate wanted for technical school in large city, Province of Quebec to teach industrial drawing, mechanics and technology, twenty hours of classes per week, salary $1[illegible] per annum with an increase of $120. per annum up to a present maximum of $[illegible]. Besides the regular day classes opportunity will be given for taking night classes with additional salary. Session from September till June 20th with two weeks vacation at Christmas. Box 100.

Situations Wanted

Summer Work Wanted

A student completing his second year in engineering at the University of Manitoba desires a position on engineering work for the summer. Will be able to commence May 1st. Box No. 19-P.

Civil Engineers

Graduate in civil engineering desires position where draughting, estimating and supervising is necessary. Experience in municipal planning, etc., speaks French and English. Box 20-P.

Graduate engineer twenty-seven years old, three and half years experience on construction, surveys etc. at present with pulp and paper company desires to make a change. Salary $[illegible] per month. Box 21-P.

Graduate in civil engineering desires position with a firm doing construction work, experience in bridge work and house construction. Box [illegible]-P.

Experienced public works and harbour engineer now employed wishes to make a change. Willing to go to any part of the world. Would prefer harbour construction work. Box 23-P.

Civil engineer, experience in charge of construction, roads, bridges, dock and harbour, extensive administration and organization experience in Canada, Africa, Australia and India. Full references on request. Records on file at Institute headquarters. Box 24-P.

Institute Committees for 1920

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SIR ALEX. BERTRAM
GEO. R. McDOUGALL
GEO. E. BELL

LIBRARY AND HOUSE

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BY-LAWS

ARTHUR SURVEYER, Chairman

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FREDERICK B. BROWN, Chairman
Chairman of each Branch.

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WALTER J. FRANCIS, (one, to retire end of 1920)
W. F. TYE, (one, to retire end of 1920)

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REMUNERATION OF ENGINEERS

JOHN MURPHY, Chairman
E. R. GRAY
FREDERICK B. BROWN
A. R. DECARY

Preliminary Notice

of Applications for Admission and for Transfer

[illegible]

[illegible]

Communications relating to applicants are considered by the Council as strictly confidential

[illegible]

FRASER S. KEITH, Secretary.

[illegible]

[illegible] (that of Canada in particular), Arithmetic, Geometry Euclid (Books I.-IV. and VI.), [illegible]

Every candidate for election as ASSOCIATE shall be one who by his pursuits [illegible]

[illegible] of certain members as references does not [illegible]

[illegible]

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BRECKON—JOHN THOMAS, of Murrayville, B.C. Born near Oakville, Ont., July 17th, 1857. Educ., grad., Oakville high school. On constrn. B. & M. R.R. in Dakota, and C.R.I. & Pac. R.R. in Kansas, and mining and irrigation work in Utah until 1889; 1890 opened private office in Salt Lake City, doing civil, hydraulic and mining eng., at same time was appointed U.S. Dep. Surveyor for Utah, Idaho and Arizona and later examiner of surveys and on conservation of water power sites until 1911; 1901-1903, chief engr., Annie Laurie Mining (gold); 1904-05, chief engr., Weimer Copper Co.; 1907, designed and constructed crib dam on Green River, Utah; 1912-13, engr., Bamburton Cement Co., Vancouver Island; 1914-15, water-works eng., Vancouver city; 1916, engr. on constrn. of water works and light plant, Prince George, B.C.; 1918 to date, engr., municipality of Langley, on roads, bridges, etc.

References: C. Brakenridge, D. Cameron, A. G. Dalzell, H. K. Dutcher, R. F. Hayward, W. H. Powell.

BYAM—FREDERICK MALCOLM, of Toronto, Ont. Born at Belfountain, Ont., March 16th, 1885. Educ., S.P.S., Toronto, 1906. 1902-03 with Gen. Contractor; summers 1904-05, in machine shops and shipbuilding plant; 1906-07 struct. draftsman, Canadian Foundry Co.; 1907-08, struct. draftsman & checker, Riverside Bridge Co. of Wheeling, W. Va.; from 1908 (5 mos.) struct. checker & designer and mech. designer, Dickson Bridge Co., Campbellford, Ont.; 1908-09 struc. designer, Smith, Kerry & Chase, Toronto, Ont.; Nov. 1909 to Nov. 1911, with the same firm in charge of the Civil Engr. Drawing Office, having charge of all Struct. & Hyd. Design; 1911-Dec. 1919, Chief Engr. in full charge of Engr. Details, Designs & Supervision of Shop Work and full erection; Dec. 1919 in private practice, Ewart, Jacobs & Byam, Engr. & Architects, Toronto, Ont.

References: J. G. G. Kerry, A. H. Harkness, A. L. Mudge, T. Taylor, F. Barber, E. A. James.

CAMERON—HOWARD STEPHEN, of Winnipeg. Born at Rexton, N.B., May 23rd, 1890. Educ., matric., New Glasgow Academy, 1908. 6 mos., rodman, C.N.R.; 2 yrs., topog'r.; 2 yrs. leveller and transitman, same road; 1 yr. asst. engr., G.T.R. in charge of steam shovel work; 2 yrs. service in France, acting as capt., 7th Ry. Troops; 1 yr. to date, chief of survey party, investigating drainage, Manitoba Drainage Comm.

References: E. K. Hall, E. M. M. Hill, J. B. McAndrew, R. W. McKinnon, D. L. McLean, J. G. Sullivan.

CAMPBELL—LYLE L., of Toronto, Ont. Born at Wangwille, Ont. Educ., B.A.Sc., Univ. of Tor. 1913. 1913, drafting, W. E. Judge, San Francisco; 1914-15, constrn. and millwork, Trinity Mining Co.; 1915, tracing and details, Wheelock & Christie, Orangeville; 1915-16, asst. hydrographer and 1916-17, hydrographer in charge of Ottawa dist., Hydro Elec. Power Comm.; July 1917 to date, details of design and layout of hydraulic developments, H.E.P.C.

References: H. G. Acres, W. Harland, T. H. Hogg, J. R. Montague, A. E. Nourse, M. V. Sauer.

CAMPBELL—VINCENT HENRY, of Winnipeg, Man. Born at Halifax, N.S., July 19th, 1880. Educ., high school. 1901-06, with C.P.R. on main line and branches as rodman and topog'r; Feb.-Dec. 1907, inst'man, G.T.R., on constrn. of main line and revision of location; May-Aug. 1908, inst'man, C.P.R. on grade reductions on line near Maple Creek, Alta.; Aug.-Dec. 1908, res. engr., C.P.R., on constrn., Moose Jaw N. W.; Mar.-Dec. 1909, res. engr. of constrn., C.P.R., Lethbridge-MacLeod cutoff; 1910, C.P.R., as res. engr. on constrn. of Carmangay branch; 1915, asst. dist. engr., Manitoba Public Works; Jan. 1916 to date, dist. engr., Reclamation branch, Man. P.D.W.

References: C. H. Blanchard, H. A. Bowman, P. Burke-Gaffney, A. H. Corbett, R. W. McKinnon.

CARMICHAEL—ROSS MACNEVIN, of Toronto. Born at Kenora, Ont., Mar. 8th, 1890. Educ., B.A.Sc., Toronto Univ. 1913. Machine shop, Vulcan Iron Works, Winnipeg, also tracing, Manitoba Bridge & Iron Works during college course; 1914 to date with Hydro Elec. Power Comm. as follows: 1914-18, asst. hydrometric engr., gathering stream flow data and hydraulic investigation work; Feb. 1918 to date, designer of hydraulic structures, gen. layout and details, H.E.P.C.

References: H. G. Acres, W. Harland, T. H. Hogg, J. A. Knight, J. R. Montague, A. E. Nourse, M. V. Sauer.

CARTER—HUGH CLAY, of Winnipeg, Man. Born at London, Eng., Feb. 5th, 1884. Educ., St. Albans School; Polytechnic Regent St., London. 1906-14, with C.P.R. constrn. dept. as follows: 1906-10, field draftsman, transitman, etc.; 1910-14, res. engr. of constrn. on double track and grade reduction work; Aug. 1914, enlisted, 4½ yrs. on overseas service, 3 yrs. held comm. in 6th South Stafford Regt., later Machine Gun Corps, returned May 1919; at present, resumed with C.P.R. as res. engr. of constrn.

References: W. A. James, C. D. MacKintosh, T. C. Macnabb. A.E.Sharpe, F.A. Wilkin.

CASWELL—ROBERT JOHN, of London, Ont. Born at Coldwater, Ont., April 13th, 1892. Educ., public and high schools; 2 yrs. night classes in maths.; private tuition; I.C.S. Summers: 1908-09, on ry. constrn., rod and levelman, C.P.R.; 1910-12, C.P.R. constrn. dept., transitman in charge field party on layout, surveys, quantities for contractors; on heavy concrete work and bridges in connection with elevated double track ry. through east end of Montreal, 1912-15; Jan.-Oct. 1915, transitman in charge of party on completion of constrn. of 25 miles of Lake Erie & Northern Ry.; 1915-16, asst. engr., Westinghouse, Church & Kerr, on constrn. of powder factory, in charge of layout of bldgs., machines, water, etc.; 1916-17, field engr., The Foundation Co. Ltd., on layout of bldgs. in connection with constrn. of nickel refinery; 1917-18, chief of field party on surveys for new power canal, Hydro Elec. Power Comm., in charge of surveys, constrn. etc.; 1917-18, senior transitman, C.P.R., maintenance dept., London, in charge of parties and asst. to res. engr.; Sept. 1918 to date, div. engr., maintenance, in charge of roadway and structures, C.P.R.

References: A. C. D. Blanchard, C. T. DeLamere, J. M. R. Fairbairn, A. C. Mackenzie, B. Ripley, J. M. Silliman.

CONNELL—JASPER SPONCE, of Vancouver, B.C. Born at New York City, July 30th, 1884. Educ., B.S. (C.E.) N. Y. Univ. 1906. 1907-08, supt. of constrn. with Hedden Constrn. Co., N.Y., in charge of Westshore R.R. Pier and Ferry Terminals, N.Y.C., and power plant for Clark Thread Mill, Harrison, N.J.; 1908-09, in charge design and estimating for Jones Constrn., N.Y.C.; 1909-12, supt. of constrn., Thompson-Starrett Co., in N.Y., Calif. and Penn'a., in full charge of constrn.; 1912-June 1919, various conslt. and constrn. work on Pacific coast; at present, manager of Foundation Co. of B.C. Ltd.

References: H. J. Cambie, J. W. Doty, H. K. Dutcher, E. G. Matheson, W. G. Swan, G. A. Walkem.

DAVIS—JOHN CASWELL, of Winnipeg, Man. Born at Montreal, Aug. 19th, 1888. Educ., B.A., Laval Univ., Montreal, 1907; B.Sc. (mech. eng.) McGill Univ. 1912. 1913-20, design fire protection systems for many large industrial plants, fire protection devices; at present, with Grinnell Co. of Canada Ltd., in responsible charge of fire protection systems, design and installation from Port Arthur to the foot of the Rocky Mts.

References: W. G. Chace, T. R. Deacon, H. A. MacKay, W. M. MacPhail, B. S. McKenzie, J. A. Meindl.

DAWSON—WILFRID LAURIER, of Ottawa. Born at Plevna, Ont., 2nd July 1892. Educ., B.Sc. (E.E.) Queen's Univ., 1913.; prelim. D.L.S. 1913; special student, London (Eng.) Univ. 1919. 1910, (6 mos.) topog. Ste Croix River Boundary, N.B.; 1911, (6 mos.) testman, Elec. Standards Laboratory, Ottawa. 1912, (6 mos.) transitman, C.P.R., Ottawa; 1913-14, asst. to C. F. Miles, D.L.S. on survey inspection in Alberta; 1914-15, asst. to waterworks engr., City of Ottawa, i/c waste water and constrn. work, etc.; 1915-19, on active service, Major in 1916; 1919, 4 mos., detail design, B.A. Nickel Corp., Deschenes; at the present time, telephone switchboard engr., Northern Elec. Co., Montreal.

References: O. Higman, L. W. Gill, W. F. M. Bryce, A. J Lawrence, W. W. Benny.

DELONG—ROBERT KEYS, of Hampton, N.B., born at Shannon, N.B., Jan. 5th, 1895. Educ., high school; I.C S.; passed Deputy Land Surveying exam. at N.S. Tech. Coll. 1915. Aug.-Dec. 1913 on location survey party; June-Dec. 1914, May 1916-June 1917, on constrn., rodman, etc.; June-Nov. 1917, leveller on location, all with St. J. & Que. Ry.; Nov.-Dec. 1917, charge of survey party on highway survey from St. John to St. Stephen, D.P.W.; July 1918 to date, transitman, C.N.R., Moncton.

References: A. D. W. Cuthbert, R. H. Emmerson, E. G. Evans, C. O. Foss, H. Phillips, H. A. Ryan.

DENNIS—WILLIAM MELBERN, of Ottawa, Ont. Born at Tyne Valley, P.E.I., July, 7th, 1885. Educ., B.Sc. (Civil) McGill Univ. 1909; D.L.S. and geodetic engr. 1909, articled pupil, G.C.Rainboth, asst. St. John River Boundary; 1910, articled pupil, N. J. Ogilvie, asst. Chilcat R., Alaska; 1911-12, in charge of triangulation and photo-topographic survey, Canada-Alaska Boundary; 1913-15 in charge of reconnaissance and primary triangulation on B.C. coast; 1916-17, in charge of reconnaissance and primary triangulation in N.B., Geodetic Survey of Canada; 1918 to date, geodetic engr., in charge of B.C. coast survey.

References: J. D. Craig, H. K. Dutcher, J. J. McArthur, N. J. Ogilvie, W. H. Powell, J. L. Rannie, F. B. Reid, W. M. Tobey.

DOODY—CYRIL WILLIAM, of Regina, Sask. Born at Winchester, Eng., June 1st, 1886. Educ., private school; full 1st class honors, City & Guilds of London Inst.; telephony 1907. 1907 (1½ yrs.) workshop, Maritime Telegraph & Telephone Co., Halifax; 1909, inst', switchboard and line maintenance, same company, Amherst, N.S.; 1910-13, in charge of all maintenance of plant, Mar. Tel. & Tel. Co., Cape Breton Islands, head office, Sydney, N.S., also assisted supt. on development studies of outside work; 1913-15, miscellaneous work as inspector for head office, Sask. Govt. Telephones, in charge and asst. on installations and plant maintenance; 1915-19, comm. officer, Imperial Territorials, Royal Engrs.; 1919 to date, head office inspector, Sask. Govt. Telephones, at present acting as manager, Regina Telephone Exchange.

References: S. R. Parker, H. B. Sherman, W. Warren, J. H. Winfield.

EVANS—EDWIN RONALD, of Moncton, N.B. Born at Hampton, N.B., Aug. 1st, 1891. Educ., matric. into Mt. Allison School of App. Science 1907; I.C.S. 1909-11, in charge and inst'man of eng. work, Montreal General Contracting Co. Ltd. on contract for deepening the all Canadian Channel, St. Lawrence River, Kingston to Brockville, drafting, etc.; Jan.-Apr. 1912, in charge of party and inst'man, hydrographic surveys, Northumber Strait Ry. Co., drafting for proposed wharves for car ferry; 1912-14, in charge of party and inst'man, ry. surveys, prelim. and location between Buctouche and Loggieville; 1914-15, with Buctouche & Moncton Ry., in charge of erecting trestle at Scotch Settlement, in charge party on realignment survey and making plans for changes in alignment; 1915-19, military service overseas, Artillery; July 1919 to date, engr. in charge of constrn., cross sectioning excavating and grading, C.N.Ry.

References: C. B. Brown, H. J. Crudge, E. G. Evans, F. H. Fay, F. B. Fripp, G. W. Shearer, S. B. Wass.

FAIRLIE—HOWARD WALLACE, of Westmount, P.Q. Born at St. David's, Ont., May 5th, 1883. Educ., grad. S.P.S., 1910; Coll. Inst.; Normal Schools. 6 mos., machinist, Porter Fiber Bottle Co., Lewiston, N.Y.; 2 yrs. power house operator, Niagara Falls Power Co.; 14 mos., Bell Telephone Co. of Canada, manager at Lethbridge, Red Deer and Lacombe, Alta.; 5 mos., Federal Eng. constrn. Co., Toronto, electrician and sales engr.; 6 mos. sales engr., Tungstolier Co. of Canada, Toronto; 8 yrs. sales engr. and sales manager, Northern Electric Co., Montreal and Winnipeg; one mo., sales engr., Monarch Elec. Co., Ltd.

References: J. A. Burnett, J. M. R. Fairbairn, P. Gillespie, L. A. Herdt, C. M. McKergow, H. Rolph, W. M. Sutherland, L. R. Thompson.

MADDEN—MAURICE STUART, of Keewatin, Ont. Born at Napanee, Ont., Jan. 27th, 1889. Educ., B.S. (elec.) 1910, B.Sc. (civil) 1913, Queens Univ. 1910 (8 mos.), student apprentice, Can. Westinghouse Co.; 1912 (5 mos.) engr.'s asst., P.W.D., prov. of Sask.; 1913, asst. engr. on power survey of rivers of southern Manitoba, Hydrometric Survey; 1913-14, asst. engr., Man. Hydrometric Survey on Winnipeg River power survey at Kenora and Keewatin; 1914-16, stream measurement work, Man. Hydrometric Survey; 1916 to date, res. engr. at Keewatin for Man. Hydrometric Survey, in charge of hydrographic survey work with regard to control of levels of Lake of the Woods.

References: C. H. Attwood, J. B. Challies, T. H. Dunn, M. C. Hendry, J. T. Johnston.

McCLELLAND—HAROLD ROBINSON, of Montreal, Q.P. Born at Ballymena, Ireland, Sept. 21st, 1884. Educ., undergrad. Royal Univ. of Ireland, courses in steam and elec. engr., Marine architecture, mechanics, etc., at Glasgow Tech. Coll.; British Board of Trade certificate as chief engr. 1902-07 apprentice engr. with John Lang & Sons, Johnstone, and the Fairfield Shipbuilding & Eng. Co., Govan; May-Aug. 1907, with latter company as eng. draftsman; 1907-11, eng. in charge of watch at sea, Clan Line Steamers, Ltd.; 1911-14, yard manager, Elderstie Graving Dock & Repair Works, Glasgow, in full charge of and responsibility for all operations; 1914-18, surveyor to Lloyds Register of Shipping, 1916-18 surveyor in charge of Chicago and Southern Great Lakes office; at present, vice-pres. N. E. McClelland and Co., Ltd., naval architects, etc.

References: F. A. Combe, W. E. L. Dyer, J. T. Farmer, A. Hutchison, I. J. Tait.

McCLELLAND—NORMAN EMILE, of Westmount. Born at Ballymena, Ireland, Aug. 12th, 1876. Educ., private schools and tutors; courses in naval architecture and mechanics, Tech. School, Belfast. 1891-96, apprentice with Harland & Wolff Ltd., Belfast; 1896-99, North Yard manager, same firm; 1899-1916, surveyor to Lloyds Register of Shipping, 1914-16, principal surveyor for U. S. and Canada; 1916-17, chief surveyor, American Bureau of Shipping; since July 1917, on own account, at present president of N. E. McClelland & Co. Ltd., conslt. naval architects, marine engrs. and surveyors.

Reference: F. A. Combe, W. E. L. Dyer, J. T. Farmer, A. Hutchinson, I. J. Tait.

McCUAIG—PETER JOHN, of Winnipeg, Man. Born at Beaverton, Ont. Apr. 18th, 1884. Educ., B.A.Sc., Univ. of Tor., 1909; school teacher's certificate, Part 2, Jr. leaving. May-Sept. 1910, shop course; 1910-11, in testing room; Mar.-June 1911, trouble work, all with Cutler, Hammer Mfg. Co., Milwaukee and Winnipeg; 1911-14, constrn. and operation, Wpg. Elec. Ry.; 1914-18, overseas; at present with Wpg. Elec. Ry., operation duty.

References: W. D. Black, F. L. Butler, P. Gillespie, A. W. Lamont, R. W. Moffatt.

McINTIRE—EARL JOHN, of Sandwich, Ont. Born at Cleveland, Ohio, Dec. 24th, 1882. Educ., public and high schools; correspondence schools. 1899-1904, inst'man and charge of corp; 1904-16, constrn. engr., Republic Iron & Steel Co., Youngstown, Ohio, complete charge of all constrn work; 1916 to date, constrn. engr., Can. Steel Corp. Ltd., Ojibway.

References: M. E. Brian, H. Thorne, J. S. Nells, A, J. Stevens, C. W. Tarr.

MILLAR—JOHN MacINTOSH, D.S.O., M.C., of Amherst, N.S. Born at Lunenburg, N.S., May 19, 1884. Educ., 4 yrs. Dalhousie Univ. 1901-05 (did not take final exam.) 1905-07 topog. transitman, resident engr. and asst. chief draftsman for MacKenzie, Mann & Co.; 1907-08, res. engr., T.C.Ry., Green River, N.B.; 1908-12, office engr., T.C.Ry., St. John, N.B., 1912, res. engr., C.P.R., Heron Bay; 1912-13 asst. engr. in charge of party reconnaissance and location, C.P.R., Lake Superior; 1913-15 asst. engr., in charge of party location and grade revision; C.N.R. Maritime Dist.; 1915-19 on active service, enlisted in ranks. Demob. as Lt.-Col.; 1919-20 asst. engr., C.N.R. in chg. party on grade revisions and locations. At present time, dist. engr. of highways, N.S.

References: G. C. Dunn, C. B. Brown, W. A. Duff, A. R. Crookshank, H. Longley, S. B. Wass.

MITCHELL—JAMES SIMS, of Paris, Ont. Born at Liverpool, Eng. Apr. 18, 1892. Educ., B.A.Sc., Univ. of Tor. 1914. May-Sept. 1912, rodman, C.P.R.; May-Sept. 1913, asst. engr., D.P.W., Port Arthur, Ont.; Oct. 1914-Apl. 1916, demonstrator, highways & strength of materials laboratories, Univ. of Toronto; May-Sept. 1915 & May-June 1916 (7 mos.) testing & inspection for Imperial Munitions Board, Toronto and Hamilton. 1916 to Sept. 1919, on active service; Sept. 1919 to date, asst. engr., Dept. Public Highways, Ontario.

References: W. A. McLean, P. Gillespie, C. R. Young, A. L. McDougall, H. T. Routly, T. R. Loudon.

MORGAN—PHILIP HAROLD, C., capt., of Strathmore, Alta. Born at Ebbw Vale, Monmouthshire, Eng., Mar. 15, 1889. Educ., Ellw Vale Grammar; private tuition, 1906-10, pupil in estate and mining surveying depts., Ebbw Vale Steel & Coal Co., Ltd.; 1910-12, asst. surveyor, Ebbw Vale Co; July-Nov. 1912, draftsman eng. dept. of Natural Resources, C.P.R., Calgary; 1912-14, office engr., Strathmore office, same dept. on charge of irrigation contract surveys; Sept. 1914, went overseas, enlisted in Gloucester Hussars, service in Egypt., Palestine, etc.; promoted to capt. and adjt., Gloucester Hussars; Aug. 1918, seconded to Royal Engrs. for survey work; on main triangulation of Palestine, etc., demobilized July 1919; at present, office engr., Strathmore office, eng. dept., Natural Resources, C.P.R.

References: A. S. Dawson, H. B. Muckleston, E. N. Ridley, R. S. Stockton.

MURPHY—MICHAEL JOSEPH, of Moncton, N.B. Born at Halifax, N.S., June 4th, 1881. Educ., LaSalle Academy; college matric.; business course. 1903-04 rodman and topog'r., N.S. Eastern Ry.; 1904-05, in prov'l. engrs. office, Halifax; 1905-06, rodman on constrn., H. & S.W.Ry.; 1906-07, topog'r. and leveller on C.N.R., Quebec and Ontario; 1907, inst'man. on constrn. of spur line from Algoma Central Ry. to Superior Copper Co. Mine; 1908, asst. engr., Georgian Bay Canal; 1909-14, leveller on location party, 7 mos. through Rocky Mts., then inst'man. on constrn. of G.T.P.Ry. through mountain section in Alta. and B.C.; including heavy rock work and tunnels; 1914-15, asst. to conslt'g. engr., Can. Govt. Rys.; 1915 to date, asst. engr. in chief engr's. office, Can. Govt. Rys., Moncton.

References: C. B. Brown, C. R. Coutlee, G. B. Hughes, R. W. Leonard, W. A. Duff, M. Murphy, F. B. Tapley, R. F. Uniacke.

MUSGRAVE—WILLIAM BURNTHORNE, of Kingston, Ont. Born at Halifax, N.S., Dec. 23rd, 1890. Educ., final year student in civil engr. Queen's Univ. Summers: 1914 with Minto Coal Co., Minto, N.B., surveying, drafting, trackwork; 1915, geological survey, Sudbury, Ont.; Nov. 1915-June 1919, military service; Summer 1919, geological survey, planetable-man, Brittania, B.C. Peace River, Alta.; at present, attending Queen's Univ.

References: J. C. Gwillim, W. L. Malcolm, A. Macphail, T. S. Scott, W. P. Wilgar.

ORR—WILLIAM SCOTT, of Niagara Falls, Ont. Born at Cobourg, Ont., May 26th, 1892. Educ., B.Sc., Queens Univ. 1916. Summers: 1911-13, rodman, C.N.O.Ry.; 1914-15, Elec. Power Comm.; May-Dec. 1916, inst'man in constrn. dept., G.T.R.; 1916-17, chief of party, H.E.P.C.; Aug. 1917 to date, res. engr., Div. I., Chippawa development.

References: H. G. Acres, A. C. D. Blanchard, H. L. Bucke, F. W. Clark, J. B. Goodwin, T. H. Hogg.

PAYZANT—SAMUEL KEMPTON, of Halifax, N.S. Born at Windsor Forks, N.S., Oct. 27th, 1891. Educ., B.Sc., Acadia Univ. 1914, B.S. (C.E.) N.S. Tech. Coll. 1917. June-Sept. 1913, student asst. on surveys and in drafting-room, P. W. D., Shelbourne, N.S.; 1914-15, junior asst. to the dist. engr., P.W.D., Halifax, draftsman and instr'man, on surveys; June-Oct. 1916, on Geological Survey (topog. party) on Kananaskis sheet, Alta, as student asst.; June-Nov. 1917, studying traffic records and equipment, Bell Telephone Co.; Jan. 1918 enlisted in Royal Can. Engrs., discharged May 1919; worked as military draftsman on staff of Major J. F. Pringle, commanding officer, Halifax; May 1919 to date, draftsman, Imperial Oil, Limited, Halifax.

References: O. S. Cox, F. R. Faulkner, H. J. Knight, C. B. Leaver, F. C. Mechin, W. P. Morrison, J. W. Roland, K. E. Whitman.

PEART—JOHN DAVIDSON, of Westmount. Born at Freeman, Ont., Aug. 8th, 1891. Educ., B.A.Sc., Toronto Univ. 1914. Summers 1911-12, with Dom. Power & Transmission Co. Ltd., Hamilton, Ont.; 1913, on gen. meter repair and calibration work, Can. Westinghouse Co., Chatham, Ont.; May-Sept. 1914, electrician in erection dept., Kent Transformer Station, Hydro Elec. Power Comm.; 1914-16, elec. engr. in charge of new installation and later maintenance of complete mine and mill elec. equipment, Tough Oakes Gold Mines Ltd., Kirkland Lake, Ont.; July 1916-Apr. 1919, military service with Can. Ry. Troops; Nov. 1919 to date, with Northern Electric Co. Ltd., Montreal, as telephone engr.

References: A. R. Ketterson, A. J. Lawrence, T. R. Loudon, T. A. MacLean, C. A. Millican.

RHODES—HERBERT ARTHUR, of Toronto. Born at Tonbridge, England, Oct. 31st, 1886. Educ., Goldsmiths Coll.; Southwestern Polytech.; private tuition; passed exam. for A.M., Inst. of C.E., England. 1906-07, office asst. and 1907-11, asst. to outside supt., Metropolitan Elec. Tramways, London, constrn. and maintenance of distribution system; 1911-13, in charge of western div., same firm; Mar.-June 1913, office asst. to D. J. Albertson, pulp and paper mill engr., Toronto; 1913-14, Eastern Power Co., Toronto, design of steel transmission towers, etc. and at Healy Falls power house during constrn. as asst. engr.; Apr.-Aug. 1914, Board of Education, Toronto, bldg. dept., design of steelwork and reinforced concrete; Aug. 1914-July 1919, Can. Field Artillery; at present, Hydro Elec. Power Comm., ry. dept., design of steel and reinforced concrete work.

References: T. U. Fairlie, F. B. Goedike, J. B. Goodwin, C. J. Ingles, J. C. Krumm, A. G. Young.

RIDDELL—JAMES, of Winnipeg. Born at Rutherglen, Scotland, Oct. 29th, 1887. Educ., Higher Grade, Scotch Educ. Dept.; I.C.S.; 3 yrs. Evening Tech., Hamilton, Scotland. 1902-06, eng. pupil to A. J. Riddell, Glasgow; 1906-07, draftsman, Western Iron Works, Winnipeg; 1907-08, estimator, Thomson Homer, heating and ventilating engrs.; 1908-10, leveller and inspector, power constrn. dept., Winnipeg; 1910-12, estimator, D. Wallace & Co., heating and ventilating engrs., Wpg.; 1912-13, asst. engr. on bridge constrn. and drafting, C.N.R., Wpg. and Edmonton; 1913-14, res. engr., Greater Wpg. Water Dist.; 1914-19, overseas; at present, city engr's dept., Winnipeg.

References: W. Aldridge, W. P. Brereton, W. G. Chace, J. G. Glassco, W. Walkden.

SAUNDERS—MALCOLM BURGOYNE, of Cobalt, Ont. Born at London, Eng., Aug. 14th, 1887. Educ., Univ. College School, London, Eng. 1905-10, pupil, Wenham & Waters Ltd., engrs., Crydon, Eng.; 1910-11, designing and supt'g. mfr. of special machinery, Permanent Printing & Process Co., London, Eng.; 1911-12, manager, Northern Ontario Eng. Works Ltd., Cobalt, machine shop, mining mach'y. repairs, etc.; 1912-13, with Cobalt Foundry, making special report for owners (O'Brien Mine); 1913-14, on mech. staff, Nipissing Mine, Cobalt; 1914-17, manager, Cobalt Garage; Jan.-July 1918, on mech. staff, Nipissing Mine, Cobalt; 1918-Sept. 1919, sales engr., and at present, in charge of sales and production, Water Iron Works Ltd. New Liskeard, Ont.

References: R. W. Leonard, E. W. Neelands, E. H. Pacy, F. D. Reid, R. P. Rogers.

PERRY—FRANK MORTIMER, of Sault Ste. Marie, Ont. Born at Toronto, Jan 2nd, 1875. Educ., 3 yrs. civil engr. course, Univ. of Tor., 1898, U. S Govt. Geodetic coast survey, inst'man; 1899-1900, transitman on location, A.C.Ry.; 1901, draftsman, Lake Superior Power Co.; 1902-03, engr. i/c of development and operation limestone quarries, Sault Ste. Marie Pulp & Paper Co ; 1904-06, mine manager, Superior Mine (Superior Copper Co.); 1907-09, operating independently, Cobalt Mining dist.; 1912-14, contractor on mine development work; 1914-16, capt. 15th Batt., C.E.F.; Nov. 1916 to date, eng. dept., Algoma Steel Corp., at present, supt. design and fabrication material for structural mill.

References: E. G. M Cape, H. E. T. Haultain, R. W. Leonard, A. F. Macallum, R. S. McCormick, J. W. LeB. Ross.

ROLPH—HAROLD, of Lachine, P.Q. Born at Toronto, Ont., Feb. 18th, 1872. Educ., grad. in civil eng., S.P.S., 1894. 1895-97, drafting, designing and supervising, Pacific Rolling Mills, San Francisco; 1897-98 surveying and mining in B.C.; 1898-1902, mining and surveying ,Yukon Territory; 1904 to date with John S. Metchalf Co., Ltd., as follows:—inspecting engr. i/c constrn. G.T.Ry. grain elevator, Montreal; engr. i/c constrn. grain conveyor system, Harbor Commn. of Montreal; contracting engr. on equipment for same, and on various other grain elevator works and reports; also design grain elevators for Australia and South America; at present, President John S. Metcalf Co., Ltd., Montreal, and John S. Metcalf Co., Ltd., Chicago, Ill.

References: F. W. Cowie, J. M. R. Fairbairn, C. B. Brown, W. J. Francis, J. M. Robertson, A. D. Swan.

ROSS—DONALD WILLIAM, Jr., of Montreal. Born at Montreal, Jan. 26th, 1874. Educ., 2 yrs. Mass. Inst. Tech. 7 yrs. draftsman, checker and engr. on erection, Dom. Bridge Co., Ltd.; 1904-08, chief engr., Phoenix Bridge Co.; 1908 to date, member of firm, contractors & engineers, reinforced concrete bldgs., roads, etc.

References: L. A. Amos, E. G. M. Cape, J. H. Hunter, J. A. Jamieson, E. S. Mattice, F. P. Shearwood, J. C. Smith, W. Chase Thomson.

TYRRELL—WILLIAM GRANT, Lt.-Col., D.S.O., of London, Eng. Born at Port Rowan, Ont., June 6th, 1882. Educ., grad. R.M.C., 1903; commissioned in Royal Engrs. 1903. 1905-08 on ry. work; 1909-13, command engineer, Montreal, O.C. 10th Ry. Constrn. Coy., R.E.; Aug. 1914-Dec. 1915, i/c Palestine Military Rys., E.E.F.; 1916-Dec. 1919; at present Lt.-Col., Royal Engrs.

References: R. Armour, M. S. Blaiklock, F. L. C. Bond, A. Crumpton, H. K. Dutcher, Wm. McNab, H. B. Stuart.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

DODD—GEOFFREY JOHNSTONE, of Montreal. Born at Port Antonio, Jamaica, B.W.I., Nov. 17th, 1888. Educ., B.Sc. (C.E.) McGill Univ., 1911. 1908-09, on meteorological work and time service, McGill Observatory, under late Prof. McLeod; May-Aug. 1909, mining with Crown Reserve Mining Co., Cobalt; May-Sept. 1910, levelman, C.P.R., North Bay; 1911-13, chief draftsman for masonry engr., G.T.R.; 1913-14, lecturer in maths. and demonstrator in civil engr., McGill Univ.; May-Sept. 1914, engr. i/c of constrn. of a fishway for Labrador Co. of Canada; Nov. 1914-Sept. 1919, military service; at present lecturer in maths. and civil engr., McGill Univ.

References: R. Armour, E. Brown, H. M. MacKay, C. M. McKergow, K. R. McLennan, H. B. Stuart.

LALONDE—JOSEPH ANTONIO, of Outremont. P.Q. Born at Au Sable, Mich., Oct. 20th, 1891. Educ., C.E. & B.A.Sc., Ecole Poly. (Laval) 1912. 1909 (3 mos.) C.P.R.; 1909-11, Alta. Central Ry., as asst. topog'r. and topog'r.; 1911-12, city of Outremont, inspector of sidewalks and sewers, transit and levelman, 6 mos.; 1912-13, North Ry. Co., transitman on location of road from James Bay to Transcontinental; 1913 to date, asst. city engr. Outremont.

References: R. Blais, A. Cousineau, J. A. Duchastel, A. Frigon, A. Surveyer.

MITCHELL—ROBERT WILLIAM, Major, M.C., of Uddingston, Scot. Born at Uddingston, Scot., Nov. 27th, 1887. Educ., Royal Tech. Coll.; B.Sc. course in civil engr., Glasgow Univ. 1905-10, apprentice, Crouch & Hogg, Glasgow; 1910-11, assistant, same firm; Apr.-Aug. 1911, asst. to res. engr., G.T.R., maintenance dept.; 1911-14, chief of party, 1913, chief asst. to res. engr., Montreal Filtration Works, constrn.; 1914-19, military service: enlisted as sapper, promoted to major, mentioned in despatches and awarded M.C.

References: F. L. C. Bond, F. Y. Dorrance, F. E. Field, Sir John Kennedy, T. W. Lesage, N. M. McLeod.

SARA—RICHARD A., of Montreal. Born at Toronto, Nov. 9th, 1888. Educ., B.A.Sc., 1911; E.E. 1914, Toronto Univ. Vacations: 1906-07, with Kay Elec. Co.; 1908, Jones & Moore Elec. Co.; 1909, draftsman, Smith, Kerry & Chace, Toronto; 1909, draftsman, John S. Metcalf Co., Midland, Ont.; 1909-10, power engr., Toronto Hydro Elec. System; May-Nov. 1911, asst. business manager, same concern; 1911-18, sales manager, City Light and Power Dept., Winnipeg; 1918-19, asst. gen. manager and elec. engr., American Cellulose & Chemical Mfg. Co., Cumberland, Maryland; Oct. 1919, to date, in partnership with C. A. Sara, Montreal, financial and shipping.

References: W. D. Black, W. P. Brereton, W. G. Chace, T. R. Deacon, J. A. Douglas, E. P. Fetherstonhaugh, G. L. Guy, F. S. Keith, J. G. Legrand.

WEST—CHARLES WILLIAM, of Thorold, Ont. Born at Campbellford, Ont., May 30th, 1890. Educ., B.A.Sc. Univ. of Toronto, 1915; 1909, timekeeper & Inspector Seymour Power & Elec. Co. on Constr'n of H.E.P. Development; 1910, inspector with Smith, Kerry & Chace, Transformer Stations & Transmission lines. 1910-13, Instrument man Ass't Eng'r, Dept. Rlys. & Canals, Trent Canal; 1914, Ass't Engr. H.E.P.C., in charge of prelim. surveys; 1916-June 1919, on active service with the Can. Engrs. as Lieut. & Capt.; 1919 to the present time, Ass't Eng'r, Dept. Rlys. & Canals, Section 3, Welland Canal.

References: C. J. Grant, J. G. G. Kerry, H. G. Acres, C. R. Crysdale, F. S. Lazier.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

BALL—SPENCER, Lieut., of Toronto, Ont. Born at Liverpool, Eng., June 30th, 1890. Educ., B.Sc. (C.E.) Univ. of Sask., 1916, 2 yrs. in classics, England. May-Sept. 1913, mtce. work on C.P.R., div. west of Saskatoon; May-Oct. 1915, research work on retentivity of moisture of earths, Univ. of Sask.; Feb. 1916, enlisted, demobilized Oct. 1919; Dec. 1919 to date, hydraulic research with Hydro Elec. Power Comm.

References: A. R. Greig, W. Harland, T. H. Hogg, C. J. MacKenzie, M. V. Sauer, G. O. Thorn.

BROWN—CHARLES KENNETH, Capt., M.C., of Winnipeg, Man. Born at Knaresborough, Eng., Sept. 21st, 1884. Educ., King James' School, England. 1902-05, articled as architect and surveyor, Bradford, Eng.; 1906 (3 yrs.) draftsman in eng. dept., G.T.P., Saskatoon and Edmonton; instr'man, 8 mos. on prairie and 1½ yrs. in Rocky Mts. on a residency, G.T.P.; 1912, res. engr. G.T.P., charge of 50 miles r. of way 6 mos., then had charge of residency in mountain div'n.; 1914-15, charge of a residency, P.G.E., south of Fort George; Feb. 1916, enlisted as private; May 1916, lieut.; Aug. 1917, promoted to Capt.; 1918 awarded M.C., mentioned in despatches, discharged Oct. 1919; at present, in bridge engr. dept., G.T.P., Winnipeg.

References: W. E. Davis, G. C. Dunn, C. Ewart, R. P. Graves, R. W. Jones, J. G. Legrand, N. J. Wallis.

BROWN—LEO B., of Camrose, Alta. Born at Grundy Centre, Iowa, June 14th, 1893. Educ., B.Sc., Univ. of Alta., 1916, prel. D.L.S. Summers: 1912, Alta. Central Ry.; 1913, Harrison & Porter, contractors and surveyors, Calgary; 1915, C.P.R. forestry branch; May 1916, enlisted with 187th. Batt.; 1917, acting adjt.; May 1917, Can. Forestry Corps; 1918 ,in charge of sawmills; June 1918, joined R.A.F.; Oct. 1918-Jan. 1920, hydrometric engr., irrigation branch, Dept. of Interior, Calgary.

References: A. L. Ford, A. MacDougall, D. H. Nelles, C. A. Robb, P. M. Sauder.

McMORDIE—HENRY CAMPBELL, of Walkerville, Ont. Born at Kippen, Ont., May 23rd, 1883. Educ., B.A.Sc., Toronto Univ. 1909. 1908 (3 mos.) Hydro Elec. prelim. survey; 1909 (9 mos.) municipal eng., Willis Chipman; 1909 (3 mos.) res. engr., Battleford, Sask.; 1910-11, draftsman, Can. Bridge Co., Walkerville; 1912-14, estimator and designer, Trussed Concrete Steel Co. of Canada Ltd.; 1914-19, military service; at present, chief engr., Trussed Concrete Steel Co.

References: H. G. Acres, J. A. Brown, W. J. Forbes-Mitchell, E. M. Proctor H. Thorne.

MONTGOMERY—CLIFFORD SAMUEL, of Howe Sound, B.C. Born at Winnipeg, Man., July 24th, 1894. Educ., B.Sc. (mech. eng.) McGill Univ. 1915. 1 yr. during vacations, in mfg. plants, including Ford Motor Co., Detroit; Feb. 1915, enlisted, granted comm. on field Aug. 1916; Feb. 1919 went on 4 mos. post grad. course at Royal Coll. of Science, Glasgow Univ.; mentioned in despatches and awarded M.C.. demobilized Aug. 1919; at present in eng. dept., Whelan Pulp & Paper Mills, Mill Creek, B.C.

References: E. Brown, C. B. Daubney, J. E. Daubney, A. S. Dawes, J. C. Kemp, A. R. Roberts.

NICHOLSON—MORRISON DONALD, of Goderich, Ont. Born at Goderich, Ont., Nov. 2nd, 1888. Educ., B.Sc., Queen's Univ., 1916. Railroad and municipal work, C.N.O.Ry. & city of Toronto; i/c of bldgs. as engr. on valuation work Central, R.R. of New Jersey; 1916-17, i/c of pilot work, C.R.R. of N.J.; 1917-19, engr. in field, Westinghouse, Church & Kerr; June 1919 to date, res. engr. on constrn., Lockwood, Greene Co.

References: E. R. Gray, J. R. Mackenzie, T. S. Scott, M. A. Stewart, S. R. Turner.

TILSTON—JOHN ARTHUR, of Toronto, Ont. Born at Toronto, June 13th, 1887. Educ., B.A.Sc. (C.E.) Univ. of Tor. 1914. May-Oct. 1913, transitman, C.P.R. under A. P. Walker, i/c of transit party on resurvey ry. work; 1917-Dec. 1919, res. engr. Baldonnell Aerodrome, Ireland, was seconded as capt. from C.E.F. to build and had full charge of same for air ministry; at present, research asst. in aero dynamics, Univ. of Toronto.

References: H. J. Lamb, T. R. Loudon, C. W. P. Ramsey, A. P. Walker, C. R. Young.

TISON—MAURICE, of Montreal, Que. Born at Montreal, April 25th, 1895. Educ., 3rd. year Student McGill Univ. (E.E.) Summers 1912-14, in City Engr's Office, Maisonneuve; 1915, Ass't Concrete Eng'r; 1916, Munition Inspector; 1917, Inspector at Northern Electric Co.; 1917-19, Lieutenant with R.A.F. on active service; 1919, Appraisal work with Dr. Herdt.

References: L. A. Herdt, C. M. McKergow, E. G. Burr, L. A. Désy, J. E. Désy.

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The Forests of Quebec

G. C. Piché, A.M.E.I.C., Chief of Forests Service, Quebec Lands and Forests Dept.

Area :

The total area of the Province of Quebec is now 450,337,761 acres, 703,653 squares miles or 1,822,461 square kilometres. The annexation of the Ungava territory in 1912 has practically doubled its former surface. The lakes and other water surfaces are estimated to cover 15,969 square miles. (1)

According to the Census of 1911, (2) the properties belonging to private individuals or companies or communities covered then 15,613,267 acres; so that the Crown would still control in Old Quebec, 209,585,294 acres, while New Quebec or Ungava, covering 225,139,200 acres, is intact, making a grand total of 434,724,494 acres. Of this last amount, and in Old Quebec, licenses to cut timber upon Crown Lands, subject to special conditions as detailed further on, have been granted over territories aggregating 44,500,000 acres.

Classification of the Forests of Quebec

Omitting New Quebec and a portion of the Labrador upland, which we are led to consider as not containing any appreciable area of commercial timber, we figure that the forests of this province capable of producing saw logs, pulpwood, etc., cover 130,000,000 acres. We have divided them into five classes according to their tenure:

(a)	Private forest..................	6,000,000 acres
(b)	Forests on lots under location..	[illegible] "
(c)	Forests leased or timber Limits	44,500,000 "
(d)	Township forest reserves.	[illegible] "
(e)	Vacant lands	78,000,000 "
	Total	130,000,000 acres

A description of each class follows. None of the private wood lands are managed according to the principles of Forestry. The same may be said of the forests belonging to settlers.

It is only upon the Crown Lands, (timber limits and township reserves), that the Forest Service of the Province exercises some influence in the direction and supervision of the cutting of trees and their utilization.

1.—Private Forests

[illegible]

These 6,000,000 acres come from the old seigniories and lands either sold to settlers by the Government or granted to railways in aid of their construction.

The largest portion of this class of forests lies in the central valley of the St. Lawrence and is divided up into small properties seldom exceeding 50 acres on an average, with the exception of certain seigniorial domains, such as those of Lotbinière and Beaupré, and the extensive territories granted as subsidies to railways.

Read at the General Professional Meeting, Montreal, Jan. [illegible], 1920.

The stands vary greatly. In fact they include high forests or coppices and pure stands of spruce, pine, or maple. Elsewhere the forests are of a mixed character, consisting of yellow birch, beech, maple, ash, mingled with spruce, balsam fir or white and red pine. (3).

The total value of these stands is about $30,000,000. It is rather difficult to estimate the revenue derived from them owing to the lack of information. But it is a well known fact that our maple groves produce yearly over $700,000.00 worth of sugar and syrup; that our farmers sell annually about 900,000 cords of pulpwood worth, on an average, $3.00 standing; so the total revenue from the private forests, including also the value of the firewood cut, is at least $7,000,000 per annum.

So far no restriction has been imposed upon these operations nor upon the disposal of the pulpwood, which is exported in great quantities to the United States.

2.—Forests on Lots Under Location Tickets

Every year the Government sells to settlers lots of land, containing 100 acres on an average, and usually well timbered. This sale is effected by means of a special contract, called a "Location Ticket," imposing several obligations, in reference to residence, clearings, etc. (4).

When the settler has complied with the various conditions enumerated in this contract, he is entitled to receive his letters patent, giving him full and free possession of his lot.

Owing to the low prices of lots and their comparative richness in timber, they have been the subject of vast speculations, especially since 1900, when spruce and balsam fir became very valuable, owing to the progress made by the pulp and paper industry in the Province. But the creation of the Forest Service and the energetic action taken have put a stop to such waste of the public domain.

The forests of this class are destined through force of circumstances, either to become part of those of the first class—when the settler obtains his letters patents—or to revert to the second class, (timber limits), from which they had been taken out to be granted to so-called settlers who have not fulfilled the conditions of their location tickets. Thus the area of these forests extends or shrinks from year to year.

There are at present about 15,000 lots under location ticket; one third of these could be patented if the owners would take the trouble to take the necessary steps to obtain a definite title.

The penalties collected from speculators from 1907 to 1919 for illegal cuttings amount to $300,000.00, but the annual amount of such fines is now diminishing greatly, as offences of this nature are becoming fewer.

According to the statistics kept by the Forest Service, the total volume of the cut of saw logs in 1918-1919 was, on private lands, 930,574,000 feet board measure, compared with 980,700,000 feet board measure, upon the Crown Lands.

3.—Crown Land Forests

Timber Limits.

This class comprises all forests usually called "timber limits," leased to various license-holders at different periods. The limits are exclusively leased by auction after a notice of at least thirty days, but we have always exceeded that delay. This auction bears upon a special amount called "bonus," which constitutes the fee for obtaining the permit or license to cut exclusively on a specific area. In 1868, there were already 19,000 square miles under lincense; from 1868 to 1919, 55,200 square miles were successively leased as timber limits. But owing to the sale of lots to settlers the area of the limits is now reduced to 69,897 square miles.

All these forests are situated beyond the villages, in the upper basin of the St. Lawrence. They contain a fairly large variety of merchantable timber, such as: white pine, red pine, grey or banksian pine, spruce, balsam fir, cedar, hemlock, tamarack, birch and maple.

The permit granted to the license-holder is valid for twelve months from the first of May. It may be renewed every year, provided the license-holder has complied with all the existing obligations, and with such others as may be determined by the Lieutenant-Governor-in-Council. The license is considered as a negotiable security, but it can be transferred only with the consent of the Minister of Lands & Forests, and after the payment of a fee of $4.00 per square mile. This system has enabled extensive limits to be concentrated and strong companies to be formed for manufacturing pulp and paper. (5).

The principal conditions imposed upon the license-holder are:

1. To pay the *bonus* as set at the auction.

2. To pay a *ground-rent* of $6.50 per square mile, before the 1st September of every year. (This amount will be raised to $8.00 per mile after 1923, for the following five years.)

3. To send, before December 1st, a statement of the quantities of timber it is proposed to cut, giving the places where they are to be cut, and the persons who are to do the lumbering:

4. Not to fell any white or red pine under 13 inches in diameter, nor any spruce, cedar, maple, etc., under 12 inches, except swamp spruce, paper birch, balsam fir, poplar, ash, elem, which can be cut at a minimum diameter of 7 inches measured on the stump, 2 feet from the ground;

5. To have all the timber cut, measured by a culler holding a certificate from the board of examiners appointed by the Government;

6. To allow all the operations to be inspected by the provincial forest rangers, to keep a shanty book in each camp for the recording of the trees cut every day, their measurements, etc.;

7. To practice as great economy as possible in the lumbering operations;

8. To produce a sworn report, before the 20th June, stating all the year's operations both upon limits and upon private lands.

9. To pay royalties or stumpage dues on all timber cut upon the limits according to the log rule and the rates adopted by the Department. (See appendix No. 5).

10. To protect the limits against fire, trespassers, etc.;

11. To export no timber that is not manufactured in Canada, i.e., converted into pulp and paper, deals or boards, or into any other articles of trade or merchandise of which such timber is only the raw material (Art. 13 of Regulations).

From 1867 to 1919, the forests under license have brought in the following amounts to the Province:—

(a)	Ground rents	$8,048,444.22
(b)	Bonuses	3,066,312.06
(c)	Transfer fees	343,529.07
(d)	Royalties or dues on timber cut	31,812,403.59
(e)	Interest on suspense accounts, penalties for illegal cutting, fire taxes	1,072,768.68
	Making a total of	$45,543,764.02

The total revenue of the Department now exceeds $2,500,000.00 per annum.

The cut on the timber limits during the fiscal year of 1918-19, amounted to 800,923,286 feet board measure of spruce, balsam, jack pine, hemlock, birch, poplar, sawlogs.

124,809,129 feet board measure of white pine.
48,083,487 feet board measure of red pine and hardwood.
168,851 railway ties.
12,973 cubic feet of square timber and minor quantities of other wood goods, such as poles, firewood, so that the total cut was practically equal to one billion feet board measure per annum. (In sealing round timber, one cubic foot equals 8 board feet, in average.)

4.—Township Forest Reserves

Since 1911, the Forest Service has devoted much attention to setting apart the uncultivable vacant lands in certain Townships to form forest reserves, which are destined to supply timber to the inhabitants of the neighbouring villages, under special regulations. (See appendix No. 6).

Seventeen township forest reserves, covering a total area of 265,000 acres, have this been created.

The quantity of timber cut on these reserves, in 1919, amounted to 111,784 cubic feet of building timber and 2680 loads of firewood, which brought a revenue to the Crown of $1,018.85 as stumpage dues.

5.—Forests Not Leased: or Virgin Forests

These forests, which are free from any incumbrance extend beyond those under license, lie either in the basin of the St. Lawrence, or that of Hudson Bay and Ungava. No cutting has yet been done on any of these Northern territories, but fire, storms, insects and fungi cause therein considerable damage every year; moreover, the growth in volume of the trees is very slow, as in all Northern forests. Therefore the annual increment in volume is rather low. To the Forest Service has been assigned the duty of making an inventory of these so they may gradually be utilized as the country's needs require.

The timber in these forests consists chiefly of spruce, balsam fir, poplar and Banksian pine; the quantity per acre varies between 6 and 15 cords, mostly of pulpwood. This reserve can furnish millions of cords of pulpwood, and as there are considerable water powers on each of the streams, it can easily be foreseen that, before long, many pulp and paper mills will be erected in the Northland, which will contribute to develop the country and advance the progress of civilization.

The Forest Wealth of Quebec

Our primœval forests were very rich. They extended to the very shores of the St. Lawrence, as we are given to understand by the relations of the first explorers of Canada. (See Champlain, Charlevoix, etc.) They consisted chiefly of white pine (Pinus Strobus), red pine (Pinus Resinosa), balsam fir (Abies Balsamea), white spruce (Picea Canadensis), black spruce (Picea Mariana), hemlock (Tsuga Canadensis), white cedar (Thuya Occidentalis), tamarac (Laryx Americana), white and red oak (Quercus Alba and Quercus Rubra), elm (Ulnus Americana and Ulnus Fulva), maple (Acer Saccharum and Acer Saccharinum and Acer Rubrum), birch (Betula Alba and Betula Paperifefa), etc. etc., All these trees were of a large size, giving a wood of first class quality. But settlement and fires soon caused the removal of the forest, first along the river fronts and finally far into the interior.

Until the beginning of the 19th century, our export trade was insignificant, limited to the demands of the colony; the shipping industry was also in its infancy. After 1830 the European market began to create a large demand upon our forests, which has continued to increase in volume, even after the wooden shipbuilding industry had disappeared in Quebec.

The first licenses to cut timber on the Crown Lands were granted in 1826, and the system has been continued until the present day with variations in the conditions of the lease. (6) (See the Annual Report of the Department of Lands and Forests for 1910, pp. 79-120).

Notwithstanding the difficulties of access to the virgin forests, the first operators did not hesitate to send their axemen very far into the interior, and they soon covered the whole section where white pine was king. A little red pine was than cut into square timber and rafted down the Ottawa, the Gatineau and the Lièvre rivers, and so to Quebec, while from the Montreal and Richelieu districts, oak and elm logs were also brought on the rafts. The methods of cutting in those early days were rudimentary: all the cutting and squaring being done with the axe. The culling of the forest was also very bad, as only the best trees were selected; moreover, only logs of the best quality were taken out. How much timber was thus wasted, no one can tell; but, even now, we come across some of these old-culled logs from which excellent timber is yet made. As a matter of fact, we have become less exigent, because the white pine is now rare and because settlements and too often the fires, have compelled the forests to fall back on the upper slopes of the river basins, into regions remote and more difficult of access. Until 1900 the white pine led the list of the trees lumbered; but spruce, which had gradually gained favor, owing to its qualities and its lower price came into great demand, not only for building purposes, but also for pulp and paper manufacturing. Hence the cut of these species has increased wonderfully, as has that of balsam fir, which wood is somewhat similar but less valuable. The other species gained ground later and the volume of their cut is now quite large. In fact, all the resinous trees of our forests are now utilized, and it remains only to dispose profitably of the hard woods, which, owing to their greater density, cannot be easily floated to the mills. Efforts have been made and are yet made, to solve this problem. Therefore the stumpage value of the hardwoods is rather low, while that of white pine and spruce is comparatively higher.

The Province of Quebec is well justified in spending enough money to protect her forests from fires, and to develope adequate means to utilize this immense fortune. Naturally, it is impossible to do this all at once, but we are satisfied with the results already obtained and we shall continue to ameliorate our conditions as the economical movement of the country warrants us to do so.

Our Lumber Industries

The value of all forest products in Canada for 1917 is estimated at $190,000,000 (See Canada Yearbook of 1918, p. 49), the share of the products of this province being about 30%. Though a quantity of logs exceeding 200,000,000 feet board measure is shipped annually outside of the Province to be converted in the mills of New-Brunswick and Ontario, yet the lumber production of Quebec exceeds all the others, and we find that for several years, Quebec has ranked first for its forest production. There are, in Quebec, over 2,600 establishments in which wood is the main raw material of which there are:

2,200	Sawmills
369	Sash and door factories
281	Planing mills factories
34	Furniture & chair factories
30	Pulp & paper mill plants
30	Box & crate factories
23	Farming implements factories
22	Vehicle & carriage
14	Butter tub & box factories
12	Broom & brush factories
10	Boat & ship building plants
8	Casket & coffin factories
8	Flooring mills

Besides sundry establishments producing railway cars, daily implemeuts, store fixtures, matches, elevators, barrels, bobbins, and spools, cigar boxes, corks and cork goods, frames, charcoal, gun handles, clothes pins, stairways, woodfiber or excelsior, patterns, beds, sewing machines, musical instruments, pianos, organs, veneer, sporting goods, trunks and valises, etc., etc.

Needless to say, several firms produce at the same time quite a number of the articles mentioned above.

With a few exceptions, all our large mills depend mostly upon the leased timber limits for their annual supply while the remainder receive their lumber from the private forest owners.

We may say that heretofore, the lumber industry in this province has been conducted solely according to the demands for particular products according to the facilities of transportation. Water courses had to be used in the past and are still used, as being the cheapest carriers, and often the only one possible. A very small portion of the timber trade in this province is now moved by the railways; but this system is gaining ground and it will develop more rapidly now the hardwoods can be sold profitably. Owing to the rather low altitude of our mountains, lumbering is not confronted here with all the engineering difficulties of the Pacific Coast, but, other problems are sufficient to give the operators plenty to think about. In the past, the main trouble was with the forest speculators, now it is the scarcity of labour.

Owing to our excellent system of rivers, their exceptional size and the normal rate of precipitation, the logs cut can be driven to the mill sites at a moderate cost. Our railways, if not as numerous as elsewhere in Canada, yet are devised in such a manner as to feed a large part of our territory. In particular, the Transcontinental has opened, in the Northwest of this Province, the Abitibi region, which is an excellent agricultural section, as good as any of the Clay Belt; this district, which will soon become a very good farming country is now producing over 90,000,000 feet b.m. yearly. Excepting the years of the Great War, our lumbermen had little difficulty in obtaining labour, at moderate prices, but now this problem is vexing, and in certain sections many are afraid, and with reason, that the lumber-jacks will not be available in the future as they formerly were.

Another drawback is the excellence of our men for this class of work, as they can handle the axe very well, are good drivers and are in fact experts in every line of this trade, hence the great demand for French-Canadian bushmen from every Province and also from many of the States of the American republic. In 1918-19 some 22,265 men were employed on our timber limits, and at least 10,000 others upon the private forests, making a total of 32,000 men employed in the cutting of woodlands.

In latter years, some efforts have been made to employ steam and gasoline tractors to diminish the expense of haulage. We must improve our methods of lumbering as the increase in the cost price of logs is constant; machinery as well as engineering skill will be called on to replace human labor, which is becoming rare, more expensive. However it is certain that, as long as the colonization continues to expand, and it must gradually extend over part of the new forested areas, the lumber companies will always find amongst the settlers a good number of daring, resolute and strong men needed for their operations. At all events, it would be wise for them to imitate Swedish methods, i.e. by establishing at several points of their timber holdings, groups of farms to be leased to their men.

An other great advantage to this industry is the great facility for shipping the finished products, either to Europe or to any point of the Eastern American markets. Over [illegible]% of the cut of sawlogs is now shipped to Europe and half of the cut of pulpwood is now converted into pulp or paper in this province, the rest being exported to the United States. The St. Lawrence, below Montreal, permits, at almost every point, the loading directly into ocean steamers, many new wharves are being constructed to increase this advantage, and the harbours of Montreal, Quebec and Trois-Rivières, are being equipped to compete with any in the world.

With the rapid exhaustion of the timber supply of Europe and of the United States, the position of the Province of Quebec is unique; located close to these two excellent markets, it will always find a chance of selling profitably all its forests products, and this should be a sufficient reason for each lumberman to organize his business permanently. The pulp & paper companies have already begun to do so, but the other forest owners have not done much in this line. We hope that they will do their share as the government is endeavouring to do all what it can.

Little attention has yet been given to foreign markets. The Forest-Service has been studying this question for two years, and numerous enquiries received direct or through the channel of the Department of Trade and Commerce of Ottawa have been communicated immediately to forest companies; we know that some of them have been succesful in obtaining a contract in this manner. Even if they had not, this would be sufficient to show our people the immense possibilities that lie abroad, and the obligation to prepare ourselves to meet the demands of the world in this trade, especially now that the European lumber markets have undergone radical transformations since the war.

Forest Administration

From the beginning of Confederation until 1873, the supervision of the cutting of timber upon Crown lands was left entirely to the local agents under the direction of two superior officers. License-holders were bound then, as now, to send in detailed reports of their lumbering operations, but the Crown agent could only effectively check by his cullers the reported quantities of square timber; consequently, only of a portion of the timber then cut was been fully reported by the license-holders.

In 1873, a body of forest-rangers was established. The duties of these forest-rangers (numbering 28 at first, and 78 in 1889) who acted under the direction of special officers called superintendents, consisted in finding out offences made against the forest laws and regulations by limit holders or by settlers, and also in ascertaining the farming value of Crown lands most advantageously situated for settlement. The new system had a good effect as we find that, with the increased additions to the supervising staff, the amounts collected for penalties and for stumpage dues have increased accordingly.

In 1905, the Provincial Government sent two students to the Yale Forestry School who were charged afterwards with the organization of The Forest Service in 1910. A forestry school was established at Laval University where forest engineers are now trained for the supervision of lumbering operations and the management of the forests belonging to the state or to private individuals.

The Forest service of the Province of Quebec, as at present constituted, has charge of the exploration of the unsurveyed territory of the Province of Quebec, classification of soils, supervision of the lumbering operations on Crown lands, reforestation, and of any other technical work of the Department in connection with forests.

The present staff consists of:

The Chief of the Forest Service.
The Assistant Chief of the Forest Service.
32 Forest Engineers, acting as District Inspectors, Assistant Inspectors, etc.
78 Forest-rangers, expert scalers.
25 Student Assistants.
2 Accountants.

Reforestation

It is only recently that efforts have been made to reclaim our waste lands; the first experiment was done at Oka, in 1889, under the direction of Father Lefebvre, a Sulpician priest, who succeeded in reclaiming [illegible] acres of shifting sands. This plantation consisted mainly of white pine and spruce wildstock, but it has grown so well that many of the trees have now a diameter of 9 to 12 inches and a height of some 40 to 70 feet. These dimensions would be greater had a judicious thinning been made now and then. Several persons have tried the acclimatization of some important foreign trees, and we have to-day at Le Platon—the seigniorial residence of the Joly de Lotbinière family—a beautiful grove of black walnut, besides various plantations of other forest trees.

In 1908, a Provincial Nursery of forest trees was established at Berthierville, with the object of raising not only indigenous trees for the reforestation of waste lands and plantations in the forested areas, so as to increase their productivity; but foreign species were also considered and a systematic study is being conducted there of all the trees growing under this latitude. At present the nursery has a stock of four million plants, and already it has shipped more than [illegible] trees. At Lachute a tract of 500 acres of drifting sands has been reclaimed partly by planting and partly by the sowing of beach grass; near Berthier Junction the same work is in progress. Planting stock has been shipped to our various colleges with the idea of educating our coming generation on this important question. The demand for plants from private owners is now very large, the limit holders are also beginning to plant, and it is a pleasure to mention the good work done by the Laurentide Company in this connection.

We are led to believe that this movement will increase very much in magnitude, and it is the intention of the government to keep pace with the demand which it has created.

We must also mention that the students of the Quebec forest school go to Berthierville every Spring in order to assist in the shipping of the material and in all the work of seeding, transplanting, etc.

The projects of the Forest Service in this line are:—

1. The establishment of forest school nurseries and the creation of scholastic societies, to do the plantation, in each village, not only of forest trees but also of shade trees, such as is done in Europe.

2. The creation of communal forests or city forests; a few projects are already under consideration.

3. The plantation of roadways, in co-operation with the Department of Public Roads.

4. The plantation of all the waste lands, which cover over three million acres in the Province. The Government has already led the movement by purchasing a tract at Lachute, but, we expect the private owners to do their share, and will furnish them the material at a very moderate price.

5. The plantation of timber limits, in order to reforest the burned areas to increase the wealth of green tracts and the introduction of better species. We estimate that there are at least 3,000,000 acres that now require such treatment. All these projects are under study; we expect to come soon to an agreement with the limit-holders as to the conditions under which this work should be done.

6. The introduction of foreign stock. (We have introduced European Larch, Norway Spruce and Scotch Pine, owing to the great facilities for obtaining good and fresh seed, and the good growth made by these trees.) But we prefer to limit the use of the foreign trees for the creation of parks and arboretums until they show they are thoroughly acclimated. Some fifty foreign species are under observation at Berthierville, such as Bull Pine (Pinus Ponderosa), Common Alder (Alnus communis), Austrian Pine (Pinus austriaca), Black Walnut (Juglans Nigra), European Walnut (Juglans Regia), etc.

Encouragement to the Forestry Movement

The Province was the first to take a decided interest in forestry questions. The first forest congress in America was held in Montreal in 1889, and ever since the creation of the Canadian Forestry Association, the Quebec people have always welcomed its meetings, following them in great numbers, and still form a very large part of its members. We must recall here the good work done by the late Mgr. Laflamme of Laval University, by the late Sir Henri and Sir Edmond Joly de Lotbinière, and also by the Venerable Mr. Little, who devoted themselves to the advancement of this great question. For a time, the Provincial Government had left to the initiative of these good citizens the bringing the attention of public on this question; but, in 1905, Sir Lomer Gouin, in publishing his programme, as Prime Minister, announced his intention to establish soon a forest school, and two young men were sent to the Yale Forest School, to study forestry. After their graduation, they were given leave to visit the European forests and study to what extent their methods could be adapted to our conditions. This led to the organization of the Forest Service, which took place in 1909, followed next year by the opening of the Forest School, just a few months before the death of Mgr. Laflamme, who had lived just long enough to see the realization of the doctrine that he had not preached in vain.

As mentioned elsewhere, a Forest Nursery was established at Berthierville, and a definite policy adopted for the reclamation and plantation of the shifting sands and waste lands in the Province.

Further to enlighten the public, lectures are given throughout the province by some of the members of the Forest Service, and a few publications are edited in the same spirit. Owing to the great task ahead this part of the programme has been somewhat neglected, but, with the increase of the technical staff, we expect to issue numerous publications, and start a vigorous campaign to educate the farmer upon the management of his woodlot and the necessity of planting his poorest lands.

Exhibits are also prepared for the various fairs or exhibitions, and collections of the woods of the various Canadian timber trees are furnished to educational institutions.

An intimate connection is maintained with the Canadian Forestry Association and it is even proposed to start a Provincial Quebec branch, to achieve more complete results.

The Administration of the Crown Lands

We deem it necessary to give now some details of the system followed for the extension of colonization in our Province as there are yet many misunderstandings on this subject.

The first settlements were established along the shores of the St. Lawrence, and the King of France granted to his military officers large tracts of lands, known as seignieuries. The seignieurial system was continued until 1793, when it was replaced by the present system of townships and lots, by which the settler can purchase a lot without the incumbrance attached to the former deed of sales. (See the study of Mtre Bouffard, advocate, in Quebec. Yearbook for 1915, pp. 255-270). At the suggestion of Governor Carleton, a return was temporarily made to the seignieurial system, but only eight seignieuries were granted by the English King, as the public insisted and obtained the re-establishment of the township, which has ever since given full satisfaction, notwithstanding the errors made. At the present time we proceed as follows: a systematic reconnaissance is made of all the unsurveyed lands adjoining the settlements by officers of the Forest Service, and, according to the reports of these experts, the township is classified into agricultural and uncultivable or forest land.

Following the spirit of the programme outlined in the Royal instructions to Governor Murray, in 1763, a village site is reserved, in each township, and whenever possible the location of the church is also made in advance, so as to give its natural nucleus to the new establishment, to the new parish. Lots are sold in progression, in order to avoid the scattering of the settlers and to lessen the expenses of roadmaking, etc.

The lots sold to settlers are inspected regularly so as to prevent speculators from transgressing the law. For each quantity of timber sold, the settler must furnish a declaration which is verified by the forest ranger; if the cutting is found illegal, a "fine" is imposed, which is sometimes followed by the cancellation of the location ticket. This control has given excellent results; seeing that they cannot elude the law, the settlers are less tempted to dispose foolishly of their lot and they work their property correspondingly. They also acquire the habit of residing on their property, and we find every year that our rural population increases, that a large area is cleared on fairly good soils, which is profitable both for the homeseeker and for the province. In fact new parishes are opened up while the old settlements are gradually filling up all the territory assigned to them.

In a semi-mountainous country like Quebec, which has suffered so much from the effect of glaciation, the percentage of good farmlands is naturally small and we do not think it exceeds 15% of the area of Old Quebec. It is much higher on the central plain of the St. Lawrence, but in the Laurentian and in the Appalachian mountains, where the colonization movement now extends, the percentage is naturally smaller; therefore it is always necessary to make a thorough classification of the township, in order to avoid the selling of poor lands. The best example of what the Government does in this regard is in the Abitibi region, which forms part of the famous Clay Belt of Ontario and Quebec; a few years ago there was only the virgin forest in this Northern and cold plateau, which lies at an altitude of nearly 1,000 feet, but to-day we see that 4200 farm lots have been sold, and a population of about 10,000 inhabitants has established itself to begin the clearing and cultivation of these good lands. On some lots, from 30 to 60 acres have been completely cleared and sown; crops are already obtained and the Abitibi will soon become the granary of our Province.

This example shows vividly that, where the soil is good, the Government will do everything possible to encourage and stimulate colonization, but, where the soil is poor, it is the policy of the administration to protect the settler against himself, as his efforts would be spent unprofitably and the land after it is cleared would be worth much less than before.

The control of the Government tends to restrain the settler from wasting his energies on poor lands, to prevent him from cutting his trees too soon, to make him burn his clearings without causing any damage to his own wood lot and naturally to the adjoining properties; in a word, to do good and real settlement by clearing each year enough land, so that he will soon be able to live on his own lot. When he has established his good faith by fulfilling his obligations, according to the spirit of the law, he obtains his letters patent, which give him an indisputable title to his homestead.

We must add that the Government spends annually about $150,000.00 to survey into lots as much land as, if not more than was sold to settlers in the year previous, so there always remain available to settlers different areas representing altogether 2,000,000 acres, and these areas are distributed in several counties so that we may safely say that the settler who wishes to remain within sight of his village spire and also the most daring settler who wishes to try his fortune elsewhere. Explorations and reconnaissances are conducted every summer to complete our knowledge of our natural resources of our virgin lands.

The Forest Future of Quebec

The reforms made during the last decade and the rigid control of the operations of settlers and limit holders have modified completely the aspect of the problem. Where in the past the lumberman and the settler were antagonistic, harmony now exists. The members of the Forest Service who were then accused of being only the agents of the lumbermen are now respected and well considered by everyone, thanks to the employment of professional men of the forest engineers. The lumbering operations are controlled more closely, not only upon the settlers' lots, but also upon the timber limits. Our system of fire protection gives us the hope that within a few more years we shall have the situation well in hand, as our people are becoming more careful and all those interested take more pains to prevent accidents.

We must also admit that with a larger technical personnel, as we have now, we can turn our attention to other problems, which we have hitherto been obliged to neglect.

We must frankly admit that the old-time methods of lumbering were not conducted according to the principles of sylviculture, but it is still the best system that could be devised under our forest conditions and, in many cases no one could have done better. It must not be forgotten, that if we were to apply faithfully the European methods of exploiting forests, lumbering would cost so much that it would discourage and possibly ruin almost anyone taking the work in hand. The danger of fire, the lack of railway facilities, the absence of market for each class of products, compel us to adopt more elastic methods, as the expenditures in lumbering must be made in direct proportion to the benefit of the enterprise. The additional value of the timber limit after its lumbering should limit the extra cost of lumbering involved by the introduction of the forestry methods.

As stated before, the actual consumption of timber upon the forests under license is practically one billion feet board measure, which gives an average cut for these 45 million acres of about 20 superficial feet. This is very small, and certainly below the annual growth. In fact, it is admitted that the annual growth of trees in volume will vary from 50 to 600 feet per acre and sometimes more according to the conditions of the locality: therefore we feel pretty sure in stating that we can largely increase our operations if we take the necessary means of handling our forests according to scientific principles. In fact, if the forests under license were handled properly, they could produce ten times as much wood as they do now and this without the least danger of exhausting them, each operation leaving them in a better producing state. Let us not forget that there are in addition some 75,000,000 acres of virgin forest lands, containing on an average at least 3 cords per acre, or 225,000,000 cords of pulpwood, which we consider as a reserve for future developments.

One of the present drawbacks is that the lumbering operations are concentrated over too small areas; in order to reduce the cost of logging, the limit-holders have a tendency to cut too much material per acre, leaving behind only a small forest capital to reduced the future stand. As the average rate of annual growth in volume is about 2% we could afford to come back every 40 years to the same place by removing only half of the actual stand, but if more than that is taken out, it means that the tract cannot be lumbered before a longer period. The larger you leave the trees or the more timber you leave behind, the sooner you are in position to log again at the same place. We fully agree with Mr. Chahoon (See Montreal Gazette commercial and financial review for 1919, p. 42) when he says that hereafter we shall have to regulate the volume of the cut, reducing it where it is needed; this will mean an increase in logging expenses, but our lumbermen and papermen are certainly in a position to stand this additional expenditure, they will certainly willingly make this little sacrifice, knowing that their woodlands, instead of losing value are becoming richer and that the propects are they will be able in the near future to cut much more timber than before. Of course, the limit holders will have to seek elsewhere the quantities of timber they cannot find now on their limits, but they are still immense areas under license that are not operated, and which should be lumbered before the timber dies of over maturity or disease, such as it is the case with balsam fir. They could also buy part of the 900,000 cords of pulpwood offered for sale every year by the private forest owners. Is it not a pity to see each year so much timber leaving this Province to feed the foreign mills whereas it could be used here with profit, and would lessen by so much the drain upon our forests? I cannot understand the indifference of some of our paper companies in this regard; it would prolong the life of their woodlands if they entered into competition for this wood, which they are in position to buy at a higher price than their competitors. A few years ago I tried in vain to interest some papermen in the pulpwood of the Abitibi district; but they would not consider my proposal on account of the freight, yet the same pulpwood from Abitibi is shipped every year to numerous points of the United States......at distances twice as great as that to their mills. In concluding, the measures to be adopted for the welfare of our forest are the following:

1. An inventory of all the forest lands; we ignore all of the North Shore forests, the Ungava is still an unknown factor. There are in these Northern lands immense tracts of forests that could supply numerous large paper plants. We should know of them as soon as possible. These explorations will require many years, but with modern conveniences, with the use of airplanes, the work can be shortened very considerably.

2. The next point is to devote much attention to the classification of lands. The agricultural soils should be mapped and organized for the establishment of settlers under the best conditions. The experiment of the Abitibi is a direct proof that it is yet possible to colonize with success in our Province, and the same methods should be repeated wherever there is a group of suitable lands that can form several parishes. The separation of forest lands from cultivable tracts is progressing rapidly, but the work could be yet accelerated for the greater good of the settler and the lumbermen.

3. Technical studies of the growth of our forest trees, of their reproduction, of the best methods of handling our woodlands should be continued, so as to enable us to organize solidly the management of our forests, in order to insure their perpetuity, and to increase their possible annual yield.

4. Economical methods have already been introduced in lumbering, but there is still a great amount of waste in the woods and in the driving of logs owing to the great distance between the mills and the forest. New method of transportation may have to be devised to avoid this loss, and particularly to allow the removal of the hardwood which, in many cutover sections, is crowding out the resinous trees that have been left. I do not doubt that the birch and the maple will be utilized before long for making pulp, their value for lumber is now very high, therefore it will not take long before it may pay to operate railways to lumber such tracts: but this will depend upon the demand and the selling price of lumber and of paper, and also upon the volume of the stand per acre.

5. The protective systems and organizations elaborated recently should be rapidly extended all over the province, so as to safeguard the remaining forests against fires. If we can protect the actual reproduction against fires, we need not be afraid of the future, because our forests trees will seed over the cutover lands and the brulés, and a new forest will soon spring up. We have, (and this is often forgotten by many), extensive areas of young forests, forming the reserves of the future; these must be protected as well as the large trees so as to insure perpetuity in our forests.

6. Now that our forests are becoming effectively protected against fire, we can devote our attention to reforestation, but it will be necessary to do this work in a business way. First, all the available waste lands belonging to private owners should be planted so as to furnish the necessary supply to our villages, to our markets, and to bring these lands into a revenue producing state. The government will certainly encourage this enterprise; we have established a nursery at Berthierville for this very purpose, and we have already made several demonstrations of the feasibility of this work, notably at Lachute and Berthier Junction. The reforestation of the timber limits is also included in our programme. The government owning the land, not the limitholder, is the first interested in this work. We shall do this work

where we are confident that there is no immediate danger of fire, and where we can protect the plantation against this enemy. The government has no intention of saddling the cost of this work upon the lumbermen, but, in cases where the lumberman is directly responsible for the deterioration of the forest, either through neglect or through wasteful lumbering, he should be compelled to repair the damages he has caused by planting. Plans are under procedure to set millions of trees yearly, and we may before long be planting each year twice as many trees as there will be cut in the province.

We should have the greatest faith in the future of our forests, as we have the material to work with, as we have a progressive class of lumbermen, perhaps better than anywhere else on the continent, on account of the fact that the population wishes to see this province advance and show the lead to the others. We shall soon have the largest paper mills of the world as we have extensive resources in our forests and in our water powers; the location of Quebec is such that we can bid for the markets of the world with all our competitors. We shall achieve all this by working together, by making the necessary expenditure and by supporting the measures of the government which has done so much already, and which is interested in encouraging the steady development of our province.

Appendix

Note.—No. 1.—Statistical year book of Quebec, 1915, p. 131.

Note.—No. 2.—Vol. V, pp. 9 & 95 of Dominion of Canada Census for 1911.

Note.—No. 3.—The following complete inventory, of 45 acres of a private forest made by the students of the Forestry School in the vicinity of the city of Quebec, is an instance of this variety of species:

190 white pine trees containing		41,864	F.B.M.	(1)
47 red pine	"	"	6,740	"
[illegible] spruce	"	"	54,161	"
967 hemlock	"	"	40,547	"
100 cedar	"	"	1,967	"
2001 balsam fir	"	"	57,084	"
470 red oak	"	"	16,068	"
41 yellow birch	"	"	1,065	"
195 ash	"	"	6,360	"
[illegible] elm	"	"	[illegible]	"
[illegible] butternut	"	"	1,549	"
1358 sugar, soft and silver maple	"	"	70,120	"
[illegible] American beech	"	"	3,100	"
620 white birch	"	"	7,000	"
30 iron wood	"	"	[illegible]	"
45 cottonwood	"	"	1,290	"
Total			341,675	"

Or about 7,000 f.b.m. per acre. It should, however, be observed that this stand is much richer than is usually found in most of the other private forests. This tract has, in fact, been properly managed while, in the others, there are no rules regarding cutting, beyond the necessary requirements of the owner or the spasmodic needs of the market.

No. 4.—(1) The purchaser must pay cash one-fifth of the purchase price and the balance in four equal annual instalments with interest from the date of sale at six per cent, but at least one instalment must be paid every year.

(2) The purchaser shall, within eighteen months from the date of the sale, build a habitable house of the dimensions of at least sixteen by twenty feet and shall occupy and reside in it continuously from that moment until the issue of the letters patent.

(3) Within five years, he shall clear and have under good cultivation (with a view to having a profitable crop), an area thereof equal to at least fifteen acres in a single block, but he must every year clear at least three acres; at the expiration of the five years, he must have on the lot a barn of the dimensions of at least 20 x 26 feet and a stable of at least 15 x 20 feet; both of these, however, may be in one and the same building. Three acres at least of the portion under cultivation must be fit for ploughing.

(4) He shall every year cultivate the land so cleared by him as aforesaid.

(5) No timber shall be cut before the issuing of the letters patent except for clearing, fuel, buildings and fences, and all timber cut contrary to this condition shall be considered as having been cut without permission on public lands.

(5a) All timber that a settler is allowed to cut on his lot of land before the issue of the letters patent and which he intends to dispose of for commercial purposes must be manufactured in Canada, and all the provisions of article 13 of the Timber Regulations now in force apply thereto.

(6) No transfer of the purchaser's rights shall be made during five years from the date of the sale except by gift inter-vivos or by will in direct line, ascending and descending, or by intestate succession, and, in such case, the donee or heir shall be subject to the same prohibition as the original owner.

(7) Letters patent shall not be issued, in any case, before the expiration of five years from the date of the sale nor before the fulfilment of all the conditions thereof.

(8) The purchaser binds himself to pay the value of the useful improvements existing on the land and belonging to others than himself or to the Crown.

Note. No. 5. Here is a table giving the classification in 1913 of timber limits in the Province of Quebec, according to their extent.

Classification of Limits According to Area in 1913

Area of limits	Number of license-holders	Total area in sq. miles	Average area per holder in sq. miles
0 to 50 square miles......	94	1,790	19
51 to 100 " "	33	2,265	68
101 to 500 " "	73	19,798	271
501 to 1000 " "	13	9,853	758
over 1000 " "	18	35,102	1,950
Totals.................	231	68,808	298

Note. No. 6.

Stumpage Tariff

All wood cut in virtue of a license during the lumbering seasons 1918-1919 to 1922-23, both inclusive, and 1923-24 to 1927-1928, both inclusive, is subject to the following charge:

		Years 1918-19 to 1922-1923	1923-1924 to 1927-28
1.—	Square, waney or flat timber, per cubic foot:		
a)	White pine, oak, hickory and walnut....................	0.08	0.10
b)	Red pine, elm, ash, cedar, basswood, birch, maple, tamarac.	0.08	0.08
c)	Spruce, balsam. grey pine or banksian pine, hemlock, white birch, aspen, poplar.........	0.04	0.06
II.	Saw logs and boom and dimension timber in the raw state, per thousand feet board measure		
a)	White pine, oak, hickory, walnut	2.60	3.00
b)	Red pine, elm, ash, basswood, birch maple, tamarac........	2.00	2.00
c)	Spruce, balsam, grey pine banksian, pine, hemlock, white aspen poplar................	1.60	1.80
d)	Cedar.......................	1.40	1.40
III.	Poles more than 18 feet in length, not exceeding 10 inches in diameter at the small end, each:		
a)	30 feet and less in length.......	0.25	0.40
b)	31 to 40 feet in length........	0.50	0.75
c)	41 to 50 feet in length.........	1.00	1.50
d)	51 feet and over in length......	2.00	3.00
IV.	Railway ties or sleepers not exceeding 9 feet in length, each.......................	0.10	0.10
V.	All other wood goods, ad valorem....................	15%	15%

Note.—No. 7

1. No one is allowed in the township reserves without a written permit from the warden;

2. Permits to cut timber may be given to any householder within a radius of twenty miles for a certain quantity of timber not to exceed 10,000 feet board measure, or 20 cords of fire wood or 300 ties.

3. The permits are subject to existing regulations of the Department, consistent with the present ones.

4. Permits must be applied for by registered letter, addressed to the warden of the reserve, between the 1st September and 1st December.

5. The permit-holder must cut only the trees marked or indicated to him by the forest agent. He must, within a delay of two years, remove all the timber mentioned in the permit; after such delay, the Minister of Lands & Forests may dispose of all the timber not removed. All the timber cut must be piled so as to be measured, in the forest, by the forest guardian whose measurement is binding. One half of the stumpage dues payable for the timber requested must be paid cash when the permit is issued, and the balance before the timber is removed. Stumpage dues will also be levied on all timber wasted such as stumps over 18 inches high, tops larger than 5 inches in diameter at the thicker end, skids not carted away, trees marked that have not been logged, etc. All remnants of the cutting must be lopped so that the branches and other debris may lay flat on the ground.

6. All timber cut contrary to these regulations will be considered as cut illegally and dealt with accordingly; the permit may be cancelled for any infraction of the regulations.

7. The permit cannot be transferred.

Recent Progress in Wireless Telegraphy

By [illegible], M.I.R.E., Assoc. A.I.E.E.
Chief Engineer, Marconi Wireless Telegraph Co. of Canada Ltd.

Historical

1867—James Clerk Maxwell read a paper before the Royal Society in which he laid down the theory of Electro-magnetism, which he developed more fully in 1873 in his great treatise on electricity and magnetism. He predicted the existence of the electric waves now used in wireless telegraphy.

1879—David E. Hughes discovered the phenomena on which depends the action of what was subsequently known as the coherer, which many years later were used in early electric wave signalling.

1883—Heinrich Rudolph Hertz at Kiel, commenced his studies of Maxwell's electromagnetic theory.

1885—Thomas A. Edison with assistants worked out a system of communication between stations and moving trains, by means of induction and without the use of conducting wires.

1886—A. E. Dolbear of Tufts College, Boston, patented a plan for establishing wireless communication by means of two insulated elevated plates, but there is no evidence that the method proposed by him, did, or could, effect the transmission of signals between stations separated any distance.

1887—Heinrich Rudolph Hertz discovered the progressive propagation of electro-magnetic action through space, and was able to measure the length and velocity of electro-magnetic waves, and to show that in the transverse nature of their vibration, and their susceptibility to refraction and polarisation, they are in complete accordance with the waves of light and heat. Hertz used as a detector of the electric waves, a simple nearly closed circuit of wire, called the "Hertz Resonator" but it was subsequently discovered that the metallic microphone of Hughes was a far more sensitive detector.

1892—Edward Branly devised an appliance for detecting electro-magnetic waves, known as a "coherer." He discovered that these waves had the power of affecting the electric conductivity of materials when in the state of a powder.

1895—G. Marconi's investigations led him to the conclusion that Hertzian waves could be used for telegraphing without wires and he made important experiments at his father's home in Italy.

1896—Mr. Marconi came to England in February and on June 2nd, lodged his application for the first British patent for wireless telegraphy No. 12039, of 1896.

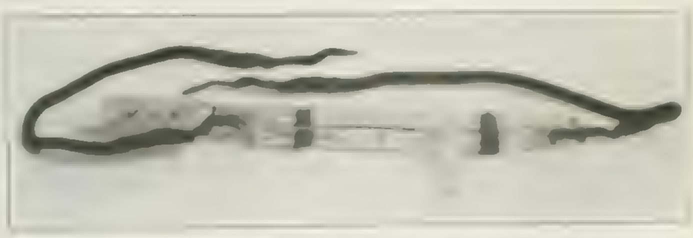
Progress was extremely rapid from 1896 on, as while the apparatus first demonstrated had a range of a few thousand yards, the range was increased to over 2000 miles four years later.

The value of wireless telegraphy was immediately apparent, and was installed on ships of the Royal Navy and Mercantile Marine at an early date. It was successfully used in the South African War in 1900 by both the army and navy. Marconi met with a great deal of opposition in the early days, and several eminent scientists scoffed at the invention, but he continued quietly with his work, receiving very valuable support from Sir William H. Preece, chief electrical engineer of the Post Office, who on December 11th, 1896, lectured on telegraphy without wires, Mr. Marconi conducting the experiments.

In 1900 Marconi was granted the famous "Four sevens" patent which covers the resonant tuning of the primary circuit to the secondary circuit of the transmitter and receiver. This invention, at once made possible the efficient use of high power for long distance working, and was followed in 1905, with his patent for the horizontal directional aerial, marking a further step of great importance in the progress of long distance work.

In 1907 the Transatlantic stations between Glace Bay, Nova Scotia, and Clifden, Ireland were opened for public service. It may be said here, that infringements of Marconi's patents were made as rapidly as they were granted, but in all cases were upheld in the courts and defendants restrained in all instances.

The Germans were rank offenders in this way, the late Professor Slaby who was present, as he said in the interests of science, during experiments conducted by Mr Marconi in May 1897, returned to Germany and lectured on wireless telegraphy, before the German Emperor and Empress at Potsdam in August 1897, and later was instrumental in the formation of the Slaby Arco Co., latterly Telefunken Wireless Co. The German had a very lively appreciation of the value of wireless, and their colonial possessions were all linked up with the headquarters in Berlin.



Marconi Coherer—Early Form of Oscillation Detector.
[illegible]

Read before Montreal Branch, Nov. 13, 1919.

Systems

There are several methods in use to-day for generating electrical oscillations, all of which may be said to have radiated from the original basic patent granted Marconi in 1896. These may be classified as follows:

(*a*) Spark,
(*b*) Poulsen Arc,
(*c*) Dynamic (Alternator),
(*d*) Valve (Thermionic).

Spark System

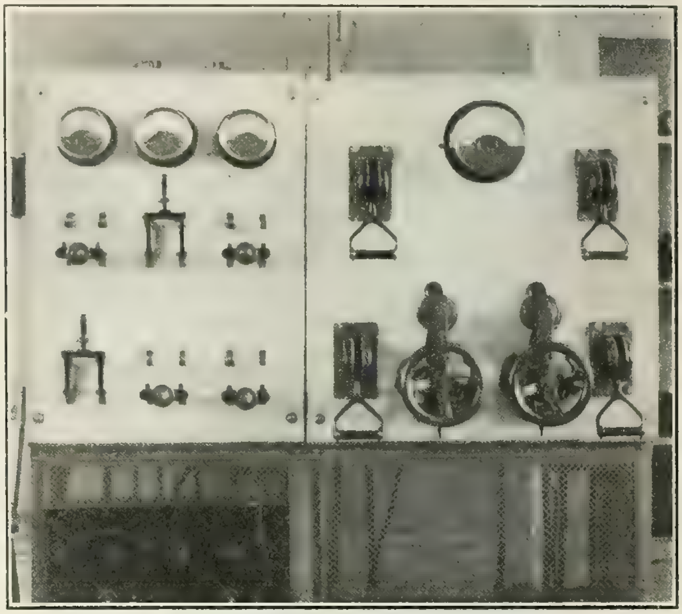
The Marconi spark system is that in general use throughout the world. It depends on the charging, or more usually discharging of a condenser, through an inductance coil. A condenser and inductance coil with a discharge gap forms the high frequency primary circuit of the oscillation transformer. This circuit is connected with a current source, which is in turn controlled by means of a signalling key. The high frequency primary circuit is coupled to the secondary circuit, consisting of an inductance coil and the aerial wires. One end of this circuit is usually grounded. The primary and secondary circuit of the oscillation transformer, are so arranged, that the natural electrical period of each is made equal. When this condition obtains, the two circuits are in resonance, or tune, with each other, at which adjustment the maximum amount of energy is radiated. When the signalling key is depressed the condenser is charged to a pre-arranged valve, which is controlled by the setting of the discharge gap. When this point is reached, the gap discharges the condenser, and oscillatory currents are set up in the inductance, which are in turn induced into the aerial system, and radiated as electro-magnetic waves. The electrical oscillations thus produced, are said to be "damped" for the reason that the train of waves dies down in amplitude due to radiation from, and the resistance of the circuit. An analogy to this is the action of the pendulum being gradually brought to rest, by the damping, due to friction etc. The discharge gap, in general use takes the form of a toothed wheel rotated by a small motor or directly on the alternator shaft. Two electrodes are arranged to coincide with particular teeth on the wheel which results in a musical note being produced in the signals which can be easily read through static interference.

Undamped electric oscillations, or continuous wave, by spark discharge can be produced, and is the method in use at the Marconi Station, Carnarvon Wales, where two transmitters of 300 K.W. each are in operation.

The generation of undamped waves by the spark method is effected by using several of these rotary dischargers in as many oscillating circuits. The dischargers are mounted on the same shaft, insulated from each other, and fixed so that the condensers discharge and recharge in succession, and so that at a given velocity the interval between the beginning of the discharge of one condenser, is equal to the period of oscillation of the aerial or intermediate circuit, or perhaps an exact multiple of the period of oscillation. The resultant of the damped oscillations thus produced, in rotation, gives rise to continuous undamped oscillations.

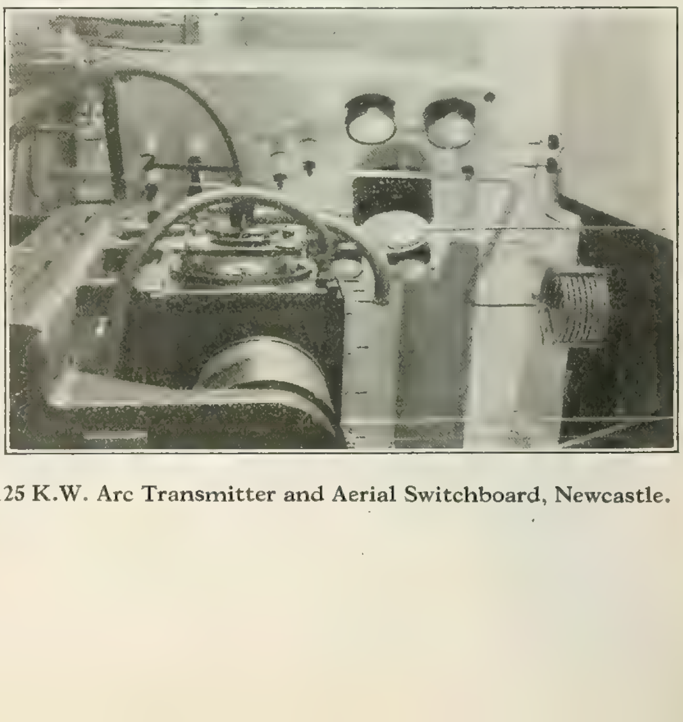
Arc System

The Arc transmitter generates oscillations practically undamped. It was discovered by the late William Duddell that if capacity and inductance was shunted across an arc, electric oscillations were generated, giving a musical note. The action is briefly as follows:

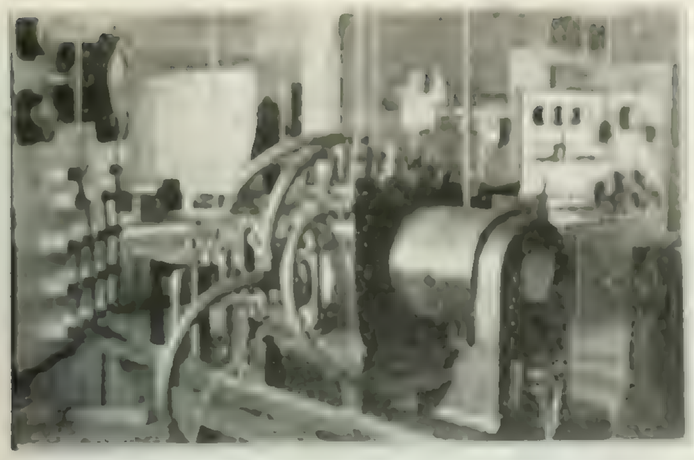


Arc Transmitter Control Switchboard.

Suppose the condenser inductance circuit applied suddenly as shunt to an arc supplied with constant current. The condenser begins to charge, robs the arc of current, the arc voltage therefore rises, and the condenser charges still further. A limit to the voltage is reached when the condenser current stops increasing, for then the steady current through the arc starts increasing, the voltage falls, the current begins to discharge more or less in the time of oscillation determined by the inductance



125 K.W. Arc Transmitter and Aerial Switchboard, Newcastle.



120 K.W. Arc Transmitter, Newcastle

and capacity. The condenser discharge now adds to the steady current through the arc, makes the arc terminal voltage lower than the normal and encourages the motion of the electricity, which goes on till the condenser is fully charged in sign opposite to the last occasion. This action plainly goes indefinitely. It is impossible in the time at my disposal to go into the construction of the arc, but I may say that its operation is extremely simple. At our Newcastle Station, we have two 120 K.W. arcs which are supplied with direct current at from 600-1100 volts. The aerial is connected to one side of the arc, and the ground system to the other. The arc is started on low voltage by striking the electrodes together, separating them and raising the voltage until the maximum current is indicated by the aerial ammeter.

Signalling is effected by short circuiting part of the aerial tuning inductance, usually part of a turn. Tuning is very sharp as the making wave and spacing wave have a difference of 100 metres only. This means that with the signalling key open, the wavelength being radiated is 100 metres longer than the signalling wave with the key closed.

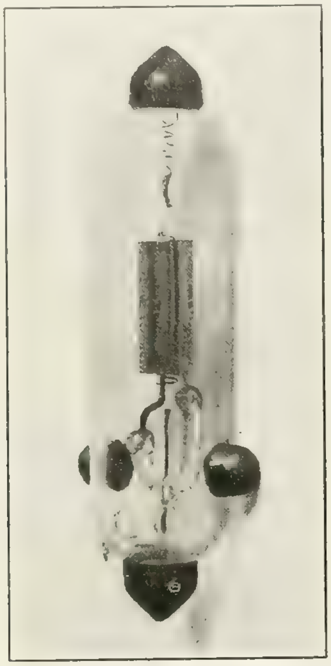
Dynamic Method

This system makes use of a high frequency alternator. Several of these machines have been built. The most successful recently for high power, are those of Alexanderson and Latour. Machines have been built and are in operation, up to 200 K.W. in size. The frequency of these machines is of the order of 20,000 cycles per second corresponding to a wavelength of 15,000 metres. The oscillations are continuous, thus giving undamped waves of constant amplitude. The high frequency machines are connected to the aerial system through an oscillation transformer, and signalling in the case of the Alexanderson Machine is effected by means of a magnetic amplifier, controlling many hundreds of amperes in the aerial circuit, by a comparatively weak current of a few amperes. The Latour alternator is similar in design to the Alexanderson Machine, and signalling is effected by short circuiting the alternator.

Marconi Two Electrode Valve used as [illegible]

Thermionic Vacuum Valve Method

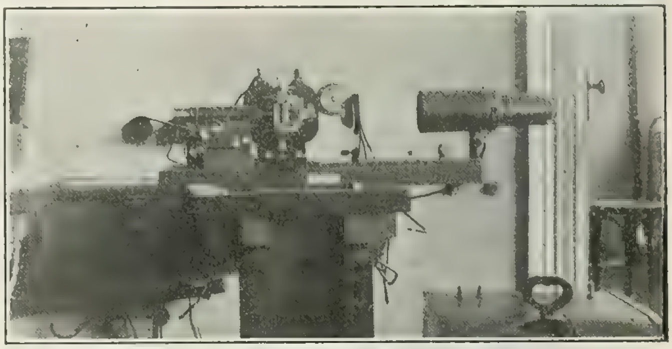
The Thermionic Valve was invented by J. A. Fleming. It consists of a small filament lamp with an additional electrode connected to a metal plate or cylinder, near, or surrounding the filament. When the filament is heated, an E.M.F. applied between the metal plate and either terminal of the filament produces in general, a much larger current from plate to filament through the rarefied gas in the bulb, than in the opposite direction. This phenomenon was noted by Edison many years ago, and was referred to as the Edison effect. It can be seen in an ordinary carbon lamp which has been in service for a considerable time, by the blackening of the inside of the bulb, which is due to electronic emission from the filament. Since the electronic discharge is unidirectional, the thermionic valve is well adapted for use as a rectifier of oscillating currents, and in its original form was used extensively by the Marconi Co. as a detector. An improvement of great value was made by DeForest by the addition of another electrode in the form of a grid, or perforated plate, fixed between the filament and the plate. The result of this improvement was to make the valve an amplifier, as well as a detector. It also functions as a generator of sustained oscillations particularly well adapted for the wireless transmission of speech. I have covered the four methods of generating electrical oscillation in a very brief manner, and may say that the last two, viz. the High Frequency Alternator and the Thermionic Vacuum Valve are the two systems which are to-day being investigated very fully by radio men generally. The High Frequency Alternator is particularly well adapted for long distance wireless telegraph and telephone transmission, and will be followed by the Thermionic Valve Transmitter very soon. The valve receiver has been brought to a high stage of development and efficiency, which may be gathered from the fact that signals from Carnarvon, in Wales, are regularly copied at Sydney, Australia, a distance of 12,000 miles. The receiver uses three valves and the signals are picked up on an aerial 100 feet in length, erected only a few feet above the ground. Wireless sets for aeroplanes are available which permit of telephonic speech or telegraphy at will between plane and plane ground. These sets will be part of the regular equipment of aeroplanes and complete equipment and organization for aeroplane routes is now available. Thermionic Valve Transmitters with a range of 1,000 miles, are also available, and equipment up to 25 K.W. will be ready shortly. Wireless telephones will occupy a field of their own, a particular application being for communication between ships, and possibly rural communities.



Marconi Three Electrode Valve, latest form of Oscillator Detector. (Full size).

Direction Finding

During the War, Direction Finding by Wireless was used extensively, and was directly responsible for many Zeppelin raids being made abortive. A large number of D.F. Stations were erected for the Admiralty by the Marconi Co. in the United Kingdom and Ireland. A constant watch was maintained at these stations, and an enemy submarine sending signals to Headquarters could be accurately located and information given to the destroyer patrol which effected uniformly successful results by depth bombs, etc. Zeppelins depended on land control stations to advise them of their position when on raiding flights, and the D.F. Stations were directly responsible for their defeat by advising the Royal Air Force of their location. Three of these stations were erected in Canada, at Canso, Chebucto Head and Cape Race. These are now used as aids to navigation, and are particularly valuable to ships during fog, the captain being given his position in the majority of cases with absolute accuracy. D.F. equipment for transatlantic flying will enable a true course to be steered day or night, or through fog.



Photographic Recorder at Newcastle.

Static Elimination

The greatest enemy of Wireless is "Static" and its elimination has been the goal sought for by many. Until recently it was impossible, at certain times, to work at all, while certain forms of static obtained. R. A. Weagant, Chief Engineer, of the American Marconi Co. who has been working on the matter for a considerable time, discovered that the most troublesome form of static referred to by those versed in the art as "Grinders" had a vertical component, and it was immediately apparent to him that with a proper arrangement of aerials, these could be cancelled out, which has been accomplished. It has also been discovered that "Static" with a horizontal component has a directional effect with regard to a particular receiving zone. This prevailing direction can be located by means of a loop aerial and the maximum noted, which will be when the plane of the loop is in the plane of direction. The minimum effect will be at right

Wireless Receiving Room, Newcastle.

angles, hence the aerials can be arranged to cancel out such static. Working along somewhat similar lines, we have erected an aerial system at our Transatlantic Receiving Station at Louisburg, N.S. The system in addition to controlling static interference, also eliminates interference from other transmitting stations, both on this Continent and in Europe. The old receiving aerial at this station consisted of a single wire about a half mile in length, supported on six steel masts, 200 feet high, which is now dispensed with. The system now installed permits of Duplex Working, which means simultaneous transmission and reception on both sides of the Atlantic.

High Speed Transmission

Modern conditions make it imperative that traffic be handled rapidly. The average speed of good hand sending is 20 words per minute, which is too slow, and automatic sending is resorted to. This is accomplished over our Transatlantic Circuit as follows: Traffic is punched on tape by means of perforators. The tape is then passed through a Wheatstone Transmitter over connecting lines to the transmitting station, 25 miles away, where it operates the relay and signalling switches. The signals are sent at a rate up to 150 words per minute. These signals are received at Clifden, in Ireland, are amplified by means of Thermionic Valves, and recorded on dictaphones. As the wax cylinders are filled they are removed to a transcribing machine and the signals copied on message blanks by ear. Even this method is found too slow, and special apparatus is now under development which will permit of speeds up to 200 words per minute, but instead of recording on dictaphones, the signals will be translated direct from the wireless circuit to the landline circuit, and from there, taken off on a printing telegraph.

Industrial Relations

By J. S. Cameron, A.M.E.I.C.,

Assistant General Superintendent, Northern Electric Co. Limited, Montreal.

"Industrial Relations" is the term used to describe the relations which exist between employer and employee, other than those directly concerned in carrying out the routine of issuing and fulfilling instructions for productive work.

This is a modern definition, concerning all the human relations which are becoming more and more complex with the growth of industry, and which require special features of organization for handling them.

All of our large industries have grown up from small beginnings, and the success of the business represented by the growth, generally reflects back to the personal supervision of the owner. In most cases the owner dealt directly with each employee and gained a personal knowledge of his problems. On the other hand, the employee could often grasp problems which confronted the business, the solution of which spelled success for himself as well as for his employer.

With the growth of business, however, it becomes increasingly more difficult for the employer to maintain his direct personal contact with his employees. The business situation to-day is such that the men who direct large establishments cannot grow up with the business, and the successful business man will see that his organization, as it expands, is planned so as to maintain the good working relations which he himself created when the business was small.

We therefore find that in large organizations the problems of industrial relations are under the supervision of a distinct branch or department, and it is therefore interesting to trace the growth of an organization to see why this is necessary.

Read before Montreal Branch, March 4, 192[illegible].

The small factory has an internal economy evolved from very small beginnings, and as it grows it is likely to become more thoroughly efficient in some details than in others. It is necessary in building up an executive staff, to delegate certain functions to each of the various officials, the tendency being for the more progressive members to exercise general supervision and become overtaxed by voluntarily assuming new responsibilities when clearly seen. The factory manager has, in addition to the advancement of his product and the improvement of the labor hour efficiency, the task of adjusting the shop routine so as to avoid delay, friction between these officials, and thus maintain the output of his plant.

While the business is small, the manager depends largely on finding suitable men to act as his subordinates, each of whom must perform more than one function and must have some latitude of development, and who is often expected to, and does judge for himself, what he shall do and when he shall do it.

In laying out an organization it is essential that each subordinate should have specific duties within the scope of his ability, and that these duties should be clearly and readily defined. Two types of organizations are generally found — the first being to divide the shop into a number of departments, each of which performs all the operations necessary in the manufacture and assembly of a complete piece of apparatus, the foreman taking care of the hiring and dismissing of their help, setting the wage rates and piece work rates, and often acting as their own inspectors.

The factory organized on this basis will likely have a lack of uniformity in the quality of the product of the various departments, which is difficult to eliminate, and furthermore, a lack of uniformity in the supervision and wages of the employees and their working relations with the foremen.

The second type of organization is based on dividing the work into departments with reference to the class of operations performed. In the manufacturing end the work is divided into departments with reference to the class of mechanical operations performed. In other words, all the drilling is done by one department; all of the milling by a second; all of the woodwork by a third department and so on. In the office end, all of the clerical work is done by one branch, all of the purchasing by a second branch, all of the technical by a third branch and so on. It will therefore be seen that this is a functional type of organization. Each branch has its functions clearly defined, and by this means, dual or overlapping control of one or more departments is avoided. It is to be noted that while this type of organization is far more complex than the first type described, on the other hand it is a logical development to meet the requirements due to growth. It secures uniformity in results, since all of the work belonging to one class is always done by the same department. We therefore find a manufacturing organization divided somewhat along the following lines:

Clerical Branch,
Production Branch,
Manufacturing Branch,
Inspection Branch,
Service and Maintenance Branch,
Industrial Relations Branch.

The functions of the Industrial Relations Branch are:

1. Employment,
2. Training Employees,
3. Wage Systems,
4. Welfare.

Employment Department

The Employment Department is the medium through which the foreman of a department can get the help he requires. The applicant is examined as to his ability, habits, and fitness, and is advised of the rates of pay and conditions under which he is to be employed. Here, the applicant, if otherwise suitable for the position, may be given a physical examination by the Medical Department. This examination is a safeguard to the worker himself and those with whom he has to work. It eliminates undesirables and very often brings to the applicant's attention some physical defects which he can easily have corrected. It is a protection for the employer, where, under Compensation Laws, fraudulent means have been attempted to obtain damages. Lacking a physical examination, the employer has no proof to offer that the defect existed when the man was hired.

Regarding production, it is to the advantage of both that the employee be placed at work for which he is physically suited. The workman may, unknowingly, take jobs which he should really shun.

Candidates who are suffering from contagious diseases or who are manifestly unfit are rejected at once.

A combination of job analysis with medical examination opens the way to placing employees to better advantage, and makes it easier to transfer to other departments those whose health unfits them for the work they are doing.

Indigestion, headaches, neuralgia and other complaints resulting from defective teeth, are reduced in number, thereby reducing tardiness and absence.

Accidents, due to defective hearing and vision are lessened. Claims for injuries received in some previous place of employment can be readily disproved.

Raising the health standards is sure to result in a more efficient, more contended working force. The employee benefits as well as the employer in knowing beforehand whether the applicant is able to do the work without menace to his health.

When an employee satisfies the Employment Department that he can meet the requirements, and after he has passed the physical examination, he is then introduced to the foreman whose acceptance is necessary before the applicant becomes an employee. The foreman therefore becomes the final employer, but he is relieved of the tedious routine of intervewing applicants and can therefore concentrate his attention on the operation of his own department.

Another advantage of centralising employment work in one department is that it is easier to control the requirements, insure equity, and maintain uniform treatment and consideration for applicants, which could not otherwise be obtained. From the contract standpoint, the moral obligation of the employer is greater than the moral obligation of the employee, for, moral responsibility increases in proportion to the opportunity for influence by control. It can generally be said that the employer keeps the employment agreement better than the employee, one reason being that he is financially responsible; another reason is that he appreciates the value of establishing his credit and the value of moral, legal and financial responsibility.

In many plants it is customary for the Employment Department to interview employees who, for any reason, are leaving, and by collecting information in this manner, study the problems so that action can be taken wherever possible to reduce the labor turn-over. Arrangements are made whereby the foreman of any department who is running out of work, can notify the Employment Department in advance that he will have to lay off some of his employees. This means that the Employment Department can often transfer the employees to other departments.

In order to insure fairness to the foreman and the employee in the case of discharging, the employee is very often interviewed by the Employment Department. If, upon investigation, it is simply a matter of personal difference between the foreman and the employee, the employee may be transferred to another department to the satisfaction of all concerned.

Training Employees

The two fundamental elements of production are—materials and men. Engineers with a sound knowledge of science and its application have made great progress in the selection and treatment of materials to meet the developments and requirements for special work, and to-day we find that industries are turning their attention more and more to the training of the men who are going to use the materials.

The introduction of special manufacturing operations requiring the definite planning of manual and machine layouts has necessitated the training of employees who will become adept in such operations, performing it with a minimum loss motion and attaining a high degree of accuracy, quality and economy in manufacture.

This condition is largely due to the increased quantity of manufacture, where large numbers of employees can be kept at work on the same operation continuously. This brings us to the first class of training, namely— that of teaching an employee a specific task—as for example, a machine or bench operation.

We have to-day as formerly, a number of employees who are taught particular trades, such as machinists, toolmakers, etc. In teaching a trade, one of two methods may be employed, the first in having a journeyman or workman teach a boy while at his regular work—the usual practice being to take the boy for three or four hours every week into a class room where he is taught to read drawings, layout work, and solve elementary problems in physics and mechanics. For the most part, these classes are held on company's time, the apprentice being paid his regular wage. The other method which applies to the larger industries, is to have a separate instruction shop which is fully equipped with machinery similar to that used in regular manufacture. For example, the boy is taught how to operate a milling machine, being under the supervision of a man whose sole idea is to teach that boy his trade—not to get a certain amount of work out of him. When he learns to run the milling machine, he is sent out into the shop where he uses his knowledge under the conditions that he will meet when he has finished his apprenticeship; and so on, until at the end of his four years he is thoroughly skilled.

There is a further training or education due to the division of a large industrial organization into separate classes of business. As for example, the commercial branch, which includes the buying, selling, warehousing, transportation, and usually financing. The engineering branch, which controls the design and specifications of the company's products; the manufacturing branch, which covers the handling of raw materials and the production in such quantities as are authorized by the commercial branch and will meet the engineering requirements.

It has been found that the best way to do this is, to teach the business as a whole, the nature and uses of the company's products, the facilities for manufacture and distribution, a knowledge of the machinery required, and a knowledge of organization and personnel. Men trained to meet these requirements may be divided into two general classes; one consists of men who have graduated from schools or universities providing technical and scientific training, the other class consisting of younger men who come from technical or high schools and who desire eventually to become engineers or specialists in some particular branch.

An illustration of this is found in one case where technical graduates who have completed four years of college work, are given a course of intensive training for 26 weeks planned so as to give them an insight into those branches of the company's activities with which they must be familiar before they can intelligently study the problems to which they will be finally assigned. More and more emphasis is being placed on furnishing these men with a broader knowledge of the business than can be gained from experience in a single department, or even a group of departments. It is interesting to note that experience has proven that it is much better to teach and give experience in assembly departments before assigning to work in process departments where the work is done on isolated parts. Considerably less time is required when the employee is given the general knowledge first, than when he is trained by following the complete process through from the raw material to the finish product. Along this line of reasoning, the student is steered to the branch of the business in which he will likely be located.

The work is carried out under the supervision of the educational director, and assignments are made covering the different features of the work, which are laid out in a logical sequence. The student may spend a period of one, two or even four to five weeks on one assignment, depending upon its importance in relation to the course he is taking. He is required to give the educational director a weekly report of the work on which he is engaged, and by means of observation trips and discussions he is able to see how his work fits in with that of other departments. For example, a student taking the engineering course, starts out in the engineering department, working on specifications and drafting. He is then given assignments in the manufacturing departments, following which he is finally assigned to the installation of the apparatus for the customer. In this way he becomes thoroughly conversant with the problems of manufacture and the service expected of the apparatus, so that he will be able to study intelligently his future engineering problems.

The practising engineer of to-day must be more or less of a specialist, and schools of engineering have under consideration specific courses and combined business and technical education. These problems have been outlined in Dean Mitchell's paper "The Future of Applied Science" as printed in The Journal for January of this year. The concensus of opinion seems to indicate that the practising engineer, even though he be a specialist, must have a broad fundamental education, and that by using his college course as a basis, he can build up a knowledge of his speciality. On this basis there will remain ample scope for intensive training by each special branch of industry to meet its own requirements.

Wage Systems

In these times of varying prices and industrial unrest, the factor bearing most directly on the maintenance of satisfactory industrial relations is undoubtedly the question of wage-payment. Each day the newspapers furnish us with fresh details of strikes and lockouts, and the loss in production through these disturbances has, since the signing of the armistice, been colossal. In practically every instance, the chief issue has been one of wages, other demands on the part of organized labor being subordinate to this one. The question as to how labor can be best rewarded has received a great deal of attention during the past thirty years and it is now, more than ever, occupying the time of some of the world's ablest engineers and economists.

Wage systems can be broadly subdivided into three classes as follows:

First — The day work or hourly rate system.
Second—The piece work system.
Third — Bonus systems.

The first of these three systems, the day work or hourly rate system involves the payment of a flat rate per hour, irrespective of the amount of work actually performed. This is the earliest and simplest method of remuneration and is in general use to-day, although modern developments in scientific management are tending to throw it more and more into the background. The disadvantages incidental to the use of day work are obvious. The system is a vague one which rewards all degrees of service alike, neglecting entirely the factor of individual performance and supplying no incentive to workmen to put forth their best effort. The day work system has the general effect of reducing the percentage efficiency of a shop to that of the most inefficient of the workmen.

In the year 1882, the late Dr. Frederick W. Taylor, at that time a machine-shop foreman in the employ of the Midvale Steel Company, entered the arena of industrial management. Dr. Taylor starting as a machinist, and passing successively through the grades of gang boss and shop foreman, had been given abundant opportunity to see at first hand, the evils of both the day work and the existent piece work systems and with that genius which later gave us high speed steel and our modern system of scientific management, he invented a remedy. He had early recognized the fact that piece work rates were not equitable owing first to an absolute lack of standardized working conditions and secondly to a similar absence of any reliable information on the output possibilities of manufacturing operations;—also that no attempt was made to instruct or train workmen in the performance of their individual tasks. So he adopted the expedient of analyzing operations into their component sub-operations, and by means of a decimally graduated stop watch, establishing the shortest possible time in which these sub-operations could be performed consistently with the turning out of good work. When sufficient time-observations had been taken to satisfactorily establish a standard time for the performance of the operation, an instruction-card was prepared which set forth in a clear and concise manner, not only the sub-operations, which the workman would be called upon to perform together with their corresponding standard times, but also any additional information relative to the mechanical or physical conditions surrounding their performance. This instruction card was then used for the purpose of training the workman to do his work in the best and fastest way. With the operations thus standardized and after a suitable allowance had been made to cover fatigue, differential piece work rates were estimated in such a way that if the workman followed the instructions set forth and accomplished his task in the stipulated time, he received an increase of from twenty to one hundred percent over his normal hourly rating, this percentage depending on the nature and difficulty of the job. If he did not quite accomplish his task in the standard time he received a somewhat lower piece work rate, and if he failed by a large margin, he incurred a penalty. By this invention of the time-study, Dr. Taylor created a new field of industrial investigation which has greatly benefited both the employer and employee, through largely increased output on one hand and largely increased earnings on the other.

The third and last method of wage-payment is the bonus plan which is usually used in combination with and in addition to the day work system. It might be well at this point, to establish clearly the difference between the terms "piece work rates" and "bonus", as the significance of these terms is sometimes confused. A piece work rate is a fixed amount paid per unit of output, under which circumstance the workman either gains or loses, depending on the efficiency of his performance. A bonus implies the payment to an efficient workman, of something in addition to his normal day work rate, the latter being assured to him irrespective of the amount of his output. A bonus system is therefore somewhat milder than the piece work system, which, when rigidly enforced, contains elements of severity.

The most successful application of the bonus plan of wage payment will probably be found in the "Task and Bonus System" invented by the late H. L. Gantt while assisting Dr. Taylor in the re-organization of the Bethlehem Steel Company. In principle, this system seems identical with the Taylor System of differential piece work, but in application, the assured day work rate places it in an entirely different category. In a manner similar to the Taylor system, task work with bonus is only applied after careful time study, and the preparation of standard instruction cards. When the best method of performing the operation has been thus determined and standardized, a bonus is paid to the workman for accomplishing his task in the stipulated time.

One company, in formulating wage systems throughout the factory, has endeavoured to adopt whatever seemed best in both the Taylor and Gantt plans. The day work system is used only where for some reason Piece Work cannot be applied as in the case of intermittent operations which are not of the "repeat" type. All operations before being placed on the piece work basis are made the subject of a careful time study and are thoroughly standardized, the rest factor being provided for by means of a fatigue allowance. A Piece Work Rate is then estimated in such a way that the workman can, if efficient, earn a substantial increase over his nominal day work rate. These details, as will be noted, are all features of the Taylor system. If, however, the workman's piece work earnings fall below what he could earn if working on the day work basis, he is given his day work rate, the system at this point assuming the character of Mr. Gantt's task and bonus plan. Operators trained under this system have rarely failed to accomplish their tasks in the time allowed. The piece work rates are so estimated that the operator receives his additional reward for the efficient performance of a reasonable day's work without excessive or hurtful exertion on his part. If, after a fair trial, a workman proves that he is incapable of performing an operation, he is transferred to more suitable work.

Plate 1
Time Study Form—front

The accompanying time study sheet illustrates the manner in which operations are analyzed and stop watch readings noted. The operation in question consists of the braiding of glazed cotton insulation about the outer surface of commutator cords by a girl running two braiding machines. The component sub-operations are shown with corresponding stop watch readings, the latter being taken in cycle, that is, with the stop watch running. When sufficient readings have been taken these are averaged, all unnecessary or waste time substracted, and the operation finally reconstructed on the basis of how long its performance should take. In this instance it has been found that a girl can give from two braiders, an output of 66 cords per hour. The application of an

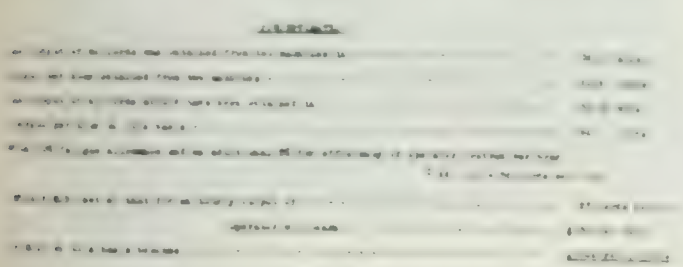


Plate 2
Time Study Form—back

allowance of ten percent to cover fatigue, and an addition of five percent to cover the fact that the girl under observation was above the average in efficiency, reduces this figure to 57 cords per hour for which the operator is paid at the rate of 4.230 Per C-Cords. If the same output at this rate, her earnings will be 19.1% more than if she were working on the day work basis.

The plan described has been found applicable to almost any type of factory work. It presupposes, however, the fact that there is a sufficient volume of standardized work to keep workmen employed steadily.

Plate 3
Instruction Card for window washing

The accompanying duplicate of an instruction card will make clear the manner in wheih the details of operations are set forth for the instruction and guidance of workman. The operation in question is of the simpler type, consisting of washing a certain standard size of factory window, these windows being found in all parts of the factory. The equipment and materials which the workman will use are first listed. Following are all the steps in the operation, these arranged in the order of their performance. The length of time allowed and the piece work rate are finally included. These instruction cards are prepared wherever their application is considered desirable and are then given to the department foreman who uses them for the purpose of training the workman to perform his task in the shortest time and in the most efficient way.

Welfare Work

Welfare work may be defined as anything pertaining to the comfort and improvement, intellectual or social, of the employees, separate and apart from the wages paid, in excess of the necessities of the industry and the requirements by law.

It is difficult to trace the development of welfare work, in as much as the very nature of certain industries necessitated first aid cabinets being located throughout the plant, or even emergency hospitals for treatment in cases of accident. This in turn led to work on prevention of accidents, the success of which turned the attention of industries to the conservation of health. Within the last ten or twelve years, the development has been rapid, and to-day we find that sanitation, good lighting, ventilation, elimination of injurious dust and gases, rest rooms for female employees, lunch rooms, drinking water systems, locker facilities, etc. are all considered as problem of welfare work.

The healthy worker is the contented worker, and the employer realizes that it is necessary to maintain the health of the employee in order to avoid lost time and inefficiency. As a matter of fact, it is difficult to estimate the exact saving to the employer through the resulting decrease in labor turn over, but we have the general experiences of industries in the United States where reductions of 10% to 15% are common in cases of employees of more than two years service. Furthermore, large reductions have been made in time lost in all cases where welfare work has been carried on consistently.

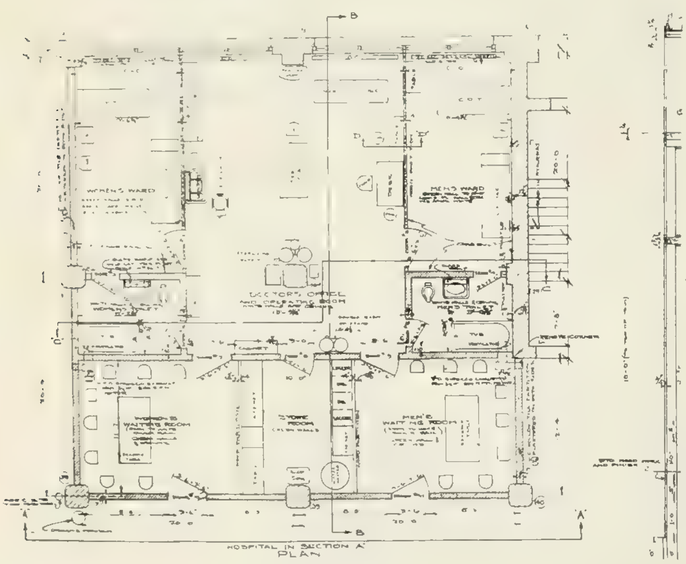


Plate 4
Plan of hospital for industrial establishment, with separate waiting room, ward and toilet rooms for men and women, and a general store room, doctor's office and operating room.

Welfare work has often times failed because the earlier efforts were paternalistic. Recent advancement is largely due to the fact that the work has been promoted by industrial men themselves; men who have risen from the ranks and who therefore understand the requirements and the solutions of the various problems encountered. In practically every industry where large reductions have been made in accidents, the results have been made possible by an organized effort which has included the active participation and co-operation of the worker. Intelligent co-operation in this manner brings the foremen and officials into closer relationship and strengthens the organization as a whole.

In view of the Workmen's Compensation Acts which are now being enforced, it is becoming more and more essential that employers promote any work which has for its object, the prevention of accidents. The employer pays in the long run for accidents, whether the claim is settled directly or indirectly through Employers' Liability Insurance.

Plate 5
View of office and operating room as shown on plan No. 4.

Red Cross work, rest rooms, lunch rooms, etc. are generally under the immediate direction of the employer. On the other hand, athletic and other features of recreation which receive financial support from the Company, are generally under the direction of the employees. As the extent of welfare activities increases, employees can, by experience, take more and more active part in its administration.

The work has not as yet become standardized, and the extent to which it is carried on depends largely on the location and nature of the industry. Many of our large paper industries, in order to get and maintain a desirable class of employees, have promoted facilities for outdoor recreation, housing and town planning.

Two of the most common and often the most difficult problems in industrial welfare are the installation and maintenance of satisfactory lighting systems, both natural and artificial, and proper ventilation which includes the removal of dust and fumes.

Poor lighting impairs the vision, and it unfortunately does so in a gradual way that it may take several years before the affected person becomes aware of it. Dim illumination, flickering light, sharp shadows and glare from bright lamps or highly polished surface within the range of vision are harmful. Experience has proven that accidents occur more frequently in plants with poor lighting than in similar plants well illuminated. Futhermore, better lighting increases production.

The standardization of illumination necessary for satisfactory results in production calls for knowledge based not only on the physical limitations of vision, but also on the character of work handled, and the speed of production involved.

The three essentials of lighting are :—

1. Efficiency.
2. Continuity.
3. Diffusion.

In the case of daylight illumination, these essentials are dependent upon:

(a) Adequate window area.
(b) Means of reducing the intensity of direct sunlight.
(c) Supplementary lighting equipment for especially dark days and towards the close of winter days.
(d) Interior wall and ceiling colouring as light as is practicable, and of a dull finish.

The problem of artificial illumination is not so much the design of lighting apparatus as it is the selection and location of lighting units in order to eliminate discomfort to the worker. Good general illumination tends to insure cleanliness and neatness throughout the plant. Walls and ceilings when painted in light flat colors are preferable to dark glossy finishes; the former diffuse the light, while the latter by reflection cause a glare. This glare may create the impression that the source of light is too powerful, whereas it may be too weak.

Plate 6
Single lighting units with diffusing reflectors above range of vision for machine lighting layout and four-light clusters for general illumination.

Where systems of individual machine lighting and bench lighting are used, the lamps should be of low intensity, shaded in such manner that the light is directed on the work. For this purpose low voltage lamps, such as used in standard train lighting equipment, of 24 watts have been found very satisfactory, especially as the filament of the low voltage lamp is heavier and therefore able to withstand vibration better than the standard 100 volt lamps.

Air cooled transformers of 300 watt capacity are mounted on a column close to the machines. These transformers can be moved as readily as the wiring of the lighting system and therefore form very compact units.

High ceilings permit the use of large and highly intensive lights spaced widely apart. When ceilings are low, small units closely spaced are required in order to obtain proper diffusion and to avoid intense glare.

Plate 7
Semi-indirect illumination for drafting room and office work.

The requirements for different classes of work have been found to be one-half to two ft. candles for aisles, passageways, etc., four to ten ft. candles for general office work, etc., eight to ten ft. candles on drafting tables.

It is preferable wherever possible to make trial installations, and if possible, use a portable photometer. When by moving the lights a certain arrangement is found satisfactory, plans can then be made for the permanent installation, and any future extensions can be checked on the power consumption in watts per square foot for the particular class required.

Emergency lights should be distributed in the main aisles, stairways, passageways and exits. These lights to be arranged so as to insure their reliable operation when, through accident or other cause, the regular lighting is extinguished. Pilot or night lights have been found essential for the use of watchmen in large plants, in which case the switching arrangement is arranged so that lights may be turned on and off at points of entrance.

Additional precautions are sometimes taken in power plants to provide coal oil lanterns ready for use, mounted on brackets so as to be accessible in case of interrupted service.

Ventilation of Workrooms

Regarding ventilation, fresh air is the prime requisite for conservation of physical energy. Whether the functions of the body during the normal working period shall be permitted to replace the broken down tissue, caused by the steady draining of reversed vital force, depends upon the quality and quantity of the pure air that prevents the poisons of fatigue from accumulating.

In an 8 hour day the worker breathes from 250 to 350 cubic feet, according to the degree of his muscular exertion. The air should never be allowed to stagnate, however ample the dimensions of the workroom, and it is generally agreed that the amount of fresh air to be supplied per hour should be in the neighbourhood of 1800 cubic feet per employee.

The ordinary plant does not require a costly ventilating installation. The great essential is to maintain in any workroom, a satisfactory balance between the air drawn from the room and the fresh air admitted to take its place. One solution of this problem is to have the inlet openings about three times the area of the outlet openings, in which case they should be uniformly distributed and air admitted over warm steam coils in order to avoid objectionable drafts.

Dangers of Dust and Fumes

Regarding the dangers from dust and fumes to the health of employees, the relative importance of clean air can be shown by the division of occupational diseases into the following classes:—

1. Diseases due to gases, vapors and high temperature.
2. Diseases due to increased or decreased atmospheric pressure.
3. Diseases due to metallic poisons, dust or fumes.
4. Diseases due to organic or inorganic dust and heated atmosphere.
5. Diseases due to fatigue.

The presence of animal, vegetable, metallic or mineral dusts in the air of the workroom is a menace to the vitality of the worker. A dusty workroom inevitably lowers the standards of shop discipline and of output, and induces chronic intemperance, due to thirst engendered by congestion of the mucous membrane of the throat.

It is therefore essential in such cases to instal exhaust systems, the general practice being to use exhaust fans directly connected to electric motors. Recently some very ingenious installations in this connection have been made, whereby the exhaust fan is by-passed in such a way that it creates a draft of air across the source of the fumes or vapors to direct these into the mouth of the inlet.

Summary

Summing up, the object is to establish definite relations of employment, and by means of training, to produce a better class of workmen; by education of the foreman, to raise his ideals to the level of the ideal of the general management. If the manager can win the confidence of the foreman, the foreman will usually win the confidence of the worker.

Attention to these points, with adequate compensation for services rendered and provision for cheerful and healthy places to work, will go a long way to maintain the management of human relations in industrial plants.

CHANGES OF ADDRESS

Owing to the fact that the firm which has been handling our stencils has removed its agency from Montreal, there may be delay in recording changes of address in connection with this number of the journal.

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOL. III. May 1920 No. 5

Notable Engineering Conference

Although embodied in the changes which took place in The Institute three years ago whereby the name and many phases of the Constitution were changed, and it is specifically mentioned in the broadened objects that The Institute declares to promote the professional interests of the members, there has been considerable uncertainty as to what this might or might not mean. To some it was believed to be dependent upon personal interpretation. By others it was declared that it was just so many words with no direct effort behind them. Despite the fact that last year's Council declared that service to individuals was an outstanding feature of The Institute's work a large number of members feel that more might have been accomplished for the individual, not knowing or realizing the difficulties encountered.

When the Council of The Institute appointed a Committee on Civil Service Classification to assist the engineers employed by the Federal Government in securing more adequate remuneration and status a clear trail was blazed on behalf of the individual, the purport of which should not be misunderstood. It meant that for the first time in the history of a purely professional organization an active concerted effort had been made to advance the material welfare of a section of its membership, and established a definite policy by The Institute from which it was never intended to recede.

During last year salary schedules and salary considerations have been considered before the various Branches, and have been discussed by the Council of The Institute. In spite of this it has been maintained by some that The Institute has no declared policy in respect to advancing the material welfare of its members.

In order that there should be no further misunderstanding on this subject, and in order that as full an expression of opinion as possible should be received from the members of Council who do not always find it possible to attend the meetings, a special Conference was called and was held in Montreal on Tuesday, April 13th, which lasted all day. At this Conference were present: President R. A. Ross in the chair; the Executive Committee of the Council, Vice-President Walter J. Francis, Councillors Brig.-Gen. Sir Alex. Bertram, Professor Ernest Brown, Arthur Surveyer, Frederick B. Brown, and H. H. Vaughan; Vice President Brig.-Gen. C. H. Mitchell; Councillors A. H. Harkness and Professor Peter Gillespie, Toronto, E. R. Gray, Hamilton, H. B. R. Craig, Windsor, (also Chairman of the Ontario Provincial Division), A. C. D. Blanchard, Niagara Falls, J. B. Challies, Ottawa, and the Chairman of the Toronto Branch R. O. Wynne-Roberts, and A. B. Lambe, Secretary of the Ontario Provincial Division. Councillor A. R. Decary also attended part of the sessions.

While there were many items on the agenda for this meeting the most important was a discussion of the existing situation whereby it is necessary for The Institute to be of greater assistance to its members, and a discussion of ways and means as to how this can best be accomplished. Every member present took part in the discussion and there was unanimity of opinion to the effect that The Institute declare its policy and plan a definite programme along the line of membership welfare promotion. On motion by H. H. Vaughan, seconded by Brig.-Gen. Mitchell the following resolution was carried unanimously:

> "That whereas this Conference of members of Council residing in Montreal and members and others of the Province of Ontario has been called by the request of Council for the purpose of offering an opportunity for the discussion of the policy to be pursued by The Institute.

Be it therefore resolved:—

That in addition to the Committee on Remuneration of Engineers already appointed by Council, a further Committee on Policy should be appointed to prepare for the consideration of Council a statement of the policies and objects of The Institute.

Further that the Council authorize this Committee on Policy to include in its statement the Council's approval of establishing by The Institute of rates of remuneration for its members both by fee and by salary, which rates The Institute will endeavour to uphold.

This resolution will come before Council for ratification at the end of the month of April.

It was further resolved at this Conference that Junior engineers should be included in the personnel on the Committee on Remuneration of Engineers. It was also decided to recommend that the constitution be amended so that Juniors should vote at Branch meetings and hold office except that of Chairman. The policy of The Institute in regard to organized labor was discussed and referred to the Committee on Policy for consideration. The part The Institute should play in developing engineers for highway construction was also brought up. It was felt that The Institute should play an important part in this matter, and the Secretary was instructed to receive suggestions to bring before Council.

A number of other matters were discussed. When the meeting was brought to a close it was felt that the Conference marked a notable step in the history of the affairs of the engineering profession in Canada.

The decision to include as a stated policy of The Institute the establishment by The Institute of rates of remuneration for its members both by fee and by salary with the influence of The Institute behind such schedules, is an open declaration that the profession as represented by The Engineering Institute of Canada pledges itself to a definite plan of promoting the material welfare of its members.

The regular meeting of Council held on April 27th, endorsed in full the resolutions of the special conference. A Committee on Policy was appointed as follows: J. B. Challies M.E.I.C., Ottawa, Chairman; A. R. Decary M.E.I.C., Quebec; Brig-Gen. C. H. Mitchell M.E.I.C., Toronto; Walter J. Francis M.E.I.C., Montreal; K. H. Smith M.E.I.C., Halifax; J. G. Sullivan M.E.I.C., Winnipeg; A. E. Foreman M.E.I.C., Victoria—with power to add thereto, having regard to geographical location.

A. H. Harkness, M.E.I.C., was appointed Chairman of the Committee on Remuneration, it being intended that this committee should include younger members of The Institute.

The Journal's Second Anniversary

With this issue *The Journal of The Engineering Institute* starts the third year of its history. While *The Journal* was inaugurated with misgivings in the minds of some, it has demonstrated in the short period of its existence that it fills a place in the professional life of the members of *The Institute* that not only justifies its establishment and its continuation, but which makes it an intimate personal entity with every member of *The Institute* interested in the welfare of the profession.

Today, no active member of *The Institute* would agree to or tolerate a proposal to discontinue its publication. In its two years it has become the centre around which the activities of the whole *Institute* from coast to coast have revolved, and during that time, backed up as it is by the Council of *The Institute*, by every Branch and Provincial Division, and by every individual member, it has reached a position that under ordinary circumstances would have required a period of a generation or more to attain. The proof of the position it occupies is evidenced by the enthusiastic interest that the members everywhere are taking in its welfare.

The Journal, reflecting as it does the welfare of the engineering profession and being the property of the members thereof, occupies a remarkable position in respect to promoting the profession's welfare, and its objects as published on the front cover are the objects of *The Institute*. It has taken some time for a few of the members, although it was early established in the minds of most, to realize just how great an advantage the profession in this country possesses in its monthly publication.

It is an asset of no small amount, the value of which is shared by every member. Every member can assist in increasing its value both to himself and to the profession by emphasizing to others the high place it occupies in the life of the engineering profession in this country. A year ago the advertising revenue of *The Journal* was practically equal to the printing cost. During the year the cost of production increased very largely both from the viewpoint of overhead expense and printing. The diversity of the activities of *The Institute* last year made it difficult to give *The Journal* the attention it deserved and consequently there was no increase in revenue. Although printing costs have increased again this year, it is a pleasure to announce to the members that *The Journal* is in a much better financial position than it was a year ago. With the strong loyal sentiment growing up on behalf of *The Journal* everywhere, which is strengthening it in no small degree, it is anticipated that before the end of the year *The Journal* will be in a highly flourishing condition. The influence of every member however is needed in this connection.

Commencing with this issue every Branch will receive an allowance for Branch News, which will assist in the Branch finances. It is anticipated that a further arrangement may be made later which will be of still greater benefit to the financial affairs of all the Branches of *The Institute*.

Let no member lose sight of the fact that he is a shareholder in *The Journal of The Engineering Institute of Canada*, and that all the support and influence he gives in its behalf will react directly to his own benefit.

Professional Engineering Acts

Elsewhere in this issue are being published the professional engineering acts of British Columbia and Manitoba both of which have become law. In New Brunswick and Nova Scotia it is expected that during the present sessions of the Legislative Assembly, other professional engineering acts will have been passed, and the Alberta Act has been passed recently. In Quebec as has already been announced, there has been established the corporation of professional engineers. In Ontario the matter of arriving at an acceptable Bill is in the hands of an Advisory Conference Committee established by the suggestion of the Ontario Provincial Division. In Saskatchewan changes were suggested by the Premier which caused the Bill to be withdrawn. The success attending the Bill in British Columbia and Manitoba will no doubt have a beneficial effect on Saskatchewan legislation.

Meeting of the Canadian Engineering Standards Association

A meeting of the Main Committee of this Association was held at Ottawa on April 12th, Sir John Kennedy, Hon. M.E.I.C., in the Chair, when a number of items of interest were dealt with.

The General Specification for Steel Railway Bridges submitted to the Main Committee by the Sectional Committee on Steel Bridges and Construction, was approved for publication. This specification, the essential provisions of which are fortunately in general agreement with the practice of the American Railway Engineering Association, is not drawn up with any intention of limiting the choice of the engineer as to type of bridge, but is so framed as to indicate definite methods of work for the designer, detailer, and manufacturer, with a view of thus obtaining uniform results as regards strength and utility.

The Specification, as now approved, is based on that published in draft form in 1918 by *The Engineering Institute of Canada*, and drawn up by a Committee of that Institute under the chairmanship of P. B. Motley, M.E.I.C., Engineer of Bridges, Canadian Pacific Railway Company. The work of the C.E.S.A. upon it was undertaken at the request of *The Engineering Institute of Canada*.

It is announced that Sub-Committees have been appointed for the purpose of drafting general specifications for guidance in the purchase of Wire Rope, both for Mining purposes, and for dredging and steam shovel work. The former Sub-Committee is under the Chairmanship of F. H. Sutherland, Inspector of Mines of Ontario, and the Chairman of the latter is K. M. Cameron, A.M.E.I.C., Department of Public Works, Ottawa.

A report from the Chairman of the Sub-Committee on Telegraph and Telephone Wire, W. J. Duckworth, of the Great North Western Telegraph Co., Toronto, stated that a specification for two standard grades of this material had been drafted and was now being considered and amended by the Sub-Committee.

J. G. Morrow, Steel Company of Canada, Hamilton, Chairman of the Sectional Committee on Steel, reported that a Special Committee had commenced work with a view of coordinating the numberous specifications for material for carbon steel forgings now being worked to in Canada, and if possible establishing the characteristics of a comparatively small number of grades of steel which could be used to fill those specifications.

It was decided to instruct a Special Committee, under the Chairmanship of E. G. Burr, A.M.E.I.C., Consulting Engineer, Montreal, to proceed with an enquiry into the desirability and possibility of framing a Canadian National Electrical Code. It was pointed out that such a document, so far as hazard to life is conserned, has been drawn up in the United States under the auspices of the Bureau of Standards, while fire hazard has been dealt with the rules of the National Board of Fire Underwriters. The Sub-Committee is to consider the measures to be taken should it be thought advisable to draft a Canadian Code for covering these subjects for wide acceptance in the Dominion.

A communication was read from the Council of *The Engineering Institute of Canada* requesting the Association to deal with a number of the specifications of *The Institute*, considering and revising them if thought necessary, as has already been done in the case of the Specification for Steel Railway Bridges. It was decided to take up first *The Engineering Institute of Canada* Specifications for Steel Highway Bridges and for Cement, and to organize suitable committees to report upon them.

It was announced that the Air Board had approved of the Canadian Engineering Standards Association, through its Sectional Committee on Aircraft Parts, as the body through which Canada is to be represented on the International Aircraft Standards Commission. This action was welcomed by the Committee and it was pointed out that the approval of the Air Board gave official recognition to the work which has already been accomplished by Canadian representatives at meetings of the Commission.

The International Aircraft Standards Commission was organized in 1917, primarily as a war measure, with the object of obtaining, as far as may be, international agreement regarding materials for aircraft as well as details of aircraft construction and equipment. It is, for example, obviously desirable that aero engine magnetos made in different countries should be built within certain limits of overall dimensions and should conform to general specifications which would enable a French magneto to be used in an emergency on a British machine finding itself in difficulties in France. The Commission has already made gratifying progress, although it is unfortunate that the United States has so far been unable to appoint a committee to take part in its work. The countries now active on the Commission are Great Britain, France, Italy and Canada.

A grant of £200 towards the funds of the Association was announced from the British Engineering Standards Association and the Secretary reported that he now had in stock a supply of almost all of the publications of the B.E.S.A., which are available for distribution at a nominal charge.

A communication was read from the American Engineering Standards Committee, advising that in the opinion of the A.E.S.C. co-operation between that body and the C.E.S.A. should be provided for by the interchange of Minutes of the Meetings of the respective Main Committees, so that joint action could be arranged for, wherever necessary. The Committee heartily concurred in this suggestion, which will be adopted in future, and the hope was expressed that many opportunities for co-operation would present themselves.

AN ACT TO INCORPORATE THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF THE PROVINCE OF BRITISH COLUMBIA

WHEREAS [illegible]

AND WHEREAS [illegible]

THEREFORE, [illegible]

1. [illegible]

Interpretation

2. [illegible]

(a) [illegible]

(b) [illegible]

[illegible]

(c) [illegible]

(d) "Council" [illegible]

(e) "President" [illegible]

(f) "Registrar" [illegible]

(g) [illegible]

(h) "Board" [illegible]

(i) Nothing in this Act shall be construed so as to require the [illegible] this Act.

(j) "Registration" [illegible]

(k) "Licensee" [illegible]

AN ACT TO INCORPORATE THE MANITOBA ASSOCIATION OF PROFESSIONAL ENGINEERS

[illegible]

1. Title

[illegible]

2. Interpretation

[illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) "Council" [illegible]

(e) "President" means the president of the association.

(f) "Registrar" [illegible]

(g) [illegible]

(h) [illegible]

3. Association of Professional Engineers

(1) [illegible]

(2) [illegible]

4. Financial Powers

[illegible]

5. By-laws

[illegible]

(1) [illegible]

(2) [illegible]

(3) [illegible]

BRITISH COLUMBIA

The Association of Professional Engineers of the Province of British Columbia.

3. (a) All persons registered as Professional Engineers under the provisions of this Act are hereby constituted "The Association of Professional Engineers of the Province of British Columbia," and shall be a body politic and corporate, with perpetual succession and a common seal;

(b) The head office of the Association shall be at Vancouver, British Columbia.

4. The Association shall have power to acquire and hold real property not producing at any time an annual income in excess of ten thousand dollars, and personal property, and to alienate. mortgage, lease or otherwise charge or dispose of the same of any part thereof as occasion may require, and to sue and be sued.

5. The Association may pass by-laws not inconsistent with the provisions of this Act, regarding:

(a) The election of the Executive Council of the Association;

(b) The government, discipline and honour of the Members;

(c) The maintenance of the Association and the management of its property;

(d) The fixing of an annual fee not in excess of fifteen dollars, and other fees;

(e) The levying, remission and collecting of annual and other fees;

(f) The examination and admission of candidates to the study and practice of Professional Engineering;

(g) The calling and conduct of meetings, voting, quorum and general business, banking, borrowing and credits;

(h) All other purposes reasonably necessary for the management of the Association.

6. (a) All by-laws or amendments thereto shall become effective only after ratification by two-thirds majority of the votes received from the Members of the Association in good standing at a meeting duly convened. The Registrar shall file with the Lieutenant-Governor in Council a copy of each by-law or any amendment thereto, immediately the same is ratified, certified under the seal of the Association as a true copy;

(b) Notwithstanding anything in this Act contained, any by-law may be disallowed by the Lieutenant-Governor in Council.

Who May Practice.

7. (a) Only such persons who are Members of the Association and registered as such under the provisions of this Act, or who have received a License from the Council of the Association as hereinafter provided. shall be entitled within the Province of British Columbia to take and use the title of "Professional Engineer," or any abbreviation thereof, or to engage in the Practice of "Professional Engineering";

(b) Any person residing in the Province of British Columbia at the date of the passing of this Act, who is at that date, and has been for five years previously practising Professional Engineering as defined in Sub-section (b) of Section 2, shall be entitled to be duly registered as a Member of the Association without examination; provided that such person shall produce to the Council, on or before the first day of April, 1921, satisfactory credentials of his qualifications;

(c) Engineers who were practising previous to the late war and who were accepted for services in the forces of the British Empire, or any of its Allies, shall be entitled to all the rights and privileges confered under Sub-section (b) of this Section;

(d) Any person who may hereafter come to the Province of British Columbia, and who shall produce to the Council a satisfactory certificate signed by the proper officers evidencing the fact that he is a duly registered member in good standing of an Association of Engineers in another Province in the Dominion of Canada, having equivalent standards of qualification for membership to this Association, together with an application for registration in this Association endorsed by the Registrar of such other Association, may become a duly Registered Member of the Association without the payment of the annual fee for the year in which he joins, but shall pay a fee of five dollars for such registration;

MANITOBA

(d) The examination and admission of candidates to the study and practice of the profession;

(e) All other purposes reasonably necessary for the management of the association.

6. Ratification of By-laws

All by-laws or amendments thereto shall become effective only after ratification by two-thirds majority of the votes cast by the members of the association in good standing.

7. Who May Practise

(1) Only such persons who are members of the association hereby incorporated and registered as such under the provisions of this Act, or who have received a license from the council of the association as hereinafter provided, shall be entitled, within the Province of Manitoba, to take and use the title of "professional engineer" or any abbreviation thereof, or to practise as a "professional engineer" or act as engineer in laying, advising on, constructing or superintending the construction of any railway or public work or any work upon which public money is expended, the cost of which is in excess of one thousand dollars.

(2) Any person residing in the Province of Manitoba at the date of the passing of this Act, who is at that date and has been for one year previously practising as a professional engineer, shall be entitled to be duly registered as a member of the association without examination, provided that such person shall produce to the Council satisfactory proof of having so practised.

(3) Any person who may come to reside in the Province of Manitoba. and who at that time is a duly registered member of an association of engineers similarly constituted of any other province of the Dominion of Canada, may become a duly registered member of the association without payment of fee for that year, if he shall produce to the council a certificate of membership in good standing in such province, and an application for transfer of registry endorsed by the registrar of the province in which he lately resided.

(4) Any person not otherwise qualified as hereinbefore mentioned, and who may desire to become a registered member of the association, shall make application to the council, and shall submit to an examination, or shall submit credentials in lieu of examination, whichever the council may decide, and shall be admitted to registry as a member of the association on payment of prescribed fees after the council shall have certified in writing that such examination or credentials have been found satisfactory to it.

(5) Any person not residing in the Province of Manitoba who is a registered member of an association of engineers similarly constituted of any other province of the Dominion of Canada, may obtain from the registrar a license to practise as a professional engineer in the Province of Manitoba, upon production of evidence of his registry in such other province, and upon payment of a fee of one dollar. In the event of such person being unable by reason of emergency or neglect on the part of the registrar, or for any good and sufficient reason, to obtain such license within three months of his making application therefor, he shall be entitled to practise as a professional engineer in the province for such period of three months without holding such license.

(6) Any person who is not a resident of Canada, but who is a member of any engineering or technical organization or society of standing, recognized by the council, may obtain a license to practise his profession in an advisory or consultative capacity.

(7) Any person who is employed as a professional engineer by a public service corporation, a private corporation, public utility or government department, whose business is normally carried on in two or more of the provinces of Canada, and who is by reason of his employment required to practise as a professional engineer in other provinces other than that of his residence, may so practise in the Province of Manitoba, without holding a non-resident license, or payment of fee, if on demand of council, he produces credentials satisfactory to the council showing that he is a registered member of an association of engineers similarly constituted by some other province of Canada.

BRITISH COLUMBIA

Partnership

Council

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8. Partnership

9. Administration

10. Board of Examiners

11. Joint Examining Board

12. Qualifications

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(h) The Secretary of the Association shall, on his assumption of office, lodge in the hands of the President of the Council a bond for one thousand dollars in some bonding company satisfactory to the Council. All the expenses arising from the furnishing of such bond shall be borne by the Association;

(i) In case of the resignation or death of any member or members of the Council, the other members of the Council shall have power to fill all vacancies so caused until the time of the holding of the next annual meeting; provided the said annual meeting is not to be held within a period of three months after the occurrence of such vacancy or vacancies.

Examinations.

10. (a) The Council shall appoint annually a Board of Examiners for each branch of Engineering as set out in Section 2, Sub-section (b), and shall fill the vacancies in the same as they occur;

(b) The duties of the Board shall be to examine all candidates for admission to membership by examination. As soon as possible, and not later than 21 days after the close of each examination, the members of the Board who shall have conducted such examination, shall make and file with the Secretary a certificate showing the results of such examination, whereupon the Council shall notify each candidate of the result of the examination and of their decision upon his application. The members of the Board shall also file with the Secretary the examination papers submitted to each and every candidate, together with the answers of the respective candidates thereto, and shall attach thereto a certified copy of their report, with the marks awarded to each candidate in each subject of such examination, and such documents shall remain on file in the office of the Registrar, and shall be open to inspection by any of the said candidates, or by any person duly authorized in writing on their behalf, during regular office hours for a period of at least six months following the examination.

11. (a) Regular examinations of candidates for registration or license shall be held at Vancouver, or such other place or places as the Council may direct, beginning on the last Monday in the months of February and November in every year, unless such Monday be a holiday, in which case they shall begin on the next ensuing day not being a holiday;

(b) Special examinations may be granted, provided the candidate or candidates for such special examination deposit in advance with the Registrar a sum sufficient to defray the expenses of such examination and the prescribed examination fees. Any balance remaining over shall be returned to such candidate or candidates;

(c) The scope of the examinations and the methods of procedure shall be prescribed by the Council, with special reference to the applicant's ability to design and supervise works which shall ensure the safety of life and property;

(d) The candidate shall submit to examination before the Board in one or more of the recognized branches of engineering, such branch or branches to be selected by the candidate;

(e) Every candidate for examination shall give at least one month's notice in writing to the Secretary of his intention to present himself for examination, and with such notice shall forward a fee of five dollars, and before undergoing examination shall pay to the Association twenty-five dollars as a fee, and before receiving his certificate of registration shall pay the annual fee set out in the By-laws and a sum of not more than five dollars for the publication of his name in the British Columbia Gazette;

(f) In case the candidate should fail in his examination, he may present himself at any subsequent regular examination by paying a fee of ten dollars.

Registration Without Examination.

12. (a) The Council shall consider an application for registration from any person who submits proof of qualifications possessed by such person by virtue of experience, training or examination by another examining body of recognized standing, and if found satisfactory shall grant a certificate of registration;

(b) Any person who, without examination, is registered as a Professional Engineer, shall pay to the Association before being so registered the sum of fifteen dollars for examination of credentials, and the annual fee set out in the By-laws, and a sum of not more than five dollars for the publication of his name in the British Columbia Gazette;

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13. Annual Fees

(1) Each person who is registered or licensed to practise under this Act shall pay in advance to the secretary-treasurer, or any person deputed by the council to receive it, such annual fee as may be determined by by-laws of the association, which shall be deemed to be a debt due by the practioner and to be recoverable with costs in the name of the council in any court of competent jurisdiction.

(2) If any registered practioner omit to pay the prescribed annual fee within six months of the date upon which it becomes due, the registrar shall cause the name of such practitioner to be erased from the register, and such practitioner shall thereupon cease to be deemed to be a registered practitioner; but such practitioner shall at any time thereafter, upon paying such fee, be entitled to all his rights and privileges as a registered practitioner from he time of such payment.

(3) The registrar shall not be required to issue a license to practise to any non-resident practitioner otherwise entitled to such license unless the fee provided for by the by-laws of the association shall have been previously paid.

14. Necessity of Registration

Any person entitled to be registered under this Act who shall neglect or omit to be registered shall not be entitled to any of the rights and privileges conferred by the provisions of this Act so long as such neglect or omission shall continue.

15. Right of Appeal

In the case of any refusal by the council to register the name of any person as a member of the association, or of refusal to issue a license to practise, the person aggrieved shall have the right to apply to a judge of the court of King's Bench, who, upon due cause shown, may issue an order to the council to register the name of such person, or to grant him a license to practise or make such other order upon such appeal as may be warranted by the facts, and the council shall forthwith comply with such order. Such order when so made shall be final.

16. Default of Registrar

If the registrar makes or causes to be made any wilful falsification in any matter relating to the register, he shall forfeit a sum not less than one hundred dollars.

17. False Registration

If any person shall wilfully procure or attempt to procure himself to be registered or licensed under this Act, by making or producing, or causing to be made or produced any false or fraudulent representations or declarations, whether verbally or in writing, every such person so doing, and every person knowingly aiding and assisting him therein, shall forfeit and pay a sum of not less than one hundred dollars.

18. Evidence

The certificate of the registrar under the seal of the association shall be **prima facie** evidence of registration or license, or non-registration, as the case may be.

19. Suspension for Misconduct

(1) The council may in its discretion, reprimand, censure or suspend or expel from the association any engineer guilty of unprofessional conduct, negligence, or misconduct in the execution of the duties of his office, or convicted of a criminal offence by any court of competent jurisdiction, but shall not take any such action until a complaint under oath has been filed with the registrar and a copy thereof forwarded to the party accused. The council shall not suspend or expel an engineer without having previously summoned him to appear to be heard in his defence, nor without having heard evidence under oath offered in support of the complaint on or behalf of the engineer. The council shall have the same powers as a justice of the peace to compel witnesses to appear and to answer under oath in the manner and under the penalties prescribed by law. The president of the council or person acting as such in his absence, or the secretary, is hereby authorized to administer oaths in such cases. All evidence shall be taken in writing or by a duly qualified stenographer.

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[illegible]

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[illegible]

20 Penalties

[illegible]

21 Practice Proven by Single Act

[illegible]

22 Summary Hearings

[illegible]

23 Information

[illegible]

24 Moneys to Association

[illegible]

25 Limitation

[illegible]

26 Provisional Council

[illegible]

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21. If any person shall wilfully procure or attempt to procure himself to be registered or licensed under this Act, by making or producing, or causing to be made or produced, any false or fraudulent representation or declaration, either verbally or in writing, every such person so doing, and every person knowingly aiding and assisting him therein, shall incur a penalty of not less than twenty dollars nor more than five hundred dollars.

22. Any information for the recovery of any such penalty or forfeiture may be laid by any Member of the Association, or by any person appointed by the Council.

23. No prosecution shall be commenced for any offence against this Act after two years from the date of committing the offence.

24. The Council may, and upon application of any three Members shall, cause inquiry to be made into matters respecting any fraudulent or incorrect entry in the Register, or the unprofessional conduct, negligence or misconduct in the execution of the duties of his office, or the conviction on a criminal offence of any Registered Member, and may in its discretion order the erasure or correction of any entry in the Register, or may reprimand, censure, suspend or expel from the Association any Member found guilty as aforesaid; provided that the name of a Member shall not be erased from the Register on account of a conviction for a political offence outside His Majesty's Dominions, nor on account of a conviction for an offence which, though within the provisions of this Act, ought not, in the opinion of the Council, either from the trivial nature of the offence or from the circumstances in which it was committed, to disqualify a person from practising Professional Engineering.

25. The Council may, for the purpose of the execution of the duties of the Council under this Act, employ at the expense of the Association such legal or other assessor or assistant as the Council may think necessary or proper; and any person whose status or conduct is the subject of inquiry shall also have the right to be represented by counsel.

26. At least one week before the first meeting of the Council to be held for taking evidence or otherwise ascertaining facts, a notice shall be served upon the person whose status or conduct is the subject of inquiry, and such notice shall embody a copy of the charges made against him, or a statement of the subject-matter of the inquiry, and shall also specify the time and place of such meeting. The testimony of witnesses shall be taken under oath, which the Presiding Officer is hereby authorized to administer, and there shall be full right to cross-examine all witnesses called, and to call evidence in defence and reply. In the event of the non-attendance of the person whose status or conduct is the subject of such inquiry, the Council may, upon proof of the personal service of the notice aforesaid in accordance with the provisions of this Section, which proof of service may be by statutory declaration, proceed with the subject-matter of the inquiry in his absence, and make their report of the facts without further notice to such person.

27. The Council, or any person interested in the proceedings on any such inquiry, may make application to the Registrar or any District Registrar of the Supreme Court to seal a writ or writs of subpœna for the attendance of any witness or witnesses, and for the production of books, papers and documents by such witness or witnesses at such inquiry in form similar to that prescribed by the Supreme Court Rules, and such writ or writs of subpœna shall have the same force and effect as though issued out of the Supreme Court, and the fees therefor and the rules governing the same shall be such as are in force in the Supreme Court.

28. Any person who has failed to pass an examination, or whose name has been ordered to be erased from the Register, or who feels himself aggrieved, or is affected by any order of the Council, or any decision of the Board of Examiners, may appeal from such order, finding, action, or decision, to any Judge of the Supreme Court at any time within six months from the date of such order, finding, action or decision, or the publication thereof; the said Judge thereof, upon the hearing of such appeal, which may be analogous to appeal to the County Court under the "Summary Convictions Act," may make such order confirming or reversing in whole or in part, or varying the order, finding, action or decision appealed from, or directing further inquiries by the Council into the facts of the case, and as to costs, as to the said Judge thereof shall seem right in the premises Such order, when so made, shall be final.

29. In all cases where proof of registration under this Act is required to be made, the production of the last annual list published in the Gazette as herein provided, or of a certificate bearing a date

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27. Operation Postponed

No provisions of this Act restricting the practice of the profession or imposing penalties shall take effect until one year after the passing of this Act.

28. Individual Seal

Every person registered under this Act shall have a seal, the impression of which shall contain the name of the engineer and the words "Registered Engineer, Province of Manitoba," with which he shall stamp all official documents and plans.

29. Former Act Repealed

Chapter 32 of the Revised Statutes of Manitoba, 1913, being "The Manitoba Civil Engineers' Act," is hereby repealed.

30. When Act in Force

This Act shall come into force on the day it is assented to.

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subsequent to the issue of the said Gazette containing said annual list, showing that the person or persons therein named is or are duly registered, certified under the hand of the Registrar for the time being and the seal of the Association, shall be sufficient evidence of such registration in lieu of the production of the original Register; and any such certificate purporting to be signed by any person in the capacity of Registrar shall be *prima facie* evidence that such person is such Registrar, without any proof of his signature or of his being in fact such Registrar; provided, always, that the evidence herein aforesaid may be displaced by any certificate of the Registrar under seal of the Association, showing the fact of erasure of any name or suspension or revocation of any licence to practise.

30. Any penalty recoverable under this Act may be recovered in the same manner as penalties are recovered under the "Summary Convictions Act," before any Justice of the Peace having jurisdiction in the locality in which the offence was committed, and every such penalty may, together with the costs of conviction, be levied by distress and sale of the goods and chattels of the offender.

31. Within one month after this Act comes into force, the Lieutenant-Governor in Council shall appoint a provisional Council consisting of eleven members, who shall elect their own officers.

At least one member shall be chosen from practitioners in each of the branches of Engineering named in Section 2, Sub-section (b) hereof.

32. The duties of the Provisional Council shall be to provide the Register called for by this Act, to enter therein the names of those and those only who are entitled to registration under the provisions of Section 7, Sub-section (b), and who apply in writing to be registered and pay the prescribed fees, and to call within six months from the coming into force of this Act the first general meeting of the Association, for the purpose of electing the regular Council and any other organization purposes of the Association; and shall have the powers conferred in this Act on the Council of the Association. Their powers shall cease on the election of the regular Council of the Association.

33. Every person registered under this Act shall have a seal, the impression of which shall contain the name of the Engineering, the branch of Engineering in which he has been accepted, and the words "Professional Engineer, Province of British Columbia," with which he shall stamp all official estimates, specifications, reports, documents and plans.

34. No provisions of this Act restricting the practice of the profession or imposing penalties shall take effect until the first day of April, 1921.

35. Nothing in this Act contained shall be construed as altering or affecting any provisions of the Coal-mines Regulation Act, Metalliferous Mines Inspection Act, or the Pharmaceutical Act.

36. Nothing in this Act contained shall be construed as preventing the carrying on by any person on his own property of any work for the sole use of himself and his domestic establishment; nor the designing, construction or installing by any person of appliances, works or plants of a value not exceeding five thousand dollars; provided, however, that such work shall not involve the safety of the general public.

CORRESPONDENCE

Employment Bureau

Editor, *Journal*,

Dear Sir:—

Having heard of several criticisms re advertisements for "Positions Vacant" in your magazine would like to call your attention to and make the following recommendation:—

That all individuals or firms advertising for engineers in your journal be requested to state more details of position, the salary the position is worth, also where advisable give their name.

I verily believe that this will be a great benefit to the employer as he should only receive replies from men who could "fill the bill". The applicant also would have some idea of the position he was applying for.

I might cite a case as example. In the March issue the following advertisement appeared:—"Town engineer wanted for a town in Nova Scotia. Applicants to state qualifications, experience and salary wanted. Apply Box No. ——"

This leaves the applicant much in the dark and might be changed to something like the following:—"Required engineer for Nova Scotia town, population.... (state population) waterworks installed, sewage system and road program to be extended. Only engineers with experience in similar position, capable of taking full charge and worth $300.00 per month need apply. Signed Mayor or Town Clerk."

Hoping you will give this your serious consideration for the benefit of the engineers in particular and the country in general, I remain,

Sincerely yours,

C. E. Hogarth, A.M.E.I.C.

Berthierville, P. Q.
April 1st, 1920.

* * *

A Correction

Editor, *Journal*,

Sir,

I sympathize with the member reporting the proceedings of the Toronto Branch in his efforts to condense into a sentence or two the substance of the various speeches at the debate on "Should Engineers Unionize" but he leaves me in an unfortunate position. He says that I do "not think legislation would help the engineer since it does not help the teachers." What I said was to the effect that legislation by itself would not save the day for the engineer, and cited on the one hand the case of the teachers in the schools of Ontario. Their profession is rigourously closed by legislation but they are very poorly paid; on the other hand I mentioned the case of the doctors who in addition to their legislation have a highly developed organization which is really a system of unionization.

I think the right kind of legislation will very materially help the engineer, but legislation alone will not [illegible] [illegible] to [illegible] [illegible].

Yours truly,

H. E. T. Haultain, M.E.I.C.

Toronto, April 7th, 1920.

* * *

A Tribute to the Institute

Editor, *Journal*,

Dear Sir:

At a Meeting of the Provincial Council of the Association representing all branches of the Technical Professions in the Province of British Columbia and the four hundred and fifty Members the following resolution dated the 31st day of March 1920, was unanimously passed:

"That the Secretary be instructed to send a letter expressing the thanks and appreciation of this Association for the pioneer work done by *The Engineering Institute of Canada* in the drafting of a Bill for Professional Engineers which had been the ground work for the Bill just passed by the British Columbia Legislative Assembly."

It is a very great pleasure to me personally to have the opportunity of forwarding this resolution and to tell you it would have been quite impossible for us to have drawn up the act in the time at our disposal without the Model Bill.

I must congratulate you upon the good results of your past labour obtained throughout the Dominion.

Yours very faithfully,

[illegible], A.M.E.I.C.,
Hon. Sec.

British Columbia Technical Association.
Vancouver, B.C.
19th, April, 1920.

B. C. Engineers Joint Legislation Committee

* * *

Telegram

[illegible], April [illegible].

Secretary Engineering Institute of Canada,
176 Mansfield St.,
Montreal, Que.

Bill respecting Professional Engineers passed Legislature and Lieut. governor. Note for Journal.

A. R. Crookshank, M.E.I.C.

EMPLOYMENT BUREAU

Situations Vacant

Chief Draftsman

Chief draftsman wanted for pulp and paper company, should be familiar with plant lay-out and equipment, knowledge of architectural drafting also desirable Box 110.

Inspectors for Fire Underwriters

Several men with engineering experience wanted as inspectors for Fire Underwriters. Men recently graduated can apply. Box 107.

Designer in Reinforced Concrete

Designer in reinforced concrete work wanted for large company in province of Quebec. Immediate applications wanted. Box 105.

Mechanical Engineer

Wanted at once mechanical man for general engineering office work on rolling mill construction. Recent graduate would do. Applications to state experience, salary wanted etc. Box 106.

Mechanical Draughtsman for Paper Mill

Mechanical draughtsman wanted, experienced in machine design and detail, preferably in connection with paper making machinery or crane and conveying machinery. Must be first class man capable of handling work through the office with despatch, permanent work for the right man. Apply stating age, nationality, detail experience and salary required. Box 102.

Junior Mechanical Draughtsman

Junior mechanical draughtsman or designer wanted, prefer man with technical training and some experience in draughting and on outside work. Preference given to man whose experience was secured with a smelting or mining company. Salary $125. per month. Box 101.

Draughtsmen and Designers

Large mining company in Northern Ontario requires several draughtmen and designers, preferably single men. $250. per month. Box 103.

Summer Work for Student Member

Wanted by a manufacturer of a well established product, selling to contractors and municipalities the services of an undergraduate for five or six months from May 1st, to collect data and to further the use of said product by public lectures and moving picture exhibit which we will furnish. Salary and expenses. Territory principal towns and cities from Winnipeg to Halifax. Apply by letter stating salary, experience if any and references. Box 109.

The Civil Service Commission of Canada hereby give public notice that applications will be received from persons qualified to fill the following positions in the Civil Service of Canada:—

Hydraulic Engineers.

962. Hydraulic Engineers at an initial salary $2,700 per annum, which will be increased upon recommendation for efficient service at the rate of $120 per annum, until a maximum of $3,180 has been reached. This initial salary will be supplemented by whatever bonus may be provided by law.

Duties.—Under direction, to have charge in a district or division of survey parties engaged in power development, hydrometric, reclamation, river regulation, and other hydraulic engineering works or engaged in the construction of such works; and to perform other related work as required.

Qualifications.—Education equivalent to high school graduation; either graduation in engineering from a school of applied science of recognized standing with three years of experience in hydraulic engineering survey, design, estimate, and construction work, two years of which shall have been in responsible charge of such work, or five years of experience in hydraulic engineering survey, design, estimate, and construction work, two years of which shall have been in responsible charge of such work; ability to manage men and to complete and make ready for publication the results of drainage investigations and surveys, or other pertinent data; tact; good judgment; administrative ability. While a definite age limit has not been fixed for this competition, age may be a determining factor when making a selection.

Examination.—Subjects and weights as follows:—Education and Experience, 200; Oral Interview, if necessary in the opinion of the Commission, 100.

A list of eligibles will be established for vacancies in the above class throughout the Dominion, but the only vacancies required to be filled at present are in the Department of the Interior, for Alberta and Saskatchewan. Persons qualified are urged to take part in this competition, in order to become eligible.

Assistant Hydraulic Engineers.

963. Assistant Hydraulic Engineers at an initial salary of $2,100 per annum, which will be increased upon recommendation for efficient service at the rate of $120 per annum, until a maximum of $2,580 has been reached. This initial salary will be supplemented by whatever bonus may be provided by law.

Duties.—Under direction, to have charge of survey parties engaged in power development, hydrometric, reclamation, river regulation, or other hydraulic engineering survey work, or to supervise the construction of power development, reclamation, or other hydraulic engineering works; and to perform other related work as required.

Qualifications.—Education equivalent to high school graduation; either graduation in engineering from a school of applied science of recognized standing with three years of hydraulic engineering experience, one year of which shall have been in responsible charge of such work, or five years of experience in hydraulic engineering work, one year of which shall have been in responsible charge of such work; ability to prepare reports on surveys or investigations, [illegible], tact; ability to manage men. While a definite age limit has not been fixed for this competition, age may be a determining factor when making a selection.

Examination.—Subjects and weights as follows:—Education and Experience, 200; Oral Interview, if necessary in the opinion of the Commission, 100.

A list of eligibles will be established for vacancies in the above class throughout the Dominion, but the only vacancies required to be filled at present are Six Assistant Hydraulic Engineers, Department of the Interior, for Alberta and Saskatchewan. For these particular positions, preference will be given to candidates who have had experience in drainage engineering and surveys. Persons qualified are urged to take part in this competition, in order to become eligible.

Junior Engineers

964. Junior Engineers at an initial salary of $1,[illegible] per annum, which will be increased upon recommendation for efficient service at the rate of $1[illegible] per annum, until a maximum of $2,040 has been reached. This initial salary will be supplemented by whatever bonus may be provided by law.

Duties.—Under direction, to make surveys, supervise engineering construction and repairs, and make computations in connection with engineering work; and to perform other related work as required.

Qualifications.—Education equivalent to high school graduation, either graduation in engineering from a school of applied science of recognized standing with two years of engineering experience, or four years of engineering experience in design, estimate, construction, and maintenance work. While a definite age limit has not been fixed for this competition, age may be a determining factor when making a selection.

Examination.—Subjects and weights as follows:—Education and Experience, 200; Oral Interview, if necessary in the opinion of the Commission, 100.

A list of eligibles will be established for vacancies in the above class throughout the Dominion, but the only vacancies required to be filled at present are Three Junior Engineers, Department of the Interior, for Alberta and Saskatchewan. For these positions preference will be given to candidates who have had experience in drainage engineering and surveys. Persons qualified are urged to take part in this competition, in order to become eligible.

Application forms properly filled in must be filed in the office of the Civil Service Commission not later than May 6, 1920. Application forms may be obtained from the office of the Employment Service of Canada, or from the Secretary of the Civil Service Commission, Ottawa.

Situations Wanted

Highway Engineer

A.M.E.I.C. [illegible] on all classes of road work, with highway, municipal, [illegible] organization and town planning experience, [illegible] position in Ontario or Western provinces. Box [illegible].

Mechanical Engineer

Mechanical engineer, B.Sc., A.M.E.I.C., open for engagement. McGill graduate, several years experience in manufacturing, design, [illegible], production, maintenance, sales engineering, very useful training in machine shop and tool room. Accustomed to handling both skilled and unskilled labour in large numbers. Box [illegible]-P.

Summer Work for Student Member

Wanted by Student member for the summer vacation. Has just completed first year civil engineering, field work preferred. Apply Box No. 29-P.

For Sale.

5" Transit Theodolite, make T. Cook & Sons, [illegible] made 1[illegible]. A cross hairs, reading to 20" with complete vertical circle and compass attached to telescope, stand and case complete. Price $[illegible]. Box No. [illegible].

OBITUARY

A. L. HERTZBERG, M.E.I.C.

A. L. Hertzberg, M.E.I.C., died at his home in Toronto on January 21st, 1920. Mr. Hertzberg was born at Horten, Norway, was educated at Horten, and at Gothenburg University, Sweden, coming to Canada in 18[illegible], when he joined the Credit Valley Railroad as asssistant engineer. After that railroad was taken over by the C.P.R. Mr. Hertzberg became division engineer at Toronto, and later district engineer. In 1882 Mr. Hertzberg married Helen E. McMaster and leaves three sons, Colonel H. F. H. Hertzberg, C.M.G., D.S.O., M.C., M.E.I.C., C. L. Hertzberg, M.E.I.C., consulting engineer, Toronto, and O. P. Hertzberg, resident engineer, C.P.R. From 1894 to 1905, Mr. Hertzberg represented Norway and Sweden in Toronto then as Vice Consul. Mr. Hertzberg has been a member of *The Institute* since 1888. During the many years he has been engaged as division engineer for the C.P.R., He occupied that position with credit to himself and to the profession. He had a kindly disposition and was a man of the highest integrity and his taking is a distinct loss to *The Institute* and to the profession.

PERSONALS

G. B. Mitchell, M.E.I.C., is now with the Foundation Co., at Lima, Peru, address Calle Rifa No. 332.

*

Onesiphore H. Cote, A.M.E.I.C., has been appointed Industrial Commissioner of the Board of Trade for Quebec.

*

A. T. Le Fevre, M.E.I.C., who joined *The Institute* in January last is at present located at Casilla, Antofa gasta, Chile.

*

Allan K. Hay, A.M.E.I.C., has been appointed engineer and secretary to the Ottawa Suburban Roads Commission.

*

J. C. Ball, A.M.E.I.C., is accorded the congratulations of the Niagara Peninsula Branch upon the arrival of a son.

*

F. N. Smail, A.M.E.I.C., formerly in the Provincial Highway Department, Regina, has accepted a position in the City Engineer's office, Moose Jaw.

*

Capt. G. H. Workman Jr. E.I.C. reported as having died on active service is alive and well. He is at present in Winnipeg, address 530 Langside St.

*

Alexander Peden, A.M.E.I.C., has been appointed structural engineer for the Dominion Bridge Company, Lachine, Que. with charge of the structural drawing office.

*

Walter K. Scott, A.M.E.I.C., has joined the firm of McGregor & McIntyre, Limited, Toronto and is transferring his membership from the Montreal to the Toronto Branch.

*

Brig.-Gen. C. J. Armstrong, M.E.I.C., was elected president of the Royal Military College Graduates Club at a general meeting of the club held on April 6th in Montreal.

C. H. Biddel, A.M.E.I.C., one of the Provincial Land Surveyors in the Government service has accepted a position as district surveyor with the Parsons Engineering Company, of Regina.

*

E. L. Miles, M.E.I.C., has recently been appointed assistant engineer to the Toronto and New York Roads Commission in connection with work which is to be carried on this summer.

*

J. E. Pringle, J.E.I.C., of Hamilton, has accepted a position as assistant engineer with the Kipawa Company on construction work in connection with the extension of the Company's sulphite mill.

*

John F. Cassidy, Jr., E.I.C., has resigned from the Department of Provincial Highways, Ottawa, and is now a member of the general contracting firm of Messrs. J. O. Giroux & Co., Limited, of Toronto.

*

C. B. Bate, A.M.E.I.C., formerly on the staff of the Department of Soldier's Civil Re-setablishment at Ottawa has been appointed to the engineering staff of the Riordon Pulp and Paper Co. at Hawkesbury, Ont.

*

D. C. Tennant, M.E.I.C., has been appointed designing engineer at the plant of the Dominion Bridge Company, Lachine, Que. He will assist F. P. Shearwood in all the erection schemes which the company may carry out.

*

G. S. MacDonald, A.M.E.I.C., has resigned his position as resident engineer of the Marine and Fisheries Department at St. John, N.B., and is planning to take over the insurance business of his father, Chas. A. Macdonald, of that city, who died recently.

*

Allan Waters, M.E.I.C., formerly city engineer of Nanaimo, following which he was provincial architect for the province of B.C. and later overseas doing war work has been appointed a resident engineer on the Lethbridge Northern Irrigation District, Lethbridge, Alta.

*

The Saskatchewan River Water Commission, Chairman A. J. MacPherson, A.M.E.I.C., is holding a series of meetings in urban and rural centres of southern Saskatchewan, in order to procure evidence as to the requirements for a water supply from the Saskatchewan River.

*

P. L. Pratley, M.E.I.C., formerly designing engineer of the Dominion Bridge Company has accepted the position of chief of staff on valuation under Lt.-Col. C. N. Monsarrat, M.E.I.C., in connection with the Department of Railways and Canals Valuation Board of the Grand Trunk Railway.

*

J. N. deStein, M.E.I.C., Secretary Treasurer of the Saskatchewan Branch of *The Institute* has been manager of the Parsons Engineering Company in association with Colonel J. L. R. Parsons, M.E.I.C., and W. R. W. Parsons, M.E.I.C. and has formed the Western Draughting & Blue Printing Company, the company has installed a large blue printing machine for this purpose.

C. Brakenridge, M.E.I.C., has returned to Vancouver after spending several months in England, where he was engaged in a study of the methods and materials employed in road building and highway construction. Mr. Brakenridge who was for some time Secretary-Treasurer of the Vancouver Branch, was welcomed at a meeting of the Montreal Branch of *The Institute* on the evening of April 8th.

The Greek Government has conferred the insignia of the Golden Cross of the Saviour to Colonel George Eedson Burns and the insignia of the Silver Cross of the Saviour to Jules A. Duchastel de Montrouge for the eminent and excellent services they rendered to the Greek residents in Canada during the Great War.

The official award of the decorations will take place on the Greek Independence Day, April 4 at 12.30 p.m. in the Oak and Blue rooms of the Hotel Windsor.

T. G. Randolph, A.M.E.I.C., served overseas with the new armies from March 25th, 1915 till April 15th, 1919 attaining the rank of Major R. E. Major Randolph was awarded the Military Cross and had the good fortune not to be wounded during his long period of service. In addition to being an Associate Member of *The Engineering Institute of Canada*, Major Randolph is an Associate Member of the Institution of Civil Engineers. He is at present with Messrs Alfred Booth & Co. Ltd., 11 Adelphi Terrace, Strand, W. C. 2., England.

C.M.Arnold, M.E.I.C., office engineer of the Reclamation Branch of the Department of the Interior has been appointed a division engineer of the Lethbridge Northern Irrigation District under Major H. B. Muckleston, M.E.I.C. Mr. Arnold has taken a leading part in the activities of *The Institute* in the province of Alberta, having acted both as Secretary-Treasurer of the Calgary Branch and Secretary of the Alberta Provincial Division. He has taken an active part in all of the affairs of the profession in that province and has placed the profession under a debt of gratitude for the excellent service he has so unselfishly rendered.

Lt.-Col. H. C. Lott, M.C., A.M.E.I.C., is at present Asst. Director Works, (E. & M. Section) Baghdad, Mesopotamian Exp. Force. Lt.-Col. Lott's responsibilities extend over the whole of Northern Mesopotamia including the cities of Mosul and Baghdad. His department also maintains all the stone crushers and rollers working on the 500 mile road between Railhead in Mesopotamia (close to the Eastern frontier) through Persia, over the Push-to-ka mountains to Enzeli on the Caspain Sea. All his skilled personnel with the exception of officers and a few British upper subordinates come from India and a few locally from the Arab population.

Lieut. Floyd K. Beach returned to Canada in April 1919 after serving for nearly two years in Flanders with the Canadian Railway Troops. Up until nearly the time of the armistice his duties were in construction and maintenance of light railways in the 2nd Army Area, and just prior to and after the armistice in rebuilding the demolished standard gauge lines in the vicinity of Cambrai. He had entire charge of the rebuilding of [illegible] [illegible] yards and engine [illegible] tracks. Since his return he has resumed his duties with the Hydrometric Surveys in Alberta and Saskatchewan and is at present Divisional Hydrometric Engineer with headquarters at Calgary.

Guy L. Tooker, [illegible] E.I.C., enlisted as a private with the 67th Battalion Western Scots on September 1st 1915. He proceeded to England on March 14th 1916 and then to France on August 13th of same year. The Battalion being broken up in March 1917, he was transferred to the 54th Battalion, and after the Vimy battle was recommended for a commission, which was subsequently obtained. In November 1917, he again proceeded to France joining the 47th Battalion. In January 1918, Lt. Tooker was attached to the 10th Canadian Light Trench Mortar Battery, rejoining the 47th Battalion after the armistice. Recommended for the M.C. after the Cambrai battle. Demobilized in Canada on July 8th, 1919.

Edwin J. Beugler, M.E.I.C., has recently been elected vice president in charge of engineering of the Foundation Company, New York. He was previously consulting engineer of Westinghouse, Church, Kerr & Co., Inc., engaged in developing plans for various engineering works and giving general supervision to construction operations. Before that he was chief engineer of Canadian work, following service as managing engineer and earlier as civil engineer of that company.

From 1902 to 1905 he was resident engineer of the Boston Terminal Company in charge of engineering and maintenance departments of the south terminal Station, Boston; 1893-1902, with the construction department of the New York, New Haven & Hartford R.R., and from 1890 to 1893 with the Philadelphia & Reading R.R.

He is also a member of the American Society of Civil Engineer, American Railway Engineering Association, and the Boston Society of Civil Engineers.

J. W. B. Blackman has recently been appointed City Engineer of North Vancouver, B.C. and is at present supervising the paving of the highway at Chilliwack.

Mr. Blackman went overseas with the first Railway Construction Troops company formed in B.C., with the rank of Lieutenant and Second in Command. On arrival in England early in 1917, Lieutenant Blackman was seconded to the War Office for engineering duty and was resident engineer and director of works in connection with the building of a large aerodrome in Norfolk. This was a large undertaking, there being some sixty different buildings and the work included water supply and fire protection, sewage disposal works, power station, roads, railways, etc. On the completion of this work Lieutenant Blackman was promoted to the rank of Captain and appointed to the staff as Chief Water Engineer, and was placed in consulting charge of forty different water supplies both in France and Great Britain. Captain Blackman returned to Canada in April 1919, and has been in North Vancouver since that date.

*

Major W. T. Wilson, D.S.O., M.C., A.M.E.I.C., who previous to the war was with the Montreal Light Heat & Power Company, returned to Canada on the C.P.O.S. "Minnedosa" from Liverpool on March 11th, having been on active duty from the beginning of the war until June 22nd, 1919. After the Armistice Major Wilson was retained for the purpose of demobilizing all Tunnelling Companies of the 3rd and 4th Armies, he being the last man out from the Tunnelling Companies. He went overseas with the C.Y.C. and was loaned to the Imperials as an officer in the Tunnelling Company, R.E., being the only Canadian officer commanding a British Tunnelling Company, seeing active service from June 1915 until the end of the war, and was engaged over the entire Western front from St. Quentin to Nieuport. Besides receiving the Distinguished Service Order and the Military Cross, Major Wilson has the distinction of being in every large engagement of the Western front with one exception. He has promised for the benefit of his fellow members, at some future date, an article on some experience of a tunnelling officer at the front. A number of unique war souvenirs are being presented to *The Institute* by Major Wilson.

*

E. A. Jamieson, A.M.E.I.C., has opened an office in the London Building, Vancouver, B.C. under the firm name of The Jamieson Engineering Company, which was formerly known as The MacAndrew Jamieson Engineering Company, and is conducting a general engineering practice combined with sales agencies of equipment for all kinds of plants. The Company is the Western representatives of the Hydraulic Machinery Company, Limited, Montreal; The Lytle Engineering Company Limited, of Montreal; The Strauss Bascule Bridge Company, Limited of Chicago; The Federal Engineering Company, Limited, Toronto; The Spray Engineering Company of Boston; The Asbestos Mfg. Co., of Montreal; Ruston Hornsby, Engineers, Lincoln, England; The Volta Mfg. Company, Welland; The Hiram Walker Metal Products Company of Walkerville, and The Waterex Waterproofing Co., of San Francisco. This firm has recently, acting as agents for the Strauss Bascule Bridge Co., been successful in closing a contract with the Corporation of the City of Victoria for the design and supervision of the Johnson Street Bridge in that city. Mr. Jamieson held the position of inspector of guns and steel, Canadian Forces after being transferred from the infantry in which he enlisted in 1915.

*

F. Harcourt Emra has established a company, F. H. Emra and Partners, Civil and Mechanical Engineers, at the Hope Chambers, Ottawa. This company will do consulting work and represent several large English manufacturing firms.

Major Emra has had an interesting career in connection with the war. He went to England early in 1915 and worked with the South Eastern Railway as assistant district engineer till July 1915 when he returned to Canada to take a commission with the 1st Canadian Pioneer Battalion. This battalion left Canada in November and landed in France early in March 1916. Major Emra was O.C. of the "C" Company of the 1st Pioneer Battalion from June to September 1916, was wounded at Courcellette in October 1916 and on return to duty was transferred to the 2nd. Battalion Railway Troops in January 1917. Major Emra was again invalided to England in September 1917 in consequence of an old wound from gas burns and on return to duty was seconded to the Admiralty in connection with the department of Auxiliary Shipbuilding. Major Emra was resident engineer of the London and South Eastern Districts and in charge of the Engineering Section at Headquarters. Major Emra resigned this important position in January 1920 and has recently returned to Canada.

*

H. B. R. Craig, recently appointed Chairman of the Border Cities Branch graduated from R.M.C. in 1899, and from Queen's University (B.Sc.) in 1903. For a year after graduation Mr. Craig was resident engineer on construction of the Bay of Quinte Railway, and in 1904 he was resident engineer on construction of the Toronto-Sudbury Branch, Wahnapitae River to Sheppard Lake. For the two years following Mr. Craig was city engineer of Kingston, Ont., but returned to railway work on construction of the Grand Trunk Pacific Railway, being resident engineer on the Lake Superior Division and on the Prairie West Division. From 1908 to 1911 Mr. Craig again took up the duties of city engineer of Kingston, and after a year of consulting work for Prescott and the counties of Lennox and Addington he was appointed senior assistant engineer, Public Works, Canada at Windsor, Ont., in 1911. In 1914 Mr. Craig was transferred to Fort William by the Department of Public Works in the capacity of district engineer after having been acting district engineer for the Windsor district for the previous year; in July 1919 Mr. Craig returned to Windsor as district engineer. In October 1902 he was elected a Student member of *The Institute*, being transferred in March 1905 to Associate Member, and was elected Member in December 1910.

*

Brig.-Gen. Harold French McDonald, D.S.O., C.M.G., Jr. E.I.C., has been appointed general manager of the Industrial Alberta Development Association with headquarters at Calgary. Before going overseas he was employed with the C.P.R., Land Department and Department of Natural Resources from 1908 till 1912, and from 1912 till 1914 was consulting engineer and surveyor, Winnipeg. He enlisted in the first month of the war and was given a commission as Lieutenant with the 16th Canadian Battalion being promoted to Captain on the Staff of 3rd Canadian Infantry Brigade September 1914. He was severely wounded at the 2nd battle of Ypres in April 1915, and later the same year was appointed General Staff Officer, 3rd Grade on the Headquarters of the 2nd Canadian Division. In January 1916 he was promoted to Major, and in May 1916 was appointed Brigade Major 1st Canadian Infantry Brigade. In September 1916 he was severely wounded at the Somme, suffering amputation of the left arm, at which time he was awarded the Distinguished Service Order for gallantry in the field. In December 1916 General (then Lt.-Col.) McDonald took charge of the Canadian troops in training in England. In 1917 he was given the C.M.G. and in December 1917 was promoted to the rank of Brig.-General. Other decorations received by Brigadier General McDonald are the Order of St. Anne of Russia, 2nd Class with Swords, and special mention to H. M. Secretary of State for War for valuable services, January 1918. In May 1917 he visited the Italian Front as a member of the Canadian Mission. In February 1919 Brig.-Gen. McDonald was appointed General Officer Commanding Military District No. 13, Calgary, and in December 1919 he retired from the Canadian Forces.

W. J. Stewart, M.E.I.C., Consulting Engineer, Department of External Affairs, has been appointed by the Canadian Government to act as a representative on behalf of the British Empire on an International Committee of Inquiry which has been set up in Paris to consider draft general conventions on Freedom of Transit, International Ports, and International Railways, and to prepare the way for the work of the League

W. J. STEWART, M.E.I.C.

of Nations on the transportation question. This appointment was made by the Canadian Government at the request of the Imperial Government.

The British Empire will have two representatives on this committee which has a very wide field of inquiry. Mr. Stewart is now in Paris and has already begun reviewing the great quantity of information which will be considered.

Hon. J. L. Cote, A.M.E.I.C., Provincial Secretary for the Province of Alberta, is at present laying the foundation for a department of research in the Province of Alberta. He was born at Les Eboulements and was educated at Montmagny and Ottawa University and graduated in 1890. Following graduation Mr. Cote worked for the Dominion Land Surveys. The years 1892-4 Mr. Cote spent in Alaska on photo-topographical survey of the eastern part of the Alaska International Boundary. After a short time spent in the East, Mr. Cote returned to Manitoba

Hon. J. L. COTE, A.M.E.I.C.

and subsequently to the Yukon where he spent a year on survey work; in 1903 he opened an office as land surveyor and engineer in Edmonton being connected with the Jasper Park Collieries. In 1909 Mr. Cote was returned a Member of Parliament for the district of Athabasca, and 1913 and 1917 was elected for Grouard after the district had been subdivided. On Sept. 25th, 1918 Mr. Cote was appointed Provincial Secretary which position he has since held.

Hon. J. D. Reid, Minister of Railways and Canals, has announced that W. A. Bowden, B.A.Sc., M.E.I.C., chief engineer of that department, has been selected by the Government of Canada to act as Canadian consulting engineer in the reference to the International Joint Commission on the question of the further improvement of the St. Lawrence river between Montreal and Lake Ontario.

The Government of the United States is also a party to this reference, and each Government undertook to appoint from its official engineering personnel an engineer to confer with a similar officer of the other Government in the acquiring of engineering data, the making of necessary surveys, and the completion of outline plans and estimates of the cost of the proposed improvement. In conformity with this arrangement the U. S. Government has appointed Lt.-Col. Wooten, a member of its permanent Government service as the corresponding person on the American side.

The reference to the commission is in the form of a series of questions, the chief of which is:—

What further improvement in the St. Lawrence River between Montreal and Lake Ontario is necessary to make the same navigable for deep-draught vessels of either lake or ocean-going type; what draught of water recommended, and what the estimated cost?

In answering this question, the commission is requested to consider:

(a) Navigation interests alone, whether by the construction of locks and dams in the river, by side canals with the necessary locks, or by a combination of the two.

(b) The combination of navigation and power interests to obtain the greatest beneficial use of the waters of the river.

W. A. BOWDEN, B.A.Sc., M.E.I.C.

Other questions deal with the apportionment of capital cost to each country, as well as cost of operation and maintenance and method of control. The possible effect on the St. Lawrence Ship Canal below Montreal is to be studied, as well as ice conditions; also what improvement may be expected of the resources, commerce and industry of each country, as well as of traffic.

The commission intends to conduct public hearings in both countries to bring out information bearing on the physical, commercial and economic aspects of the project. Hearings will probably commence about May 1st. Engineering plans and estimates are to be submitted to the commission as soon as practicable, but not later than one year from date of appointment of the engineers. And the commission is requested to forward to the two Governments its final report not later than three months thereafter.

No delay is anticipated from the Canadian standpoint. As a matter of fact, it is understood that Mr. Bowden already has tentative plans well advanced. His appointment is regarded as eminently suitable.

BRANCH NEWS

Victoria Branch

Horace M. Bigwood, A.M.E.I.C. Secretary.

At the meeting of the Victoria Branch, *Engineering Institute of Canada*, at the Provincial Library on April 14th, E. P. Girdwood, M.E.I.C., gave a paper on River Protection, Roads, Bridges and General Engineering Construction, chiefly in British Columbia. The lecture was illustrated with about 120 photographs, showing methods of protecting river banks from the erosion of fast flowing rivers, and the construction of roads and railways alongside water courses, which necessitated difficult side-hill cuttings. Bridges of various types and sizes were shown, and described regarding construction methods and results. As illustrating the difficulties engineers experience in designing and carrying out work in country about which little is known, the speaker gave details and views along the G.T.P. Railway, where owing to the river, alongside which they were located, backing up for over four miles, it was necessary to raise the grade, and the bridges fifteen feet above the height originally intended.

The views along some provincial highways not only showed good roads of moderate grades, but also beautiful views and scenery unsurpassed anywhere.

It is unfortunate that the work of the local branch of *The Institute* seems so little known or receives so little support. The attendance was too small considering the amount of labor entailed, and expense incurred to prepare the paper.

The Branch will close the season with a reception on April 26 at the Knights of Columbus Hall.

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Vancouver Branch

J. N. Anderson, A.M.E.I.C., Sec.-Treas.

At a meeting of the Executive Committee of the Vancouver Branch held on April 12th, the following matters were dealt with.

The resolution of the Toronto Branch March 18th re Status and Remuneration of Engineers was endorsed. In this connection, however, it is felt that the British Columbia Technical Association has done much, and is still actively engaged in trying to right just the points covered in the resolution, so that in this Province a live organization is in existence. The work of the B.C.T.A. together with Act of Parliament recently passed regulating Professional Engineers are considered by the Executive here to be of very material benefit in amending the conditions stated in the Resolution.

The Resolution re Purchasing Commission passed by the Victoria Branch on the 16th of March was endorsed.

Edmonton Branch

[illegible], A.M.E.I.C., Sec.-Treas.

At a general meeting of the Edmonton Branch held on April 14th, it was decided to abandon the idea of holding the Western Professional Meeting in Edmonton this year owing to the work necessary in organizing the proposed Association of Professional Engineers as per bill passed by the Legislature of Alberta at their last session. They will however, give their support to any other Branch that may wish to hold the meeting.

Saskatchewan Branch

J. N. de Stein, M.E.I.C., Sec.-Treas.

The April meeting of the Branch concluded the activities of the season, as during the summer months no regular meetings are held except the summer meeting, which according to the By-laws of the Branch has to be held alternately in the various centres of the Province. It was decided to hold it as Saskatoon this year, but the date has to be left open, in order to make it fit the Western Professional meeting, which it is hoped will materialize this year.

The members of our Branch were very gratified to hear that legislation in some of the Provinces of our Dominion has been enacted successfully. It was felt that energetic steps must be introduced in our Province, and the preliminary work started immediately, in order to insure the passing of a satisfactory Act at the next session of the legislature. The question is just being decided — at the moment of the writing of this report — whether our effort should be renewed to bring it up as a Government measure, or whether a proposed "Professional Act" would have a better chance of passing, if submitted in the form of a Private Bill.

The matter has been handed to a joint Committee consisting of the Legislation Committee and the Executive Committee of our Branch with full power to act and to levy such funds as are necessary. To engineers in other Provinces, the fact that all the work in connection with legislation is carried on by this Branch needs a little explanation. Saskatchewan occupies a somewhat unique position in that respect, inasmuch as practically every professional man who is affected by a future "Engineering Profession Act" is a member of our branch.

It was also felt with a great deal of satisfaction that in view of the fact that all western branches have secured legislation we may look forward to considerable assistance from the Western members of *The Institute* in our efforts to procure legislation.

R. J. Lecky, A.M.E.I.C., the official representative of our branch at the annual meeting of *The Institute* at Montreal gave a report of the meeting. A very important resolution was passed by the Branch regarding future annual meetings of *The Institute* which resolution follows:

Whereas: We believe the annual meeting of *The Engineering Institute of Canada* appears to be largely for the transaction of *The Institute* business, and its present form does not warrant the expense necessary for attendance of the majority of its members;

Whereas: There is not at present an opportunity for some classes of Engineers of the Dominion to meet to discuss matters pertaining to their class of work;

Whereas: Certain classes of engineers hold regular annual Dominion-wide meetings to discuss matters pertaining to their particular class of work, which meetings we believe could be arranged to advantage to conform with the time and place of the annual meeting of *The Engineering Institute of Canada*;

Whereas: The Professional meetings held in connection with the Annual meetings and at other times, though of considerable benefit to those attending, and to the membership at large, have been more Provincial than Dominion-wide;

Therefore Be it resolved, that in the opinion of this branch, there is, at present an opportunity for the annual meeting of *The Engineering Institute of Canada* to gradually expand into a Dominion-wide Professional meeting in addition to a business meeting, the Professional meeting to be divided into sessional sections which would embrace all classes of the Profession, each section to be devoted to one or more branches of the Profession, so that it would be of such importance to the Profession as to warrant the attendance of a larger proportion of its members than now attend;

Resolved further, that this Branch request the parent executive to give this matter their early consideration, that the above may be considered in the preparation of the next Annual meeting;

Be it further resolved, that the Secretary of this Branch be instructed to forward a copy of this resolution to the Secretary of the parent Institute and to all the Branches.

If this suggestion is adopted it will mean that the future General Professional Meetings of *The Institute* held in conjunction with the Annual Meeting will mean — in its various sessions — an Annual Meeting for Highway, City, Waterworks, Railroad, Electrical Engineers, etc., etc, and will certainly tend to considerably improve the attendance and also increase the interest in *The Institute*, especially if standing Committees will be formed in the various branches of our great profession.

It was also decided to support the invitation extended by the Manitoba branch to the parent Institute to hold the annual meeting 1921 in Winnipeg and the advisability of suggesting to hold the annual meetings alternately in the east and west will be taken up by the Branch Executive.

A number of correspondents, members of the branch, for *The Journal* were appointed at the various centres of the Province.

H. B. Sherman, A.M.E.I.C., Engineer in charge of operation of the Sask. Government Telephones read a very interesting paper on Rural Automatic Telephones in Saskatchewan, dwelling on the method of simplex dialing, an invention of the Vice Chairman of our branch, W. R. Warren, A.M.E.I.C., and explained the fact that the Saskatchewan system of rural automatic telephones as gradually introduced in the Province was the most advanced system on the continent.

Winnipeg Branch

Geo. L. Guy, M.E.I.C., Sec.-Treas.

At a meeting of the branch held at the Engineering Buildings, March 3rd, an address was given by Captain J. W. Wilton, M.L.A. on plans for dealing with the natural resources of the Province.

Captain Wilton who is a member of the Provincial Legislature and supported the measure on the above subject in the present legislature gave an extremely interesting paper, which was listened to by a large attendance. Discussion took place in which a large number of members took part.

The attitude of the meeting was most emphatic on the necessity for bringing to the notice of the public the need of a complete scientific study of the resources of the Province, together with a well thought out scheme for their development. A motion was passed that the Branch concur in the recent action of the Government and the Government be requested to take this matter up, further and take prompt action to prevent the resources being exploited and to ensure the utmost benefit to the public in their ultimate development.

On March 17th, a paper was read by G. R. Pratt, on "A New Type of Combustion Engine". Mr. Pratt's paper described a new development in the use of fuel for power, which he has been working on, and by means of diagrams and drawings showed how large economics could be affected by his system. With his arrangements the thermal cycle approached nearer the ideal conditions than any present heat engine.

A good discussion took place, members showing great interest in the invention. Mr. Pratt was given a very hearty vote of thanks from the branch, it being pointed out that this was one of the most original papers which had been presented to the branch and it was felt that after the development difficulties were overcome the invention would undoubtedly have a great bearing on the economic use of fuel in the future.

A motion of condolence was passed by the Branch on the death of their late Chairman, W. A. Duff.

Considerable interest has been taken by local engineers in the disintegration of concrete in alkali soils which has been brought to their notice by the recent trouble occurring on local concrete structures, most of which are undoubtedly due to this action.

Several members of the local branch have been appointed on the committee to investigate and report on this with reference to the Greater Winnipeg Water District project.

The Winnipeg branch of *The Engineering Institute of Canada* held its annual dance in the Fort Garry hotel on Wednesday, April 7. The students of the engineering department of Manitoba university, a large number of whom are student members of the branch, decided to hold their annual dance in conjunction with the *Engineering Institute*. There was therefore be a very representative gathering of engineers from this province. The patrons and patronesses were as follows: Brig.-Gen. H. N. Ruttan, C.M.G., and Mrs. Ruttan, Mr. and Mrs. J. C. Sullivan, Mr. and Mrs. T. R. Deacon, Mr. and Mrs. W. G. Chace, Mr. H. A. Bowman and Major E. P. Featherstonhaugh. The reception committee was composed of Mr. and Mrs. W. P. Brereton, Mr. and Mrs. W. M. Scott, Mr. and Mrs. Guy C. Dunn, Prof. and Mrs. J. N. Finlayson, Mr. and Mrs. W. J. Dick. The Rotary club quartette contributed numbers; there were also other interesting entertainment.

On April 1st a meeting was held in the University Building. Mr. McNamara of the Provincial Bureau of Labor gave a paper on "Safety Engineering". The paper was illustrated by moving pictures. Mr. McNamara gave a number of interesting statistics showing the economic loss in Canada due to accidents, many of which were preventable. He described the various means undertaken by large manufacturing and public bodies in Canada and the States to educate the public, and particularly the working man, to the necessity of taking precautions to prevent accidents. An interesting discussion took place, a large number of the members taking part.

Prof. Dorsey moved a motion that a small committee be appointed to consider the desirability of an effort being made to organize a wireless network in Manitoba.

That in view of the nature of radial communications being able to reach the frontier of the Province, under any emergency and in times of commercial stress and storm it should be under the Provincial Government control.

That the committee be authorized to fully consider the question and to report to the branch on what steps they think desirable with regard to the development of a wireless system of communication throughout the Province.

The Bill entitled "An Act Respecting Engineering Profession" has passed the legislature. Very few alterations were made to the original draft, such alterations being of a minor character. The Act is in line with the recently considered legislature at the special meeting which was held in Montreal.

A Provisional Council to administer the Act was appointed, and consisted of:

J. G. Sullivan, M.E.I.C., Consulting Engineer, Manitoba Drainage Commission.

W. M. Scott, M.E.I.C., Consulting Engineer.

J. M. Leamy, M.E.I.C., Power Commissioner Manitoba.

W. J. Dick, M.E.I.C., Mining Engineer.

W. P. Brereton, M.E.I.C., City Engineer, Winnipeg.

The Act calls for the council to provide a register and to register applicants.

Within six months of the coming into force of this Act a general meeting of the Association for organizing purposes will be held, when a permanent council will be elected.

The old Manitoba Civil Engineers Act, Chapter [illegible] of revised Statutes of Manitoba, 1913, is repealed.

The Act came into force the day it was assented to.

R. A. Ross, [illegible] of Montreal was visiting Winnipeg during the month.

The annual meeting of the Branch will be held on Thursday, May 6th, 1920.

Sault Ste. Marie Branch

Geo. H. Kohl, A.M.E.I.C., Acting Sec.-Treas.

Newton L. Somers, A.M.E.I.C., having resigned the Secretaryship of the Sault Ste Marie Branch on account of removal from the city, the Branch has unanimously chosen Geo. H. Kohl, A.M.E.I.C., as next year's Secretary-Treasurer. This appointment does not take effect officially until the end of the current year, but Mr. Kohl will carry on the duties of Secretary-Treasurer for the balance of the present year.

Border Cities Branch

J. E. Porter, A.M.E.I.C., Sec.-Treas.

At a meeting of the Border Cities Branch held in Windsor on Friday April 16th., D. A. Molitor, M.E.I.C. of Detroit, gave an address on the advantages of the metric system. Mr. Molitor enumerated four main advantages: simplicity, its international character, its single table of mensuration and the fact that it is based on the decimal system. Mr. Molitor gave the arguments against adopting the metric system, the chief of these being the expense and inconvenience of the change, but in view of the very great advantages inherent in the metric system these objections should not be held as too serious. The meeting, over which H. Thorne, A.M.E.I.C., Vice-Chairman of the Branch presided, was well attended, and gave Mr. Molitor an enthusiastic reception and an attentive hearing.

Niagara Peninsula Branch

R. P. Johnson, A.M.E.I.C., Secretary.

The Branch Executive Committee held a meeting at Niagara Falls on April 10th, and transacted a large amount of business, of which the following items are of interest to the membership generally:

Note was made in the Branch News of the March *Journal* of a resolution calling upon the Ontario Provincial Division to set up machinery for bringing to the attention of the Ontario Government the appointment of engineers to public positions and commissions where it was apparent that only a technical man possessed the necessary qualifications. A letter has been received from the Secretary of the Ontario Provincial Division acknowledging receipt of the resolution, and advising that it would come before the Executive of the Division for further action at its next meeting.

Another resolution of the Branch Executive is noted in the March *Journal* which has to do with the preparation of a salary schedule by the Ontario Provincial Division. A letter from the Secretary of the Provincial Division acknowledging receipt of this resolution was read and noted by the Branch Executive. Another letter from the Toronto Branch, giving approval of the resolution, was noted. The Chairman, as Branch representative on the Ontario Provincial Division, reported to the Executive the action which had been taken on the resolution. He showed that the members of the Provincial Division Executive had been circularized to obtain their opinions as to the best method of preparing such a schedule. The result of a ballot provided that the matter would come before the Division Executive at its next meeting in April.

The Executive Committee has had under consideration for some time the appointment of a Branch Legislative Committee and at the last meeting appointed F. E. Sterns A.M.E.I.C., as convener of this committee. The remainder of the committee is to be appointed later after consultation with Mr. Sterns.

The Chairman reported the recent visit of the Secretary of the Ontario Provincial Division to Niagara Falls and the meeting between him and the Chairman and Secretary of the Branch and the Chairman and Secretary of the Professional Meeting Committee. This meeting had to do principally with the 1920 Professional Meeting.

Messrs. K. C. Fellows, A.M.E.I.C. and S. D. Heuther A.M.E.I.C. were appointed auditors to audit the books of the Branch and report to the Annual meeting.

A resolution from the Toronto Branch calling upon Council to immediately take up the salary question was read and fully endorsed.

Trip to the Coniagas Smelter

The Branch held a trip of inspection to the works of the Coniagas Reduction Co. at Thorold, on Saturday afternoon, March 27th.

D. A. S. Mutch A.M.E.I.C., superintendent of the plant, gave a short talk before the trip through the works was started, and explained the process of reducing cobalt ore to its several refined constituents, and exhibited samples of the product from the natural ore state through all stages of refinement. These included metallic cobalt, nickel, silver, cobalt oxide in three forms, copper sulphate and arsenic.

The members were then conducted through the works in two parties, one in charge of Mr. Mutch, and the other under the leadership of Mr. Knittell, works chemist.

The first point visited was the blast furnace in which the ore is partially refined, most of the worthless content removed as slag, and the valuable metallic elements collected in a molten condition as bullion. The furnace was tapped for the benefit of the party, and the process of opening the cinder notch allowing the white hot [illegible] to flow into the ladles, and again closing the notch, was watched with great interest. As the mass cooled, the metals settled out in distinct layers according to their relative weight. When the cold mass was turned out of the ladle it was seen that the silver occupied the bottom portion with the nickel and cobalt above. The silver bottom was removed with a blow from a hammer, and sent on its course for complete refinement by chemical means.

The smoke from the blast furnace contains the iron content of the ore, and this is recovered by precipitation and filtration of the fine arsenic dust.

After the blast furnace treatment the process of obtaining each by-product is a chemical one supplemented by heat treatment at certain stages.

The chemical process consists in obtaining all the metals in solution as salts, neutralizing these to the point of precipitation of one by-product, filtering this out in filter presses and repeating the process with the remaining liquid till all the metallic salts are precipitated. These salts are washed, dehydrated and heated to a molten state and the refined metal obtained. The copper sulphate is crystallized out from the liquid in lead lined tanks, dried in a centrifuge, screened to size and packed for shipment. It is necessary to use lead pipes and pumps throughout the chemical process with special, acid resisting valves.

The final stage of the silver refinement is done in electrolytic baths. The cobalt remains in the oxide state and is shipped in this form. The party was interested in seeing this material being packed for shipment to the Orient.

The members are indebted to Mr. Mutch and Mr. Knittell for their clear explanations of each stage of the process and to Lt.-Col. R. W. Leonard, M.E.I.C.; President of the Coniagas Reduction Co., and Past President of *The Institute*, for the opportunity afforded of seeing the plant.

About thirty-five members participated in the trip.

Toronto Branch

H. A. Goldman, A.M.E.I.C., Secretary.

A general meeting of the Branch was held in the Engineers' Club on Thursday, March 25th, 1920 at 8.15 p.m.

The Chairman (R. O. Wynne-Roberts) presided.

It was moved by Mr. Cross, seconded by Mr. McMaster: "that the Spring Session of the Branch be extended one week to include May 13th, and that Mr. Slater from Washington be invited to come to Toronto to give a lecture, on that night, on the tests performed by the Emergency Fleet Corporation." *Carried.*

The Chairman then called upon the Speaker of the evening, Frank Barber, A.M.E.I.C.

Mr. Barber at first compared Canadian bridges with those built in Europe, pointing out that many bridges in Canada were built too light for the traffic, and the result frequently was disaster. Many bridges are built of wood, and therefore, are short lived, while the European bridges are built to last longer. But, said Mr. Barber, the time for wooden bridges has gone by. Steel largely replaces wood in tall buildings and also in bridges, and in a few years concrete will have replaced steel in bridges, except in special cases. The two characteristics usually attributed to steel, whereby it excels wood, are durability and fireproofing, but, said Mr. Barber, steel is neither durable nor fireproof. The average life of a steel superstructure is probably fifty years.

Mr. Barber then discussed the relation between the architect and the engineer. In the past, he said, the engineer has arrogated to himself the function of both the engineer and architect, this he claimed was a mistake. The practice often has been to call in the architect after all the design and planning of the structure was complete, and the architect was merely expected to add something for ornamentation. This, Mr. Barber thought, was not sufficient. He believed the architect should be consulted while the structure is being passed because he said "No great progress can be made until there is a greater co-operation between the engineer and the architect.

In the discussion which followed, the following members took part: Professors Young and Gillespie, Messrs. Oxley, McCarthy, Connor, Mylrea, Taylor, Hogarth and Engholm.

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A meeting of the Branch was held at the Physics Building of the University of Toronto on Thursday, March 18th, 1920 at 8.15 P.M.

E. L. Grauel, Field Engineer of the Automatic Telephone Co., delivered a lecture and demonstration on the many different features of the Automatic Telephone.

As the subject under discussion was one of general interest to the public, the meeting was thrown open to the general public.

After the lecture and demonstration a moving picture film, taken at the Annual Meeting of *The Institute* at Montreal, was thrown on the screen.

A regular meeting of the Branch was held at the Engineers' Club on Thursday, April 1st, 1920 at 8.15 p.m.

Two letters, which were received from Mr. Keith were read by the Secretary; one letter announcing the fact that the Council had appointed a Committee on Engineering Remunerations to deal with Engineering salaries and the other letter stating that the invitation by the Toronto Branch to hold the next Annual Meeting of *The Institute* at Toronto was accepted by the Council.

The following resolutions, which were previously passed by the Executive Committee, were also approved at this General Meeting:

"Whereas the Federal Government of Canada has decided to create a new department of Public Health, and

"Whereas in the opinion of the Toronto Branch, E.I.C., it is important that engineers should be represented on the Board;

"Be It Therefore Resolved that the Council should be requested to appoint a committee of members resident in Ottawa to urge upon the Government the importance and desirability of having at least one engineer on the Federal Board of Health."

"Whereas the Toronto Branch of *The Engineering Institute of Canada* at an open meeting held on March 4th, 1920 passed a Resolution urging the Council forthwith to request each Branch to appoint a Committee to investigate and report upon the structure and constitution of an organization designed to bring into operation direct and concerted efforts toward the improvement of the economic status of engineers, a copy of which was forwarded to the Headquarters on March 9th, 1920; and

"Whereas the members of the Toronto Branch desire to know what steps have been taken by Headquarters to give effect to their request, and

"Whereas the Council has invited a conference with the Ontario Councillors, the Chairman and Secretary of the Provincial Division and the Chairman of this Branch to discuss any and all Ontario matters which it is thought require special attention, and

"Whereas it is important that the question concerning the economical status of all engineers should receive the earliest possible attention,

"Be It Therefore Resolved that the Councillors, who are *ex-officio* members of the Executive Committee, and the Chairman of the Toronto Branch of *The Engineering Institute of Canada*, who are invited to Montreal on April 13th next, be requested to explain at the conference the urgency of the appointment of Committees to carry out the requirements named in the Resolution above referred to, and that a copy of this Resolution be sent to Montreal and to the delegates to the Convention."

The Chairman then called upon A. V. Hall, who read an excellent paper on "Town Planning and the Canadian Engineer." The Speaker outlined the elements which must be considered in the planning of a town.

An extensive discussion followed in which the following members took part: Messrs. Oxley, Bonnel, Powell, Hynes, Phelps and Storrie.

Kingston Branch

W. P. Wilgar, M.E.I.C., Sec.-Treas.

The Kingston Branch has been particularly fortunate since its organization, in the co-operation of its members in the matter of interesting technical papers and the courtesy of outside members in supplementing the local contributions.

The first paper, presented by J. M. Campbell, M.E.I.C., dealt with the details of construction and operation of the Kingston Mills Power plant.

Large scale plans and blue prints were used in illustration, and the methods of overcoming the early difficulties of operation were presented in a most interesting manner.

On the 2nd of February the Branch Secretary gave an address on the pioneer days of the National Transcontinental Railway in Northern Ontario and by means of lantern slides illustrated transport and supply arrangements incidental to the isolated portion of that district.

On the first of March the General Secretary, Fraser S. Keith, visited the Branch and delighted a very large attendance with his exposition of the aims and activities of The Engineering Institute.

He spoke particularly of the attitude of The Institute concerning its members, and pointed out its unique position along these lines in the field of technical societies.

On the 5th of March Professor Peter Gillespie of the Toronto Branch drew an audience of three hundred to listen with interest to his address, "Aesthetics of Bridge design as applied to Reinforced Concrete."

Errors of judgment and conventional conceptions in the reinforcing of structural details in design were illustrated by lantern slides.

On the 19th of March Captain F. M. Dawson, M.C., read a paper on "The Microscopic Examination of Cement and Concrete."

Capt. Dawson pointed out the enormous discrepancy between the cement used in proportioning and that which was effective as cementing material. He spoke of the results recently obtained in research along these lines by the addition of a catalytic agent, and illustrated his statements by remarkable photomicrographs of cement and cement mortars.

These, reproduced on the screen, showed clearly the unhydrated cement and the voids of ordinary portland cement mortars, and brought out in contrast the effects of certain catalytics, in reduction of the unhydrated percentage, and the consequent increased density of the mixture.

The members of the Engineering Society of Queen's University, the Undergraduate Engineering organization, were invited to attend all branch meetings, and demonstrated by a large and regular attendance a very keen interest in Branch affairs.

Peterborough Branch

R. L. Dobbin, M.E.I.C., Secretary.

On Thursday evening, March 18th, the Branch was addressed by A. B. Lambe, of Ottawa, Secretary of the Ontario Provincial Division on the subject of "Institute Affairs". Among other things Mr. Lambe described the progress of Legislation in the various provinces and what the Ontario Division proposed to do in this respect.

John Murphy, Electrical Engineer for the Department of Railways and Canals, was the speaker on Thursday, April the 8th, when he gave his celebrated lecture on "Ice, Frazil and Anchor Ice." Both moving pictures and lantern slides were used to illustrate the lecture which resulted in one of the best meetings the Branch has yet had.

The Nominating Committee appointed at the last meeting made the following nominations for the elections which will take place in May:

Honorary Chairman, R. B. Rogers,

Chairman, R. H. Parsons,

Vice Chairman: E. R. Shirley, P. L. Allison,

Secretary: R. L. Dobbin, W. G. Montgomery, B. L. Barns;

Treasurer: D. L. MacLaren, A. B. Gates;

Executive Committee: P. P. Westbye, A. L. Killaly, Jas. Mackintosh, J. A. Goulet, G. R. Langley, C. E. Sisson, C. H. Rogers, A. P. Miller, J. D. W. Magie, W. A. Logan, T. E. Gilchrist, N. D. Seaton.

Ottawa Branch

M. F. Cochrane, A.M.E.I.C., Sec.-Treas.

The Branch has held three meetings during the past month. On April 1st, at the regular monthly luncheon at the Chateau Laurier the principal guest and speaker was Mr. Storker Storkersen, who was first officer of the Anglo-American Arctic Expedition in 1906-07, and second in command of the Northern section of the Canadian Arctic Expedition 1913-19. Mr. Storkersen gave a graphic description of his experiences whilst in command of the last ice exploring party of the Canadian Expedition in 1918, when for eight months he and his companions lived and travelled on the ice floes, relying for their food almost entirely on hunting.

On April 8th, the Branch held a joint meeting with the local branches of the Town Planning Institute, and the Ontario Association of Architects, to hear J. Noulan Cauchon, A.M.E.I.C., explain the proposed removal of the Grand Trunk Cross Town Tracks. The subject was fully discussed by representatives of the various local organizations and the members of the Branch present expressed their general approval of the proposition for the removal of the Grand Trunk Cross Town Tracks, and for the transfer of the handling of all through traffic in Ottawa to a line and yards to be established outside the existing city limits.

The Executive Committee have considered that it would be in the interests of the Branch to have each year a popular lecture on some engineering subject of general interest. John Murphy, M.E.I.C., Chief Electrical Engineer, Department of Railways and Canals, and Railway Commission, was selected as the speaker for this year and delivered the first lecture of these annual series on April 21st, his subject being " Canada's Ice Problems and their Solution." Mr. Murphy's work in this connection is very widely known and drew a large and appreciative audience to the Collegiate Institute Hall where the meeting was held. He spoke more particularly in connection with ice jams and floods, hydraulic power plants, and the possibility of earlier navigation. The moving pictures showing frazil and anchor ice in process of formation, which have previously been seen by several of the Branches, were followed with great attention.

Montreal Branch

Frederick B. Brown, M.E.I.C., Secretary.

With John T. Farmer in the Chair, the first meeting of April was held on Thursday, April 2nd, when Lord Congleton, Jr. E.I.C. gave a most interesting address on naval gunnery, with particular reference to recent developments in fire control and direction. Lord Congleton has served for twelve years as a gunnery lieutenant in the Royal Navy and is thoroughly familiar with his subject. The lecture was fully illustrated with lantern slides showing the latest forms of naval gun sights, the director system, etc. An interesting point brought out in the course of the lecture was that with the perfection of the director system — developed largely through the initiative of Admiral Sir Percy Scott — one man controls the fire of not merely the guns of his own ship but those of the next in line. Another unique feature of the director system is that the rolling of the ship is taken advantage of to such an extent that frequently better firing is done in heavy weather than in smooth water. The discussion which followed the reading of the paper was lively.

On Thursday April 9th Capt. F. M. Dawson A.M. E.I.C., gave an illustrated lecture on "The Microscopic Examination of the Hydration of Portland Cement and Super Cement". This paper was highly technical and the result of much careful research work; it will be printed in a later number of *The Journal.* The lecture was illustrated with a number of lantern slides. Following the reading of the paper a number of members interested in this line of work joined in the discussion.

The third meeting of the month was held on the 16th, Arthur Surveyer, Chairman. The lecturer of the evening, Olivier Lefebvre, illustrated his splendid paper on "The Regulation of the St. Maurice River and the Gouin Dam" both with lantern slides and moving picture films showing the progress of construction work on the dam. Among the members who complimented Mr. Lefebvre, was Sir John Kennedy, Hon. M.E.I.C.

On April 23rd, J. Melville Allison gave a lecture on coton rope drive, the address being illustrated by a series of lantern slides specially sent from England, showing various types of cotton rope used for power transmission, and the methods of using it.

Mr. Allison said that in England they had paid much more attention to rope drive for power transmission than on this continent. Cotton, he said, had superseded manila and any other material for rope drive in this connection. Manila rope, he said, was cheaper than cotton, but the latter would carry a third more power, with a lifetime in the ratio of five to one, while the cotton rope was much less affected by atmospheric conditions.

St. John Branch

A. R. Crookshank, M.E.I.C., Sec.-Treas.

Good progress has been made this month with the Bill that the Association of Professional Engineers of the Province of New Brunswick have brought before the. Provincial Legislature, as it has received its first and second reading, and passed the committee stage on April 20th.

The Bill, as approved by the Provisional Council, was distributed to all engineers in the Province, and was filed with the Legislature on March [illegible]. The Bill was accompanied by a petition signed by 104 engineers.

Several of the Moncton engineers did not approve of some of the sections and called a meeting, which was held in Moncton on March [illegible]th, and was well attended, and several amendments were adopted.

On March 31st, a delegation from that meeting met the St. John Councillors and the other engineers and spent the day in thoroughly discussing the amendments. The majority of the amendments were approved, and the rest modified, and they were recommended to the Provisional Council.

The Council met that evening at Fredericton, with Moncton and other engineers, and the Association's legal adviser, and completed work on the revision of the amendments so that the Act, as amended, would be agreeable to all. The Act as amended was formally approved at a meeting of the Council the next morning, April 1st, after which a large delegation of engineers waited on the Law Committee of the Legislature and pleaded their case. The Committee had to adjourn before they had completed their study of the Bill.

The Law Committee completed their study of the the Bill the following week, and it was taken up in the Committee of the House on the [illegible].

The Committee had no objection to the principle of the Bill, but did not approve of the definition of "Professional Engineer," as they considered it might unintentionally infringe on the liberties of other classes of workmen, so sent it back to the Law Committee to be amended.

Some opposition was raised by the Association of Domestic Sanitary and Heating Engineers of New Brunswick, who objected on account of their not being included in the working of the Act.

The Law Committee amended the definition by changing the first three lines of Section 2, subsection (b) from "The practice of a Professional Engineer within the meaning of this Act embraces advising on, valuating, designing, laying out, and supervising the construction, enlargement," etc. to "'Practice as a Professional Engineer" shall mean and include the designing, laying out, and supervising in a professional capacity the construction, enlargement,' etc. The first clause of this refers to the penalty clause, section 11 (a).

It is expected that the third reading will take place before this goes to press.

The St. John Branch held its regular monthly meeting on April 22nd with G. G. Murdoch, M.E.I.C., in the Chair.

The Committees on the "Old Court House" rebuilding proposition, and on City planning reported progress.

The speaker of the evening was Capt. C. McN. Steeves, M.E.I.C., late Adjutant 9th. Battalion Canadian Engineers, who took as his subject "Organization of Military Bridging Operations."

Mr. Steeves dealt very exhaustively with all the detail steps and operations followed by the Engineering Corps in France in preparation for and the building of temporary or semi-permanent bridges for army purposes.

On first entering upon an area information was gathered from all possible sources of the location, dimensions, etc., of existing bridges in the country that was or might be occupied. Also information was obtained regarding possible bridge sites, railroad, highway and other transportation facilities, resources of the country in building material, etc.

Large depots were established at the rail-head, where complete supplies of standardized bridging materials, tools and equipment were kept. This included fabricated steel and wooden spans from 10 to [illegible] feet long all ready to be put together at the bridge site, trestle bents of varying heights, standard lengths of boat sections, etc. Smaller depots were opened up at transportation centres farther inland.

When a bridge was found to be necessary the Engineers of the field party would obtain information as to the requirements of the case and would report to Headquarters the size and type of span required, the stock of material at hand, transportation difficulties, and would make arrangements for the rationing and the taking care of the men composing the working parties. Detail methods of handling the material and transporting it to the site worked out so as to have the material arrive when wanted and to avoid congestion or other interference to rail or highway traffic. Highways had to be improved to take the heavy steam or petrol lorries, and yards at the site prepared for storing the material as delivered and from where it was taken and erected into the structure as required.

Materials would start arriving from the depots in from twenty-four to thirty-six hours after the requisition had been sent in so little time was given in getting ready to receive it. Piers and abutments were made of pier supports or built up of three foot cribs of angle iron, bolted together by light timbers. These coming already built would be put together quickly.

A novel departure from civilian practice was the placing of the spans without any falsework. The span was built inshore on rollers and ropes were attached to its river end and led to derricks on the opposite bank of the river. When it was completed it was pulled across until it rested on the bridge-seat on the farther side. Preventer tackle attached to dead men and the inshore end of span controlled the movement.

After an interesting discussion on Mr. Steeves' paper considerable business was transacted which included a resolution approving of the stand taken by the Manitoba Branch re the Federal Civil Service classification.

Halifax Branch

[illegible], M.E.I.C., Sec.-Treas.

A meeting was held in the [illegible] Banquet Room on Friday, March 26, at 1 P.M. ([illegible]). The attendance was [illegible] including Messrs. H. S. [illegible], representing the Dartmouth Board of Trade, H. L. Hart, representing the [illegible], [illegible], representing the Halifax Board of Trade, Geo. L. [illegible], representing the Rotary Club, and C. P. Wood, representing the Commercial Club, these gentlemen being guests of the Branch.

The following letters were read:

Halifax, March 20th, 1920.

F. A. Bowman, Esq.,
Chairman Halifax Branch,
Engineering Institute of Canada.

Dear Sir:—

Your committee appointed to investigate a proposed Bridge across Halifax Harbor at a suitable point nearer the center of population (than that suggested at the "Narrows") and as brought up at the Citizens Joint Committee, beg to report as follows:—

The type of bridge to be considered is one to carry street railway vehicular and pedestrian traffic. From available information it is quite certain that the Admiralty will not permit piers or obstructions of any kind outside of pier-head lines. As a result this puts a low level bridge, with draw or lift spans out of the question.

A high level bridge was then investigated and as a height of at least 150 feet was necessary for the entire width of Harbor, nothing else seems feasible except a Suspension type, which would be cheaper than a cantilever to give the full necessary clearance. The site suggested was that between the vicinity of the Dockyard on the Halifax side and Black Rock point on the Dartmouth side. A sketch plan is herewith submitted showing soundings, elevations, and profile of approaches, the soundings being obtained from Admiralty chart of 1918, and profile from measurements and levels on the ground. It will be seen from this sketch that the height of Main piers is approximately 200 feet to base of Towers. Approches on the Halifax side can be obtained as shown with a fairly easy grade from Lorne Terrace, and on the Dartmouth side the long approach seems the best.

Under these conditions we estimate the cost of Bridge at not less than $10,000,000.00 arrived at as follows:

Two main piers	$ 2,400,000.00
Anchorage	600,000.00
Suspension Span	3,000,000.00
Approaches	2,000,000.00
Right of Way & Engineering	2,000,000.00
	$10,000,000.00

The annual cost of such a Structure would be in our opinion about $1,300,000.00 arrived at as follows;

Upkeep	3%	300,000.00
Depreciation	3%	300,000.00
Interest	7%	700,000.00
		$1,300,000.00

Further we do not believe, from enquiry made during the short time at our disposal, that more than 25% of the annual cost could be raised by any system of reasonable tools and rentals. We therefore beg to report that we do not consider this proposition could be justified by the traffic which it would serve.

For the Committee,

(Sgd.) L. H. WHEATON,
Chairman.

F. A. Bowman, Esq.,
Chairman,
Halifax Branch, Eng. Assoc. of Canada.

Dear Sir:—

As a delegate from this Branch to the Joint Committee on the proposed Dartmouth Bridge, I wish to deal further with this question beyond my instructions as Chairman of our own Society's Committee, which dealt solely with the Bridge at the Dockyard site. Any one can see from the sketch that, assuming the permission of the Admiralty were granted for a Low Level Bridge, there are some complications connected with this which require attention.

If this bridge were built to enable railway connections; and this is quite feasible, either the grade problem, due to over head crossing of tracks on each side of the Harbor, would compel broken grade approaches, and result in an unaesthetic structure; or a double deck bridge with traffic floor above the railway level would have to be built, thus, adding materially to the cost.

Again, if you eliminate railway connections, the traffic bridge could be built at same level as floor of over-head bridges-giving us higher piers, but not increasing cost, as this would be off-set by the elimination of the railway connections.

In my opinion, the bridge at the narrows, while lengthening the distance to and from Dartmouth, seems the most feasible, and the most likely to be financed—since there is the hope of Government aid in all or the greater part of the cost, which is less than any other structure, better located for railway traffic, and more in keeping with the amount of other traffic to be served.

Yours very truly,

(Sgd.) L. H. WHEATON,
Consulting Engineer.

The Chairman gave a brief outline of the reasons for the appointment of the Bridge committee and of their work in getting up the report. The report of the committee was then read by the Chairman and ordered incorporated in the minutes as heretofore given.

Mr. Wheaton then explained how the figures in the report were arrived at. Relative cost data were given for a bridge at the Narrows and a low level bridge at the Dockyard in comparison with the estimates for a suspension bridge at the latter point.

A lively discussion followed; in this several visitors took part and many interesting facts were brought out.

The Chairman extended the thanks of the branch to the guests for the part they had taken in the discussion and also extended the thanks of the branch to Mr. Wheaton and his associates for the excellent work done.

Mr. Allen, on behalf of the general bridge committee extended the thanks of that committee to Mr. Wheaton and his associates, and stated that the report would be laid before this committee at an early date. Mr. Hart, in seconding this vote of thanks on behalf the Progressive Club expressed his personal pleasure in being present.

Preliminary Notice

of Applications for Admission and for Transfer

[illegible] April, 1920.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in May 1920.

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:—

Every candidate for election as MEMBER must be at least thirty years of age, and must have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. The term of twelve years may, at the discretion of the Council, be reduced to ten years in the case of a candidate who has graduated in an engineering course. In every case the candidate must have had responsible charge of work for at least five years, and this not merely as a skilled workman, but as an engineer qualified to design and direct engineering works.

Every candidate for election as an ASSOCIATE MEMBER must be at least twenty-five years of age, and must have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in some school of engineering recognized by the Council. In every case the candidate must have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, shall be required to pass an examination before a Board of Examiners appointed by the Council, on the theory and practice of engineering, and especially in one of the following branches at the option of the candidate: Railway, Municipal, Hydraulic, Mechanical, Mining, or Electrical Engineering.

This examination may be waived at the discretion of the Council if the candidate has held a position of professional responsibility for five years or more.

Every candidate for election as JUNIOR shall be at least twenty-one years of age, and must have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the Council, if the candidate is a graduate of some school of engineering recognized by the Council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: Geography, History (Govt. of Canada in particular), Arithmetic, Geometry (Euclid Books I-IV and VI), Trigonometry, Algebra up to and including quadratic equations.

Every candidate for election as ASSOCIATE shall be one who by his pursuits, scientific acquirements or practical experience is qualified to cooperate with engineers in the advancement of professional knowledge.

> The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

CALVIN—JONATHAN DAVID, of Montreal, Que. Born at Garden Island, Ont., Nov. 20, 1883; Educ. B.A.B.Sc. (Civil) Queen's Univ. 1907; Summer 1906, with the Kaministignia Power Co. Fort William, asstg. at installation Turbines and Generators; 1907-14, Marine Supt. Calvin Co. Ltd., Shipbldrs., Forwarders, Wrecking Plant etc., 1914-19, served with C.E.F., 2½ yrs. in France with 6th Field Co., C.E. (Lieut.) and 10th Brig. C.E. (Major). At Present Supt. of Docks for The Century Coal Co., Montreal.

References: A. Macphail, W. P. Wilgar, W. L. Malcolm, L. W. Gill, L. C. Gwillim.

CHRISTIE—FRANK CARL, of Yorkton, Sask. Born at Yorkton, Sask., March 1895; Educ. B.A.Sc., Toronto Univ., April 1917; 1914, Apr.-Sept., draftsman H. K. Moberly; 1916 Apr.-Sept. Inspector Canadian Inspection and Testing Labs, Ltd.; Apr. 1917-March 1919, employed Fegles Bellows Engr. Co. Ltd., Ft. Wm. Ont. as Asst. Supt. on constrn. of grain testing plant and storage elevator, 1918, Feb. to Apr. 1919, as designing engr.; Dec. 1918-Mar. 1919, in chge. of erection struct. steel on Sask, Co-Operative Elevator at Pt. Arthur, Oct. 1919 to March 1920, in chge field work in surveying, railroad and municipal work for H. K. Moberly.

References: E. B. Webster, H. T. Crosbie, C. S. Cameron, H. G. Phillips, P. Gillespie.

CLARK—ARTHUR LEWIS, of Kingston, Ont. Born at Worcester, Mass., U.S.A., Feb. 19th, 1873; Educ. B.Sc., Worcester Polytechnic Inst., 1894; Ph. D. Clark Univ., 1905; 1896, foreman plant New Rochelle Gas & Fuel Co., New Rochelle, N.Y.; Since 1906, Prof. Physics Queen's Univ. Since Oct. 1919, Deac. of Fac. of Applied Science Queens Univ., Member of Amer. Phys. Society, Assoc. International du Froid, Société Française de Physique, Amer. Society of Refrig. Engrs.; Fellow of Royal Society of Canada.

References: J. M. Campbell, A. Macphail, J. G. Gwillim, L. Malcolm, W. P. Wilgar.

CONNELL—ALBERT GRAINGER, of Winnipeg, Man. Born at Airdrie, Scotland, July 31st, 1887; Educ. 1902-07, Royal Tech. Coll., Glasgow, Scot.; 6 yrs. Apprenticeship with G. Arthur & Son, Civil Engr., Scotland, 1902-08; 1908-11, Asst. Highway Engr. Lanark County Council, Scotland; 1911, C.N.R. as Structural Draftsman; 1911-12, draftsman, levelman & transitman on location survey C.N.R.; 1912-13, Same as above with H.B. Ry., on prelim. & location survey; 1913-14, topog'r., Reclamation Branch, P.W.D., Man.; 1914-19, on active service with Royal Engrs.; At present Asst. Engr. Reclamation Br. P.W.D. of Manitoba.

References: H. A. Bowman, F. A. W. MacLean, A. H. Corbett, R. W. McKinnon, C. H. Blanchard.

CONRADI—FREDERIK JOSEF, of St. Catharines, Ont. Born at Trondhjem, Norway, July 13th, 1880; Educ. Columbia Univ. 2 yrs., C.E. 1905-06; Cooper Inst. of Science and Art. 1907-08; C.E. Course I.C.S.; 1908-11, Draughtsman; 1911, in chge. detail drwgs. on bridge and structural steel work D.B.Co., Montreal; 1914-17, asst. bridge and lockgate engr., Welland Ship Canal (design and erection) 1917, Mich. Cen. R.R. Co. Detroit, design of erection scheme for New Niagara River Bridge; 1918, Plant engr. Johncke Shipbldg. Co. New Orleans La., Complete chge. of enlargement of yards at Madisonville La.; 1918-19, plant engr. Brit. Am. Shipbldg. Co., Welland, Ont.

References: R. W. Leonard, W. H. Sullivan, F. E. Stern, J. L. Weller, D. C. Tennant, R. P. Johnson.

COSSITT—MURRAY FREDERICK, of Halifax, N.S. Born at Sydney, N.S., June 2nd, 1892; Educ. High Sch. Education; 4 yrs. evening classes in mathematics, two I.C.S. courses; Aug. 1911, rodman of mineral areas in Nova Scotia for N.S. Mines Dept. 1914, transitman for above mentioned survey; 1915 in chge. of survey in and around Halifax for McKenzie, Pickings and McCallum, Recd. P.L.S. certificate, 1918 Asst. to chief eng. for Foley Bros. putting in the concrete foundations etc., for transitsheds at Halifax Ocean Terminals. At present in chge. of survey work and gen'l. engr'g. for Pickings and Roland Civil and Mining Engrs. Halifax, N.S.

References: J. W. Roland, H. B. Pickings, C. St. J. Wilson, D. S. Wickwire, K. H. Smith, H. W. Mahon.

DANPHINGE—ENNA E., of Halifax, N.S. Born at Hubbards, N.S. June 28th 1895. Educ. "B" Cert. Halifax County Academy. Cert. in Land Surveying N.S. Tech. Coll. 1914; April 1914-Oct. 1916 Practised land surveying in Nova Scotia; Oct. 1916 Instr'man with Imperial Oil Co. Dartmouth, N.S.; Sept. 1917 Joined C.E.F. served overseas as N.C.O. bldg. light rys. Retd to former position in June 1919.

References: C. B. Leaver, F. C. Mechin, E. F. Handy, H. W. L. Doane.

DeSAVIGNY—HERBERT JAMES, of Weyburn, Sask. Born at Owen Sound, Ont. Aug. 19th 1880; Educ. 1894 passed into Collegiate Inst. Owen Sound—had to give up on account of poor health.; 1902 started on location party in Engr. Dept. C.P.R. worked way up to transitman. Instr'nam on constrn. for 2 yrs. 1907-15 Res. Engr. 1915 constrn. closed down; called back to position 1919.

References: J. G. Sullivan, W. A. James, F. A. Wilkin, C. H. Larson, C. Flint.

FORTIN—EUGENE, of Quebec, Que., Born at Quebec, Que., Mar. 1st 1889; Educ. Quebec Seminary and private course; 1907-11, rodman and draftsman on T.C.Ry.; 1911-12, rodman and levelman on location Quebec Eastern Ry., and instr'man on constrn C.N.R.; 1912 to date, Dept. of Roads Quebec., up to 1916 in chge of instrument work on constrn, 1916-20 Div'n Engr. in chge of constrn and maintenance of Roads.

References: A. Fraser, J. A. Lefebvre, R. Savary, J. O. Montreuil, P. Joncas T. E. Rousseau, J. E. Roy, F. X. Ahern.

FRANCIS—THOMAS FREDERICK, Lieut. of Carbon, Alta., Born at Moncton, N.B. March 29th 1890; Educ. 3 yrs Ap. Sc. McGill, enlisted at commencement of 4th yr; 1908-11, with C.P.R. on constrn and location as topog'r and instr'man; Summers 1912-13, Acting Res. Engr. and Res. Engr. on constrn (C.P.R.), experience in grading, track-laying, structural work etc.; 1914, with C.P.R. Kootenay Central Branch, cost details & supt'g of concrete foundations; 1915, on constrn of Rogers Pass Tunnel as force accountman, instr'man and concrete inspector; 1916, with Mettagami Pulp & Paper Co., as driftsman on Power Plant and Asst. to Res. Engr. on constrn; 1916-19, overseas with 239th Ry. Constrn. Battn. enlisted as private received comm. in France; July 1919 to date, Res. Engr. on Mile 12-24 Acme Empress Branch C.P.R.

References: J. R. C. Macredie, W. A. James, J. McGregor, F. W. Alexander, H. M. Mackay, J. R. McLean.

FRASER—ALEXANDER SYME, of Kamloops, B.C. Born at Annan, Scotland, Jan. 21st 1874. Educ. Annan Academy 1888, Science and Arts Exam. and London City and Guilds Exam. 1887, Heriot-Watt College (Edinburgh) Elec. Engr. 1900; with D. Bruce Peebles Co. Ltd., Edinburgh as Mech. Armature Winder, Tester, Erector; 3 yrs engr. in chge Eglinton Iron Works, 1 yr in chg Royal Paper Mills, London, Eng.; 1 yr Constrn engr, Can. Gen. Elec. Co.; 3 yrs engr. in chg. Frost & Wood Co. Smiths Falls, Ont.; 3 yrs Supt. Smith Falls Elec. Ry. Co.; 3 yrs constrn engr. B. C. Elec. Ry. Co. Victoria; 3 yrs master mech. B. C. Elec. Ry. Co.; 1 yr Supt. Public Utilities, Kamloops, B.C. Has designed and installed steam and hydro elec. plants. Supt'ed install'n of complete power house equipment with generators up to 8,000 K.W. each. At present City Manager, Kamloops, B.C.

References: F. S. Keith, A. E. Foreman, E. N. Horsey, N. M. Hall, C. G. Cline, C. Varcoe.

FREDEA—MAURICE FRANK, of Chester, N.S. Born at Chester, N.S. May 10th 1894; Educ. B.S.C. (C.E.) Queen's Univ. May 5th 1920; Summers 1913 and 1914 rodman and topog. with Can. Geol. Survey.; 1914-19 with C.E.F. 6th Field Co. C.E. Granted Comm. Jan. 1918; mentioned in despatches. Summer 1919 topog. with Can. Geol. Survey.

References: A. Macphail, W. P. Wilgar, T. S. Scott, K. Weatherbee, L. Malcolm.

GRAY—SAMUEL WILSON, of Halifax, N.S. Born at Westville, N.S. May 8th 1892; Educ. B.Sc. (C.E.) N.S. Tech. College; 1913 (4 mos.) rodman and leveller N.S. Highway Survey; 1914 (5 mos.) Concrete Insp. N.S. Highways (Co. of Pictou) Sept. 1914 to Feb. 1916 Chief Clerk to Genl. Supt. H. & S. W. Rly. handling all Tie and Timber contracts and traffic regulations (schedules, correspondence etc.,) Feb. 1916-Nov. 1919 on active service 1 yr in Canada with C.E.; 14 mos. France with Seige Artillery duties as follows: Laying out lines of fire, controlling artillery fire, range finding and ranging of Batteries and working out of all corrections necessary for accurate firing of guns. At present Industrial Surveyor with Dept. of S.C.R. Halifax, N.S.

References: K. E. Whitman, R. P. Freeman, H. W. L. Doane, J. W. Roland, H. W. Mahon, C. A. Fowler.

GRAY-OWEN—JOSEPH, of Regina, Sask. Born at Bangor, England, July 1883; Educ. Univ. of Wales; Articles pupil John Gill, M.I.C.E. Bangor, England; 1902-04, Asst. City Engr. Bangor, England; 1905-11, Town Engr. Llangollen, Wales; 1911-12, G.T.P.Ry. on Engr'g Staff-field and office; 1913-15, Town Engr. Outlook, Sask.; 1915-19, with C.E.F. At present Res. Engr. Parsons Engr'g Co., Regina, Sask.

References: J. N. deStein, E. B. Merrill, A. W. Gray, R. O. Wynne-Roberts.

HANNA—DAVID McLEAN, of Windsor, Ont. Born at Toronto, Ont., Feb. 6th 1884; Educ. Matric. 1 yr S.P.S. Toronto; 6 yrs chainman & rodman with Railway Section Dept. of Works, Toronto; 4 yrs transitman & leveller, and 6 yrs Chief of Surveying and Drafting for same company. At present Supt. of Water Works Plant & Construction, Windsor, Ont.,

References: E. Brian, M. A. Stewart, E. M. Proctor, E. A. James, H. W. McAll, W. R. Worthington.

HAZEL—FREDERICK BRACKENRIDGE, of Winnipeg, Man. Born at Carnoustie, Scotland; July 5th 1890; Educ. B.Sc. (Engr) St. Andrews, Scotland, 1911; 1911 (4 mos), levelling and drafting for Univ. of Manitoba; 1912-16, Constrn Dept. Winnipeg Public School Board Reinforced Concrete and Gen'l Bldg. Design, Supervision of Erection; last year in charge of drafting office; 1916-19, with C.E.F. one yr dftsman for 3rd Can. Ry. Troops, location, constrn and maintenance of Light & Standard Rys. in France; May 1919 to date, Draftsman for Manitoba Drainage Commission, Winnipeg.

References: J. G. Sullivan, D. L. McLean, J. McGregor, F. A. W. MacLean.

HENDERSON—B., of Brandon, Man. Born at Bradford, Yorks, England, January, 1877; Educ. 3 yrs. mech. eng. Tech. College, Bradford; 1904-05 chainman and rodman on location T.C.R.; 1905-6, chainman and rodman on constrn. T.C.R.; 1907-9 instr'man on constrn. T.C.R.; 1909-11, res. engr. on constrn. T.C.R.; 1912-14, office engr. dist. office, St. Boniface; 1915-16 res. engr. H.B. rly.; 1916-19, Can. Engrs. 7th Fld. Coy. and rly. troops; 1919-20, instr'man maintenance of Way C.N.R., Brandon

Reference: G. L. Mattice, J. V. Dillabough, A. M. Macgillivray, G. F. Richan, J. B. Porter, L. E. Silcox, N. B. MacTaggart.

HOOVER—OWEN HUGO, of Calgary, Alta. Born at Little Brittain, Ont., Educ., B.A.Sc. Toronto, 1912; Summer work—prospecting Engr. and drafting; 1912, asst. field engr. Dept. of Int. Irrigation Dept. Calgary, Alta., 1912-16 Hydrometric Engr. Dept. of Int. Irrigation Office, Calgary; 1916-19 overseas—gunner with 1st Can. Heavy Battery; At present Hydrometric Engr., Dept. of Int. Irrig. Office, Calgary, Alta.

References F. H. Peters, A. L. Ford, P. M. Sauder, J. W. Porter, F. K. Beach

MUNN—WILLIAM GEORGE QUADE, of Peterboro, Ont. Born at Quebec, Que., Feb. 26th 1880. Educ., Sabrevois College, Montreal, Silver Medal for Math. and private tuition; 1895-1902, served apprenticeship as machinist with Robert Mitchell Co. Northern Elec. Co., and Allis Chalmers, Rockfield; 1906, draftsman with Dom. Roller Bearings Co., Niagara Falls, Ont.; 1907, draftsman with Otis Fensom Co., Hamilton, Ont.; 1909-12, Draftsman with William Hamilton Co. Ltd., Peterboro; 1912 to date, Chief Draftsman with above company in full chge of drawing office and design of Hydraulic Turbines etc., under direction of Chief Engr.

References: P. P. Westbye, R. L. Dobbin, W. G. Montgomery, C. E. Sisson, R. H. Parsons.

NEILSON—ALEXANDER BROWN, of Winnipeg, Man. Born at Winnipeg, Man., Jan. 12th 1881. Educ., High School, partial course in Eng'g Amer. Corr. School.; 1911-15 in charge of all well drilling for City of Winnipeg.; 1915-16 in chge. of erection of Elec. Machinery at Fire Service Water Works. 1918 in chg. of Water Main Survey for Winnipeg. Asst. Engr. in chg. of water works constrn. for Winnipeg. At present Asst. engr. Engr'g Dept. City of Winnipeg.

References: W. P. Brereton, W. M. Scott, A. L. Cavanagh, W. Aldridge, E. V. Caton, W. G. Chace.

O'NEIL—JOHN, of Fredericton, N.B. Born at Fredericton, N.B. June 16th 1889; Educ., B.Sc. (C.E.) Univ. of N.B. 1912; Summer work, with Power-Brewer, Bridge Contractors, and Asst. to City Engr. Fredericton; 1910, Engr. for Ryan Constrn Co. Fredericton, on brick & Concrete Bldgs; 1912-13, City Engr. Fredericton; 1913-15, Asst. Bridge Engr. with Hennepin Bridge Co., Minneapolis; 1915 (8 Mos.), with transportation party on D.L.S., Base Lines; 1916-19, Overseas with C.F.A.; At present taking Post Graduate Course at Univ. of N.B. Instructor and Demonstrator at same University.

References: G. E. Howie, L. L. Theriault, R. F. Armstrong, J. A. Stiles, H. R. Loggie, A. A. Colter, W. E. Ewing.

O'NEIL—Miss MARY, of Fredericton, N.B. Born at Fredericton, N.B. July 1st 1893; Educ. B.A. Univ. of N.B.; Seven years experience in Engr'g office as tracer, clerk, and stenographer. At present asst. tracer and stenographer in Engr's Office D.P.W. Fredericton, N.B.

References: C. O. Foss, A. A. Colter, B. M. Nill, L. Theriault, D. W. Burpee.

PIERARD—LEANDRE, of Winnipeg, Man. Born at Farciennes, Belgium, Nov. 16th 1881. Educ., B.Sc. Liege, Belgium, 1902; 1902-09, not engaged in engr'g, work; 1909-13, with C.P.R. as draftsman & instr'man on Ry. constrn & location, & Res. Engr. in chge of constrn; 1913 to date, dftsman and (from 1916) designing dftsman Chief Engr's. dftg office, Winnipeg, Man., (C.P.R.)

References: C. H. Fox, J. A. Hesketh, J. C. Holden, W. A. James, F. Lee, T. Lees, J. G. Sullivan.

POLSON—ALEXANDER VIVIAN, of Winnipeg, Man. Born at Winnipeg, Man., June 4th 1893. Educ., Mech. Engr. Cornell Univ. 1917; B.A. Univ. of Man. 1914; Summer work, Land survey with McColl Bros. & Bayne & Hobbs Winnipeg; 1917-18, Sales Engr. Goulds Mfg. Co., Seneca Falls, N.Y.; 1918-19, U.S.A. Army, Science & Research divn., Aviation Section, Signal Corps; 1919 (May to Aug.), Winnipeg Light & Power Dept.; 1919 to date Asst. Maintenance Engr. Winnipeg Electric Ry. Co.,

References: G. B. McColl, E. V. Caton, S. Wilkins, W. N. Smith, A. H. O'Reilly, W. C. Taylor.

RENAUD—DAMIEN, of Quebec, Que. Born at St. Lin des Laurentides, Que., Dec. 30th 1872. Educ., St. Mary's College, Montreal; 1905-11, draftsman, leveler & transitman in Canal Engrs Office; 1911-16, on Constrn Staff for Lachine Canal; 1918 to date, Dept. of Highways, Prov. of Quebec, working for Mr. J. A. Lefebvre, Engr., in charge, supervising road constrn, bridge etc., also making surveys estimates and plans.

References: H. R. Lordly, A. Fraser, J. A. Lefebvre, R. Savary, P. Joncas, T. E. Rousseau, P. Piche.

RICHARDS—WILLIAM ALLINSON, of Ottawa, Ont. Born at Toronto, Ont., Dec. 10th 1882. Educ., 3 yrs Science McGill 1902-05; 1906-09, with C.P.R. as rodman and instr'man; 1909-10, Acting instr'man C.P.R. maintenance of way, Winnipeg to Fort William; 1910-13, draftsman and Senior Draftsman N.T.C.Ry. North Bay & Cochrane Dist. C.P.R.; 1913-14 and 1919 to Jan. 1920, Chief Draftsman Ry. Hydro Elec. Commission, Toronto; 1914-19, overseas 2nd Battn Inf. Prisoner April 1915, Discharged 1919. At present, Senior Draftsman Interior Dept., Reclamation Service, Ottawa, Ont.

References: A. T. Tomlinson, G. L. Mattice, A. H. Willets, G. G. Gale, R. B. Young, H. R. Cram, W. C. Gillis, E. J. Turley.

ROSS—WILLIAM EWART, of Peterboro, Ont. Born at Ardsley, Leeds, England, March 2nd 1889. Educ., 5 yrs Wakefield Grammar School, 2 yrs Mining Elect'l Course (not completed) Univ. of Sheffield, England; 1906-07, Power house, boiler-room, and machine shop, Hemsworth Coal Co., Hemsworth, England; 1908-10, Asst. to Elect'l Engr. with above company; 1910-12, Elect'n in chge Sheepbridge Coal & Iron Co., England, Install'n and superv'n of haulage etc., and gen'l mining machinery; 1912 (6 mos), with Standard Lumber Co., Manitoba; 1913 (8 mos), Foreman of constrn Elect'l install'n Town of Souris, Man.; 1914-18, with C.E.F. Infantry and Mach. Guns. Enlisted as Sgt. promoted to Lieut.; 1918-19, Dept. of S.C.R., Ontario. 6 mos Asst. Dist. Vocational Officer, later Supt. of Curative Workshops. Install'n and Gen'l Super'n of Machinery and Equipment for various branches occupational Therapy; Sept. 1919 to date, draftsman Can. Gen'l Elec. Co., Peterboro. Switchboards and Indus'l Control Apparatus.

References: H. E. T. Haultain, G. R. Langley, E. R. Shirley, P. L. Allison, T. G. Gilchrist, A. L. Sutherland.

RUTTON—JOHN DOUGLAS, of Winnipeg, Man. Born at Winnipeg, Man., April 5th 1889. Educ., 2 yrs University of Manitoba; 1907 & 1909 (7 mos), with C.P.R. as rodman & leveller; 1910 (4 mos), with City of Winnipeg; 1911 (2 mos), with City of St. Boniface, Man.; 1911-14, with H. N. Ruttan, Consltg Engr. Winnipeg, instr'man & dftsman; Prepared plans and supt'd constrn for sewerage, water supply, asphalt pavements etc.; 1914-19, with C.E.F.; At present Rural Engr. for Municipality of Fort Garry.

References: H. N. Ruttan, M. P. Blair, W. Aldridge, W. P. Brereton, W. J. Dick.

SMITH—GORDON J., of Kingston, Ont. Born at Kingston, Ont., Oct. 31st 1891. Educ., B.A. (1912) B.Sc. (C.E.) 1915 Queen's Univ.; 1910 Sampling and surveying Centre Star Mine Rossland B.C. 1911 Maintenance of Way C.P.R.; 1912 Asst. to Prov. Geologist Northern Ontario; 1913 Hydrographer, Dept. of Interior, Western Canada; 1914 Oil Geologist, Western Canada; 1915-17 Asst. Prof. of C.E. N.S. Tech. Coll. Halifax, N.S. 1916 (5 mos) Asst. to Chief Engr. on Halifax Ocean Terminals in chg. of Water End of this work. At present engaged in commercial enterprise.

References: J. B. Harvey, W. P. Wilgar, J. W. Roland, A. Macphail, G. H. Whyte.

SMITH—HENRY DENNE St. ALBAN (Lieut.), of Calgary, Alta. Born at Peterboro, Ont., March 28th 1890. Educ., R.M.C. 1911; 1911-12, Dept. Rys. & Canals, and City Engr's Office, Toronto; 1912-14, Dept. of Int. Calgary, Hydrographic Surveys, and Asst. Engr. Irrigation Divn; 1914, C.E.F. Lieut. 4th Field Co. C.E. 1916-18, O.C. 4th Field Co. C.E., June 1918 to demobilization O.C. 4th Battn C.E. Awarded D.S.O. and twice mentioned in despatches; 1919 to date Engr. Irrigation Divn. Dept. of Interior, Calgary, Alta.

References: F. H. Peters, B. Russell, N. M. Sutherland, P. A. Fetterley, R. G. Saunders.

SNELSON—WILLIAM HOYT, of Calgary, Alta. Born at Rolla, Miss. U.S.A. March 4th 1885. Educ., High School, Breckenridge, Colo., C.E. course I.C.S,; 1900-05, land surveying, irrigation surveys, etc.; 1905-06, with Monarch Con. Lumber Co., Monarch, Colo., in chge of location & constrn parties; 1907-09, reconnaissance work and field engr. in irrigation location; 1910-12, office engr. and res. engr. Colorado and Nevada; 1912-14, Asst. Engr. in constrn of small canals,etc. Dept. Nat. Resources, C.P.R.; 1914-15, Asst. Engr. Irrigation Branch, Dept. of Interior, Coaldale, Alta.; 1915-16, in chge irrig. investigation and demonstration work, Gluchin, Alta., 1916 to date Chief Agric. Engr. Irrig. Branch Dept. of Int. Calgary, Alta.

References: S. G. Porter C. M. Arnold F. H. Peters, A. S. Dawson, G. N. Houston.

STAYTON—EDWARD MOSES, of Liberty, Miss. U.S.A. Born at Independence, Mo., Sept. 4th 1874; Educ. Special course in C.E. Missouri, 1892-94; 1894 (6 mos) recorder on precise level party U.S. Coast and Geodetic Survey; 1895-96 rodman and instr'man on constrn. Kansas City Southern Ry.; 1896-98 Div. engr. in chge of constrn. Kansas & Oklahoma Central & Southwestern Ry.; 1898-1901 Asst. to City Engr. Independence, Mo., on constrn. sewer system etc.; 1901-02 Res. Engr. on constrn. Arkansas & Choctaw Branch, Frisco Ry.; Dec. 1902-April 1903 Locating Engr. Cherryvale, Oklahoma & Texas Ry., April 1903-Dec. 1904 Chief Engr. proposed Kansas City, Parkville, & St. Joseph Ry., Dec. 1904-April 1905 located and built 8 miles narrow gauge road in Spanish Honduras; April 1905 to Sept. 1906, Chief Engr K.C.P. & St.J.Ry., and K.C.St.J. & Excelsior Springs Ry., Sept. 1906 to July 1907 Locating Engr. Div. No. 1 Missouri River & Gulf Ry., (proposed), between Kansas City and Gulf of Mexico.; July 1907 to Dec. 1908 Locating Engr. for betterment work Central Georgia Ry., Jan. 1909 to June 1911 Chief Engr. surveys, Kansas City and St. Louis Electric Ry., June 1911 to March 1916 general consultation practice, location and constrn. of highways and railways: March 1916-June 1916 Highway Engr. Jackson County, Mo., June 1916 to Dec. 1916 Major of Artillery U.S.A. on Mexican Border; Aug. 1917 to May 1919 Major & Lt.-Col. 110th Engrs. U.S.A. (one year in France) May 1919 to date Consulting Engr. for the location and constrn. of highways in Clay and other Missouri Counties.

References: The American Society of Civil Engineers.

TEMPLETON—GEORGE WINSTON, of Vancouver, B.C. Born at Bushmills, Ireland, April 12th 1891. Educ., 1908-10 Belfast Tech. Inst. 1911, private tutor W. J. Kerr M.A., Vancouver, B.C.; 1908-10, with Sirocco Engr'g Co., Belfast, Ireland; 1911-13, Gen'l Contracting, Vancouver, B.C.; 1913-15, Asst. to Dist. Engr. Prov. Water Rights Branch, Vancouver, B.C. 1915, enlisted in C.E.F., discharged 1917 medically unfit, 1918, re-enlisted and turned down for overseas service, discharged Jan. 1919; 1919 on constrn of ways, docks, etc., with Foundation Co., Vancouver, B.C. At present Asst. to Mr. E. A. Jamieson on Hydro Elec. Power Surveys.

References: E. A. Jamieson, J. A. Walker, J. H. Kennedy, N. C. Sherman, C. T. Hamilton, W. J. Johnston.

THORNTON—HENRY EDGAR, of Prince Rupert, B.C. Born at Burton-On-Trent, England, Dec. 2nd 1886. Educ., High School, Burton-on-Trent. Home Study; 1906-08 chainman on Dom. Land Survey; 1908-13 Topog. etc. and Instr'man on constrn. and track work C.P.R.; March 1913-Dec. 1913 Res. Engr. 20 miles prairie railway constrn. C.P.R.; 1914-15 Transitman, concrete and steel bridge work, C.P.R.; 1915 to July 1918 Contractor and Farmer; July-Dec. 1918 with 10th Can. Engrs. Winnipeg; Dec. 1918 to date Instr'man in chge of maintenance of way party Prince George to Prince Rupert G.T.R.

References: W. A. James, J. R. C. Macredie, C. H. Larson, W. S. Fetherstonhaugh, W. H. Tobey.

MACLEOD—GEORGE, of Vancouver, B.C. Born at Stoer, Scotland, Oct. 20th, 1886; Educ., Public & High School, Scotland, 3 yrs. apprenticeship as pupil teacher; 1908-11, rodman, instr'man. and Bridge Inspector (wooden bridges) G.T.P. Prince Rupert, B.C.; 1911-12, instrn'man. in chge. of party tracklaying etc., G.T.P.; 1912-14, Res. Engr. on track work and bridges C.N.O. Ry.; 1916-19, Overseas Can. Ry. Troops and Can. Bridging Co. as Sapper Sgt. & C.Q.M.S.; 1919, instr'man. and Asst. to Engr. in chge. Rly. Work for Brooks Scanlan & O'Brien, Stillwater, B.C.; At present instr'man. on Harbour Improvements for Vancouver Hbr. Committee.

References: G. Scott, W. H. Tobey, J. R. C. Macredie, G. P. Stirrett, J. D. Smith.

McLELLAN—ROY ALEXANDER, of Saskatoon, Sask. Born at Harriston, Ont., July 31st, 1889; Educ., B.A.Sc. Toronto, 1912, D.M. & S. Land Surveyor; Summer work Asst. Surveyor of townsite surveys etc.; 1912-14, with Murphy & Underwood, Consl'tg. Engrs. Saskatoon, Res. Engr. in chge. of sewerage constrn. etc. and March & April 1913, relieved the Asst. City Engr. of Kitchener; 1915, Asst. on Survey party for Dept. of Interior, Ottawa; 1916-19, on active service, Lieut. also acting second in command of company Can. Ry. Troops on Standard Guage Constrn. in France & Belgium; June 1919, to date, Engr. & Surveyor for Murphy & Underwood, Saskatoon, Sask.

References: C. F. Szammers, J. E. Underwood, A. A. Murphy, F. A. Wilkins, K. P. Johnston, G. H. Hemmerick, E. P. Bowman.

PETERS—HUGH, of Esquimalt, B.C. Born at Victoria, B.C., Aug. 21st, 1890; Educ., Grad. R.M.C. Kingston, 1910; 1910-11, topog. on location surveys Vancouver Is. with Can. Nor. Pac. Ry., 1911-12, Asst. to Dist. Engr. B.C. Agency M. & F.Dept. Responsible chge. of roads & trails on West Coast Vancouver Is.; 1912-13, Asst. to Supt. of Pac. Coast Constrn. Co. Victoria, B.C.; 1913-15, Asst. to Dist. Engr. Vancouver Is. P.W.D., Jan. to April, 1914, Res. Engr. P.W.C. Victoria Breakwater Constrn.; 1915-19, on active service with Pioneers & Ry. Troops B.E.F. At present Asst. Engr. Vancouver Is. Dist. P.W.D.

References: A. E. Hodgins, G. B. Hughes, F. H. Peters, J. A. Keefer, A. F. Mitchell, J. B. Shaw.

POWELL—ROBERT WYNYARD (Jr.), of Thorold, Ont. Born at Ottawa, Ont., Oct. 11th, 1891; Educ., R.M.C. 1911; 1911, draftsman Transcontinental C.N.R. location; 1911-12, Asst. to Supt. St. Charles River Import Works; 1912-13, Asst. Engr. P.W.D.; 1914, Staff of S. J. Chapham; 1914-16, Lieut. with 4th Field Co. Can. Engr. Adjt. 4th, Divnl. Engrs. during mobilization, Transferred to 11th Co. Can. Engrs., 1917-19, Chief Instructor E. T. Depot, St. Johns, Que., Promoted to Major. Wounded three times. Awarded M.C. and Bar. At present Asst. Engr. Welland Ship Canal.

References: M. J. Butler, A. S. Grant, G. I. Chapleau, F. S. Lazier, C. R. Coutlee.

SULLIVAN—ARTHUR WILLIAM, of Valleyfield, Que. Born at Valleyfield, Que., Sept. 2nd, 1885; Educ., Q.L.S. Laval, 1908; 1903, transitman on N.T.C. Ry., different surveys in Northern Quebec for Capt. Machin; 1910-13. on paving works for City of Montreal; 1913 to date, private practice and City Engr. for Valleyfield. All kind of Engr'g. Works in sewers, roads and surveys.

References: L. G. Papineau, Armand C. Crepeau, C. E. Gauvin, F. C. Laberge, T. W. Lesage, L. S. Pariseau.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

CULSHAW—JOHN GOLDSWORTH, of Calgary, Alta. Born at Windle, St. Helens, Lancashire England, Aug. 31st, 1886; Educ., 1903-05, instruction in bldg. constrn. & Surveyors quantities at Gamble Inst. St. Helens, Passed Part 1 (Honors) South Kensington in same, 1905-07, course of Sanitary Engr'g. Sch. of Sc. Liverpool Univ. Exam. passed in same; 1903-07, Asst. in office of Wm. Goldsworth, Surveyor to Whiston Rural District Council, Prescot, Eng., 1907-14, with G.T.P. Ry. as rodman & instr'man. on constrn. draftsman, topog'r. etc. on location surveys, and from 1910, Res. Engr.; 1914-15, leveller & transitman on prelim. surveys, Alberta & Great Waterways Ry.; 1915-19, on active service with 11th Service Battn., So. Lancashire Regt., Aug. 1919, to date, temporarily field draftsman on reclamation work under Mr. F. H. Peters, Comm. of Irrig., Calgary, Alta.

References: F. H. Peters, G. C. Dunn, A. J. Gayfer, R. P. Graves, W. M. Wilkie, W. R. Smith.

CUMMING—KENNETH NEIL, of Marion, Mass., U.S.A. Born at Chatham, Ont., March 9th, 1894; Educ., B.A.Sc. (Honors) Toronto, 1916; 1916-19, Asst. Engr. with Marconi Wireless Tel. Co. of Canada; March 1919, to date Asst. Engr. with Marconi Wireless Tel. Co. of America (now Radio Corpn. of Am.) on install'n. of equipment.

References: A. E. Roach, L. M. Arkley, T. R. Loudon, F. C. Mechin, C. P. Edwards.

EADIE—ROBERT SCOTT, of Montreal, Que. Born at Ottawa, Ont., Aug. 29th, 1895; Educ.,at present taking 4th yr. in C.E. at McGill; 1916-19, Lieut. in Can. Engrs.; 1917 (5 mos.) in chge. of constrn. of Camp Bldgs. at Hastings, England; 1918 (2 mos.) on constrn. of holments in France; June to Sept. 1919, Instr'man. on Bldg. Constrn. Ottawa.

References: H. M. Mackay, E. Brown, W. P. Wilgar, R. E. MacAfee, A. R. Sprenger.

MERSTON—WILLIAM CHARLES, of Victoria, B.C. Born at London, England, March 30th, 1884; Educ., 3 yrs., McGill Univ., B.C. Land Surveyor Exam. 1910, Fellow Royal Geographical Society; 1907-10, civil engr'g. with C.P.R. and Esquimalt & Nanaimo Ry.; 1910-20, Civil Engineer and B.C. Land Surveyor, 1912, constructed and designed Bridge over White River, 1914-19, with C.E.F.; At present B.C. Land Surveyor.

References: A. W. R. Wilby, D. O. Lewis, R. A. Bainbridge, C. E. Cartwright, J. M. Rolston.

TOM—JAMES ARCHIBALD, of Guelph, Ont. Born at Goderich, Ont., Sept. 19th. 1892; Educ. B.A.Sc. Toronto, 1915; Summers 1912-13, rodman & draftsman with Irrig. Branch Dept. of Interior; 1914, Asst. Engr. same dept. Calgary, Alta.; 1915-19, overseas with C.F.A.; 1919 to date Asst. Engr. to City of Guelph, Ont.

References: H. R. Carscallen, L. R. Brown, F. McArthur, J. R. Cockburn, P. Gillespie, E. D. Gray, R. G. Lye.

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VOLUME III — MONTREAL, JUNE 1920 — Number [illegible]

Replanning Montreal and District

[illegible], M.E.I.C.

Montreal spent fourteen and a half millions of dollars in expropriations for street widenings, extensions, etc., during the six years ending [illegible]. In addition to this the actual operations of carrying out these schemes must have amounted to several millions more.

This may be described as Montreal's medicine bill, taken on account of some of the troubles affecting her as the result of bad planning.

The disease itself, however, continues to run its course unarrested, and every year is taking a deeper and firmer hold.

The Cost of Faulty Planning

What the ravages of this disease has cost the City of Montreal in cold cash during the last quarter of a century is not easy to estimate. That is not like the fourteen and a half millions or more entered in the ledger, it cannot be expressed in figures, but it is none the less real and substantial. It is the unseen and unrelenting daily drain which week by week, month by month, and year by year piles up to an astonishing aggregate, beside which the fourteen and a half millions appear paltry and insignificant.

When one thinks for instance of the tremendous cost of street cartage every day in a city like Montreal and realizes that by reason of congestion and delays, indirect routes, short loading on account of steep grades and so forth, there must be a loss of something approaching one third on the cost of that cartage, we might profitably inquire into a question like that, but we are not very inquisitive.

When one considers the needless waste of land, of grading and of paving in our streets, because it is our wont to accept them exactly as laid down for us by the land owner or the real estate man, every new subdivision thickly seeded with an [illegible] crop of future expropriations, this might well afford us food for deliberation, but we do not deliberate.

And when we see, as we can hardly help seeing, the most prodigal, almost incalculable, needless expenditure on the laying and maintenance of our streets, and the maintaining of water, sewerage, power and other services, because we indiscriminately scatter our factories and industrial establishments all over the place, regardless of their harmful effects on nearby business and residential properties, surely all this might teach us wisdom. But it doesn't.

Read before Montreal Branch, [illegible], 1920.

And when we observe everywhere around us the chaotic conditions, the general state of instability and makeshift, the putting up and pulling down, building and rebuilding, all of this the result of hap-hazard and indiscriminate development, and through the want of planning with a purpose, we might well if we had not become callous and inured to it all determine to find a better way.

Of course we know in our hearts that some day or other the reckoning must be paid, some day we must face the inevitable and tackle the question with grim resolution, in the meantime the most we care about doing is to — temporize.

Benefits of Good Planning in Dollars and Cents

During the last few years the great metropolitan city of New York has been wrestling with the problem and has evolved a scheme by which, it is authoritatively stated, that from plans and estimates prepared and beginning to be carried out, they figure on saving within the next twenty years the vast sum of a thousand million dollars. We may argue from that something of how many thousand million dollars New York must have lost in the past through not having commenced sooner, and we may at the same time take the lesson home to ourselves, and further argue that Montreal, with conditions essentially similar, must have a tremendous leakage, and could by endeavouring as much as possible to put a stop to that leakage save in proportion to its relative size and population well over a hundred millions within the next twenty years.

Chicago too, after years of laborious groundwork by its engineers, followed by an active propaganda of public enlightenment, has succeeded in evolving a scheme that bids fair to transform one of the ugliest and dingiest of cities into a veritable Paris of the West.

The Growth of Montreal

It seems indeed that Montreal is asleep and relatively a back number amongst its compeers, since it was recently stated here by Thomas Adams that it was the only one of all the cities approaching its size and importance on the North American Continent that is still without a general and comprehensive scheme of civic betterment. This, moreover, in face of the fact that by reason of its unique and strategic situation as an ocean port in the heart of a continent its destiny is so plainly manifest. For Montreal in spite of all its disabilities has progressed in a most marvellous way, if mere increase in bulk can be called progress.

Its growth has been coincident with that of the Dominion of Canada, and while during the last thirty years the population of the Dominion has barely doubled, that of its largest city has more than quadrupled.

It does not seem therefore that there is very much of a gamble about the future of Montreal, and it could hardly be called too optimistic to surmise that within the next ten or twelve years we should reach a population of a million and a half.

Mere bulk however is not everything, and one hesitates to think of what kind of a city it will be by that time if such development should take place along existing lines and not on more sane and rational ones. What will our central streets then be like since they are crowded and congested now? Will our railroad crossings continue to block our street traffic in still more accentuated form? Will there be four times the number of killings at these crossings since there will be twice the number of people and twice the number of trains? Will our factories all have moved away indiscriminately to the outskirts, there to create a new plethora of slums in addition to the old ones left behind? Will our present provision of parks and playgrounds then be sufficient, and how many incline elevators will be necessary to take the "rabble" up to the top of Mount Royal, or will they still congretate thick as flies on the plain below? Where shall we then park our automobiles since they will have multiplied ten times over, and it is doubtful if all the public squares and breathing places will be able to contain them?

These are questions suggested in rather a light vein it is true, but still requiring serious reflection, and careful and laborious working out.

If we look at the map of Montreal and begin with that section skirting the river, we observe first a number of somewhat irregular and rather narrow streets, which constituted the old town of Ville Marie. As a matter of fact that is the only portion of the city which has really been planned or shows any clear evidence of design; the rest is only a patchwork of subdivisions, hitched together, which is a very different thing.

Over a century ago Town Planning as an art was held in higher esteem than it is in these days, for history tells us that the French King commissioned his engineers to prepare this plan, and it must be conceded they succeeded better than we have ever been able to do at a later date, excepting perhaps for the narrowness of the streets, surely excusable when we consider that those pioneers had not the faintest motion of the mighty city that would eventuate from the nucleus they were then laying down.

Above Craig Street the character of the layout changes and becomes practically rectangular with what may be called the uptown streets predominating over the crosstown ones in the proportion of about three to one, which is just the reverse of what it should be considering that the city is spreading along the river and is about twice as long as it is broad.

This is where we got away from the town planning, and into the subdivision business, and we have been getting worse and worse ever since. For it is simply a case of laying out the streets according to the farm lots, without relation to the shaping of the town itself or the trend of traffic within, and very little correlation of adjoining subdivisions one with the other.

The King of France has long since passed away, and his engineers and their methods have alike been forgotten. We have become democratic now and imagine we are free, but are really the slaves of a more merciless tyrant of our own creation. For the Real Estate Monarch holds undisputed sway, and the divine right of private ownership upheld by legislative authority exacts its tribute and dictates and determines for us the form and the manner in which the land shall be used, leaving on the shoulders of the always and longsuffering taxpayer the burden of paving, and all the inconveniences and troubles besides.

The difference between the absolutism of an older day and that of the more modern and up-to-date autocracy is one mainly of motive. For whereas the former was benignant and concerned throughout in the development of the land for the well-being of the inhabitants, the latter is interested only to the extent of getting all of it for the largest and quickest returns it can get.

Street Widths

But we are not altogether at the mercy of the real estate dictator, there is at least one reservation our laws have laid down in the Province of Quebec, and that is that within an incorporated town the minimum width of street shall be 66 feet. On the other hand it is doubtful if they could have made a worse selection, for this is too wide for any purely residential street, and much too narrow for a main traffic thoroughfare, especially with double track tramways. And the effect has been that we have practically no main thoroughfares except those that have been widened at tremendous cost, while all our streets have become more or less through traffic streets, necessitating wasteful and expensive paving and maintenance.

Of course outside of an incorporated town this stipulated minimum is of no effect. There they can be anything the proprietor pleases, and our real estate friends are enterprising enough to see that nearly all our subdivisions are made long in advance, and become part of some minor municipality which by Act of Parliament is annexed holus-bolus to the city.

The extent to which this sort of thing aggregates may be gathered from a glance at a tabulation of total street mileage of the city since 1907, in which year we observe the total was 40 miles. In 1910 it was 70; in 1914, 117; in 1916, 222; and in 1919 had reached the astonishing total of 584; or in twelve years in which the population had about doubled, the street mileage had multiplied itself fourteen times over. At first sight this may appear something to boast about, but it really should give us the gravest concern; for it is evident that the hitherto fairly compact nature of the city's growth is giving place to thin and scattered development, with its attendant obligations but without corresponding resources.

The great outstanding shame, for it is doubtful if any other word can express it, is that the City itself should have so little to say regarding the nature and disposition of its own streets, until they are practically past remedy. Yet it should be remembered that the main reason is not that Montreal is without the power, but because she does not exercise it.

The Importance of the General Plan

Unless we are much mistaken, Montreal is really exceptional and very fortunate in having the power and authority to require that all new subdivisions shall conform to the general plan. The unfortunate thing about it is that she has not got the PLAN. And further more we are told that Montreal is too poor and has no money to pay for it; so we are forced to the conclusion that Canada's metropolis is in the sad and somewhat paradoxical predicament of not having enough money to pay for a plan, and never will have enough money until she gets one.

Senator L. O. David the late veteran City Clerk, in citing the principal causes which have contributed to bring the city into financial straits, among others mentioned the following:—

"Absence of a general plan showing the manner of laying out the streets and the width thereof, not only in the city but also in the adjoining municipalities, which will, sooner or later, form part of the city. Owing to the lack of such plan, the streets have been laid out according to the caprice of the interested proprietors and, as a result, there have been effected costly expropriations which have increased our debt by several millions of dollars.

Acceptance by the city of streets which only existed on plans and, therefore, obligation of performing all municipal works in such streets at the expense of the citizens generally. In all the large cities of Canada and the United States those who desire to divide an immovable into building lots have to make their divisions according to the general plan of the city and they must, moreover, perform, at their own expense, all municipal works, to wit: sewers, levellings, pavings, sidewalks, etc., and such work must be done according to the plans and specifications prepared by the city engineers. Needless to say that our debt would not be so high if this system had been adopted.

Absence of a uniform legislation, which would have placed the city and the municipalities which are bound to form part of Montreal, in the same conditions as to the manner of laying out the streets, of carrying out municipal works and of paying the cost thereof, which would have prevented the city from bearing the responsibility for and paying the cost of expensive works, which are often useless and do not agree with our general system."

Looking broadly at the situation, it seems evident that whatever troubles we are now afflicted with by the central portion of the city are in a fair way to be repeated in the outlying districts, only in more intensified form and on a greatly enlarged scale. Indeed signs are not wanting to show that in the method of laying out some of these new subdivisions the practice of preying on the city has developed into a kind of science.

However distressing and ominous such features may be for the future, they are relatively of minor importance for the present compared with the great central fact that the layout or rather conglomeration of layouts that compose the City of Montreal is not on the lines of economical development. It is hardly necessary to point out amongst engineers that its general rectangular character is a wasteful one, or to do more than mention as regards grades that the practice of going plumb up the face of a hill instead of taking it on the bias is devoid of ordinary common sense.

Traffic Thoroughfares and Residential Streets

Regarding the streets of Montreal the commonest criticism we hear is that the streets are too narrow. But a better understanding of the subject would declare that on the contrary most of them are too wide, only a few of them, and these the most important main throughfares are too narrow. The great trouble is that we turn all our streets into through traffic streets, and pave them or endeavour to pave them as such, and the work is never done; it is entirely too big a job. The reason that we have so many holes in St. Catherine St. is because of our outlying residential streets of 60 and 80 feet width that we are striving to pave in concrete and asphalt, when 36 feet streets with the building line set back, and 24 ft. roadways paved with a good tar macadam should suffice. Is it not strange that we engineers should by patient research and careful design and supervision be straining every nerve to save the fraction of a cent off the cost of a yard of asphalt or concrete, and then go unquestioningly and plaster all over these streets anywhere from fifteen to forty per cent more than there is any necessity for, just because it is not our business to inquire?

Is it not forcibly clear that the width nature and disposition of streets in a city are primarily engineering questions of the utmost importance and concern, requiring serious and earnest study, and not to be settled lightly by a wave of the hand from the self interested landowner or his docile surveyor doing his bidding?

It is the main traffic thoroughfares that claim most earnest attention, and these with due and proper study and consideration of the volume and trend to traffic present and prospective, should be of ample capacity, of most direct route, and paved in the strongest and most enduring manner possible.

They should facilitate and invite traffic, whereas subsidiary streets should discourage everything but local traffic, and can quite well be narrow and tortuous, and be ever so lightly paved. The money saved on the one hand could be much more advantageously spent on the other, and still leave a handsome margin of profit.

It is doubtful if it can be said that Montreal has any typical main thoroughfares. We have some which for want of a better medium are used as such, and these are always congested, and in a condition of constant transition and upheaval.

The practice of widening them as necessity compels, especially under existing expropriation laws, experience has abundantly proven to be extravagant and prodigal, and the results in no sense commensurate with the cost. In many cases equivalent advantages could have been attained by the simple expedient of rounding off some of the principal corners, for as the strength of a chain is the strength of its weakest link so is the capacity of a street to be measured by its ability to digest the traffic at its busiest crossings. It may be noted that at many of the more congested corners on central St. Catherine Street such improvement as this would have been of the greatest advantage, and it is to be lamented that in recent years at several of these corners old buildings have been replaced by new and valuable ones, and such golden opportunities have been allowed to pass idly by.

Improving Traffic Facilities

Generally speaking, the widening of principal streets is anything but a paying proposition, not only as regards actual expenditure, but the attendant dislocation of traffic and business is by no means to be lightly estimated. It is usually cheaper and more satisfactory to open up new parallel streets through less valuable property, at the same time as much as possible to weed out buildings of an objectionable nature.

Still more promising is the new diagonal main thoroughfare with its double effect of at once reducing distance and grades, and at the same time relieving both uptown and crosstown streets of their overburden of traffic. It may be objected, of course, that the new diagonal superimposed on an existing rectangular layout is not an economical one as regards land, leaving as it does a number of odd shaped cuttings at the crossings, This is true, but even that has the advantage of providing open spaces that break up the dull and deadly monotony in the regimental regularity of the gridiron pattern. After all, notwitstanding its tawdriness, it is Broadway that is the outstanding feature of New York, and not Fifth Avenue with its never ending repetition of complacency and smugness

These open spaces, too, offer a fine solution of the automobile parking problem which is irritating enough already, and bids fair ultimately to become a vexation of the first magnitude.

The cost of constructing wide diagonal boulevards would naturally be tremendous, and could not be attempted under existing expropriation laws, but, on the basis of a fixed percentage over assessment, and with powers of excess condemnation, there can be little doubt that by thorough and careful study and planning and economical execution the expense would be amply justified by the results.

The improved land values on such wide boulevards would naturally involve less rigidity in our by-laws regarding the height of buildings. Without attempting for a moment to criticise the propriety of the decision recently given on this question, the wisdom of setting a fixed arbitrary limit for all over the city is surely open to criticism. This is surely a question which should be settled in relation to site, surroundings and locality, for it is not difficult to see how a ten story building on St. James or Notre Dame Streets may easily be more of an iniquity than a sixteen or twenty story one on a public square or a wide boulevard, while a ten story apartment house on a narrow street in an uptown residential district is a greater evil than either.

Indeed the carrying out of any great improvements in a city like Montreal can hardly be made feasible without counting on a considerable increase in land values involving the erection of higher and better buildings, and it is the public square and the wide boulevard which should have them and not the narrow side street. Such views as these may be deemed somewhat heretical from the orthodox town planning standpoint. Common sense would indicate however that a great metropolitan city should be proportionately and uniformly great, and the concentration and condensation of business can be of greater import to the public at large than the conservation of a few rays of direct sunlight.

What Town Planning Does

Town Planning has never been more aptly or comprehensively described than by the expression of "Everything in its place and a place for everything." It is the essence of orderliness in city development, but our usual practice is almost the antithesis of this. The ill considered intermingling of industrial business and residential premises has precipitated a condition in which each element is detrimental to the advantageous development of the other. As a natural consequence whichever is most injured and least able to hold its ground has to get out of the way of the offender.

The home gives place to the shop, the shop to the office building, the office to the industrial flat, and in the rear of the procession comes the big heavy factory driving everything before it.

Now it could have been arranged, that certain areas contiguous to main transportation lines should have been reserved for factory purposes, with room for extension, where they might have every facility for carrying on their work, an economic concentration of water, sewerage, light, heat and power, services, special fire protection, and the elimination to a large extent of ruinous cartage on other than main thoroughfares suitably paved. Certain other areas appropriate for residential development could have been selected, and these suitably laid out with streets winding or otherwise, and of no larger capacity than would be necessary for local requirements, with the exception of a few main boulevards on which our public, semi-public, amusement, and tall apartment buildings could be placed, and all of these steadily improved and embellished.

Adequate provision could also have been made for shipping and financial operations located in a way that would be mutually helpful and advantageous each with the other, and planned altogether with a view to the ultimate and highest development of each component part, and to the stability and embellishment of the whole. Such a consummation would be an incalculable and universal benefit to the whole community.

Such ideas as these are by no means so fanciful as they may at first sight appear. On the contrary they are intensely practical and practicable, and to a greater or less extent are actually being carried out in other places today with most beneficent results. And the more study that is given to the question the more it compels the wonder that New York and other large cities should be able to get such result and save such fabulous sums of money, and replaces that wonder by amazement that they did not [illegible].

Railways and the City

The question of the railway situation in any city is one which lies at the very foundation of the civic structure, and to understand it we would do well to remember in the words of one of the railway people themselves that "Railways are not built to carry passengers or freight, but to earn dividends." The convenience and accommodation of the public is therefore not of such paramount importance to them as the securing of business, especially under competitive conditions. In the original locations of these railroads, as in most other things, the lines of least resistance are usually followed, and the most direct route, the easiest grades and the cheapest right of way and construction are the governing factors, always with a keen eye to getting the inside track of a rival road. And so it is not to be wondered at if these railways, the great originators of traffic should themselves be least considerate of those kinds of traffic other than their own, or as mindful of public welfare or feeling as we may think they might be. But that is no reason why the public should neglect to hold up its end in the best way that it can.

It may be said that it takes railways to make a city, and there is nothing like railways to break one. Most of the great towns of the North West which before the advent of the railways were nothing but prairie, and since then have been called into being and sprung up into busy flourishing centres, are now groaning in travail with the iron grip on their vitals, enmeshed as they are in network of rival railways. And this is equally true if less obvious in the greater cities of the East. The trouble is that the questions between the railways and the towns, and in particular the level crossing problem, is not usually settled on the ground of paramount interest or importance, but on the basis of precedence, the simple matter of having got there first, and the railways usually have it, and their motto is "J'y suis, j'y reste." The City of Montreal has a big enough problem on hand in the question of railways already existing, yet notwithstanding all the bitter experience of the past and of the present, it is doubtful if it is fully alive to what may be in store for it in the future, since there are many miles of such lines projected and even approved by the Board of Railway Commissioners involving scores of level crossings with their perilous and paralyzing effects.

The railway question on the Island of Montreal is one that should not be left entirely to the railways even as regards the initiative, but should be a matter of the most careful study either by the city officials or by independent railroad experts conversant with town planning principles and acting on behalf of the city and in the public interest.

Parks and Playgrounds

There is still one question that calls for remark and that is recreation, and especially parks and playgrounds. It is all outlay of course, there is no visible income, but it is doubtful if any money the city can spend can bring in a richer return. Coming out of the Windsor Hotel one day last summer a gentleman of considerable standing from the West remarked looking over on Dominion Square;— "Montreal has many valuable pieces of land, but I doubt if it has anything of such intrinsic value as that," and the force of this remark is brought home to us when we consider that judging from the value of adjoining property this square must be worth anywhere from $10 to $25 a foot. And the question rises in our minds " Would the City be willing to pay anything like that price for it now in order to turn it into a public park, or again, if it had not been for such a park would the bordering property have been anything like so valuable?".

And above all have we failed to understand that there are such things in life as are actually above and beyond all monetary consideration?

Montreal is at present not so badly off for parks and playgrounds so far as actual area is concerned, these are however not so well distributed as they might be, and the fear must be expressed that inadequate provision is being made for the future with a denser population. It is also to be regretted that no part of the magnificent river front has been conserved for this purpose, and that too in face of the fact that other large cities have shown us the commendable example of actually turning over areas used for commercial and wharfage purposes into recreation grounds for the people. It may be said we have the Back River to fall back upon, but real estate enterprise is carefully reserving that for private and individual exploitation and preserve.

Access to Mount Royal

Without Mount Royal which is the crowning glory of the city to which it gives its name we would be poor indeed; and with it under existing conditions we are not much better off, since it is practically inaccessible excepting to a few of the privileged ones who are rich enough to own or hire a conveyance or strong and healthy enough to be able to walk there, and by them their mountain is highly appreciated and very jealously guarded from intrusion. There is however a less fortunate class which consists of the great majority hailing from the densely packed tenement districts and even from the slums. These people have nowhere else that they can go, and since the mountain is the heritage of the entire populace their equal rights and greater necessity should entitle them to whatever special privilege is to be had. From time to time there has been renewed agitation to provide adequate, easy and cheap means of communication with the top of the mountain for all classes without discrimination, and it has always been met with a curtain barrage of protest from the well entrenched batteries of the privileged ones with their high explosives in the press. In default of more solid arguments all sorts of suppositious ones are used, as for instance that if the Tramways Company once get a foothold on the mountain they will be running lines everywhere around; that it will be nothing but another Coney Island debauch, that the mountain will be entirely disfigured with deep cuttings and ugly gashes in its side; and that all the little children within erach or sight will be killed.

There are at least two propositions under consideration at present that have the inherent elements of really satisfying results, and in the absence of more reliable data which a careful survey alone can supply it is impossible to determine their relative constructional advantages. The one is to carry a tramway line behind the mountain and the other to come round in front. At present the only debatable point between them is whether such a line should be kept as much as possible in obscurity, something to be ashamed of and hidden out of sight or else something to be proud of and brought right out into the open and made a special feature.

It should be remembered that there is nothing inherently ugly in the construction of a road, a tramway line or even a steam railroad; it all depends on how it is done as to whether it will prove a disfigurement or even a positive enhancement to the surroundings. And it seems also evident that of the two propositions the latter is more accommodating for the different sections of the mountain, besides affording an unrivalled scenic route, with the possibility of developing at the top a Promenade Terrace overlooking the whole city that would favourably compare with the world-famed Dufferin Terrace at Quebec. A terrace like this could be embellished with artistics shelters, fountains, monuments, band-stand and flower plots, and could be railed off and illuminated at night, becoming a wonderful and attractive resort.

The Role of the Engineer in replanning Montreal

In conclusion, let it be said it can readily be seen that the task of replanning and improving a city like Montreal is clearly no one man's job, even with a lifetime's work. It involves the compilation of a vast amount of sociological and economic data, and with this data the best that can be expected will be merely an approximation of the desired result. This approximation can only be arrived at by a series of compromises requiring immense study and the application of the best brains that can be mobilized. The problem is essentially for the engineers, requiring at the same time the collaboration of the best architects and landscape men. And of one thing we can be very sure, that whatever obtacles and difficulties are in the way, while the compelling force may, and undoubtedly will become stronger as the years roll by, the solution of the problem itself will never be easier than it is to-day.

The Central Ontario System of Hydro-Electric Power

[illegible]

The Hydro-Electric Power Commission's Central Ontario System serves the territory approximately included between Whitby and Kingston, including Prince Edward County on the South, and Fenelon Falls and Tweed on the North. In order to supply this district with power, the Commission in 1916, took over the power developments and transmission system of the Electric Power Company.

The Electric Power Co. was started by Messrs. Smith, Kerry and Chase in 1908 and 1909, when they built what is now called No. 11 Power House at Campbellford, and a short transmission line of about 24 miles from thence north-easterly to Deloro to feed the Deloro Mining & Reduction Company. In 1910 a branch was started from this line to Madoc and also to Sulphide to feed the Nichols Chemical Company. Before the latter line was finished, a branch was also started to feed Belleville. Shortly afterwards, the line was extended east and west to feed the Canada Cement Co. about six miles east of Belleville and westerly to Trenton.

The system developed very rapidly in 1911 and 1912, taking in the Peterboro Light & Power Co. with the old Auburn Power House and its contract with the Quaker Oats Co., also the Trenton Electric & Water Co. at Trenton, and transmission lines were built from Trenton to Oshawa and to Peterboro and Lindsay, taking in the towns en route. The power house at Fenelon Falls and the Distributing System were also taken over from the Lindsay Light, Heat & Power Co., By the end of 1913 there were seven power houses operating in parallel and feeding into a system of 250 miles of 44,000 volt transmission line.

Since the Hydro took over the system, various extensions have been made. Transmission lines have been built from near Trenton to Picton, from Napanee to Kingston, from Healey Falls to Trenton, and a line will shortly be in service connecting Peterboro directly with Healey Falls. A number of low tension feeders have also been added to increase the territory covered by the substations already in operation. To keep up with the increasing demand for power, additional generating equipment has been installed at Healey Falls, and other new developments are contemplated.

The generating stations are all Hydro-Electric, developed along the Trent Valley Canal, the greater number being on the Trent River. This river drains an area of approximately 4350 sq. miles. The discharge varies considerably at different seasons, reaching as high as 6000 to 7000 f.s. during the Spring freshets, and decreasing during dry seasons to as low as 1000-1200 f.s. during the latter part of summer. The stations are designed to fully utilize the average minimum summer flow.

The power houses are numbered to correspond with the numbering of the dams along the canal. The plants at No. 2 near Trenton and No. 5 near Frankford, rated at 3000 K.W. and 250 K.W. respectively, generate at 6600 volts and feed into Sidney terminal station at dam No. 2, where the voltage is stepped up to 44,000 and fed on to lines O, P, & M., feeding west to Port Hope, north to Healey Falls and also to Belleville. The substation at dam No. 1 which supplies Trenton is also fed from Sidney terminal station and supplies feeders 6600 V. The switching arrangements at Sidney terminal are such as to permit practically any combination to be made between the power houses and lines. By the use of double buses on both the low and high tension sides, the station can be operated in two independent sections. Synchronizing apparatus is provided for paralleling with any of the power houses or lines. This station is also intended to receive the power generated at future developments on this section of the canal.

A 6600 volt feeder from Dam No. 6 supplies the Commission's customers at Frankford.

The power house at dam No. 11 at Campbellford of 2000 K.W. capacity, generates at 2400 volts, which is stepped up in the station to 44,000 volts, and feeds on lines A to Deloro, Madoc and Sulphide and G. to Belleville. A 6600 volt feeder supplies the rural district between Campbellford and Hoard's, and a 2400 volt feeder supplies the Commission's Power customers at Campbellford. A 2400 volt tie line also connects with dam No. 12, from which the Commission receives 1100 K.W. by contract with the town of Campbellford.

The Healey Falls Plant at dam No. 14, of 9000 K.W. capacity, generates at 6600 volts, which is stepped up in the station to 44,000 volts and feeds on lines O. to Belleville and R. to Trenton, and will also feed the new tie line between this point and Peterboro. Special switching equipment is provided for operating the station in three separate sections if necessary.

The generating station at dam No. 18, at Peterboro, of 1500 K.W. capacity, generates at 2400 and 6600 volts, which is stepped up to 44,000 volts in a transformer station near the power house, and connects with line K. to Port Hope and Lindsay. The new tie line will also connect here. Three 6600 volt and one 2400 volt feeders from No. 18 to the Peterboro sub-station supply the Peterboro Utilities Commission and the Peterboro Radial Ry.

The station at dam No. 30 at Fenelon Falls generates about 700 K.W. at 2400 volts. This is stepped up to 11,000 and is transmitted to the sub-station at Lindsay, where it is stepped down to 4400 volts. Power from line L from Peterboro is also stepped down to 4400, No. 30 being operated in parallel with this line.

The K.W. ratings given above are on a basis of 80% power factor. The plants Nos. 2, 11 and 14 are equipped with Tirrill regulators for maintaining constant voltages. A synchronous condenser of 1500 K.V.A. capacity is installed at Oshawa for regulating voltage and correcting power factor at this end of the line.

Read before Peterborough Branch, Dec. [illegible], 1919.

Switching stations are located at Port Hope and Belleville. The Port Hope switching station forms the junction of lines H.K. and C. The lines are controlled by oil circuit breakers, that on line C. only, being automatic at present. The switching station at Belleville forms the junction of lines M. B. E. F. and Belleville tap. There are two buses each of which may be cut into two sections. Selector switches allow any line to be connected to either bus, and all lines are controlled by oil breakers, those on E. F. and Belleville Tap being automatic at present.

The transmission lines are carried on wooden poles and total about 370 miles in length. They operate at 44,000 volts, the neutral being ungrounded. As the system becomes more extensive, it appears advisable that the neutral should be grounded, in order to localize line troubles to the sections on which they occur.

Line R. connects the Healey Falls Power House with Sidney terminal station. This line serves only as a feeder between the Plants in the vicinity of Campbellford and the lines along the Lake front, there being no substation fed from it. It is designed to transmit 7000 K.W. Sectionalizing switches are located at Myersburg and Wooler. This line was built to carry a second circuit.

The Western section includes lines H. C. K. & L. It is connected to generating station at Sidney Terminal, Peterboro and Lindsay, through automatic oil circuit breakers, and with the tie line from Peterborough to Healey Falls in service, it will be also fed from the latter point. It will be noted that lines R. H. K. and Y. will form a closed loop. This gives duplicate service to Peterboro and to all other sub-stations on the loop. In case of a line breakdown, the faulty section can be cut out and service restored on the entire section.

Similarly, on the Eastern section, lines O. G. B. M. & R. from a loop, so that any section of these lines that may be in trouble can be cut out, and service quickly restored. This, with the duplicate lines from Belleville to Lehigh, gives the greater part of the load on this section two possible points of supply.

The Northern section consists of lines A. Q. Madoc tap and Delora Tap. Line Q. forms a loop with line G. and the section of line A between No. 11, Power House and Harold. As there is no automatic circuit breaker on line Q., one set of switches is normally left open on one side of Stirling tap tower, to prevent trouble on either the eastern or northern sections from causing interruptions on both.

The fact that the system is supplied from generating stations at widely separated points is a further protection against interruptions. For instance lines M. R. and K. might all be out at the same time, and the service on lines H. and C. maintained through Sidney terminal station from power house No. 2 and No. 5.

All power houses and transmission lines are normally operated in parallel. The transmission system may therefore be considered as a bus into which all power houses feed, the power being distributed to sub-stations located as required. This arrangement is very flexible from an operating standpoint. The total load can be divided between the various power houses in any proportion desired, or can be transferred from one station to another in such cases as a break-down of generating equipment, sudden reductions in stream flow etc. During the low water season it is possible by properly distributing the load, to obtain the greatest use of the water at all plants. Also, in the winter months, the turbines and racks may become blocked with frazil ice, but as this seldom occurs simultanenously at all stations, the load from the plants shut down can be transferred to those not affected. Parallel operation is also a great assistance in maintaining proper regulation, as variations in load are divided between all power houses, instead of falling on one.

There are occasions however, when it is advisable to operate the system in two or more separate sections, such as when storms are passing over the lines, or when trying out the lines to locate trouble. Special switching arrangements are provided for this purpose. As previously stated, the power house at Healey Falls may be arranged to operate in three distinct sections, each feeding a separate line. It is possible at Sidney terminal station to make practically any combination necessary between No. 2 and No. 5, power houses and the outgoing lines. The switching station at Belleville has two separate buses, each of which may be cut in two parts, so that practically any combination of lines may be made.

The operation of the system is under the direction of the load despatcher at Belleville. A private telephone system following the transmission lines connects with all stations and patrolmen. It is the despatcher's duty to see that there are sufficient generators in service to carry the load, and to maintain the proper distribution of load and excitation between the various power houses. In cases of trouble he orders the necessary switching for sectionalizing and testing, and gives all clearances for work on the lines. For this work, an operating diagram is used, which shows the electrical lay-outs at all stations, with indicators to show whether the various switches are open or closed.

A regular system of patrols covers the entire transmission system weekly, the object of which is to inspect the physical condition of the lines, and note all defects that may later lead to breakdown. The patrolmen are available at all times for further inspection and repairs in times of trouble. Any defects found are repaired in such a way and at such times as to reduce interruptions to service to a minimum.

The automatic protection to service, lines and apparatus on such a system, is a fairly complicated problem. In addition to the relays, (devices that automatically open switches under predetermined conditions) at all points of distribution, the lines are equipped with relays at the sources of power and at the switching stations. These relays all have a definite adjustable time setting, and this setting is adjusted, having regard to the position of the line and the sources of power, so that a minimum amount of line is isolated when trouble developes. This localizes disturbances and ensures service to the parts of the net work not affected.

Two factors of importance in the loading of such a system are the load factor and the diversity factor.

Electric Generating and Transmission Systems of the Hydro-Electric Power Commission of Ontario

LEGEND

The characteristics of different loads, that is, the time of maximum and minimum demand, vary considerably, so that a resultant of these characteristics governs directly the generating capacity that must be available for service at any time and the number of hours a given capacity is utilized.

This condition is observed by taking the ratio between the maximum load and the average load over a given period and is known as the load factor. On the Central Ontario system this factor runs around 55% taken over an average year.

Due also to the fact that the peak load of a number of consumers do not occur simultaneously, it is possible to serve a load, whose component peaks are in excess of the actual rating of the apparatus in service. This is called the diversity factor and is the ratio between the sum of the various peak load and the actual maximum load a recorded on the station meters for a given time. On the system described, it varies between 1.05% and 1.15%.

The population served by this system runs well over 100,000 and the industries served include plants for the manufacture of chemicals, automobiles, portland cement, rubber goods, ore reduction, wood pulp, crushed stone, and the many varied industries found in the different towns. In view of the present coal situation and its prospects for the future, it is apparent that Central Ontario is fortunate in the progress made toward independence of this commodity for industrial purposes.

The Commission's engineers are at present investigating new relays and if considered advisable, these will be installed, replacing earlier types of relays. With the closing in of the loops referred to, reverse power relays will also be installed at certain points on the loop, so that sections in trouble can be isolated without interfering with service to any of the towns.

New power houses for the Trent River system are under consideration and a good deal of engineering has been done. It is hoped that construction will commence in the very near future.

The Commission is installing a very large plant at Queenston, consisting of 4 - 48,000 K.V.A. units. In this connection an investigation is being conducted into the engineering and economic possibilities of building a transmission line from Toronto to Oshawa, tying in the Central Ontario System with the Niagara system.

This would mean frequency changers in Toronto, and probably 44,000 volt transmission line from that point to Oshawa, the frequency changers serving the double purpose of changing the frequency from 25 to 60 cycles or vice versa, and they could also be used as condensors to help out the power factor on the Toronto end of the Niagara System and also for the western end of the Central Ontario System.

This would give double service to points west of Port Hope and also makes available any quantity of power that may be required in the Central Ontario District.

Cotton Rope for Power Transmission

J. Melville Alison

The subject of ropes for power transmission is given close attention and consideration by engineers engaged in this class of work in England in fact it is fair to say that in Great Britain this subject is given closer technical and practical consideration than it has hitherto been given on this side, particularly from the rope-makers' standpoint.

Features of English Practice

The outstanding features of English practice may be briefly stated as follows:

1. Cotton has entirely supplanted any other material for transmission work in England — manila is of the dim and distant past.

2. The ropemaker is consulted as to plant layouts, speeds, sheave diameters, centres, grooving, etc., and his opinion is deferred to.

3. Guarantees of maintenance are required and given in almost all installations.

4. The manila and steel rope manufacturers employ cotton ropes for transmitting their power.

5. The efficiency and longevity of cotton ropes have commanded the employment of this material in the manufacture of transmission ropes.

It is necessary at the outset to state why cotton should dominate other materials. Longevity and a higher factor of efficiency are the factors in the case. The longest life we have is of ropes installed in October 1879 (in 24-hr day work), and still doing service, but it is common to find cotton ropes doing night and day duty for periods of twenty years and over. A higher initial cost is readily overlooked. In rolling mill practice we get up to ten or more years for hot roll work, and fifteen or more in cold roll tin plate mills.

In England possibly the rope drive is utilized much more freely than in Canada or United States, but on the other hand, the installations here, are, in many instances, much larger than in England.

Cotton vs. Manila

In discussing the question of cotton or manila for transmission ropes, one must not lay too much stress

Read before Montreal Branch, April 22nd, 1920.

upon initial cost, for although cotton is dearer than manila, its superior coefficient [illegible] and greater elasticity add so greatly to driving force that up to one-third more horse-power may be transmitted. Further, its prolonged life, being reckoned at approximately five to one, will reduce appreciably excessive first charges to an insignificant item.

The loss of production due to frequent stoppages for replacement or take-up of manila ropes must however be figured as the greatest argument in favor of cotton ropes which seldom require further attention, particularly on English System Drives, after they have been properly fixed by a skilled splicing mechanic.

Tensile Strains

The tensile strain of a driving rope does not enter largely into the problem, else manila would undoubtedly hold the field, but its fibres are of so harsh and wiry a nature, that they do not take kindly to the successive twisting and bending operations, nor do they cling to the sheaves with the tenacity of the softer material. Having little natural resilience, the strands scrub one upon the other, setting up internal abrasion, which not only proves an inconstant quantity, but also invariably leads to repeated tightenings.

Three vs. Four (or More) Strand Ropes

Rope of three, four or even seven strands is sometimes employed, but since the contest lies mainly between the three and four strand, it will suffice to demonstrate the advantage held by the three strand over the four or any other construction.

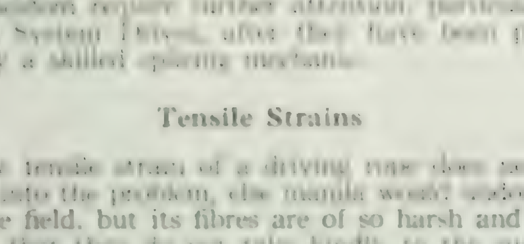

Fig. 1. Section of Three and Four-Strand Ropes

Examining the section of a three strand rope, (fig. 1), we obtain an equilateral triangle by connecting the centres of each strand, demonstrating the triangulation of the strains, a principle adopted by all engineers in erecting angular constructions, such as bridges, etc. In a rope of this construction we have a trinity of elastic spirals, so supple that they will bend to and fro without disturbing their formation. With the four strand rope, adopting the same method of connecting the strand centres, we obtain a square and an illustration of the parallelogram of forces from the four centres. Again, the four strand rope cannot be constructed without a supporting core, and since this is indispensable to its construction, its collapse must mean the dislocation of the whole structure, and as the core represents only about one fortieth of the area, it may be reasonably assumed that the [illegible] force exerted by the alternate contraction and extension of the strands as the rope passes over the sheaves, must tend toward the crushing out of this core, the period of endurance being limited by its tenacity and the tension at which it is held. This is what actually takes place.

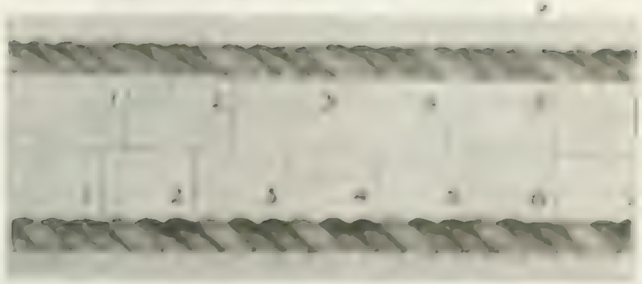

Fig. 2. Relative Elongation of Three and Four Strand Ropes

Spiral Elongation

This will probably be the more readily grasped by referring to Fig. 2 which shows a three and four strand rope in parallel, with the turns of each strand indicated by the figured lines. Thus the turns of the three strand gradually gain upon the four in the proportion of one in five or in other words, six turns of the three strand occupy the space of five turns on the four strand, say, in ropes of the same thickness. The strand spiral of a seven strand rope is nearer the straight line, being almost double the length of a three strand rope.

It will, therefore, be acceptable that the medium engaging the greatest number of turns should prove to be the most resilient and more capable of dispersing all the shocks and stresses set up for instance in rolling mill work than any other. Again, as affecting the bending capacity of the rope, another important difference is observable — only two strands appear between every turn of a three strand, while three occupy the spaces between every turn of a four strand.

Grooving

In laying out a groove it should always be borne in mind that a rope is to all intents and purposes an elastic wedge and reaches its highest driving capacity when it is pressed to the shape of the groove itself. This compression ought, therefore, to be anticipated, for if the sides of the groove are merely shown as tangent to the circle representing a given size of rope, and this is so with all American illustrations I have seen, then there is present the danger of making the groove too shallow so that when the compression takes place, and possibly after a short term of running, the rope is liable to find its way to the bottom of the groove, when gripping is considerably weakened and slipping takes place, the true indication of which is heated sheave rims. Grooves with curved sides have proved not only hindrances to driving force, but also a stimulus to that destructive rolling action which is the very antithesis of good practice, and should, therefore, always be discouraged.

Hence, curves being disallowed, permit only the angular groove, and we contend that the rope should divide the angle of the groove and not the groove the rope.

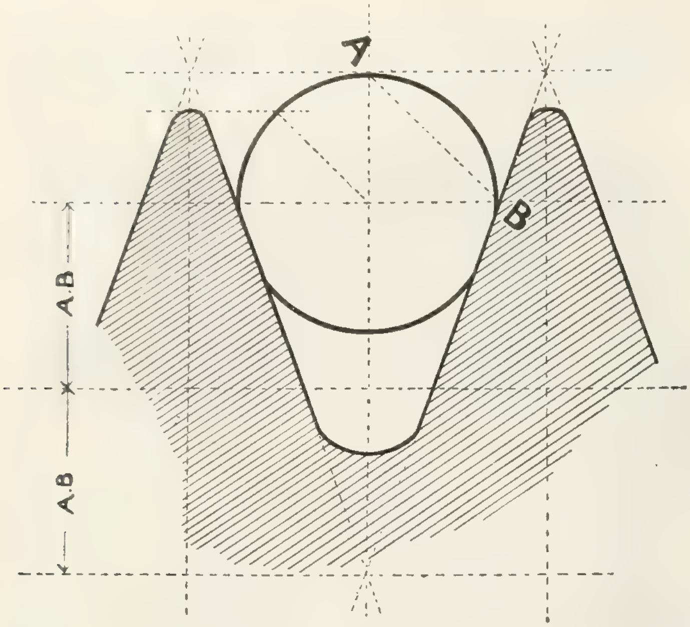

Fig. 3.

Without use of the protractor, the groove demanded by a given size of rope, may be set out as shown in Fig. 3.

First set a circle of equal diameter to the rope, draw the vertical and horizontal centre lines. The chord of the arc AB is then marked off. This becomes the unit measurement and when laid off downward along the vertical line from the centre of the circle, indicates the centre of the curve of the bottom ot the groove. Laid off a second time from this centre, the apex of the inverted angle of the groove is determined. This angle always comes out at about 40 deg. whatever the size of the rope may be. Extend the lines of the angle through BB, cutting off segment of the circle on the way, until they intersect the upper horizontal line at CC, which points fix the radii of the mid-flanges. This groove may be taken as a standard for ropes over 1-inch diameter and also shows the approximate actual compression which takes place in a rope at work.

The value of good grooving cannot be too strongly advanced. A further great benefit to be obtained in successful transmission is by polishing the grooves. It is difficult to understand why the engineer has not seen to this being done here, since it must be a grievous fact to him to know that his second set of ropes will do better than his first, pointing to the fact that the first set are expected to polish the tool marks from the grooves.

Fixed or Revolving Ropes

It has been a matter of education in England to get the engineer to agree as to whether the fixed-wedged or revolving rope is the better driving medium. The wedged rope with its angular formation gains in groove contact over the revolving rope, and contact means power. Further, the wedged rope cannot have the tendency to slip which the revolving ropes would have, and also the life of the revolving rope is considerably reduced. The cause of ropes revolving is difficult to ascertain, but it is computed that the life of a rope is reduced by at least one-third when it revolves.

Ropes which are underworked will very often tend to revolve, a golden rule in rope transmission being that ropes like work to do.

Perhaps the most apt illustration of a wedge-shaped medium is the drive on a motorcycle, where a V-shaped belt is fitted to a V-groove, without, however, the belt reaching bottom, yet obtaining the greatest possible groove contact and impact.

Longevity of Cotton Ropes

As to the life of cotton ropes much, of course, depends upon their size and the conditions under which they have to work. All things being equal, durability may be gauged by sectional area, and the most economical diameters range from $1\frac{1}{2}$ in. to $1\frac{3}{4}$ in., more of the latter being used in England than any other size. For rolling mill work, however, it so often becomes a matter of sheave widths, that 2 in. ropes are generally used. A remarkable case of longevity may be mentioned of 24 cotton ropes $1\frac{3}{4}$ in., diameter employed to transmit 820 h. p. at a velocity of 4396 ft. direct from the engine fly wheel 28 ft. in diameter, in a Lancashire cotton mill. These were fixed in October, 1879, and are still running in 24-hour a day service, a period of over 40 years. Another set has been working 28 years, on an average of 20 hours per day, and appear little the worse for wear.

Such cases of longevity lead to the conclusion that fatigue of material due to constant activity does not readily manifest itself in well-made cotton ropes. Their quick recovery from driving strain is suggested as the cause, since they pull down on the working side and bulge out to their normal diameter, immediately upon passing to the idle or slack side of the drive.

English vs. American Systems

There are advocates of both systems on this side of the Atlantic. We in England, are almost exclusively roped under the English multiple system, — and have little experience of the American continuous method. Our education however in this latter has been considerably advanced during the last six to ten years on this side, and it has been amply demonstrated that good cotton rope on the continuous system will pay for itself dollar-for-dollar, and give a handsome return on the investment.

In England we are satisfied that the multiple rope system is the better in all-round practice. Immunity from stoppage is the most important factor, since it is seldom that more than one rope gives way at a time. The offender may be laid aside to await a favorable opportunity for replacement. An admission made to me by one of the leading authorities of the American system was that while all his experiments had been made with manila rope he had the impression he could get still better results with a good cotton rope.

Short Centres

For evidence of the fact that by adding sufficient rope to make up any deficiency in contact, driving may be successfully accomplished when sheaves are almost touching, we need only refer to the case of an engine in Scotland, (Fig. 4), where spur gearing was removed and rope sheaves fixed on the same centres, permitting only a distance of 8" between sheave rims. A load of [illegible] h.p. is comfortably transmitted with 16 ropes 1½ in. diameter. At a mill in the north of France the sheaves are so close that a finger would scarcely pass between them.

Fig. 4 Short Centre Rope Drive

A drive has been erected for the Armstrong-Whitworth Company of Canada Limited, at Longueuil, Que., in which the sheaves are 108 in. and 72 in. in a rolling mill plant, with only 15 ft. centres and grooves for 12 – 1¾ in. ropes, which allows for only 7′ 6 between rims. This drive was fitted under guarantee of maintenance from the ropemakers, who originally were consulted on the scheme.

Over Roping

Over roping certainly retards efficiency. The fault sometimes manifests itself by the slack changing with the pulling side, and at other times by the ropes travelling across the grooves or even leaving the pulleys altogether. When such troubles arise it is best to remove one or several ropes if need be, without interfering with the splicing. Pass them over both pulleys and tie them well back to avoid revolving shafts. They can then be readily put back to work as the others give out. We have known instances where half the original number were taken off before satisfactory driving was obtained. This state of things frequently arises, even under [illegible] regular loads, when actual requirements come below the calculated power.

Over or Under Driving

While it is, and has been, generally accepted that the slack side of the drive should come on top, this position is not always obtainable, nor is it under all circumstances desirable. With an erratic or fluctuating load, such as obtains in rolling mill practice, we recommend the slack to come on the bottom. The variable load of the mill tends to set up considerable oscillation in the ropes and if the slack is above, may cause the ropes to ride or even jump off the sheaves. On the other hand, if the slack is below, any tendency of the rope to wander from its appointed track is held very largely in check by the pull on the tight side, also gravity and the weight of rope will control the oscillation.

Rope Guards

If, however, ropes persist in wandering from their appointed track, we recommend the erection of a rope guard in comb fashion, which should be placed approximately [illegible] percent of the centres away from the driven sheave. In rolling mill practice in England this is very freely adopted.

Sheave Diameters

Sheave diameters have a very important bearing upon the question and while in England the minimum standard is taken as approximately [illegible] times the diameter of rope, in America [illegible] times is accepted.

This however is largely a question of speeds to sheave size, as for instance a ½" rope will run comfortably over a [illegible] sheave at 1000 R.P.M., a 1" rope over a [illegible] sheave at 3000 R.P.M., and it is only when the speed rises to 5000 feet P.M. that we meet the [illegible] times rule for 1" rope.

Here again cotton scores over manila, since its softness readily admits of superior bending properties while the native harshness of manila and almost entire absence of resilience compel a higher minimum sheave diameter to which ropes of this material can be bent over. The power table is calculated upon an average contact arc of 170 deg.

Centrifugal Force

Groove impact also acts in opposition to centrifugal force, which has proved so potent a factor in belt drives, that whatever is done by way of compensating with narrower belts, adhesive dressings, or squeezing out the inevitable air-cushion, it will assert its retarding influence at a velocity fixed roughly at about [illegible] feet per minute, when the power calculated on the basis of width must be discounted in proportion to the increase in speed.

As affecting the rope drive, however, many tables are compiled whereby a steady decrease of transmitted power over 4800 feet per minute is shown, until we find ropes at 7000 feet capable of transmitting only half the load of the same rope at 4800 feet.

Diameter of Ropes

Velocity in feet per minute	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4000			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5000				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6000					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7000							[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

While few cases of rope transmission exceed a velocity of 5000 feet, possibly because of the necessity for specially constructed sheaves, those of higher speeds totally disprove the theory of centrifugal detraction at the higher velocities, but rather reveal a larger ratio of increase than the advancing figures of Table No. 1 indicate. We have drives in England and France running at over 7000 feet per minute, and transmitting the higher calculated horsepower, but I think all are outdone by a drive which I encountered in Cleveland where the ropes are running at 7800 feet per minute. The driving sheave is 14 ft. 4 in. diam., making 168 rev. per min. with driven sheave 4 ft. 7 in. diam., and fitted with 19 2-in. ropes to transmit approximately 1400 h. p. The driven sheave only shows a 27½ times diameter of rope but is giving comparatively good service. This will prove a unique illustration to friends in England, but seems to leave us farther in the dark as to centrifugal force.

Effect of Moisture

Cotton ropes are also less susceptible to atmospheric changes than manila for the reason that moisture more readily evaporates through the fibres, thus rendering them practically immune from internal mildew which so often is apparent in a discarded manila rope.

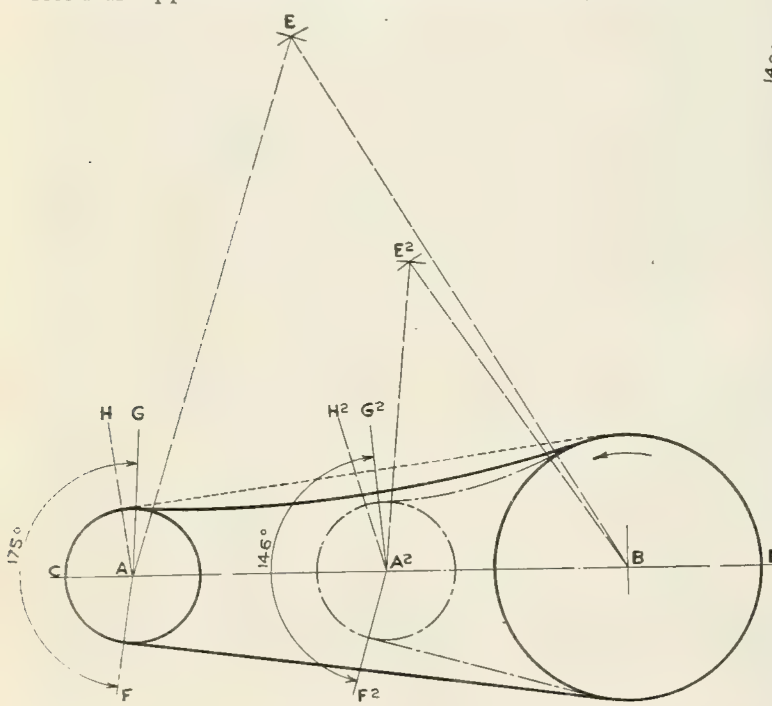

Fig. 5.

Arc of Contact with Slack Above

Before dismissing the consideration of sheave diameters, it will be well to notice another phase of the same question, viz., that which deals with the arc of contact.

It needs but little reasoning to prove that rope contact reaches its maximum when both pulleys are equal in size, but when unequal the utmost quantity realizable is that carried by the smallest pulley whether it be driver or driven. The full value of this assessment, however, also depends upon the centre distances, as may be readily inferred by reference to the geometrical formula, Fig. 5.

First, measure the length of the two radii crossing at E from A to D off point B, and from B to C off point A. A line carried through the centre at A gives FE. The line AH is gained by taking the vertical of the top pulley line, while equally dividing the angle AHE by C produces the angle FAG, which represents an arc 175 deg. By bringing the small circle to the second position and repeating the same formula the arc FAG, is constructed and gives only 146 degrees.

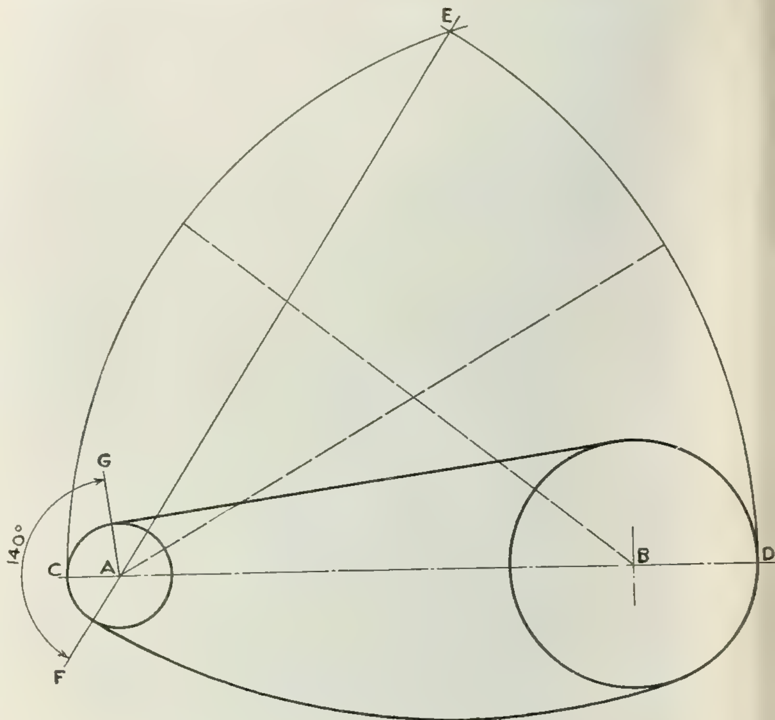

Fig. 6.

Arc of Contact with Slack Below

The formula is somewhat altered in order to ascertain the arc of contact for any distance of centres with slack below. Therefore, mark the distance from A to D and B to C at E, which gives the curve radius for the under slack and constructs FAG by the lines EF and AG, the latter vertical with the upper line over top of circle, thus declaring an angle of 140 degrees. (See Fig. 6.)

This formula will be found useful for ascertaining the depths of rope pits, by what may be termed the ultimate slack.

Generally speaking, it is advisable to discount the transmitting value of the ropes by the amount of difference between the actual arc of contact and 170 degrees, but when the sheaves are comparatively large, these difference may be neglected.

While an effective working tension of about 200 lb. per sq. in. of rope section may be calculated upon, this figure may, in some cases, be profitably exceeded. To quote an instance, a large sheet rolling mill, when first installed, was driven by 26 ropes 2 in. diameter by electric motors and to provide against a peak load of 1500 h. p. was helped by the momentum of two heavy fly wheels making 35 r. p. m. or a peripheral velocity of 3516 ft. Tests conducted under working conditions revealed a high rate of resistance, which diminished as the load rapidly advanced from 150 to 900 h. p. This was considered due to over roping at the lower power. Six of the ropes were accordingly removed. Running with only 20 ropes lowered their average friction from (say) 5.8 to less than 3 percent, brought about steadier transmission, and materially improved the output.

Inter Stranded Cotton Driving Rope

Allowing the claims in favour of the three-strand rope, without further advocacy of the general principles involved, it may be logically contended that if such a rope possesses constant roundness throughout, if the yarns are equal in tension, resiliency, tensile strength and lustre, each one following its appointed track without deviation, and are all of the best procurable quality, then we have arrived at a point bordering on perfection in the making of driving ropes, and their manufacture and application has been a close study for over 20 years.

is maintained in the [illegible]. [illegible] construction means that with the rope in work each thread takes its relative proportion of duty, and again in wearing only the external layer will show [illegible], leaving the next layer intact. This feature is of [illegible] value since there are many instances where say a [illegible] in. rope, after years of work is reduced in diameter, but has still sufficient life left in it [illegible] where ropes of about [illegible] in. diameter [illegible].

There is no limit in length in manufacturing this rope other than may be restricted by convenience in transportation.

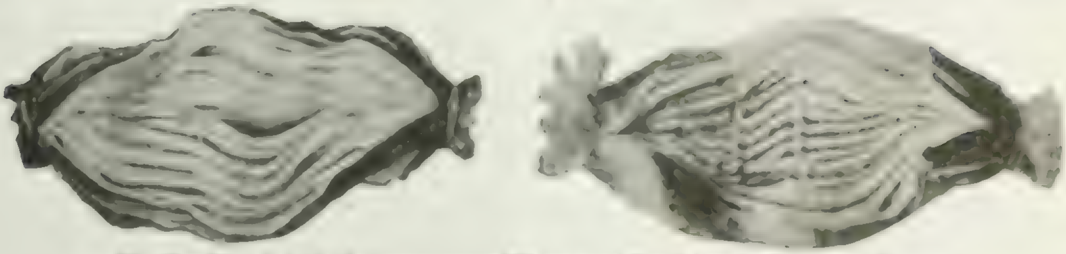

Fig. 7. Even Lay in Inter-stranded Rope and Crinkling in Ordinary Rope.

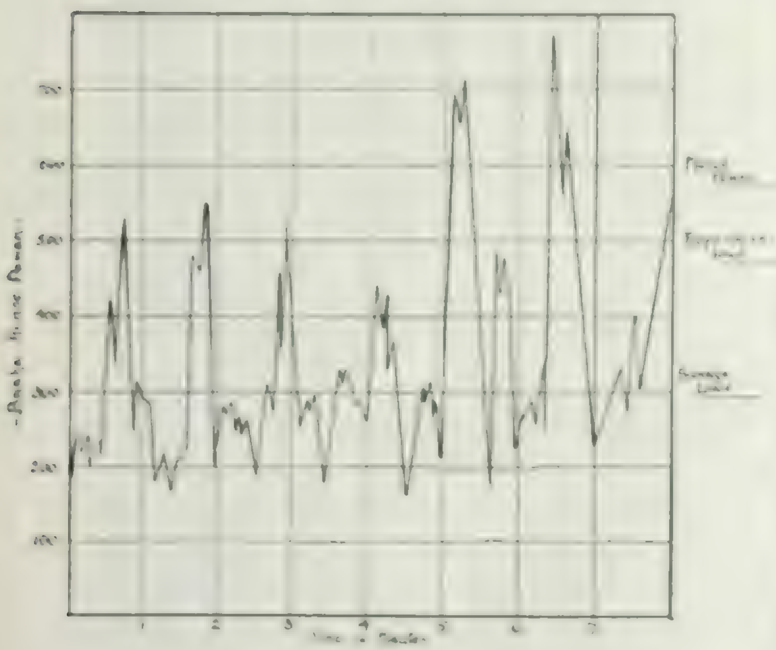

Fig. 8

Fig. 10. Vertical Drive.

This rope is made expressly for power transmission from the finest selected American yarns. Each of the three strands is made up of a succession of sheaths or layers of yarns, which may be peeled off until the centre thread is reached. The rope is machine built, under hydraulic tension, so that a perfect and continued tension is secured to each thread, from the moment these threads are fed to the machine. The crinkling effect to be found more or less in all rope made by the ordinary method is thereby eliminated.

As previously mentioned, the triangulation of strains is secured in three strand ropes and in this particular rope

Splicing

All that has been said relative to the making of power driving ropes and their application to transmission of power would be of little value without some reference to the question of splicing.

TABLE OF HORSE POWERS

For Good Three-Strand Cotton Driving Rope

Rope Veloci in feet per m.	1/2 in.	5/8 in.	3/4 in.	7/8 in.	1 in.	1 1/8 in.	1 1/4 in.	1 3/8 in.	1 1/2 in.	1 3/8 in.	1 3/4 in.	1 7/8 in.	2 in.
1000	1.	1.6	2.3	3.2	4.2	5.3	6.6	8.	9.5	11.2	13.	14.9	17.
1100	1.2	1.8	2.6	3.6	4.7	5.9	7.4	8.9	10.6	12.5	14.5	16.7	19.
1200	1.3	2.	2.9	4.	5.2	6.5	8.1	9.8	11.7	13.8	16.	18.5	20.9
1300	1.4	2.2	3.2	4.4	5.7	7.1	8.8	10.7	12.8	15.1	17.5	20.2	22.8
1400	1.5	2.4	3.5	4.8	6.2	7.7	9.5	11.6	13.9	16.3	18.9	21.9	24.7
1500	1.6	2.6	3.8	5.2	6.7	8.3	10.2	12.5	15.	17.5	20.3	23.5	26.5
1600	1.7	2.8	4.1	5.5	7.1	8.9	10.9	13.4	16.	18.7	21.7	25.	28.3
1700	1.8	3.	4.4	5.8	7.5	9.5	11.6	14.2	17.	19.9	23.1	26.5	30.1
1800	1.9	3.2	4.6	6.1	7.9	10.1	12.3	15.	18.	21.	24.4	28.	31.8
1900	2.	3.4	4.8	6.4	8.3	10.7	13.	15.8	18.9	22.1	25.7	29.5	33.5
2000	2.1	3.6	5.	6.7	8.7	11.2	13.7	16.6	19.8	2 .2	27.	31.	35.2
2100	2.2	3.8	5.2	7.	9.1	11.7	14.4	17.3	20.7	24.3	28.2	32.5	36.8
2200	2.3	3.9	5.4	7.3	9.5	12.2	15.1	18.	21.6	25.	29.4	33.9	38.4
2300	2.4	4.	5.6	7.6	9.9	12.7	15.7	18.7	22.5	26.5	30.6	35.3	39.9
2400	2.5	4.1	5.8	7.9	10.3	13.2	16.3	19.4	23.3	27.5	31.8	36.6	41.4
2500	2.6	4.2	6.	8.2	10.7	13.7	16.9	20.1	24.1	28.5	32.9	37.9	42.9
2600	2.7	4.3	6.2	8.5	11.1	14.1	17.4	20.8	24.9	29.4	34.	39.1	44.4
2700	2.8	4.4	6.4	8.8	11.4	14.5	17.9	21.5	25.7	30.3	35.1	40.3	45.8
2800	2.9	4.5	6.6	9.1	11.7	14.9	18.4	22.2	26.5	31.1	36.1	41.4	47.1
2900	3.	4.6	6.8	9.4	12.	15.3	18.9	22.8	27.2	31.9	37.1	42.5	48.4
3000	3.1	4.7	7.	9.6	12.3	15.7	19.3	23.4	27.9	32.7	38.	43.6	49.6
3100	...	4.8	7.2	9.8	12.6	16.	19.7	23.9	28.5	33.4	38.9	44.6	50.7
3200	...	4.9	7.3	10.	12.9	16.3	20.1	24.4	29.1	34.1	39.7	45.6	51.8
3300	...	5.0	7.4	10.2	13.2	16.6	20.5	24.9	29.7	34.7	40.5	46.5	52.8
3400	...	5.1	7.5	10.4	13.4	16.9	20.9	25.3	30.3	35.3	41.2	47.4	53.8
3500	..	5.2	7.6	10.6	13.6	17.2	21.3	25.7	30.8	35.9	41.9	48.3	54.7
3600	...	...	7.7	10.8	13.8	17.5	21.7	26.1	31.3	36.5	42.6	49.1	55.6
3700	...	...	7.8	11.	14.	17.8	22.	26.5	31.8	37.1	43.2	49.9	56.4
3800	...	...	7.9	11.1	14.2	18.1	22.3	26.9	32.2	37.7	43.8	50.7	57.2
3900	...	...	8.	11.2	14.4	18.3	22.6	27.3	32.6	38.3	44.4	51.4	58.
4000	...	...	8.1	11.3	14.6	18.5	22.9	27.7	33.	38.8	45.	52.1	58.8
4100	...	...	...	11.4	14.8	18.7	23.2	28.1	33.4	39.3	45.5	52.7	59.6
4200	...	...	...	11.5	15.	18.9	23.5	28.4	33.8	39.8	46.	53.3	60.3
4300	...	...	...	11.6	15.2	19.1	23.8	28.7	34.2	40.2	46.5	53.9	61.
4400	...	...	...	11.7	15.4	19.3	24.1	29.	34.6	40.6	47.	54.4	61.7
4500	...	...	...	11.8	15.6	19.5	24.4	29.3	35.	41.	47.5	54.9	62.3
4600	...	...	...	11.9	15.8	19.7	24.7	29.6	35.4	41.4	48.	55.4	62.9
4700	...	...	...	12.	16.	19.9	24.9	29.9	35.8	41.8	48.5	55.9	63.5
4800	...	...	...	12.1	16.2	20.1	25.1	30.2	36.1	42.2	49.	56.4	64.1
4900	...	...	...	12.2	16.3	20.3	25.3	30.5	36.4	42.6	49.5	56.9	64.7
5000	...	...	...	12.3	16.4	20.5	25.5	30.8	36.7	43.	50.	57.4	65.3
5100	...	...	...	....	16.5	20.7	25.7	31.1	37.	43.4	50.4	57.9	65.9
5200	...	...	...	....	16.6	20.9	25.9	31.4	37.3	43.8	50.8	58.4	66.4
5300	...	...	...	....	16.7	21.1	26.1	31.7	37.6	44.2	51.2	58.9	66.9
5400	...	...	...	....	16.8	21.3	26.3	32.	37.9	44.6	51.6	59.4	67.4
5500	...	...	...	....	16.9	21.5	26.5	32.3	38.2	45.	52.	59.9	67.9
5600	...	...	...	....	....	21.7	26.7	32.5	38.5	45.3	52.4	60.3	68.4
5700	...	...	...	....	....	21.9	26.9	32.7	38.8	45.6	52.8	60.7	68.9
5800	...	...	...	....	....	22.1	27.1	32.9	39.1	45.9	53.2	61.1	69.4
5900	...	...	...	....	....	22.2	27.3	33.1	39.4	46.2	53.6	61.5	69.9
6000	..	..	..	....	....	22.3	27.5	33.3	39.6	46.5	54.	61.9	70.4

This is so important to the well-being of the system in general that rather than have installations spoiled by indifferent workmanship expert splicing mechanics, properly trained to this duty, are sent out from England to all parts of the world.

We have experimented with different devices of metal and other couplings, with a view to dispensing with splicing, but nothing has yet been found, which, in England, would be considered against the long splice. This is usually calculated at about 82 times the diameter of the rope.

Operation of the Quebec Public Health Act

Theo J. Lafrenière, M.E.I.C., Chief Sanitary Engineer to the Superior Board of Health of the Province of Quebec.

The first Public Health Act in this province was passed in 1849, during the cholera epidemic of that year, but the act was temporary, to be used at times of epidemics only. The permanent act was passed in 1886, creating the Board of Health. Before going into the details of the present law, a brief review of the first health measures promulgated in this country, may be of interest.

The first measure dates back to 1667, during the French régime; the members of the clergy were requested to keep a record of all births, deaths and marriages occurring during the year, and to transmit a copy of the same to the civil authority. This order is still in force to-day in this province; since 1893, a copy of the record is also transmitted to the recorder of vital statistics.

In 1676, a law was passed ordering every householder to have a privy pit, and putrescible refuse had to be disposed of without creating a nuisance. The inspection of bread and meat was established in 1706.

After the cession of Canada to England, in 1763, health matters remained stationary, the orders issued under the French régime being maintained. During that period, the first measure of importance was passed in 1795, after the separation of Quebec from Ontario. The typhus epidemic in Ireland was threatening the

Read at the General Professional Meeting, Montreal, Jan. 29th, 1920.

colony, in order to guard against its invasion, the quarantine of all incoming ships was decreed, and the captain of the ship had to give all information required by the inspector under the penalty of death "without benefit of Clergy."

From that date, the government concerned itself with Public Health at times of epidemics only. A campaign against smallpox was made during 1815 to 1821 and vaccination was much recommended. The cholera epidemic of 1832 caused the Government to appoint a Health Commission composed of sixteen members, for the time of the epidemic only. With the appearance of cholera in 1849, the legislature passed an Act creating the Central Board of Health, with extensive powers, and the act could be applied whenever the health of the public was threatened. The act was used in 1854, 1866, 1885 and in 1919 during the influenza epidemic and can still be declared in force by proclamation.

Three years after the confederation, in 1870, the municipal code was passed, giving to every municipality, the power to make regulations concerning health matters, such as inspection of buildings, abatement of nuisances, construction of water and sewerage works, and control of infectious diseases. Few municipalities used the powers granted by this act which contained the health laws in existence from 1870 to 1885, and when the smallpox epidemic occurred in 1885, the government had to resort to the special act of 1849. It was then decided to have a permanent board of health for the whole province and in 1877 a commission composed of six members was appointed. The powers granted were limited, being rather advisory in their nature, but amendments passed in 1888, 1890 and 1893 made them a real public health act, with enough powers to promote public health in the province.

At first, the organization of the Board consisted of a president, a secretary and one inspector, but in 1893 and 1894, a statistician, a chemist and a bacteriologist were appointed; in 1899, consulting sanitary engineers were nominated, and in 1909 a division of sanitary engineering was created. In 1911, the province was divided into ten districts, with a medical inspector in charge of each district under the direction of a chief inspector.

The members on the Board have been increased from six to ten, and to-day the Board is composed of eight doctors, one dentist, and one engineer whose commission has expired several months ago, but the vacancy has not yet been filled.

The Quebec Health Act, after numerous amendments, is quite complete. Powers are given to municipalities by the municipal code or the statutes of the province, and the Board of Health has the authority to force the municipalities to use such powers granted to them. The general duties of the Board consist in the study of vital statistics, the investigation of the causes of contagious diseases, the sanitary control of water-supplies and water courses, the surveillance of the local boards of health, and in making regulations respecting industrial establishments.

The section of the Public Health which is of special interest to the engineer is the one relating to water supply and sewerage. The clauses 3978 and 3906 are similar; they require that plans and specifications of water and sewerage works and of treatment works be submitted to the Board for approval before their execution. Proposed extensions to old installations come under these two articles. The plans to be submitted must be prepared by a graduate engineer, licensed or engineer authorized to practise in the province.

No by-law providing for such work can be submitted to the approval of the ratepayers, before the plans are approved by the Board of Health. The demand for approval is made by the municipality, corporation or person for whom the work is to be done, and infringement of these clauses renders the party liable to a fine of one hundred dollars, and the works may be demolished when injurious to public health.

In accordance with article 3900, the Board has made regulations determining the information that must be contained in the plans submitted. General and detailed plans are required, and must be accompanied by a report prepared by the engineer, the said report giving the necessary data for the comprehension of the project.

When the water supply is derived from surface waters, the Board will approve of such plans only that provide for adequate purification works, unless the supply is otherwise protected against all sources of contamination. If the supply is of underground source, a map of the district within 1,000 feet of the proposed source showing houses, barns, privies, etc., shall be submitted. When for extra fire protection, there are by-passes by which partly treated or raw water can be used, the circumstances under which they are to be used shall be described, and their frequency indicated. The valves controlling the by-passes, when approved, shall be sealed by a representative of the Board of Health, and opened only under the provisions governing their approval.

The plans for sewerage works shall show the entire area of the municipality and the proposed sewers on all streets, even if the construction of some of the sewers is to be deferred. Where grades causing a velocity of less than $1\frac{1}{2}$ feet per second, with sewer flowing full, are used, an explanation for the use of such grades shall be mentioned in the engineers' report. Under ordinary circumstances, the Board will approve such plans only that are designed on the separate system. When the combined system is used, all supplementary data necessary to calculate the run off, etc., shall be furnished. The project shall provide for sewage treatment of such a nature as not to cause undue pollution of the stream or body of water into which the sewage or the effluent is to be discharged.

When the plans submitted are for the extension of an existing system, only such information as is necessary for the comprehension of the plans need be furnished.

A preliminary report of the project may be submitted to the Board of Health, prior to the submission of final plans.

Article 3910a is of a special character, and usually does not appear in similar acts. Whenever the Board finds that on account of the geographical situation of two or more municipalities and for the sake of their future development, it is necessary or advantageous for such municipalites to perform jointly certain sewerage works, for reason of health or economy, the question may be referred to the Public Utilities' Commission which determines the nature of the work to be executed, and apportion the cost of such works. The object of this article, is to prevent, in the case of contiguous towns, water intakes and sewer outlets in close proximity. Any municipality may borrow the necessary moneys to comply with the order of the Commission without affecting its ordinary borrowing powers. One such case is now before the Public Utilities' Commission.

Extensive powers are conferred on the Board by articles 3911a, b, c, d and e, which are an adaptation of the Bense Act of Ohio. They permit the sanitary control of rivers and the improvement of existing water supplies. The method of procedure is as follows:—The Board investigates the polluted body of water or the source of water supply, as the case may be. The results of its findings are transmitted to the interested parties, and a conference is held at which the parties discuss the results of the investagation; then the Board gives its order. Any municipality, corporation or person who is not satisfied with the decision of the Board, may appeal within a delay of fifteen days, and the question is then submitted to a board of arbitrators composed of two sanitary engineers, one appointed by the party who seeks revision and the other by the Provincial Secretary. If necessary, the two engineers may appoint a third arbitrator or have him appointed by the Superior Court. The decision of the majority of the arbitrators is final, and is executory as if it were an order of the Board of Health.

Any municipality, to comply with the order of the Board, is authorized to borrow the necessary amount without having to observe the required formalities regarding loans.

Any person or corporation operating waterworks, ordered to improve the quality of the supply, may apply to the Quebec Public Utilities Commission, who shall establish the apportionment of the cost of the improvement between the owner of the waterworks and the municipality using the supply. This provision is made in order to protect the waterworks owner, in the instances where the supply has become polluted, due to causes beyond his control.

A heavy fine is provided to enforce this section of the act, and moreover, the Board has the right to have the improvements done at the expense of the municipality, corporation or person in default.

Most of these powers have been granted by the legislature since 1915, and consequently their application has been somewhat difficult, due to the conditions created by the war. Eight filtration plants have been installed and six more plants have been ordered; one town has changed the source of its supply and another one is resisting the order of the Board; the case is now before the court. Two sewerage systems have been ordered, and four municipalities have been required to join in a common sewerage project.

Several water purification plants have been installed upon the recommendation of the Board, and to-day, 860,000 people are supplied with filtered water, and 170,000 with chlorinated water. Sewage disposal works are seldom needed on account of the high degree of dilution obtainable in most cases, and it has been the policy of the Board to insure a safe water supply by water purification rather than by sewage treatment.

The study of the water-supplies in the province shows that there are 440 waterworks; half of them are very small, but 192 serve minicipalities with a population of over 500 inhabitants. The combined population served by these latter is 1,383,700.

Sources of water supplies in town of more than 500 population.

Source of supply	Number of works	Population	Per cent of total population
Rivers	97	1,192,512	86.2
Lakes	20	52,879	3.8
Springs or wells	75	138,338	10.0
Total	192	1,383,700	100.0

It appears from the table, that 86.2% of the population is supplied with river water; 3.8%, with lake water; 10% with underground water.

The water obtained from lakes or springs is generally good; the water derived from the rivers requires purification. The supply of 86% of the population using river water is filtered or chlorinated, but the supply of the remaining 14%, representing 60 towns, will be difficult to improve, because the towns are small. The cost of filtration works is almost prohibitive for a small municipality; and chlorination, without expert supervision, does not afford much protection.

A new method of controlling the operation of water purification plants has been tried for a year. The method consists in the examination, for the presence of B. Coli, of daily water samples, sent by mail. By this means, any decrease in the efficiency of the plant may be quickly detected and remedied before harm is done. Better results have been obtained from chlorination plants, by this continuous control, and it is to be hoped that in the near future, all water supplies in this province derived from rivers exposed to contamination, shall be either filtered or disinfected.

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOL. III. June 1920 No. 6

The Seventh Western Professional Meeting will be held in Niagara Falls, September 16th, 17th and 18th, and the Eighth Professional Meeting will be held in Halifax, October 13th, 14th and 15th.

Annual Meeting 1921

At a meeting of the general committee of the Toronto Branch of *The Institute* formed to arrange the details of the annual meeting at Toronto next year active steps were taken, ensuring the greatest possible success for this gathering. The energy with which the members of the Toronto Branch have taken up the matter of the annual professional meeting next year at Toronto combined with the excellent choice that has been made of the chairmen of the various committees indicates that there will be held next year in Toronto a meeting which will equal or surpass any other in the annals of the engineering profession in Canada. This year has already seen the profession making notable strides in its advancement, and it is intended by the members of the Toronto Branch that next year will see the engineering profession in a position of strength and influence much greater than at any previous time. The entire membership of *The Institute* is behind the Toronto members in their efforts in this connection, and it is expected that in attendance, interest and achievement the annual meeting in Toronto next year will break all previous records.

The following have been selected as chairmen of the various committees:—General Committee: Col. H. J. Lamb, D.S.O., M.E.I.C.; Finance Committee: W. A. Bucke, A.M.E.I.C.; Entertainment Committee: Prof. T. R. Loudon, M.E.I.C.; Technical Papers Committee: C. A. McCarthy, M.E.I.C.; Publicity Committee: J. R. W. Ambrose, M.E.I.C.; Accommodation Committee: J. B. Carswell, A.M.E.I.C.; Service Committee: Prof. H. E. T. Haultain, M.E.I.C.; Joint Secretaries: L. W. Wynne-Roberts, A.M.E.I.C., and J. R. Montague, A.M. E.I.C.

The dates suggested for the meeting are Tuesday, Wednesday and Thursday February the first, second and third.

Improving the Highway Improvement Act

W. A. McLean, M.E.I.C., Deputy Minister of Highways, Ontario is responsible for a change in the Highway Improvement Act of Ontario, which gives a striking illustration of the recognition that the building of highways involves technical knowledge and skill, and that as far as Ontario is concerned it is intended to have competent direction on the construction and maintenance of the highways of Ontario. The Council of *The Institute* expressed its appreciation to Mr. McLean in recognizing the standing of the membership of *The Engineering Institute of Canada*, and the sentiments of Council will be endorsed by the membership of *The Institute* in this connection.

The wording of the Act mentioned is as follows:—

His Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario enacts as follows:—

1. Section 7 of *The Highway Improvement Act* is amended by striking out the words "or some other competent person" in the third line, and by adding thereto the following subsection:

(2) Every engineer hereafter appointed by the council of a county, in pursuance of this section, shall be a graduate in civil engineering of a university of recognized standing, or a member of *The Engineering Institute of Canada*, or an Ontario land surveyor.

A Notable Tribute

Canadian engineers have recently received probably the highest tribute that has yet been paid them, and directly as a result of their magnificent work during the war, in getting preference by the British Government for engineering positions available in Mesopotamia. In the employment bureau department this month will be found an announcement calling for engineers, the remuneration being, generally speaking on a much higher scale than is being received in Canada. The above incident will be received with satisfaction by the engineering profession in this country, placing as it does the official seal of merit on the Canadian engineer and singling him out as having no superior in the world.

Employment Service Bureau

The employment bureau is an important service to the members of *The Engineering Institute*, and the gradual but sure growth of the utility of this service during the past year has been encouraging. Originally the Bureau was confined largely to headquarters between issues of *The Journal*, but a recent extension of the work has increased its scope. It is now the policy to forward to the branch secretaries the information regarding applications for engineers whenever practicable, in order that the informations may be given the widest possible publicity in the shortest time. Thus the branch secretaries have information of value, not only to the members, but also to those not members of the branch, who if desirous of making a change may get in touch with the nearest branch secretary inquiring if recent application have been received for engineers. It may not be generally known, but a member living outside a Branch centre may become a member of any branch upon written request and receive the notices of Branch meetings. In some cases the branch secretaries have adopted the idea of giving a list of the latest vacancies on the post cards announcing the meetings, which applies particularly to the winter months. The federal and provincial government, municipalities, railroads and industrial companies, including not only the metal working industries, pulp and paper, contracting, and other corporations employing engineers, but also companies not heretofore in the habit of engaging technical men are making use of the possibilities which *The Institute* present as a clearing house for engineers. More and more will this be the case as it becomes better known what a distinct advantage it is to any one requiring the services of an engineer to be able to take advantage of the facilities offered by *The Institute* and of having the fact known to such a wide body of highly trained men as are constituted in this organization.

The employment Service Bureau now being well established will attain great efficiency as the more employing members of *The Institute* realize the usefulness to be gained through using this service.

Engineering employment is fairly satisfactory at the present time, there being still a dearth of junior engineers, and the students from the universities are getting more responsible work than was offered them a few years ago. The present graduating class has been absorbed and many of the younger engineers on leaving college have the choice of several positions.

Message to Good Roads Congress

Embodying good-will towards the Canadian Good Roads Association and a constructive suggestion regarding making greater use of technical men in the construction of highways, the following message was presented to the Congress by W. A. McLean, M.E.I.C., on behalf of the Council of *The Institute*:

"The Council of *The Engineering Institute of Canada*, recognizing the important place which highway construction and maintenance must of necessity play in the social, industrial, agricultural and commercial development of Canada desires to extend to the Canadian Good Roads Association best wishes for a successful convention in Winnipeg and to assure the Association of the interest with which *The Institute*, representing the Engineering profession as a body, will follow the proceedings of this Congress.

The Engineering Institute may be permitted to refer with some degree of satisfaction to the services which the engineering profession has performed in creating the magnificent network of steam railways which to-day traverses all occupied portions of Canada; and with some pride may refer to the distinguished services in the great war which the various Railway Construction Battalions of Canada were able to achieve in competition with the best engineering skill of all nations, achievements as was made possible only by reason of the ability, energy and experience gained under conditions of peace.

It is to be recognized that the improvement of common roads has been a matter of comparatively recent and that such improvement on a substantial scale is now the most important public work remaining to be carried out in order that Canada may be enabled to take advantage of her wonderful resources and the opportunities which have been created by railway and canal construction and other works of development.

Provincial and municipal highway and street departments in the recent expansion of their work, it is stated, have found difficulty in obtaining experienced highway engineers to place in charge of this construction. Such a shortage of highway engineers, if it exists, is probably due in part to the failure of rural and urban Councils to utilize services of engineers on minor works of road improvement through which experience would have been gained to qualify them for the present under demand.

When steam railway construction was initiated, a similar scarity of railway engineers existed; but experience (said to be a costly teacher) rapidly produced a corps of railway engineers of ability adequate to the wonderful results which have been reached.

Highway engineers of finished calibre and qualifications as the railway and other branches of construction can only be produced through the medium of experience. But this *Institute* would submit for the consideration of the Road Congress, that technically trained men will usually respond most effectively to experience, and that the most valuable supervision can be produced only by providing the necessary experience for technically trained men.

The tendency of some highway authorities has been to employ practical men and men of local influence in positions which might readily be opened to young engineers. The Provinces are annually turning out from their Universities, groups of young men who have spent several years of labour at expense and without remuneration in procuring a technical education. As a practical suggestion, *The Engineering Institute* would offer the recommendation that the experience which is largely lost by bestowing it upon laymen might with benefit be conserved by preferring for these minor positions, young technical graduates—a practical method of conservation which would ultimately mean much as a matter of public economy and efficiency.

In submitting this view the Council of *The Engineering Institute* is aware that narrow motives might be imputed; but rather, the Council is disposed to believe that the national advantage of well qualified and experienced engineering services in the great work of highway development will be accepted by the Good Roads Congress, as common ground for co-operative effort, and the sincere interest which the Council has already expressed in the proceeding of the Congress."

Convention of the American Waterworks Association

The Fortieth Annual Convention of the American Water Works Association will be held in Montreal June 21-24, the Windsor Hotel being the headquarters. A large number of members of the Association are expected to be present at this Convention from the Dominion and from the United States and a very interesting programme has been arranged. It will be noted from the programme that members of *The Engineering Institute of Canada* are taking an active part in presenting papers. The address of welcome will be read by Commissioner R. A. Ross, M.E.I.C., President of the Institute.

The Council of the Institute has issued a cordial invitation to the Waterworks Association and convention delegates to make use of the Headquarters Building for any purpose they may require.

* * *

Tentative Programme

Monday, June 21.

Registration, meetings of Executive and other Committees and informal get aquainted meetings in lobies and exhibit room.

Monday Evening.

Informal reception at the Windsor Hotel.

Tuesday, June 22.

Opening of Convention, reading of following papers: The Municipal Water Supply of Montreal, by Thomas W. Lesage, M.E.I.C.; The Works of the Montreal Water & Power Company, by F. H. Pitcher, M.E.I.C.; The Experience in Montreal in the Manufacture of Alum, by James O. Meadows, A.M.E.I.C.

Afternoon

The Water Works of the City of Quebec, by Arthur Surveyer, M.E.I.C.; Water Supply Problems in the Province of Quebec, by T. J. Lafreniere, M.E.I.C.; The Water Works of St. John, N.B., by Frank A. Barbour, M.E.I.C.

Evening

Water Works Experiences, by Beekman C. Little; Economic Features of Pumping Station Operation, by Leonard C. Day; Difficulties in Building the Louisville Pumping Station, by James B. Wilson.

Wednesday, June 23.

The New Water Supply of Winnipeg, by James H. Fuertes, M.E.I.C., and Wm. G. Chace, M.E.I.C.; President's Address, by President Carleton E. Davis; Reports from Sections; Report of the Association's Representatives on the American Electrolysis Committee; Report of the Committee on Private Fire Protection Services, Nicholas S. Hill, Chairman; Report of the Committee on Official Standards for Water Analysis, Jack J. Hinman, Jr. Chairman; Report of the Committee on Standard Specifications for Cast Iron Pipe and Specials, Frank A. Barbour, M.E.I.C., Chairman; Report of the Committee on Cold Weather Troubles, Charles R. Bettes, Chairman.

Afternoon

Entertainment by the Water Works Manufacturers Association, possibly a trip through the rapids of the St. Lawrence River.

Evening

A smoker for the men, given by the Water Works Manufacturers' Association, and for the ladies a theatre or card party.

Thursday, June 24.

Discussion of Water Meters. This will be opened by several papers by members of the Association. All members of the Association with any information of interest on this subject are requested to communicate with John M. Goodell, 106 Loraine Ave., Upper Montclair, N.J.

A separate meeting will be held by the Chemical and Bacteriological Section at which a paper will be read by Colonel Geo. A. Johnson on quality of water.

Afternoon

A general discussion of the legitimate uses of water, water waste, etc.

Evening

Passage of Deep Water to Sea Water, by Dr. Wm. P. Mason; Cost-Plus Contracts in Water Works Construction, by Geo. W. Fuller, M.E.I.C.; Standard Forms for Contracts, by C. W. Hubbell; The Trend of Prices, by Leonard Metcalf.

Arrangements have been made for trips about the city of Montreal, inspection of water works, etc. A special trip may be arranged to the Saguenay River.

REPORT OF COUNCIL MEETING

The main features of the regular meeting of Council held on April 27th were reported in the first editorial of the May issue of *The Journal*.

At the adjourned meeting of Council held at headquarters on Monday, May 3rd, Branch resolutions were noted and approved.

The compendium on engineering legislation compiled for the use of the Advisory Conference Committee of Ontario was presented and received with thanks. The action of W. A. McLean, M.E.I.C., Deputy Minister of Highways, Ontario, in amending the Highway Improvement Act to give recognition to the engineering qualifications of members of *The Institute* was noted and the thanks of *The Institute* expressed to Mr. McLean for his action in this connection. The suggestion of Dr. Herdt that the name of the Electro Technical Committee of *The Institute* be changed and known as the Canadian International Electrotechnical Commission was approved and the name of H. A. Dupré, A.M.E.I.C., was added to the Committee. Items ninety-five to one hundred and two of the proceedings of the Main Committee of the Canadian Engineering Standards Association meeting of April 15th relating to *The Engineering Institute of Canada* were noted to the effect that the Canadian Engineering Standards Association proposed taking over the standards of *The Institute* as suggested and that credit would be given to *The Institute* for all work done thereon by *The Institute*. The name of J. B. Challies, M.E.I.C., was added to *The Institute* Committee on Remuneration of Engineers. Letter from the Edmonton Branch advising that they were unable to undertake the responsibility of having a Professional meeting this year was noted. The suggestion that the present maximum limit of twenty-five years for students be increased, and the present minimum of thirty-five years for members be decreased was referred to the By-laws Committee with a request that this committee confer with the Board of Examiners and Education and report to Council. The recommendation regarding changes in the By-laws to enable juniors to vote and hold office in Branches [illegible] of chairman, approved at the last meeting of Council, was referred to the By-laws Committee with a request that a draft be made of the changes to include this suggestion. The question of publishing transactions as recommended by the Publication Committee was considered. It was decided to make a note in the agenda of the next meeting and that all councillors be advised that the question of publication of papers and transactions be discussed at the next meeting of Council, and later submitted to the membership for decision.

Resignations were accepted as follows:—

H. R. Crossley, G. H. G. Conrwick, F. C. Albert.

Classifications were made for a ballot returnable at the next regular meeting of Council.

In April the following elections and transfers were effected:—

Members

R. N. Blackburn of Regina, Sask., chief boiler inspector, Prov. Gov't of Sask.; J. G. Berning of London, Eng., Stockholm Tech. Univ., Managing Director of Berning & Co. Ltd.; W. L. Dennault of Coniston, Ont., Chief Engineer, Mond Nickel Co.; W. P. Dobson, B.A.Sc., M.A.Sc. (Univ. of Tor.), Laboratory engr. Hydro-Elec. Power Comm. Toronto; E. T. Croll of Niagara Falls, Ont., Plant engr. on Chippawa-Queenston Power Dev., Hydro-Elec. Power Comm.; H. V. Haight, B.A.Sc. (Univ. of Tor.) of Sherbrooke, Que., Chief engr., Canadian Ingersoll-rand Co.; J. D. Hathaway, of Westmount, Que., Pres. British Manganese Co. Ltd.; G. P. Hawley of Cedars, Que., resident engr. Cedars Rapids Mfg. & Power Co.; W. G. Hewson, B.A.Sc. (Univ. of Tor.) of Toronto, rly. engr. H.E.P.C.; E. D. LeMay of Toronto, city surveyor, Toronto; W. B. Lindsay, C.M.G., D.S.O., of Strathroy, Ont., G.O.C. Can. Engrs. and chief engr. Can. Corps.; W. MacLachlan, B.A.Sc. (Univ. of Tor.) of Toronto, consultant, Industrial relations, H.E.P.C.; L. D. Magee of Peterboro, Ont., works engr. Can. Gen. Elec. Co.; J. McEvoy, B.A.Sc. (McGill Univ.) of Toronto, consulting mining engr. and geologist; G. L. Sneath of Amherst, N.S., gen. mgr. Robb Engineering Wks.; D. W. Roper, of Toronto, C.E. Univ. of Tor. '00, vice-pres. and mgr. Ontario Rock Co. Ltd., engr. and mgr. Electro Metals Quarries, Ltd., Welland, Ont.; H. M. Scott, of Montreal, mgr. mech'l. dept. P. Lyall & Sons, constrn. Co.; P. T. Sise, B.Sc. (McGill Univ. '01) of Montreal, president, Nor. Elec. Co.

Associate Members

N. T. Binks, B.Sc. (McGill Univ. '[illegible]) of Montreal, sec.-treas. John MacGregor Ltd., engrs. and contractors; W. M. Cruthers, B.A.Sc. (Univ. of Tor. '[illegible]) of Peterboro, engr. Can. Gen. Elec. Co. [illegible]; F. E. Darrell, B.Sc. (C.E., Univ. of Maine '[illegible]) of [illegible], and of res. engr. Price Bros. & Co. Ltd.; A. L. Dickinson, B.Sc., M.Sc. (McGill Univ.) of Peterboro, induction motor designer, Can. Gen. Elec. Co.; D. A. Duffy, of St. John, N.B., asst. to road engr. St. John; K. A. Dunphy, B.Sc. (Univ. of N.B.) of [illegible], Man., dir. engr. bridge and bldg. [illegible]; R. H. Findlay, Assoc. Royal Tech. Coll. of Westmount, Que., chief draft'g dept. [illegible], Dom. Bridge Co.; V. S. Foster, B.Sc. (Univ. of Kansas) M.Sc. (Penn's State Coll.) of Peterboro, engr. in chge. D.C. machine design. Can. Gen. Elec. Co.; L. F. Fyles, B.Sc. (McGill Univ.) of Calgary, Alta., deputy district vocational officer for Alta. D.S.C.R.; A. M. Grant, B.Sc. (Queen's Univ.) of Ottawa, in chge of triangulation, Montreal and district, Geodetic Survey of Canada; R. L. Hearn, B.A.Sc., (Univ. of Tor.) of Toronto, chief asst. to hydraulic engr., chge of designing and drafting staff, Queenston-Chippawa development; V. J. Hvidt, (Poly. Tech. Copenhagen '09) of Princeton, res. engr., Copper Mountain Branch, Kettle Valley Rly.; C. J. Jeffery, of Armstrong, B.C., res. engr. on constrn. C.N.R., Okanagan Branch; F. B. James, of Walkerton, Ont., private practice; B. F. Lamson, B.Sc., (Queen's Univ.) of St. Catharines, asst. city engr.; C. J. LeBlanc, B.A.Sc. (C.E.) (Ecole Poly. '10) of Montreal, engr. in chge. contract works road dept. Montreal; W. S. Lockhart, B.Sc. (E.E.) (McGill Univ.) of Montreal, elec. engr. Engineering Co. of Canada; W. M. MacAndrew, B.A.Sc., (Univ. of Tor.) of Vancouver, B.C., member of firm MacAndrew-Jamieson Eng. Co.; J. P. Mackenzie, (Glasgow Univ.) of Vancouver, in chge of eng. work, Loomis, McFee, Henry & McDonald, contractors; M. S. Madden, B.S., B.Sc., of Keewatin, Res. engr. at Keewatin for Man. Hydrometric Survey; W. F. McKnight, B.Sc. (McGill Univ.) of Montreal, educ. director, Nor. Elec. Co.; R. Morham, of Toronto, draftsman Hydro-Elec. Power Comm.; R. R. Murray, B.Sc. (N.S. Tech. Coll.) of Halifax, re-educ. principal, D.S.C.R.; B. T. O'Grady, of Nelson, B.C., locating engr. for P.W.D. for West Kootenay; F. E. Orr, (Queen's Univ.) of Alfred, Ont., supt. in chge of erection of plant, Alfred; G. H. Patterson, B.Sc. (Univ. of N.B.) of Quebec, transitman in chge of foundation work, St. Malo Shops, C.N.R.; H. C. F. Poste, of Cornwall, Ont., mgr. St. Lawrence Power Co. Ltd., mgr. Cedars Rapids Transmission Co.; W. Ramsay, (Dundee Univ.) of Nelson, B.C., dist. engr. West. Kootenay; J. J. Richardson, of Quebec, Que., asst. dist. engr. C.N.R.; G. L. Ridout, (R.M.C. '07) of Toronto, engr., Norman McLeod, Ltd.; H. S. Rimmington, B.C.E. (Univ. of Man.) of Winnipeg, designing engr. and asst. to bridge engr. C.N.R.; F. A. Ritchie, of Sault Ste. Marie, drawing and engr. on constrn., Algoma Steel Corp.; A. R. Robertson, B.A.Sc., (Univ. of Tor.) of Toronto, sales engr. McGregor, McGregor and McIntyre, Ltd.; S. G. Smith, of Toronto, asst. to chief land surveyor, C.N.R.; R. D. Sutherland, B.Sc. (McGill Univ.) (R.M.C.) of Montreal, on eng. staff, Electrics Ltd.; F. E. Umphrey, of Winnipeg, in chge of drainage dists., prov. of Man.; J. Veitch, (Heriot Watt Coll.) of Winnipeg, engr. in chge. mech. dept. Man. Power Comm.; W. C. Way, M.Sc. (Queen's Univ.) of Ottawa, director of surveys lab., Dept. of Inter.; H. M. White, (Univ. of Tor.) (Hons.) of Winnipeg, designing engr. Winnipeg Branch, Dom. Bridge Co.; J. M. F. Wilson, B.Sc. (London) of Winnipeg, head of dept. of elec. eng., Kelvin Tech. High School; J. Young, (Univ. of Tor.) of Winnipeg, chief inspector, Western Canada Fire Underwriters Ass'n.

Juniors

P. Danais, B.Sc. (C.E.) (Queen's Univ.) of Baie St. Paul, installation of water plant with R. Fortin; N. H. Daniel, B.A.Sc. (Univ. of Tor.) of Toronto, drfts'man, Toronto harbour Comm.; D. C. M. Davies, of Regina, inspector of P. W., Prov. of Sask.; R. C. Eastman, of Capreol, Ont., res. engr. m't'ce of way, C.N.R.; J. W. D. Farrell, B.A., B.Sc. (Queen's Univ.) of Regina, draftsman, irrigation div., Dept. of Inter.; H. E. Miller, of Charlottetown, P.E.I., in chge of North Lake Boat Harbour, layout and constrn.; V. C. Moulton, B.Arch. (McGill Univ.) of Westmount, Que., estimating and drafting, Douglas Bremner & Co.; A. Pirie, of Vancouver, asst. engr. B.C. hydrometric Survey, Water Power Branch; J. R. Ross, (Univ. of Man.) of Winnipeg asst. to municipal engr., Rockwood, Man.; J. H. Russell, of Peterboro, Ont., with Russell-Townsend Co., Contractors; W. J. Rutherford, of Westmount, Que., attending McGill Univ.; A. B. Rutherford, of Westmount, Que., attending McGill Univ.; W. B. Scott, of Montreal, attending McGill Univ.; N. H. F. Smith, of Ottawa, Ont., in chge of subdiv. of adjusting div., Geodetic Survey of Canada; A. R. Whittier, B.Sc. (Queen's Univ.) of Ottawa, final year Queen's Univ.; E. P. Wilson, of Montreal, attending McGill Univ.; J. K. Wilson, of Montreal, attending McGill Univ.

Associate

F. Hankin, of Montreal, president, Francis Hankin & Co. Ltd.

Transferred from the class of Associate Member to Member

W. E. Davis, B.A. (Ohio State Univ.) of Winnipeg, office engr. G.T.P.; E. P. Fetherstonhaugh, B.Sc. (E.E.) (McGill Univ.) of Winnipeg; J. D. McBeath, B.A.I. (Univ. of N.B.) of Moncton, asst. city engr.; P. H. Mitchell, (Univ. of Tor.) of Toronto, partner C.H. & P.H. Mitchell, conslt. engrs.; W. H. Munro, (S.P.S.) of London, Eng., senior hydraulic engr., Vickers, Ltd.; J. J. Newman, (S.P.S.) of Windsor, Ont., private practice; J. Rocchetti, (Liege Univ.) (E.E.) of Winnipeg, chief engr. Man. Power Comm.; J. S. Tempest, of Ottawa, Ont., supervising hydraulic engr. Reclamation Service.

Transferred from the class of Junior to Member

J. C. Brown, (Univ. of N.B.) of Constantinople, chief engr., Anatolian Rlys., in Asia Minor.

Transferred from the class of Junior to Associate Member

G. Affleck, of Winnipeg, dist. engr. Reclamation Branch, P.W.D.; W. W. Dynes, B.C.E. (Univ. of Man.) of Winnipeg, asst. engr. City of Winnipeg; E. Duncan, (Glasgow Tech. Coll.) of Galt, Ont., locating engr., Hydro. Elec. Power Comm.; L. I. Easton, B.C.E. (Univ. of Man.) of Winnipeg, designing, bridge dept., C.N.R.; H. F. J. Estrup, (Polytech. Coll. Copenhagen) of Welland, Ont., director and president, British-American Shipbldg. Co. Ltd.; H. P. Heywood, of Toronto, asst. engr., Toronto Harbour Comm.; K. R. MacKinnon, B.Sc. (McGill Univ.) of Omaha, Neb.; K. W. Morton, of New Westminster, B.C., asst. engr. on design and supt. of constrn. P.W.D.; W. H. Norrish, B.Sc. (Queen's Univ.) of Ottawa, in chge of D.L.S. party; G. R. Turner, of Fredericton, N.B., asst. res. supt. eng. branch K unit. D.S.C.R.; C. S. Walley, B. Eng. (Liverpool Univ.) of Winnipeg, supt'g. engr., Lount Eng. Co. Ltd.

Transferred from the class of Student to Associate Member

Y. Lamontagne, B.Sc. (C.E.) (McGill Univ.) of Montreal; H. R. Urie, B.C.E. (Univ. of Man.) of Winnipeg, dist. engr., Good Roads Board.

Transferred from the class of Student to Junior

A. M. Alberga, B.Sc. (C.E.) (McGill Univ.) of Montreal; L. F. Barron, B.A.Sc. (Univ. of Tor.) of Hamilton, Ont.; W. S. Collins, B.C.E., (Man. Univ.) of Winnipeg, draftsman, bridge eng. dept., C.N.R.; W. W. Crouch, B.C.E., (Man. Univ.) of Selkirk, Man., inst'man on constrn. C.N.R.; J. A. Dufresne, B.A.Sc., C.E., (Laval Univ.) of St. Placide, Que., engr. hydraulic service, dept. of Lands and Forests, Quebec; J. C. Irving, B.C.E. (Univ. of Man.) of Winnipeg, asst. engr., Good Roads Board; H. MacNeil, of Montreal, inst'man on m't'ce., C.N.R.; F. G. Rounthwaite, B.Sc., (C.E.) (McGill Univ.) of Montreal, asst. to constrn engr., Atlas Constrn. Co. Ltd.

The following Students were elected

H. R. Burton, W. L. Campkin, I. B. Cassidy, C. M. Cassin, J. P. Devenny, A. L. Doucette, H. A. Gauthier, W. C. Gilman, A. W. Isaac, C. M. Johnston, D. Massey, L. W. May, H. H. Niles, J. B. Parker, F. C. Richardson, M. G. Stewart, J. A. Wright.

CORRESPONDENCE

Re Draftsmen and Engineers

Editor, *Journal:—*

Dear Sir,

In the February issue, a letter appeared on this subject.

I desire to deal with a different phase and show that it is allied with absorbing outside engineers and draftsmen into Canada, principally from the Old-Country.

In railways, few engineers were skilled draftsmen. It was the custom for field men to be brought into the drafting room during winter. The few who developed real skill had great difficulty in getting sent out again as engineers. Often an engineer took the place of the chief draftsman. Recent practice is the reverse. Those who do not acquire great skill, even though their work is very good, are let out of drafting anyway. This is very hard on a railway engineer in a slack time. Especially so because the same old countryman stays in the drafting room and in the minor field positions, preventing the engineer in winter, and the Varsity man in the holidays, from getting experience and the money to re-attend the fall session. At the head office of one of Canada's great systems this spring, there were six Old Countrymen and one lone Canadian at the engineering drafting tables, to say nothing of the other departments. The international character of The Institute is all very well, but it is time for some Canadian authorities to wake up.

W. C. McLean, A.M.E.I.C.

781 Shaw St., Toronto.

An Enquiry

Editor, *Journal:—*

Dear Sir,

It is the opinion of the writer that the usefulness of *The Journal* would be much enhanced if there was a section in which Members could make enquiries relating to problems which arise in their daily work; for instance the writer would like information on the following subjects:

1. What is the strength of Mild Steel, Cast Steel and Cast Iron at Temperatures above the normal?

2. What is the power ratio between a worm and a gear, also the strength of the teeth?

3. What are the physical properties of Antimonial lead?

Yours truly,

C. D. [illegible], A.M.E.I.C.

British America Nickel Corporation Ltd.,
Deschenes, P.Q.
May 5, 1920.

* * *

1. The best information on this subject is to be found in the standard text-books on heat-treatment. Among these are: "Hardening and Tempering Steel," by Bernard E. Jones, published by Cassell and Company, (in the library); "The Crystallization of Iron and Steel," by J. W. Mellor, published by Longmans and Green (in the library); "The Composition and Heat Treatment of Steel" by Lake, published by McGraw-Hill.

2. There are several excellent text-books on machine design which give full information in answer to the question; "Machine Design" by F. R. Jones, published by Wiley and Sons (in the library); "Machine Design" by Smith and Marx, published by Wiley and Sons.

3. Very little on the subject of antimonial lead is to be found in current mining literature. Bibliographies are given in "Mining Engineers' Handbook" by Peele; there are also references in "Prospector's Field-book and Guide" by Osborne and Von Bernewitz.

In connection with all of these questions reference is recommended to the annual volumes of the Engineering Index, the files of the Transactions of the American Society of Mechanical Engineers, American Society of Testing Materials, Canadian Mining Institute, American Institute of Mining Engineers; also to the files of the technical journals such as "Canadian Machinery", "Machinery", "Canadian Mining Journal", and "Engineering and Mining Journal". The principal technical publishers are Wiley and Sons and McGraw Hill, both of New York.

EMPLOYMENT BUREAU

A letter has been received from Col. Houliston with information regarding appointment of eight irrigation engineers for service in Mesopotamia. Further particulars with regard to this appointment may be obtained from headquarters, any of the Branch Secretaries, or Col. J. Houliston, A.M.E.I.C., Dept. of Militia & Defense, Ottawa, Ont.

Situations Vacant

Boxes 83, 90, 87, 88, 89, 94, and 93 are filled.
Boxes still available 92, 96, 99, 100, 101, 102, 103, 104, 105, 106, 107, 109, 110.

The Paper Company referred to in Box 92 in the April *Journal* still requires instrumentmen, draughtsmen and rodman, but does not wish applications from inexperienced men.

Civil Engineer

Experienced civil engineer wanted for pulp and paper company in the province of Quebec. Box 114.

Investigation of Water Power

Civil Engineer; field work—charge of party on investigation of a water power. Box 116.

Hydraulic Engineer

Hydraulic Engineer; office work, designs and estimates on hydro-elec. power house work, etc. Box 118.

Electrical and Mechanical Engineer

Electrical and Mechanical Engineer; office work, designs and estimates on hydro-elec. power house work, transmission lines, etc. Box 117.

Assistant Draughtsman

Assistant draughtsman for new development in wireless apparatus in connection with experimental and development work, good opportunity for entering the field of wireless engineering. Box No. 111.

Engineer for Consulting Engineering Work

Engineer to take charge of office work in leading consulting engineer's office, preferably with structural designing experience. Work will include office management and design principally structural work on buildings and bridges; layout of waterworks and sewerage systems. This is a permanent position with good prospects. State experience, references and salary required. Box 115.

Junior Assistant Roadway Division

Wanted, a young graduate for Junior Assistant in Roadway Division. A permanent position for the right man. Box No. 119.

Situations Wanted

Quebec Land Surveyer S.E.I.C. Young man seeking employment preferably of a permanent character. Box No. 33-P.

Civil Engineer

Civil engineer, A.M.E.I.C., sixteen years experience construction work as chief of party, squadman and assistant chief draughtsman, chemical works smelter and railway, present salary $250.00, rural situation desired. Box 30-P.

Civil Engineer

Civil Engineer, B.A.Sc., S.P.S., Toronto, four years engineering experience, at present with Pulp Company, returned soldier, wishes position as Assistant Town Engineer, or Assistant on construction work, salary $200 per month.

Structural Engineer

Structural engineer with varied experience including responsible charge of important works both in Canada and India, would like to become associated with a construction company in Ontario, Quebec or Eastern Canada. Has had responsible experience in connection with drains and sewers, reservoirs and dams, land reclamation, irrigation river control works, open caisson foundations, paved and earth roads etc. also experience in reinforced concrete steel and brick construction. Box No. 31P.

UNIVERSITY OF MANITOBA APPOINTMENT IN CIVIL ENGINEERING

The Board of Governors will proceed shortly to appoint an Assistant Professor of Civil Engineering, having regard especially to his qualifications in Municipal Engineering and Hydraulics. Initial salary, $2,500. The successful applicant will be expected to enter upon his duties on or about September 1st, 1920. Five printed or typewritten copies of letter of application and testimonials should be in the hands of the Board of Governors on or before June 20th, 1920.

THE SECRETARY,
BOARD OF GOVERNORS,
University of Manitoba,
Winnipeg, Canada.

Member's Exchange

Transit for Sale

Buff and Buff Transit. 5" Horizontal and 4" Vertical Circle. In excellent condition. Price $175.00. Box No. 1A.

OBITUARIES

Cameron A. Buck, Jr., E.I.C.

Cameron A. Buck, E.I.C., died from pneumonia at Black Lake, Que., on March 20th. At the time of his death Mr. Buck was civil engineer with the Black Lake Asbestos and Chrome company of Black Lake, Que. He obtained his high school education in Edmonton, and attended the University of Alberta from 1911 to 1916 when he received the degree of B.Sc. During his university course he took a keen interest in student societies and activities as well as obtaining a high academic standing winning the Applied Science Scholarship in his sophomore year. In 1915 he was manager of the International Championship Rugby team. After graduation Mr. Buck was engaged in munitions work in Toronto, later joining in the Canadian Engineers with the rank of Lieutenant. He was overseas one year being discharged in June 1919.

Lieut. Clarence Thorne Evans, Jr., E.I.C.

The Border Cities Branch of *The Engineering Institute of Canada* suffered the loss of another of its members in the death on the 9th, instant, of Lieut. Clarence T. Evans, Jr. E.I.C., after an illness of only one week. Since his return from overseas in 1918 the late Mr. Evans had been draughtsman for the Canadian Steel Corporation, Ojibway, until a few months ago when he joined the General Motors Corporation, Walkerville in a similar position.

The late Lieut. Evans spent two and a half years in the University of Michigan on mechanical engineering, having entered as an honor matriculant. He started his engineering career with the Packard Motor Company in 1906, in 1911 he was designer with the General Motors Co., in the experimental department. He entered *The Institute* as Junior on Nov., 27th, 1919.

Gerald C. Williams, M.E.I.C.

The death occurred in Detroit of G. C. Williams, A.M.E.I.C., who a few months ago was Secretary-Treasurer of the Border Cities Branch.

Mr. Williams was born at St. Thomas, Ont. on April 23rd, 1880, and was educated at the public and high schools of his native town. Mr. Williams was from March 1901 to September 1902 a pupil in railroad engineering with the Grand Trunk Western Railway, and was later draughtsman with the Pennsylvania Salt Company, Wyandotte, Mich., draughtsman with the American Bridge Company, Detroit, Mich. with the Canadian Bridge Co., $2\frac{1}{2}$ years as draughtsman and two years as assistant to principal in charge of work. For the past fifteen years he had charge of structural sales with the Canadian Bridge Co., Walkerville, until last August when he joined the firm of Whiteside & Kales, Detroit, Mich., in a similar capacity.

The late Mr. Williams was sick for some weeks with influenza which was followed with complications resulting in his death.

Peter Scott, A.M.E.I.C.

Intimation has been received of the death at Glasgow, Scotland in April last, of Peter Scott, A.M.E.I.C. He was a native of Greenock, Scotland, and having graduated from the Glasgow & West of Scotland Technical College in 1901, he served a pupilage under the late [illegible] Caldwell, A.M.I.C.E., on the Greenock Waterworks systems, and in the construction of reservoirs and [illegible] works for various towns in the West of Scotland. Coming to Canada in 1908, he was employed as draughtsman in the Construction Department of the Canadian Pacific Railway at Montreal, and from 1912 to 1914 was engaged as assistant engineer on Water Survey for the Com. [illegible] [illegible] Eastern Lines. In 1915 he returned to Scotland and was appointed senior assistant engineer of [illegible] Glasgow area, with supervision of [illegible] work all over Scotland. He devoted himself assiduously and unsparingly to this work to an extent that undermined his health which was never very robust. It was always his intention to return to Canada as soon as circumstances were favourable. But at the early age of thirty seven years, and leaving a widow and one child to mourn his loss, a very promising career has been cut short. A loyal and lovable nature, and a kind and cheerful companion, has passed away.

Major Thomas Henry Jones, B.A.Sc., M.E.I.C.

After thirty-seven years continuous service as city engineer of the city of Brantford, Ont., Major Thomas Henry Jones, B.A.Sc., M.E.I.C., passed away suddenly on the afternoon of Sunday, April 25th following an attack of pneumonia. The late Major Jones was born at Brantford, Ont., on April [illegible], [illegible], and graduated from McGill University in civil and mechanical engineering with the degree of B.A.Sc., in [illegible], and two years later commenced a general practice as engineer and surveyor in the city of Brantford having passed his final examinations as Provincial and Dominion Land Surveyor the year previous. In 1883 he was appointed acting city engineer for the city of Brantford as well as for the surrounding townships. During the intervening years he has had charge of all public improvements for that city and during that time has been a faithful employee endearing himself to the citizens in a way that makes his passing taking a severe loss to the city of Brantford.

Familiarly known as T. Harry Jones he occupied a prominent place in the civic activities of the community. He was an ardent chess player, an [illegible] of [illegible], a keen lover of sports and an able [illegible]. In religious and civic matters he took a prominent part, conducting a young men's bible class in the [illegible] Methodist Church. He is survived by Mrs. Jones, two sons, Gordon R. Jones, a missionary in China, who served in the late war, Duncan Jones and three daughters, Misses Wilma, Marjorie and [illegible] and two brothers, Colonel C. S. Jones, Crown Lands Department, Toronto, and S. Alfred Jones, [illegible] in the city of Brantford. In 1890 the late Major Jones became an associate member of *The Institute* transferring to full membership in 1897. He took an active part in the affairs of *The Institute* having been present at the last annual meeting and as vice-president of the Ontario Provincial Division attended the meetings of the Executive and gave valuable assistance. His sterling character and fine manly qualities will always be remembered by those who were privileged to be associated with him.

BRANCH NEWS

Victoria Branch

Horace M. Bigwood, A.M.E.I.C., Secretary.

Engineers End Season—The winter social season of the Victoria branch of *The Engineering Institute of Canada* ended on the evening of Monday April 26th, with the final monthly reception. These functions have been held throughout the winter in the K. of C. Hall and have proved popular with *The Institute* members and their friends. They have assisted in keeping up interest in the local branch. It is planned to hold luncheons or meetings of some form during the Summer.

Calgary Branch

Arthur L. Ford, M.E.I.C., Secretary-Treasurer

C. M. Arnold, M.E.I.C. having accepted a position on construction on the Lethbridge Northern Irrigation Project, has resigned as Secretary-Treasurer of the Calgary Branch, and the Executive Board has appointed Arthur L. Ford, M.E.I.C., as Secretary-Treasurer in his place.

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At an informal meeting on May 4th in Calgary, a committee was appointed to consider and report on the question of the Western Professional Meeting which it is proposed to hold this Autumn. The committee is composed of F. H. Peters, M.E.I.C., G. W. Craig, M.E.I.C., Alex. S. Dawson, M.E.I.C., G. N. Houston, M.E.I.C., A. I. Payne, M.E.I.C., F. Beach, A.M.E.I.C.

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The Legislation Situation in Alberta

Arthur L. Ford, M.E.I.C.

Back in the nineties the professional engineers in Eastern Canada were active in the matter of gaining legislation for engineers. Two Acts were put through, one in Manitoba and one in Quebec. After this the whole matter was dropped and nothing further was done until about three years ago, when, through the activities of F. H. Peters, M.E.I.C., the Calgary Branch of the E.I.C. started in to work on the idea again. It is a matter of very great interest to all members, not only of the Calgary Branch but of the Alberta Division to know that Professional Engineer's Acts have been passed in British Columbia and Manitoba, are before legislatures in New Brunswick and Nova Scotia, and particularly that the Engineering Professional Act was passed by the legislature of Alberta on or about April 10th last.

Printed copies of the Alberta Act are not yet available. However, the joint Committee of engineers, who were interested in gaining the legislation supplied copies of the proposed Act to a large number of engineers. The Act as passed is, generally speaking, the same as the proposed Act except that registration is not a necessary antecedent to practice. Registration is voluntary, and the control as regards admission and registration is placed with a Board appointed by the Senate of the University of Alberta.

The Act names nine professional engineers, representative of all the branches of the profession, as corporate members and constituting an interim council. These members are given the necessary powers, and their duty is to enlarge the association, by providing for the admission of new members, and their duties and interim offices cease when the first general meeting is held.

The personnel of the Interim Council is as follows: O. E. S. Whiteside, Pres. of Can. Mining Institute, International Coal and Coke, Coleman, Alta.; L. E. Drummond, Tagler Block, Edmonton, Alta., Consulting Mining Engineer; F. H. Peters, M.E.I.C., Commissioner of Irrigation, Calgary; R. J. Gibb, M.E.I.C., Asst. City Engineer, Edmonton; J. F. McCall, Chief Engineer, Power Dept., City of Calgary; F. W. Hobson, Chief Inspector of Boilers, Alberta Government, Edmonton, Alta.; W. R. Pearce, Supt. of Alberta Government Telephones, Edmonton; R. A. Brown, City Electrical Engineer, Calgary; R. L. S. Wilson, Prof. of Civil Engineering, University of Alberta, Edmonton.

This Interim Council held an organization meeting at Calgary on May 6th and laid plans and made as many arrangements to carry out the work devolving on them under the Act as possibly could be made at that time. Such interim by-laws were passed as are necessary to provide a procedure to carry on the business of the Association until the general meeting is held. The interim entrance fee of $10.00 was fixed with a view to making the dee as low as possible and at the same time producing sufficient revenue to carry on the business. The interim by-laws also provide that the first election of officers shall be by letter ballot so prepared as to produce equal representation in the Council of the four main branches of the profession, viz:—civil, electrical, mechanical and mining.

R. L. S. Wilson has been appointed Interim Registrar of the Association and under the supervision of the Board appointed by the Senate of the University he will now proceed to admit new members to the Association.

Applications may now be submitted for admission to the Association of Professional Engineers of Alberta and to become registered as a Professional Engineer in Alberta.

Applications should be made in accordance with a form decided upon by the Interim Council, and blank copies of this form may be obtained from any member of the Interim Council or from the Secretary of the Calgary Branch of *The Institute*. The forms when filled in should be sent to R. L. S. Wilson, Interim Registrar and Secretary, Association of Professional Engineers, University of Alberta, Edmonton. It is suggested that there be included with the application a concise but complete statement of the applicants professional career, giving details of work done with dates.

All applications should be accompanied by a remittance of $10.00 payable at par at Edmonton to R. L. S. Wilson. It is hoped that applications will be submitted at an early date because the Act is mandatory as the calling of a general meeting of the then members of the Association on or before July 10th, next, and the general meeting will elect the first regular officers and consider the adoption of By-laws of the Association.

While the Act as passed is not all that was desired by professional engineers because it is voluntary instead of obligatory, the voluntary Association (pending the time of getting something better) can be made to serve the same purpose as an obligatory one if it is backed up by all the qualified professional engineers in Alberta. The consensus of opinion seems to be that the Act makes possible a well-foundationed organization which will not only give a proper protection to the public but also give a proper material recognition to the professional engineer.

It would seem that the feeling towards this new Association is very favourable throughout the province not only by members of *The Institute*, but by all professional engineers.

The joint committees which were formed for the purpose of bringing the Act before the legislature were very successful in getting team play amongst all branches of the engineering profession and it is expected that this feeling is going to be maintained by all the engineers in the province getting behind the Act and making it a success.

On May 4th an informal meeting of engineers was held at the Board of Trade Rooms, Calgary, to discuss the question of the formation of an Association of Professional Engineers. Mr. Peters was chosen to act as chairman and after he had reviewed the work that had been done to secure legislation in this province as well as in other provinces of Canada, he called for a full discussion. This discussion developed that the engineers present were in favour of the forming of the Association which was afterwards proved by the passing of a motion to that effect by a unanimous vote.

About forty to fifty engineers representative of various branches of the profession were present, and interest in the question was fully sustained until the hour of adjournment was reached.

Immediately after the meeting on May 4th those members of the Calgary Branch who were present discussed informally another very important question. As the Edmonton Branch had found it impossible, on account of their activity in connection with the Professional Engineers' Act, to go ahead with the Western Professional Meeting, they had thrown open the field to any other Western Branch which would like to undertake the holding of this meeting. Mr. Craig, the acting Chairman, dwelt on the excellent meeting which had been put on by the Saskatchewan Branch at Saskatoon in 1918 and expressed himself as in favour of the Calgary Branch going ahead with it provided suitable arrangements could be made and a success ensured.

After considerable discussion as to ways and means the meeting unanimously expressed itself in favour of holding the Western Professional Meeting under the auspices of the Calgary Branch this summer and appointed Messrs. Craig, Peters, Hanson, Dawson, Pierce and Bosch, as a committee to study the question in detail and to report to a general meeting of the Branch.

This committee has held two meetings and are now in a position to report to the Branch at a general meeting called for Saturday night, May 22nd. They will report in favour of holding the meeting at Banff, Alta., during the last week in July or first week in August. The proposal also is to have the engineers and their guests live under canvas during the meeting. Tentative arrangements for securing tents have been made with the Park Branch of the Dominion Government. The feature together with the natural attractions at Banff should make the gathering one to be remembered by all attending it and it is to be hoped that the general meeting will approve the committee's suggestion so that we may all look forward to a happy and jolly three days at Banff under canvas.

At a meeting of the executive committee held in the Dominion Government Irrigation Offices in April, Arthur L. Ford was appointed Secretary-Treasurer to succeed C. M. Arnold who had accepted a position out of town. Although unable to continue his secretarial duties, Mr. Arnold is remaining a member of the Branch.

Saskatchewan Branch

J. N. deStein, M.E.I.C., Secretary-Treasurer.

The summer meeting of the Saskatchewan Branch will be held on Thursday, July 15.

Winnipeg Branch

Geo. L. Guy, M.E.I.C., Secretary-Treasurer.

On April 21st at the regular meeting of the branch held in the University of Manitoba, a paper was read by C. A. Clendening, A.M.E.I.C., entitled "Some Observations on Electrical Distribution".

The paper dealt with the economics of city distribution very fully. An interesting discussion took place in which a large number of the members present took part.

On Thursday, May 6th, the annual meeting of the Branch was held in the University Buildings.

Reports of Committees were received and approved. The report of the Secretary showed that a very successful season had just been closed.

Total enrollment to date showed.

Members........	[illegible]
Associate Members.	[illegible]
Juniors	[illegible]
Students	[illegible]
Local Affiliates.	[illegible]
Total membership.	24[illegible]

An increase of 44 over the previous year.

The average attendance per meeting during the session was 46.

Some important questions were discussed thoroughly during the session among which were the Legislation for Engineers, Research into the "Disintegration of Concrete in Alkali Soils" and the "Drafting of New By-laws".

The retiring chairman, Mr. W. P. Brereton thanked the members and committees for their co-operation during his term of office, and congratulated the branch on its progress during the recent year.

The scrutineers reported the following elections:

Chairman:	W. M. Scott.
Sec.-Treas.:	Geo. L. Guy.
Executive Com:	E. P. Featherstonhaugh, J. Brydon Jack, A. W. Smith, J. G. LeGrand, J. M. Leamy, J. G. Glassco.
Auditors:	W. Aldrich, R. H. O'Reilly.
Nomination Com:	E. V. Caton, A. W. Smith, J. H. Douglas, F. H. Farmer, B. Gaffrey.
Research Com:	D. S. McKenzie, J. W. Dorsey, J. Finlayson, W. J. Melstead, T. Kipp.
Programme Com:	W. M. Scott, D. McLean, J. G. LeGrand, D. R. Deacon, J. M. Leamy.
Library & Publication Committee:	Geo. L. Guy, G. B. McColl, G. H. Brown, D. F. Gorie, G. P. Morse, E. P. Patterson.
Legislation and Public Affairs:	W. J. Dick, J. M. Leamy, M. H. Lyons, S. E. McColl, A. J. Taunton.
Advisory Com:	J. G. Sullivan, H. M. Ruttan, J. G. LeGrand, Frank Lee, D. H. Ross.
Councillors:	W. M. Scott, T. R. Deacon.

Among other business transacted W. G. Chase, M.E.I.C. reported that certain Engineersi nterested in the disintegration of concrete would be visiting the City in the near future. The committee was authorized to make the necessary arrangements for their entertainment and if necessary to arrange for meetings, at which an interchange of view and discussion can be arranged.

Notice of motion was given to amend the by-laws and to allow juniors being allowed to vote on branch matters, and to hold office, except that of Chairman.

A letter was received stating that Calvert Townley, President of the American Institute of Electrical Engineers, would be passing through Winnipeg on his way west early in June. The secretary was instructed to write and invite Mr. Townley to stop off on his way through and meet the local engineers. The committee was instructed to make the necessary arrangements for his entertainment if he accepted the invitation.

Border Cities Branch

J. E. Porter, A.M.E.I.C., Secretary-Treasurer.

The regular monthly meeting was held on May 7th. in the auditorium of the Chamber of Commerce, with H. B. R. Craig, Chairman, presiding.

The first item of business taken up was the amendment of the Branch By-laws allowing Juniors of *The Institute* to have the same rights as Corporate Members with the exception that a Junior Member shall not be eligible for election as Chairman.

A very interesting feature of the evening was the presentation of the Gzowski Medal, awarded to Geo. F. Porter Esq. M.E.I.C. by the Gzowski Medal Committee of 1919, for the part taken by him in the preparation of the paper entitled "The Design Manufacture and Construction of the Superstructure of the Quebec Bridge". The joint authors of this paper, Messrs Phelps Johnston M.E.I.C. and G. H. Duggan M.E.I.C. were each to be presented with the Gzowski Medal in Montreal. On presenting the Medal, the Chairman pointed out that this Medal is awarded yearly for "The Premier Engineering Paper in Canada", and he took occasion to congratulate the Branch on their having as a member one of such pre-eminent ability and importance in the Engineering and Industrial world as Mr. Porter.

This paper has been distributed to the members of *The Institute* and has created a great deal of favorable comment. It has been acknowledged by experts to be in its year, the outstanding engineering publication in engineering circles throughout the world. Mr. Porter and his two associates have good reason to be proud as winners of this Medal. Mr. Porter, in reply, gave the members considerable encouragement in the work of *The Institute.*

The present financial status of the Branch was discussed at some length and the possible sources of income were considered. As the Branch was somewhat in arrears the motion was carried unanimously that a circular letter be sent to the members requesting a voluntary subscription of from two to five dollars for the maintenance of the Branch.

Mr. Craig reported the recent Conference of Ontario Representatives and Council at Montreal, dealing with the questions of Legislation and Salary Schedules, and the action taken at this Conference appeared to meet with the approval of those present.

In the absence of M. E. Brian, Branch Representative on Provincial Council, the Chairman gave a brief report of the Proceedings of Provincial Council Meeting held recently in Toronto.

The meeting adjourned at 10 P. M.

Niagara Peninsula Branch

R. P. Johnson, A.M.E.I.C., Secretary.

A. C. D. Blanchard, M.E.I.C., chairman of the Branch, attended the conference between the Montreal and Ontario Councillors and the Executive Committee of the Ontario Provincial Division which was held in Montreal on April 13th. Mr. Blanchard attended the conference in a dual capacity, that of Councillor and also as a member of the Ontario Division Executive. The chairman also attended the meeting of the Provincial Division Executive held in Toronto on April 24th.

A general meeting of the Branch was held at the Engineer's Club, Thorold, on April 23rd, at which Dr. R. C. Snowdon of the Hooker Electrochemical Company, Niagara Falls, N.Y. spoke on "The Purification of Public Water Supplies."

The speaker dealt with the subject in a general way, with particular reference to the natural waters of the Niagara District. The physical features of water were first dealt with; hardness due to mineral salts in solution and methods and devices for softening water for industrial and laundry purposes. The sanitary aspect of the subject dealt with the removal of micro-organisms by means of various filters and chemicals.

A good discussion took place at the close of Dr. Snowdon's address in which A. Milne, A.M.E.I.C., of the St. Catharines Water Works, took the leading part. Mr. Milne outlined the early history of water purification and showed how steady improvements had brought the science up to its present efficient state. N. R. Gibson, A.M.E.I.C., proposed that the Branch should study the proposed metropolitan water supply scheme for the cities and towns of the Niagara District. Mr. Gibson advised that it was too early yet to take any definite action as no specific proposition had been put forward by its originator up to the present time and closed his remarks by proposing a vote of thanks to Dr. Snowdon for his paper. The motion was seconded by W. P. Near, M.E.I.C., and carried unanimously.

A few items of business took up a short amount of the meeting's time. Among these was the question as to the form of gathering the coming annual meeting of the Branch should take. The discussion on this brought out the feeling of the members and gave the committee in charge of the arrangements data with which to proceed.

The attendance of the meeting was about thirty.

F. E. Sterns, A.M.E.I.C., of the Niagara Peninsula Branch, has been chosen by the Executive as convenor of the recently appointed Branch Legislation Committee.

A. C. D. Blanchard, M.E.I.C., chairman of the Niagara Peninsula Branch, has the congratulations of the Branch in having recently been elected a Councillor as one of the additional Councillors to represent the new district in Ontario.

One of the most successful Annual Meetings of the Niagara Peninsula Branch was held on May 19th. The meeting took the form of a dinner and smoker and a very lively entertainment was furnished by a representative group of [illegible]. A number of [illegible] were made up from [illegible] and songs and everyone joined heartily in singing as the songs were thrown on the screen. The Professional Meeting to be held in [illegible] was discussed and $250.00 was pledged from those present as a guarantee subscription. The Secretary, Rex P. Johnson, A.M.E.I.C., was presented with a silver cigarette case with the crest of The Institute engraved upon it. The new officers and Branch Executive are:

Chairman,	W. P. Near.
Vice Chairman,	N. R. Gibson.
Sec.-Treas.,	Rex P. Johnson, Box 205, Niagara Falls, Ont.
Executive,	H. L. Bucke. W. H. Sullivan. F. S. Lazier. A. J. Grant.
(Ex. officio),	A. C. D. Blanchard, Lt.-Col. R. W. Leonard.

Toronto Branch

[illegible], A.M.E.I.C., Secretary-Treasurer.

A special General Meeting of the Toronto Branch was held at the Mining Building of the University of Toronto on Thursday, May 13th, 1920 at [illegible] P.M.

At the request of the Council of *The Engineering Institute of Canada* arrangements were made for the presentation at this meeting of a gold badge of honorary membership in *The Engineering Institute of Canada* to Dr. W. H. Ellis, late Dean of the Faculty of Science and Engineering of the University of Toronto.

Professor H. E. T. Haultain, M.E.I.C., in a brief speech of introduction pointed out the varied qualities possessed by Dr. Ellis. They were, he said, of an academic, scientific and business nature, and he was eminent in all three. He was a poet of no mean ability, a skilled raconteur and a fisherman. He was the outstanding man of culture in the University, many-sided, well-rounded. Many men had come under his beneficent influence in the character of a teacher. But he was not of a soft, gentle, academic type. He had borne arms in his country's service. Lately during the clash resulting from the rivalries of the Dominion and Provincial Governments on the subject of the training of returned men, in which work Dr. Ellis had taken a responsible post, he had stood firm and the storm had passed. Through his influence, the School of Engineering Research had been established, and in this respect he was specially worthy of welcome by *The Engineering Institute*.

C. H. Rust, M.E.I.C., followed, speaking of the admiration and love of his students for Dr. Ellis. R. O. Wynne-Roberts, Chairman of the Branch, then presented the gold badge to Dr. Ellis amid hearty applause.

In replying, Dr. Ellis stated that while he was not an engineer, he had long worked and associated wit engineers, and had, perhaps, gained some of their atmosphere. He appreciated the honor greatly.

After the presentation of the badge, Professor W. A. Slater, B.S. C.E. M.S., Engineer Physicist, United States Bureau of Standards, proceeded with a lecture on the tests of Reinforced concrete beams and ship frames for the United States Emergency Fleet Corporation. "There is a general impression that the concrete ship has failed," said Professor Slater. "I wish to correct that impression. I am not ready to say that it has been an unqualified success, but structurally, so far as we know anything about it in use, it has been a success."

A concrete ship would suffer the same damage as other types of ship in collision, said Professor Slater. The salvation of the ship was the ease of repair and the smallness of the hole resulting from impacts. Extensive tests had been carried out to prove the strength of reinforced concrete for ship purposes. The failure of the concrete in these tests had been a tension failure. They showed that it was necessary to inspect the steel used as carefully as the concrete.

Professor Slater had a number of slides showing the members that were tested and also the diagram and tables that were prepared after the tests giving the results obtained and the conclusions arrived at. He also had a complete moving picture outfit showing the testing work in actual performance.

A very interesting discussion followed in which many members took active part.

The meeting adjourned at 11.45 P.M.

Peterborough Branch

R. L. Dobbin, M.E.I.C., Secretary

A regular meeting of the Branch was held on Thursday April 22nd, 1920, when a paper was read by P. P. Westbye, gen. mgr. of the Wm. Hamilton Mfg. Co. of Peterborough. His subject was the History and Development of the Pulp and Paper Industry. Many lantern slides, made from Mr. Westbye's own collection of photographs, were used, and also a film loaned by the Ontario Government Motion Picture Bureau.

The Annual Meeting of the Branch was held on May 6th, in the Board of Trade Rooms. The Vice-Chairman, R. H. Parsons, being called out of the City, appointed C. E. Sisson to act as Chairman of the meeting.

The first item of business was the appointment of two scrutineers to act with R. B. Rogers in counting the Ballot for the election of officers. R. E. Stavert and J. H. Reid were elected for this work, and retired with Mr. Rogers.

While the ballots were being counted, Mr. Sisson gave a short report on the activities of the past season, and referred to the change from the Engineer's Club to the Branch of *The Institute.*

E. R. Shirley, Chairman of the Meetings and Papers Committee read the report of that Committee, as follows:

"The year just coming to a close marks the inauguration of a new era in Peterborough Engineering Circles. During the year we have been somewhat disorganized owing to the passing of the old Engineers Club, and the establishment of the new Branch, the delay consequent upon the election of the new officers, adoption of new By-Laws, and appointing of new Committees. Finally we have been most seriously handicapped by the lamentable death of our Chairman, G. Reid Munro, and another of our fellow-members, A. F. Bookhout.

In spite of these difficulties, we are able to review our year's work, and report a most successful season. The meetings held were as follows:

September, 18, 1919: "Construction Methods on the Hunter Street Bridge." *Speaker*, Chas. Townsend, of the Russell-Townsend Co.

November, 6, 1919: Inaugural Banquet of Peterborough Branch.

December, 8, 1919: "Central Ontario System of the H. E. P. C. *Speaker*, G. B. Smith, Belelville, Superintendent.

January, 8, 1920: "Digest of Proposed Legislation for Engineers." *Speaker*, Jas. Mackintosh, Peterborough.

January, 24, 1920: Continuation of same subject.

February, 12, 1920: "The Economic Significance of Canada's Fire Waste." *Speaker*, J. Grove Smith, Dominion Fire Commissioner. Illustrated with lantern slides and moving pictures.

February, 19, 1920: "Water Filtration." *Speaker*, R. L. Dobbin, Waterworks Superintendent. Illustrated with Lantern Slides.

March, 18, 1920: "Institute Affairs." *Speaker*, A. B. Lambe, Sec. Provincial Division.

April, 8, 1920: "Frazil and Anchor Ice." *Speaker*, John Murphy of Ottawa. Illustrated with moving pictures and lantern slides.

April, 22, 1920: "History and Development of Pulp and Paper Industry." *Speaker*, P. P. Westbye, Gen. Mgr. Wm. Hamilton Co. Illustrated with lantern slides and moving pictures.

The inaugural banquet marking our entrance into *The Institute* was probably the most successful affair of its kind ever held in Peterborough. It was graced by the attendance of the President, Vice-Presidents, and members of the Council, and also many of the most prominent engineers of the Dominion. This banquet is still referred to by our guests, as well as ourselves, as the one big event of the year. We hope to duplicate the performance next Fall.

You will note from the outline of the meetings given above that we have increased the number from one to two per month. We were of the opinion that this would increase the interest in the Branch, and due to the added opportunity of mingling together and becoming better acquainted, be of mutual advantage to all the members. It is our recommendation that this practice be followed by our successors.

P. L. Allison, Chairman of the Membership Committee reported as follows:

"When the Branch was organized last year, there was a membership of 25 corporate and 4 juniors. In spite of the fact of the death of our late Chairman, G. R. Munro, and of A. F. Hockland, it is gratifying to note that the branch has had a very satisfactory growth. At the present time there are 33 corporate and 8 junior members, and 17 affiliates.

The qualifications for the various classes of members may be found in the Charter of *The Institute*, and it is to be noted that only corporate members, that is Members and Associate members, may vote and hold office. We have discussed the matter of allowing the Juniors to vote and hold office, and it is pleasing to the Executive Committee to announce that recently a letter has been received from Mr. Keith, saying that Council has given permission for Branches to amend their By-Laws to allow of this. It is proposed to take this step at an early date."

The Scrutineers then made their report and declared the following elected to direct the affairs of the Branch for the coming season:

Honorary Chairman, R. B. Rogers, M.E.I.C.

Chairman, R. H. Parsons, M.E.I.C., City Engineer.

Vice Chairman, P. L. Allsop, M.E.I.C., Industrial Control Engineer, Canadian General Electric Co.

Secretary, R. L. Dobbin, M.E.I.C., City Waterworks Superintendent.

Treasurer, D. L. McLaren, A.M.E.I.C., Assistant Engineer, Can. Gen. Elec. Co.

Executive Committee:

C. E. Sisson, M.E.I.C., Transformer Engineer, Can. Gen. Elec. Co.

P. P. Westbye, M.E.I.C., Gen. Mgr. Wm. Hamilton Co.

Jas. Mackintosh, M.E.I.C., Hydraulic Engineer, Hydro. Elec. Power Comm.

D. L. W. Magie, M.E.I.C., Works Engineer, Can. Gen. Elec. Co.

A. L. Killaly, A.M.E.I.C., Superintendent, Trent Canal.

C. H. Rogers, M.E.I.C., Manager Peterborough Canoe Co.

R. L. Dobbin was elected to represent the Branch on the Executive of the Ontario Provincial Division.

After the announcement of the result of the elections, an informal entertainment took place. Moving pictures and refreshments in the shape of coffee and "hot dogs", formed the main items.

Ottawa Branch

M. F. Cochrane, A.M.E.I.C., Secretary-Treasurer.

On May 8, A. P. Davis, President of the American Society of Civil Engineers and Director of the United States Reclamation Service, who at that time was visiting Ottawa in connection with the sittings of the International Joint Commission, was tendered a luncheon at the Chateau Laurier by the Executive Committee of the Ottawa Branch, in conjunction with the Past Councillors, Vice-Presidents and Presidents residing in Ottawa. Mr. Davis was attended by Mr. Hobbs, State Engineer of Montana and B. E. Jones of the United States Geological Survey.

In his speech, Mr. Davis referred to the difficulties which now confront the American Society of Civil Engineers, and strongly emphasized the importance of maintaining the high professional standard of that society, and for the necessity of broadening and democratizing its work.

He congratulated Canada on its Engineering Institute, which embraces all classes of engineers.

On May 19th, the new badge was presented to His Excellency, The Governor General, as an Honorary Member, by Colonel W. P. Anderson, as the Senior Past President, in Ottawa.

Colonel Anderson, who was accompanied by the Chairman and Secretary of the Branch, explained the enlarged plans of *The Institute* and its increasing success. His Excellency, after most cordially thanking the delegation for presenting him with the badge, asked to be kept informed as to the meetings of *The Institute* and of the Ottawa Branch, and stated that it was his desire to attend those meetings whenever it was possible for him to do so.

Montreal Branch

Frederick B. Brown, M.E.I.C., Secretary.

Several events occurred at the final meeting for the season of the Montreal Branch of *The Engineering Institute of Canada* held on April 29th that marked an important epoch in the annals of *The Institute*. Lord Shaughnessy, chairman of the C.P.R., and Sir John Kennedy, dean of the engineering profession in Canada, were both present, and were presented with gold badges, as honorary members of *The Institute*, the badges being exact replicas of that struck for the Prince of Wales, when, during his visit here last year, he consented to become an honorary member of *The Institute*. The presentations were made by R. A. Ross, M.E.I.C., as president of *The Engineering Institute*, and were carried out with full ceremonial, both recipients making brief speeches of appreciation.

An interesting paper was read by D. E. Blair, of the Montreal Tramways Co., on "The Engineering Features of Tramway Operation." There was a large attendance, and the various events were greeted with much applause, refreshments being served at the close.

An interesting discussion followed, taking part in by Commissioner Ross and Prof. L. A. Herdt, of the Tramways Commission, both of whom showed sympathy with the ideas promulgated by Mr. Blair.

At the conclusion of the engineering paper, Walter J. Francis, as chairman of the branch, took the chair, and called upon Commissioner R. A. Ross to present the Gzowski Medal for the most meritorious contribution to engineering literature during the year. This year, he said, the medal had been presented to the three authors of the paper on the construction of the Quebec bridge, which was universally recognized as the most important contribution to the world's engineering literature during the past year.

Commissioner Ross then presented the medals to Messrs. Phelps Johnson and G. H. Duggan with a brief speech in which he complimented them on producing a piece of engineering literature which had been approved by the profession throughout the world. Both recipients made short speeches of thanks.

Chairman Francis then said that the occasion had arrived when they could present the gold badges as honorary members of *The Institute* to two of their most honored members, Lord Shaughnessy, head of the greatest transportation company in the world, and Sir John Kennedy, whose long and useful life was synonymous with the progress of engineering in Canada.

Amidst prolonged applause, Commissioner Ross, as president of *The Engineering Institute of Canada,* then pinned the gold badges on the lapels of Sir John Kennedy and Lord Shaughnessy.

Sir John Kennedy, who was received with three cheers, said that he had assisted at the birth of *The Canadian Engineering Institute;* its first meetings having been held at his house, and later at his office. Since then the original society had grown to become a national institution, with branches all over the Dominion, with great good to the profession and to the country, helping to do and build better things.

Sir John recalled the time sixty years ago when the then Prince of Wales had visited Hamilton, Ont., and officially started the first turbine pump ever made in Canada, when he himself had had the honor of starting the other one of the twin turbines. Looking back over that long history of engineering development and all that had been accomplished by *The Engineering Institute,* he felt very grateful for the honor now conferred upon him. (Applause.)

In presenting the badge to Lord Shaughnessy, Commissioner Ross said it was peculiarly fitting, since the C.P.R. was the greatest institution in Canada, and one which had made the Dominion known throughout the whole world, the time probably not being far distant when its transportation enterprises would encircle the globe. As head of the C.P.R. during much of its growing period, Lord Shaughnessy had had much to do with engineers, and knew how much the company owed to the engineers, while the latter knew how much they owed the C.P.R.

In expressing his thanks, Lord Shaughnessy said that during a great part of his career he had been actively associated with engineers, and had lived in an engineering atmosphere.

"During the past 25 years," said Lord Shaughnessy, "I have been associated with many enormous engineering enterprises of every description. I have consulted with and taken the advice of civil, hydraulic, mining, marine and mechanical engineers of every description. During all those years they were my guides, philosophers and friends, and, while I have not had the training of an engineer, I have learned very much from the profession.

"Jointly, through this friendly co-operation we have carried out during the last quarter of a century many great engineering works involving the expenditure of many hundred millions of dollars. Generally the work was satisfactorily done. Sometimes there may have been a miss, but we were jointly responsible, and did not blame each other.

"I appreciate very much the honor you have done me in making me an honorary member of your society, and, while I cannot hope to enjoy this membership for many years to come, I hope that your society will continue to grow and prosper, for the good of Canada's development."

The retiring chairman, Walter J. Francis, M.E.I.C., then made his valedictory address, thanking the members of the branch for the interest they had shown in its work during the past two years, which had resulted in unprecedented growth in its work, to such an extent that the meetings had been changed from fortnightly to weekly, with greatly increased membership and attendance.

Votes of thanks were passed to the retiring chairman, and the various committees which had acted during the year.

St. John Branch

Harry F. Bennett, A.M.E.I.C., Secretary-Treasurer.

A meeting was held on April 22nd in the old Post Office Building. After reports from Harry F. Bennett and G. G. Murdoch in connection with the Old Court House Reconstruction and the City Planning Committees has been presented, the Chairman called upon the speaker of the evening, Capt. C. McN. Steeves, M.E.I.C., late Adjutant 9th Battalion, Canadian Engineers, who read a very comprehensive and interesting paper on "Organization of Military Bridging Operations".

The Secretary read correspondence with other Branches. On motion of Mr. Steeves, seconded by Mr. Goodspeed, it was decided that the St. John Branch endorse the action of the Vancouver Branch in passing the following resolution at their March Meeting. "That this Branch goes on record as being unalterably opposed to such amendments of the Civil Service Act as (etc.) tending to eliminate competitive examinations for Civil Service positions and to introduce the old evil system of patronage, etc. etc.

Moved by H. Bennett, seconded by Mr. Goodspeed that the resolution of the Toronto Branch of March 4th re requesting Headquarters to appoint a Salaries Committee, etc., be laid on the table until after passing of our Act, etc. Carried.

Moved by G. Macdonald, seconded by Mr. Steeves and carried, 'That we approve of the resolution of the Manitoba Branch of February 18th re Civil Service Classification and that the Secretary advise the Council to that effect."

* * *

The second Annual Meeting of the St. John Branch was held in the old Post Office Building, May 6th, 1920, with past president A. Gray in the chair. After the minutes of the last Annual Meeting and the meeting of April 22nd had been read and adopted the Secretary read the report of the Secretary-Treasurer and Executive which was adopted. The following reports were then read, Committee on Concrete in Sea Water, Civic Centre Committee, City Planning Committee, Salaries Committee and Legislation Committee.

On account of the absence of the Chairman, Mr. C. C. Kirby, from the City, A. Gray read the Chairman's retiring address and on Mr. Waring, seconded by Mr. Goodspeed, a hearty vote of thanks was tendered Mr. Kirby for his untiring efforts in behalf of the Branch and the profession in general.

On motion of Mr. Cushing, seconded by Mr. Goodspeed, a vote of thanks was tendered Mr. Crookshank for his effective work as Secretary-Treasurer.

Mr. Hatfield reported for the Employment Committee and on motion the report was adopted and the Committee continued in office.

Mr. Crookshank reported for the By-Laws committee, which report was adopted.

The scrutineers then announced the new executive as follows:

Chairman: G. G. Murdoch, M.E.I.C.,
Secretary-Treasurer: H. F. Bennett, A.M.E.I.C.
By ballot, F. P. Vaughan, A.M.E.I.C.

The new officers took their places and F. G. Goodspeed read a most interesting paper on the "Improvement of navigation in river estuaries, with particular reference to the Mississippi River."

At the conclusion of the paper a hearty vote of thanks was tendered Mr. Goodspeed on motion of Mr. Gray and seconded by Mr. Hatfield.

Mr. Crookshank read the report of the Harbour Commission Committee which was adopted and the executive asked to appoint a similar Committee to carry on the work.

On motion of Mr. Crookshank the incoming officers were authorized to transact the financial business of the branch.

On motion of Mr. Gray the resolution adopted by the Toronto Branch re compensation was left to the executive.

On motion of Mr. Huestis the matter re Juniors voting and holding office was left to the executive.

Combined Annual Report of the Executive Committee and of the Sec.-Treasurer

We beg to herewith submit our report for the Second Branch Year of the St. John Branch of *The Engineering Institute of Canada*, covering the period between the Annual Meetings of January 1919 and May 1920.

The Executive Committee met nineteen times during their term of office, and transacted a large amount of business.

There were fourteen meetings of the Branch, ten in 1919, and four in 1920, besides the second Maritime General Professional Meeting, held on September 10th, 11th and 12th.

Papers were read, addresses given, and important business transacted at the meetings, as follows:—

Jan. 14th, 1919. Annual meeting. "A Contractor in a Clyde Shipyard" by G. S. Baxter, A.M.E.I.C. Election of officers as stated below. Committees appointed. Legislation and By-laws discussed.

Feb. 20th, 1919. "Reminiscences of the Early Days of Railway Location" by C. O. Foss, M.E.I.C. By-laws amended by Executive Committee, adopted by letter ballot.

March 27th, 1919. "The Reconstruction of the Bridges on the Dominion Atlantic Railway" by O. K. Hare, A.M.E.I.C. Committees appointed. Legislation discussed. Chairman submitted his proposed draft of act.

Apr. 17th, 1919. Chairman's report re Montreal inter-branch legislation conference. Calgary salary paper discussed. Salaries & Employment Bureau Committees appointed.

May 8th, 1919. "Aids to Navigation in New Brunswick Waters" by G. S. MacDonald, A.M.E.I.C. Concrete in sea water and General Professional Meeting committees appointed.

May 29th, 1919. "Experiments with High Potential High Frequency Electric Currents" by F. P. Vaughan, A.M.E.I.C., M.A.I.E.E.

July 2nd, 1919. Discussion re legislation, based on E.I.C. printed Draft of Act, preparatory to E.I.C. ballot on it.

Sept. 10th, 11th, and 12th, 1919. General Professional Meeting—Details published in *Journal*.

Nov. 13th, 1919. "Cape Breton Breakwater" by Geoffrey Stead, A.M.E.I.C. "New Brunswick Highways" by B. M. Hill, M.E.I.C.

Dec. 10th, 1919. Public meeting in Board of Trade Rooms, held in conjunction with Housing Committee of the Board of Trade and Commercial Club. Report of Architects Ross & McDonald on rebuilding Old Court House, read and discussed.

Dec. 18th, 1919. Discussion continued from adjourned meeting of Dec. 10th. "The Dominion Housing Act and how it applies to types of houses suitable to St. John under local building conditions" by Chas. L. Archibald, A.M.E.I.C.

Jan. 22nd, 1920. "St. John and its Harbour, with particular reference to its protection" by F. W. Holt. Commission Acts discussed. Committee appointed.

Feb. 10th, 1920. Public meeting in Board of Trade Rooms. "Town Planning and Engineering Problems" by W. F. Burditt, Chairman St. John Town Planning Commission, "General Principles of Town Planning" by H. L. Seymour, A.M.E.I.C.

Mar. 11th, 1920. "The methods adopted in our location surveys in wooded country" by Moses Burpee, M.E.I.C. Civic Buildings and City Planning Committees appointed.

Apr. 22nd, 1920. "Organization of Military Bridging Operations" by Capt. C. McN. Steeves, M.E.I.C.

May 6th, 1920. This an Annual Meeting, when election of officers will take place, and paper of F. G. Goodspeed, M.E.I.C. on "Improvements of Navigation in River Estuaries, with particular reference to the Mississippi River" will be read.

The three public meetings, at which the building of a Community Centre, with Court House and City Hall, with plan to utilize the whole block here for civic buildings, instead of rebuilding the "Old Court House," (destroyed by fire) and the study of City planning were taken up, have disseminated considerable information, and the publicity of the discussions will undoubtedly have a beneficial effect on public opinion, both as regards these subjects and the Branch itself.

During the year, a new set of By-laws, patterned after the E.I.C. Standard Set, were drawn up, adopted, and have been approved by the Council.

The matter of obtaining legislation for New Brunswick engineers has taken up a large amount of time and effort, culminating in the formation of the "Association of Professional Engineers of the Province of New Brunswick" at a public meeting called by our Chairman, and held September 12th, in St. John. An executive council was elected, with him as chairman, and they revised the E.I.C. draft of Act to suit New Brunswick conditions, submitted it to the engineers of the Province, for their approval, and presented it to the Legislature, who passed it after it had been amended, and it has now become law.

Effective work has been done by the several committees. The Employment Committee actively co-operated with the Provincial Soldiers Civil Re-establishment Committee and the Government Labour Bureau. The passing of the Civil Service Act and the Reclassification of the Government employees was urged. Data has been gather re the salaries paid engineers in New Brunswick. The committee on Concrete in sea water has prepared a very complete bibliography on this subject. A committee of the Halifax Branch is co-operating in the work of investigating this important matter.

Two delegates of the Branch are on the Vocational Training Committee, which brought about the inauguration of this system in the city, and which assists the official committee where necessary.

The Branch, during its two years of life, has accomplished much for its local members, and for the engineers of the Province as a whole. The membership is better acquainted with each other and with the subjects of vital interest to them. Their interest in civic matters has been concretely shown, and the public is beginning to appreciate having engineers among them to assist in investigating problems and by their technical advice. This is concretely shown by our Chairman being officially requested, as chairman of the Branch, to be present at the recent conference which took up the matter of the Union of the Maritime Provinces of New Brunswick, Nova Scotia and Prince Edward Island.

It has been the policy of the executive to give as much publicity as possible to the doings of the Branch in "*The Journal*" and in the press, and they recommend that this be continued, as they consider it effective in stimulating public interest in the engineer and his work and so enhancing his status in the community.

The executive recommend that, in future, the Secretary be authorized to engage clerical assistance from time to time, in handling the work of his office. This will, no doubt, mean a levy on the Branch members to meet the increased expenditure. This has been done by other Branches this year.

Officers elected at Annual Meeting held January 14th, 1919:—

Chairman, C. C. Kirby; Secretary-Treasurer, A. R. Crookshank; Executive Committee-men, Past Chairman, A. Gray, C. O. Foss, G. G. Hare, G. G. Murdoch.

The following committees were appointed during the Branch year:—

Membership, Executive as a whole, Publication, C. C. Kirby, A. R. Crookshank; Proceedings, C. O. Foss, G. G. Hare; By-laws, Executive Committee. Delegate to Ottawa Legislative Meeting, C. C. Kirby; Delegate to Montreal inter-Branch Meeting, C. C. Kirby; Soldiers Civil Re-establishment, C. O. Foss; Civil Service, G. G. Hare, G. G. Murdoch, A. R. Dufresne, J. A. Grant; Salaries, C. C. Kirby, G. G. Murdoch, A. R. Crookshank; Vocational Training, F. P. Vaughan, A. R. Crookshank; Employment Bureau, G. N. Hatfield, F. G. Goodspeed, J. A. W. Waring; Concrete in sea water, A. Gray, G. S. Macdonald, F. G. Goodspeed, G. G. Hare, G. S. Baxter; General Professional Meeting; Executive with G. S. Macdonald, A. R. Dufresne, G. N. Hartfield; New Civic Buildings (Old Court House), H. Bennett, C. McN. Steeves, J. A. Grant; Harbour Commission, etc., C. C. Kirby, A. R. Dufresne, G. G. Hare; City Planning, E. M. Archibald, G. G. Murdoch; Auditors, J. A. W. Waring, C. O. Foss.

The statement of Membership of the Branch on May 1st, 1920, is as follows:—

Grade	Resident	Non-Resident	Total	Election Pending
Members..........	13	4	17	..
Associate Members..	26	4	30	..
Juniors.............	6	..	6	2
Honorary Associates.	1	..	1	..
Associates..........	1	..	1	..
Affiliates...........	10	..	10	..
	57	8	65	2

Membership at end of 1918.......	43
Net gain..................	22
Moved away during period.......	13
Gross gain.................	35

The financial statement is herewith attached.

Respectfully submitted,

C. C. KIRBY,
Chairman.

A. R. CROOKSHANK,
Secretary-Treasurer.

A summary of the financial report is given herewith: total receipts 1919, $386.99; expenditures, $345.42, leaving a net balance in the bank of $41.45, assets on hand valued at $81.35 as against liabilities of $50.00.

Report of Committee on Harbour Commission

This committee finds that the matter of Harbour Commission, Government for the Port of Nationalization, is one in which the matter of public policy is most chiefly concerned and that the full amount of information necessary for a recommendation is either not available or has to be treated confidentially by the Members of the Committee.

This Committee begs to be dissolved and suggests that if the meeting so desires a new Committee be appointed with a different personnel.

C. C. Kirby,
Chairman.

Report of Publicity Committee

We beg to call the attention of the members of the Branch to the amount of advertising that the Engineers have received in the newspapers since the formation of the Branch two years ago.

We wish to express our appreciation of the generous manner in which our local newspapers have given space to the report of our doings.

The following approximate list shows the amount of material printed in the newspapers, column width:—

Year	Reg. Reports	Gen. Prof. Meeting	Total	Columns
1918	114 inches	237 in (Halifax Papers; 107 in (St. John only)	468"	23
1919	245 "	597 in (St. John only).	842"	40
1920	125 "		130"	5½
(To May 1st)			1440"	68.5

Nearly ten complete pages of newspaper reports of the doings of engineers.

The Journal published the following St. John news and articles in columns of 9", two columns per page:—

Year	Reports	Papers	Total	Gen. Prof. Meeting	Cols.
1918	11	16	27	79 Halifax papers.....	106
1919	17	88	105	12	117
1920	8	—	8		8
(To May 1st)...			140 cols.		231

A total of 70 pages of St. John material.

Respectfully submitted,
A. R. Crookshank.

Report on Legislation

On April 24th, the "Engineering Profession Act" was passed by the Legislature of New Brunswick and received the Royal assent. This act was submitted as a Bill by the Council of the Association of Professional Engineers of New Brunswick. The only amendment by the Legislature, except as proposed by the Council, was the alteration of the term "principal assistant" to that of "an assistant" in the paragraph dealing with initial registration.

Some opposition was encountered in the Committee stage towards the definition clause, it being the feeling of the Members that the definition should be reworded so as to prevent a possible misuse of the Act by having the definition so broad that some persons might be unduly interfered with who should be properly allowed to proceed with their business without being required to become registered Professional Engineers. This difficulty was overcome by the insertion of the words "in a professional capacity" in that part of the definition setting forth the kind of work which, when undertaken, constitutes the practice of a Professional Engineer.

The Act was amended by the Council rather considerably from the original draft bill of the E.I.C. These changes were chiefly those of expression rather than of principle in order to get the meaning more clearly expressed, on the recommendation of the Council's legal adviser.

Differences of principle were made from the E.I.C. Model Bill in the clause by which foreign engineers may now be admitted to practise on license instead of being limited to consultation work only. Consultation work was made permissible to foreign engineers without the formality of license. This latter change was made to conform with the expressed wishes of the Law Committee of the Legislature. British Columbia has also included this feature in its act.

The following is the present situation regarding Legislation in the other Provinces:—

British Columbia, Alberta and Manitoba have passed similar acts.

Saskatchewan and Ontario have not yet applied for Legislation.

Nova Scotia has had its bill passed by the Lower House and the bill is at present before the Legislative Council.

Quebec has passed an amendment to the existing Quebec act placing its administration in the hands of the "Corporation of Professional Engineers of Quebec."

(Sdg.) C. C. Kirby,
Chairman.

Halifax Branch

[illegible], M.E.I.C., Secretary-Treasurer.

The Annual Meeting of the Halifax Branch was held at the Green Lantern at 6.30 p.m., Thursday, May 13th, 1920, attendance [illegible], including General C. H. Mitchell of Toronto and Dr. F. H. Sexton of Halifax, as guests of the Branch.

After the [illegible] of the [illegible], the Chairman called for the report of the Secretary-Treasurer which was given as follows:—

Report of the Secretary-Treasurer

The report of the present Secretary-Treasurer covers the period from January 1st, 1919 to May 13th, 1920. As the members will remember, the officers for 1919 were held in office until this meeting.

During the period [illegible] meetings were held as follows:—

January 15th, 1919; The Annual meeting at which the following officers were elected:—

Chairman	F. A. Bowman, M.E.I.C.
Secy-Treas.	K. H. Smith, M.E.I.C.
Executive:	J. L. Allen, M.E.I.C.
	A. E. Dyer, A.M.E.I.C.
	W. P. Morrison, M.E.I.C.
	A. G. Robb, M.E.I.C.
	L. H. Wheaton, A.M.E.I.C.

February 20th, Paper by Capt. T. S. Scott on Roads.

March 20th, Paper by W. G. Gordon, transportation engineer, Canadian General Electric Co. on "Main Line Railway Electrification in Canada."

April 3rd, A special meeting dealing with Engineering Legislation.

April 25th, Report on the results of the meeting of the Legislative Committee held in Montreal. At this meeting K. H. Smith the Secretary-Treasurer tendered his resignation and on May 1st, the Executive Committee appointed F. R. Faulkner to fill the vacancy for the remainder of the year.

June 4th, Devoted to making preliminary arrangements for the proposed Professional Meeting in St. John, in September and to a discussion of the proposed Legislation for Engineers.

October 22nd, Paper by A. C. Brown on "The Results of Experiments of the effects of Ironstone on Cement and Lime mortars."

December 17th, Devoted to a discussion of the proposed Halifax-Dartmouth bridge.

February 16th, 1920, a special meeting at which was shown a film from the Kopper's Manufacturing Co., illustrating a modern By-Product Coke plant.

February 27th, At this meeting the standard branch by-laws were adopted and the officers for 1919 were continued in office until the annual meeting in May. K. H. Smith read a paper on "The Water Powers of Nova Scotia."

March 26th, At this meeting the report of the bridge Committee was presented. This report dealt with some of the projects for the proposed Halifax-Dartmouth bridge.

Membership

On January 1st, 1919; the Secretary's report showed a membership as follows:—

Member	24
Associate Members	29
Juniors	6
Branch Affiliates	2
Total	61

The membership at present, including those recently accepted by the Council is as follows:—

Members	34
Associate Members	55
Juniors	10
Students	17
Branch Affiliates	4
Total	120

The increase in membership is then as follows:

Members	10
Associate Members	26
Juniors	4
Students	17
Branch Affiliates	2
Total	59 or 97%.

The above numbers include all those who were on the list from the Head Office in January but some of these may have moved from the city and now be attached to other branches. Thirty two of the membership are resident outside the twenty five mile limit. It is interesting to note that of the 17 Student members, 9 are at present at the Technical College.

It is distinctly encouraging to note that applications are pending from 22, including 8 students at Dalhousie and the Technical College.

There are still a number of engineers in this City and vicinity who are eligible for admission and every member of the branch is earnestly requested to constitute himself a canvasser. This work cannot all be done by the officers. There are also a number in the city who, while not engineers, are interested in engineering works and who would be eligible for Branch Affiliate membership. A determined canvass among these would no doubt yield satisfactory results.

The financial report divided into two parts—for 1919 and 1920, was read.

The financial report as read shows a satisfactory balance on hand, the balance January 1st, 1920 being $98.96, this being an increase of $46.44 over the balance on hand in 1919, the current balance being $45.37.

After the adoption of this report the Chairman of the Branch then presented his report which will be given in full in the July *Journal.*

I. P. MacNab then presented the report of the scrutineers which showed the following officers elected for the ensuing year.

Chairman: C. E. W. Dodwell
Sec.-Treas.: F. R. Faulkner
Executive Committee:

K. H. Smith	for two years
W. P. Morrison	
L. H. Wheaton	
H. W. L. Doane	for one year
J. L. Allen	
A. S. Robb	

F. A. Bowman, the retiring chairman, is also a member of the Executive as the immediate past chairman and also as a member of the Council resident within the jurisdiction of the branch.

In installing the new chairman, Mr. Bowman thought the Branch had honored itself by electing Mr. Dodwell to that position, he was one of the charter members of the Canadian Society of Civil Engineers, Secretary of that organization for the first year, Vice-President three times and Councillor eleven times. In accepting the chair, Mr. Dodwell expressed his thanks for the honor that the branch had conferred on him and felt that the coming year was full of promise for the engineering profession in general and the Halifax Branch particularly. He gave a brief report on the progress of the Professional Engineers' bill. It had already passed the lower house and was now before the upper chamber. He felt that if the bill became a law, *The Engineering Institute of Canada* would be greatly benefited. He then called on Dr. F. H. Sexton who as a member of the Committee on Legislation, and as a member of the Professional Council, had rendered signal service to the profession.

Dr. Sexton, after congratulating Mr. Dodwell on the election and the Branch on their choice of Chairman, dealt with the progress of Legislation. He felt that the future of the Engineering profession was assured. Even though some may think that the large number now entering the Engineering Colleges might cause a surplus in the profession, he felt that an engineering training was a splendid foundation for any line of work. The Chairman then introduced General C. H. Mitchell.

General Mitchell, after expressing his pleasure in being able to be present, gave the members of the Branch a hearty invitation to attend the professional meeting in Niagara Falls next September, and the annual meeting of *The Institute* in Toronto next January. He then gave an account of the progress of Engineering Legislation in Ontario and spoke of the difficulties that had been encountered in that Province. He spoke of the work of the Toronto Branch had done in preparing a schedule of fees and salaries. This Schedule had been considered at a conference in Montreal recently and it is possible that *The Institute* may now take up the problem of raising the fees and salaries of Professional Engineers, providing the body as a whole is agreeable. He urged the fullest co-operation and requested suggestions from the Halifax Branch.

General Mitchell felt that the engineering profession had not received due recognition in the past, partly owing to the disinclination of engineers to play a stronger part in public affairs. There were many public questions on which the branches could give invaluable advice and thus aid their community and the profession as well. He spoke of the great demand at the present time for men with engineering training and felt that an increasingly larger number of engineers would, within a few years after graduation, find themselves in business. He agreed with Dr. Sexton that the engineer's training was the best foundation for a business career.

After the Chairman had conveyed the thanks of the Branch to both General Mitchell and Dr. Sexton, the meeting adjourned.

PERSONALS

S. C. Brown, Jr.E.I.C., has been appointed chief engineer, J. P. Porter & Co., contractors.

D. O. Wing, A.M.E.I.C., has been placed in charge of the St. Johns, Que. office of Anglin-Norcross, Ltd., contracting engineers and builders.

H. M. Scott, A.M.E.I.C., has changed business connections and is now with F. Lyall & Sons Construction Co. Ltd., Wellington Ave., Montreal.

F. H. Small, A.M.E.I.C., has resigned his position with the department of highways, Regina, and has accepted a position on the engineering staff, City of Moose Jaw.

Meyer Goodman, A.M.E.I.C., formerly assistant engineer, Dept. of Public Works, Montreal, has recently opened an office at Room 14, McLean Building, 10 St. John St., Montreal.

C. H. Jette, A.M.E.I.C., has tendered his resignation as assistant engineer, Public Works of Canada, and accepted a position in the engineering department of the St. Maurice Paper Co., Three Rivers, Que.

H. R. Safford, M.E.I.C., President of the American Railway Engineering Association has been appointed to represent the Association upon Engineering Council which the Association has recently joined.

E. P. Muntz, A.M.E.I.C., of the Niagara Peninsula Branch, has recently resigned from the staff of the Welland Ship Canal and is engaged as contractor's engineer on reconstruction work on the Grand Valley Railway, with headquarters at Galt.

F. Harcourt Emra, M.E.I.C., has been honoured by the King as being awarded the order of O.B.E. In 1918 Mr. Emra was appointed assistant director to the Admiralty for engineering work and was acting as director of shipyard extensions for the whole of that year.

C. M. Arnold, M.E.I.C., having accepted a position on construction on the Lethbridge Northern Irrigation Project, has resigned as Secretary-Treasurer of the Calgary Branch and Arthur L. Ford, M.E.I.C., has been appointed by the Executive of the Branch as Secretary-Treasurer.

James Macdonald, A.M.E.I.C., member of the Executive Committee of the Peterborough Branch is at present engineer in charge of the hydraulic surveys being carried out in the Nipissing District of the Hydro-Electric Power Commission of Ontario, with headquarters at North Bay.

J. A. Burnett, A.M.E.I.C., of Smart & Burnett, consulting engineers, Montreal, has been appointed by the Grand Trunk Railway interests to assist in the government appraisal of the electrical equipment of St. Clair Tunnel Co., Oshawa Railway and Montreal and Southern Counties Railway Co.

*

R. H. Parsons, M.E.I.C., city engineer of Peterborough, has just returned from a trip to New Orleans, La. and Houston, Texas, where he has been looking into the activated sludge sewage disposal plants located there, and also new types of sewage pumps. Mr. Parsons has recently been elected Chairman of the Peterborough Branch.

*

L. D. W. Magie, M.E.I.C., works engineer of the Peterborough Plant of the Canadian General Electric Company, and P. L. Allison M.E.I.C., industrial control engineer for the same Company, have recently returned from an inspection trip through the General Electric Company's plants at Pittsfield, Erie, Bloomfield and Schenectady.

*

N. A. Pearson, A.M.E.I.C., resigned from the Irrigation Office, Dept. of the Interior at Calgary in March of this year, having held the position of Chief Draughtsman for the past six years. He has accepted an appointment with the American Smelting and Refining Company at Santiago, Chili in connection with the design and erection of the company's large copper reduction works.

*

Gordon Grant, M.E.I.C., formerly chief engineer of the Transcontinental Railway and of the Quebec and Saguenay Railway, has been appointed chief engineer of highways, with headquarters at Ottawa. This appointment is in addition to Mr. Grant's duties as consulting engineer to the Department of Railways & Canals.

*

Walter E. Joyce, A.M.E.I.C., who has been chief engineer of the Montreal Tunnel since the death of S. P. Brown, M.E.I.C., has resigned this position to take charge of the Ridout Suspension Bridge, Kingston, New York. In taking up this new work Mr. Joyce is returning to the scene of his former labour as he was actively connected with the building of the Manhattan Suspension Bridge.

*

R. J. Lecky, A.M.E.I.C., Regina, President of Provincial and also of Regina Association of Canadian Building Construction Industries represented the province of Saskatchewan on the employers side of the Industried conference held at Ottawa, which completed its session on May 1st on uniformity of labour laws. Mr. Lecky is also a member of the committee on legislation of the Saskatchewan Branch.

P. M. Sauder, M.E.I.C., who organized the Hydrometric Surveys in Alberta and Saskatchewan and since their inception has been chief engineer, has resigned from the Government Service and has accepted a more lucrative position with the Lethbridge Northern Irrigation District. Mr. Sauder has taken an active interest in the work of *The Institute* and for three years was Secretary of the Calgary Branch.

*

L. M. Arkley, M.E.I.C., professor of mechanical engineering, University of Toronto, was elected President of the Graduates Society of McGill University of Toronto organized on May 1st at a dinner held at Hart House, University of Toronto, at which seventy graduates of McGill were present. Doctor Frank D. Adams, Hon. M.E.I.C., acting principal of McGill University and dean of the Faculty of Applied Science, Dr. W. H. Ellis, Hon. M.E.I.C., and Sir Robert Falconer of the University of Toronto, addressed the gathering.

*

Arthur L. Ford, M.E.I.C., was appointed chief hydrometric engineer on Mr. Sauder's resignation. Mr. Ford has had a long and widely varied engineering experience. He was actively connected with the construction of the Grand Trunk Pacific Railway as inspecting engineer for the Dept. of Railways and Canals. After the completion of this railway he transferred to the interior department and his recent appointment as chief hydrometric engineer is a recognition of his valued services in the latter department.

*

H. L. Seymour, A.M.E.I.C., assistant to Thomas Adams, housing and town planning adviser to the Dominion Government, will soon sever his connection with the government in order to accept an offer of partnership with Frank Barber and R. O. Wynne-Roberts, consulting engineers, Toronto. Mr. Seymour has been very prominent for several years past in town planning activities, and played a leading part in the formation of the Town Planning Institute of Canada. In his new connections Mr. Seymour intends to link town planning with the firm's other activities.

*

Edward A. Ryan, B.Sc., A.M.E.I.C., has resigned from the engineering staff of the Laurentide Co. Ltd., Grandmere, Que., and has opened an office in the Southam Building, Montreal, where he will carry on a general consulting engineering practice specializing in mechanical and electrical equipment of buildings. Mr. Ryan has acquired the use of the office records, drawings, files, data, etc. of R. J. Durley, M.E.I.C., of whose office in Montreal he was formerly in charge. Mr. Ryan has been engaged in the last few years on work in connection with mechanical, electrical and ventilating plants for the Fort Garry Hotel, Winnipeg; Toronto Union Station; Sun Life Building, Montreal; British Chemical Co., Trenton, Ont.; and The Laurentide's Company's plant, Grandmere, Que.

Lt.-Com. C. P. Edwards.

Appointed Officer of the Order of the British Empire.

Lt.-Com. C. P. Edwards, R.N.C.V.R., A.M.E.I.C., Director of Radiotelegraph Service, Naval Department, Ottawa, has been appointed as an Officer of the Order of the British Empire, Military Division, for services rendered during the War. Commander Edwards has had direction of all the Radio activities of the Dominion Government, both naval and commercial, since [illegible]. He is one of the most active members of the Executive Committee of the Ottawa Branch, and Chairman of the Committee on Proceedings. He is a Fellow of The Institute of Radio Engineers.

LT.-COM. C. P. EDWARDS, R.N.C.V.R., A.M.E.I.C.

Commander Edwards' Branch performed most useful work during the War, and he was singled out for special mention in Lord Jellicoe's report, recently laid before Parliament, for the "eminently satisfactory and efficient manner" in which the radio war work of the Canadian Naval Service had been organized and carried out.

Appointment to International Conference on Seamen's Employment.

G. J. Desbarats, C.M.G., M.E.I.C., has been appointed Canadian delegate to the International Conference on Seamen's Employment, which is to be held in Genoa on [illegible] June next.

This Conference is in connection with the League of Nations and is the outcome of the International Labour Conference recently held at Washington. It will deal more particularly with the application of the Washington Convention to seamen, the limitation of working hours to 48 per week, the supervision of articles of agreement, establishment of facilities for securing employment for seamen, and the possibility of drawing up an international seamen's code.

G. J. DESBARATS, C.M.G., M.E.I.C.

Canada is closely interested in this matter in that there are at present [illegible] vessels on the Canadian register employing a total of [illegible] men and boys.

This is not the first time Mr. Desbarats has represented Canada at important conferences, having attended several Imperial Conferences and also acted as plenipotentiary for Canada at the International Radiotelegraph Conference of 1912; this latter appointment has considerable interest, the same being the first time a representative ever acted for Canada as a nation instead of going as a member of a British delegation.

Appointments of a diplomatic nature such as this usually go to the legal profession, but all who know Mr. Desbarats are assured that he will conduct his mission to the satisfaction of the Canadian Government and to the honour of himself and the Engineering profession.

Engineers, as a body, are pleased that one of their members should be selected for so important a mission, and the Government is to be congratulated on the appointment.

Victoria Branch Chairman

[illegible] Ernest Foreman, B.Sc., M.E.I.C., who presides over the destinies of the Victoria Branch as Chairman, is chief engineer of Public Works of the Province of British Columbia and has under his control the entire engineering work of the province embracing over [illegible] hundred thousand square miles of territory. During his course at McGill University he was leader in his class and graduated with honours, winning the British Association prize and medal. After graduation in [illegible] he resided for a number of years in Toronto going to Vancouver in [illegible] where he was engaged in engineering construction and later in consulting practice. From 1910 to 1912 he was supervising engineer on the Dallas Road sea wall for the city and provincial governments, Victoria, B.C. In 1912 he was appointed engineer-in-charge of reconstruction of Smith's Hill reservoir and from 1912 to 1916 was

ALVAH ERNEST FOREMAN, B.Sc., M.E.I.C.

Chairman, Victoria Branch

assistant city engineer of Victoria receiving the appointment in 1917 of public works' engineer in the provincial government. Mr. Foreman takes a keen interest in civic as well as engineering matters and is doing much for the welfare of the engineering profession. He was successful in securing substantial increases to the remuneration of engineers employed in his department; which he has brought up to a state of efficiency, which members of the provincial government refer to with pride.

*

Rotary President, Lethbridge, Alta.

Sam. G. Porter, M.E.I.C., Superintendent of Operation and Maintenance of the Department of National Resources, Canadian Pacific Railway Co., at Lethbridge, Alta., was elected President of the Rotary Club at the Annual Meeting held recently.

Mr. Porter's work on behalf of the engineering profession is well known by members of *The Institute.*

Speaking of his appointment as President of the Rotary Club, the Lethbridge Daily Herald says: "President-elect Sam Porter is one of the most enthusiastic members of the Lethbridge Rotary Club and while he has been a resident of Lethbridge for only a little more than a year he has entered into all the interests of the community with zest. He was one of the members of the club who had much to do with making the visit of the Lethbridge Rotarians to the district convention at Calgary such a success.

Sam Porter lived on a farm in Texas for 20 years and that is where he acquired his broad breezy outlook

SAM. G. PORTER, M.E.I.C.

on life. From the Lone Star he went to the Massachusetts Institute of Technology, graduating in civil engineering. He is also a Master of Arts from the Baylor University, Waco, Texas, member of *The Engineering Institute of Canada,* and member of American Society of Civil Engineers.

During his career as a practicing engineer he has been three years with the U. S. Reclamation Service, six years as Chief engineer of Arkansas Valley Sugar Beet and Irrigated Land Co., Colorado, five years with the irrigation branch of the Dominion Government, Reclamation as special inspecting engineer and assistant chief, during which time he had charge of many of the surveys upon which irrigation districts in Southern Alberta are now being formed. A little over a year ago he came to Lethbridge to take charge of the Lethbridge project of the Canadian Pacific Railway irrigation department in which position he has had district success. Under his guidance the Lethbridge Rotary Club foresees a year of activity in all its ramifications.

*

John W. Le B. Ross, M.E.I.C., Superintending Engineer, Sault Ste Marie Canal, who has been the active head of the Sault Ste Marie Branch of *The Institute* since its inauguration, continues as Chairman of the Branch for the ensuing year. Mr. Ross has an enviable record of thirty-two years in the service of the Canadian Government in connection with the construction and maintenance of the canals and river channels of Canada.

JOHN W. Le B. ROSS, M.E.I.C.

Chairman Sault Ste Marie Branch; Superintending Engineer Sault Ste Marie Canal.

Twenty years of this period were spent on the St. Louis between Cornwall and Prescott and for the past twelve years in charge of Sault Ste Marie Canal.

Mr. Ross joined *The Institute* as Associate Member in [illegible] and was promoted full Member in 1901.

Border Cities Branch Chairman

H. B. R. Craig, M.E.I.C., recently appointed Chairman of the Border Cities Branch, graduated from R.M.C. in 1899, and from Queen's University (B.Sc.) in 1901. For a year after graduation Mr. Craig was resident engineer on construction of the Bay of Quinte Railway, and in 1904 he was resident engineer on construction of the Toronto-Sudbury Branch, Wahnapitae River to Sheppard Lake. For the two years following Mr. Craig was city engineer of Kingston, Ont., but returned to railway work on construction of the Grand Trunk Pacific Railway, being resident engineer on the Lake Superior Division and on the Prairie West Division. From 1908 to 1911 Mr. Craig again took up the duties of city engineer of Kingston, and after a year of consulting work for Prescott and the counties of Lennox and Addington he was appointed senior assistant engineer, Public Works, Canada at Windsor, Ont., in 1911. In 1914 Mr. Craig was transferred to Fort William by the Department of Public Works in the capacity of District Engineer after having been acting district engineer for the Windsor district for the previous year; in July 1919 Mr. Craig returned to Windsor as District engineer. In October 1902 he was elected a Student member of *The Institute*, being transferred in March 1905 to Associate Member, and was elected Member in December 1910.

Howard G. Kelley, M.E.I.C., who has been president of the Grand Trunk System since 1917, gained his early experience of railway work in the wild west, going straight from the University to railway construction work to share the hardships of the pioneers of railway building. After a brief interlude of mining he returned to the railway, and soon began to take over positions of responsibility.

HOWARD G. KELLEY, M.E.I.C.

President of the Grand Trunk Pacific Railway, has been appointed Chairman of the Committee of Management for the amalgamation of the Grand Trunk Railway with the Canadian National System.

In 1907 he was appointed chief engineer of the Grand Trunk Railway System, and [illegible] years later became vice-president in charge of operation, maintenance and construction, which office he relinquished on appointment as president of the Grand Trunk and Grand Trunk Pacific Railways.

Montreal Water Board

At a recent meeting of the Administrative Commission of Montreal a very important step was taken in connection with the water supply of the city. An advisory board of engineers, to be known briefly as "The Water Board of Montreal", was appointed to study in all its details the water supply problem of Montreal, including the generation or purchase of power of any kind, the enlargement of the filtration plant, the provision of reservoirs, the construction of pumping stations, canals, conduits, and so forth. The duties of the Board are to consist further in the supervision of the preparation of plans, specifications and estimates, and of the construction of the works.

A. E. DOUCET, M.E.I.C.

The Board is composed of three of our well known members, A. E. Doucet, M.E.I.C., Walter J. Francis, M.E.I.C., and R. S. Lea, M.E.I.C. Mr. Doucet is the Director of Public Works of the City of Montreal and is Chairman of the Board; Mr. Francis, one of our Vice-Presidents, is a member of the firm of consulting engineers of Walter J. Francis & Company; Mr. Lea is a member of the firm of consulting engineers of R. S. & W. S. Lea.

In order to facilitate the functioning of the Board the other members of the above named firms will act on the Board, Frederick B. Brown, M.E.I.C., representing Mr. Francis, and W. S. Lea, M.E.I.C., representing Mr. Lea. By this excellent arrangement the Corporation has practically engaged two established Consulting

R. S. LEA. M.E.I.C.

Engineering firms to act in an advisory capacity in conjunction with the Chairman of the Public Works Department. The fee for the advisory services of each of the members of the Board is said to be $10,000.00 per annum.

The Board has already entered upon its duties and has organized its staff and placed a number of orders for plant and equipment. Charles Desbaillets, A.M.E.I.C., formerly manager of the Gas & Light Department of the City of Sherbrooke, has been engaged as engineer in charge.

WALTER J. FRANCIS, M.E.I.C.

Retirement of H. J. Cambie, M.E.I.C.

H. J. Cambie, M.E.I.C., who has recently retired from active service with the Canadian Pacific Railway has just completed a professional career of sixty-seven and a half years.

As a boy of sixteen, fresh from school in England, Mr. Cambie entered the office of W. Walter Shanly in September 1852, who was then making surveys for the proposed Toronto and Guelph Railway, which was absorbed the following year by the Grand Trunk Railway when the latter obtained a charter.

H. J. CAMBIE, M.E.I.C.

He occupied various junior positions with C. S. Gzowski & Co. contractors for the Grand Trunk Railway, West of Toronto, from 1853 to 1859, and after the completion of the Grand Trunk Railway, there not being any railway engineering work in Ontario, served his time to Col. J. S. Dennis, passed as a land surveyor and under him, made explorations and surveys for the Province of Ontario in the Muskoka and Parry Sound districts during 1860 to 1862.

From 1863 to 1866 Mr. Cambie was employed by Sir Sanford Fleming on explorations and surveys for the Intercolonial Railway in the Province of Quebec and in Nova Scotia.

During 1867 to 1869, as engineer for Punchard Clarke & Co., contractors for the Windsor and Annapolis Railway in Nova Scotia, he located and constructed the Western half of that line forty-four miles.

During 1870 to 1873, Mr. Cambie had charge of construction under Sir Sanford Fleming as chief engineer of the Intercolonial Railway from Rimouski to near Lake Metapedia and resided at Metis.

During 1874 to 1875, under Marcus Smith, he was employed on surveys for the Canadian Pacific Railway in British Columbia.

In 1876 Marcus Smith, having been appointed acting chief engineer, took charge of all the surveys in British Columbia during that and the following years until in 1879 it was decided by the Government, on the advice of Sir Sanford Fleming, to adopt the Fraser River route, with terminal on Burrard Inlet.

During 1880 to 1883 Mr. Cambie had charge of construction of Government Contract 60, through the canyons of the Fraser River. The most difficult and costly work which had been attempted in Canada up to that time.

In 1884 he entered the service of the Canadian Pacific Railway Company and during that and the following year, had charge of the construction of their main line from Savona (the end of the Government Work in British Columbia) to Kamloops and Shuswap Lake, about sixty miles.

From 1886 to 1903, he was in charge of the Maintenance, of the Pacific Division of the Canadian Pacific Railway, embracing the main line and all its branches in British Columbia.

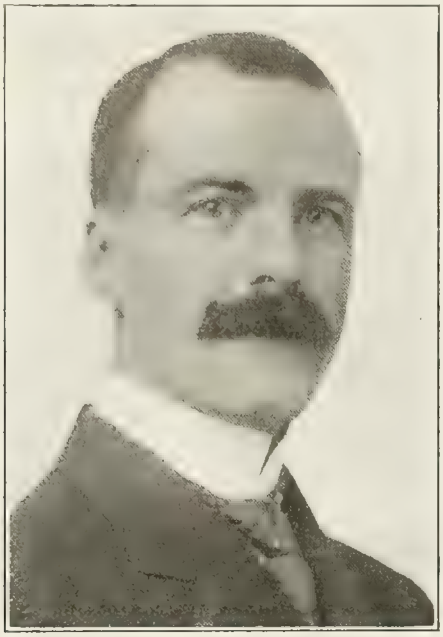
In 1904 Mr. Cambie was appointed special Assistant engineer for the Canadian Pacific Railway, with office in Vancouver, and during 1905 to 1907 had charge of the construction of the Nicola Valley Railway and from 1908 to March 1920, was chief engineer of the Esquimalt and Nanaimo Railway.

S. J. HUNGERFORD, M.E.I.C.

S. J. Hungerford, M.E.I.C., has been appointed to represent the Government on the Commission for the amalgamation of the Grand Trunk Railway with the Canadian National Railways.

City Planning Conference

The twelfth Annual Conference on City Planning was held this year, 19 to 22 April, at Cincinnati. While already a member of the Board of Directors of the American City Planning Institute, I greatly appreciated the privilege of being designated as the special representative there of *The Engineering Institute of Canada,* and a like honour which was extended to me by the Town Planning Institute of Canada to represent them also.



NOULAN CAUCHON, A.M.E.I.C.,

This meeting showed the ever increasing membership and attendance which has become characteristic of the movement. The Institute which comprises the technical men meets jointly with the Conference which comprises the representatives of municipalities and other bodies interested in city betterment—physical and sociological. A notable feature was the increasing number of engineers who are taking an interest in and contributing papers and taking part in the discussions. City Planning is fundamentally economic engineering and, the carrying out of plans at least, must in the nature of things rest largely in the hands of City Engineers. The more the engineer studies the science of economics the more ready and better able will he be to enjoy and profit by the collaboration of the Architect and the Landscape Artist.

The most notable paper from our angle delivered at the Conference was the one by the presidential address, Nelson P. Lewis, chief engineer of New York City, on Transportation Problems in Cities.

The dominating discussion of this Conference was zoning in the regulating of the use and development of land in cities involving width of streets and the relation of buildings thereto as to height cubage and air space etc.

The annual dinner at Hotel Sinton, where the Conference was held, was presided over by Alfred Bettman, a prominent lawyer of Cincinnati and an indefatigable friend of Sound City Planning who paid a glowing and generous tribute to the part which Great Britain and her Dominions had played in the great War.

A stimulating incident of the dinner was an address by a Chicago representative who depicted such progress being made in their City Planning that he led us to believe that Chicago would soon become a more attractive home than Heaven—and he was a lawyer at that! So you see what fascinating possibilities await the enthusiastic mind.

Altogether City Planning has taken a good stride in progressive advancement as a result of this most successful Conference.

NOULAN CAUCHON, A.M.E.I.C.

Preliminary Notice

of Applications for Admission and for Transfer

[illegible] May, 1920

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in June, 1920.

FRASER S. KEITH, Secretary.

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*The professional requirements are as follows:—

Every candidate for election as MEMBER must be at least thirty years of age, and must have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. The term of twelve years may, at the discretion of the Council, be reduced to ten years in the case of a candidate who has graduated in an engineering course. In every case the candidate must have had responsible charge of work for at least five years, and this not merely as a skilled workman, but as an engineer qualified to design and direct engineering works.

Every candidate for election as an ASSOCIATE MEMBER must be at least twenty-five years of age, and must have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. In every case the candidate must have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, shall be required to pass an examination before a Board of Examiners appointed by the Council, on the theory and practice of engineering, and especially in one of the following branches at his option: Railway, Municipal, Hydraulic, Mechanical, Mining, or Electrical Engineering.

This examination may be waived at the discretion of the Council if the candidate has held a position of professional responsibility for five years or more years.

Every candidate for election as JUNIOR shall be at least twenty-one years of age, and must have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the Council, if the candidate is a graduate of some school of engineering recognized by the Council. He shall not remain in the class of Junior after he has attained the age of thirty-five years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: Geography, History (that of Canada in particular), Arithmetic, Geometry, Euclid (Books I-IV and VI), Trigonometry, Algebra up to and including quadratic equations.

Every candidate for election as ASSOCIATE shall be one who by his pursuits, scientific acquirements or practical experience is qualified to co-operate with engineers in the advancement of professional knowledge.

> The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

[illegible]—JAMES [illegible], of [illegible], Ont. [illegible]

References: F. S. Keith, [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

[illegible]

References: [illegible]

FULLERTON—JAMES THORNTON, of Vancouver, B.C. Born at Victoria, B.C., Feb. 11th, 1891; Educ: B.Sc. (C.E.) McGill 1914; 1907-10, Gen'l. constrn. with Dominion Govt. in North B.C.; 1914-16, Asst. to D.L.S.; 1916-19, overseas, Lieut. C.F.A.; 1919-20, D.L.S. Govt. work; At present with Fullerton & Bell-Irving, Civil Engrs., Vancouver, B.C.

References: W. H. Powell, H. F. V. Meurling, W. Smaill, W. J. Johnston, J. A. Walker.

GEMMEL—HENRY WALTER RITCHIE, of Miniota, Man. Born at Selkirk, Man., Oct. 27th, 1884; Educ: 1st and 2nd yr. in C.E. Toronto, 1905-07, Commission to practice surveying in Manitoba and Alberta, 1912; 1907-08, Asst. to W. B. Young, M.L.S.; 1909, Asst. to J. Molloy, D.L.S.; 1910, locating engr. Alberta and Great Waterways Rly.; 1911-12, res. engr. with John Galt, Engr'g. Co.; 1912-13, surveying in Alberta; 1914, res. engr. and locating engr. on drainage with Sask., Govt.; 1914-19, on active service, Lieut. 43rd Bn., Wounded Jan. 1916, awarded M.C. July 1917; At present Municipal Engineer for Rural Municipality of Miniota on System on Good Roads.

References: S. A. Button, M. A. Lyons, G. B. McColl, J. W. Harris, A. A. Young.

GORDON—JOHN, of Winnipeg, Man. Born at Forres, Scotland, Jan. 29th, 1884; Educ: Electrical Engr'g. Armstrong College, Newcastle, England; 5 years apprenticeship in mech. and elec. engr'g. 2 yrs. in Chief Engr's. Dept. as electrical dftsman North Eastern Rly.; 1910-12, mechanical dftsman, G.T.P. Rly., Rivers, Man.; 1912-15, electrical engr. G.T.P. Ry., and in chge. of all electrical work (exclusive of telegraphs); 1915-16, general electric foreman, C.G. Rlys. (western lines), and in chge. of all electrical works (exclusive of telegraphs); 1918-19, Signal & Electrical Engr., C.G. Rys. (western lines), and responsible for all electrical work, together with electric signal locking; Aug. 1919 to date, Asst. Electrical Engr., Can. Govt. Rlys. (western lines).

References: A. H. Eager, E. V. Caton, A. V. Redmond, A. W. Lamont, F. H. Farmer, C. A. Clendinning.

GRANT—CLIFFORD GORDON, of Prince William, N.B. Born at Upper Southampton, N.B., Dec. 17th, 1881; Educ: 2 yrs. (1907-08) Univ. of N.B., 2 yrs. (1910-11) Queen's Univ.; 1906 (3 mos), rodman Bangor & Aroostock Ry., Maine; Summer, 1909, tapeman Teminkaming & Nor. Ont. Ry.; Summer, 1910; under R. H. Montgomery, D.L.S.; 1911-13, dftsman, topog'r. and leveler C.N.R.; 1913, (May-Nov.), transitman on location St. John & Quebec Ry.; 1913-16, instr'man on maintenance, Can. Govt. Rys.; 1916 (June to Oct.) Res. Engr. St. John & Quebec Ry.; 1917-18, instrn'man G.T.R. Toronto; At Present Crown Land Surveyor Prov. of N.B.

References: S. B. Wass, H. Phillips, E. G. Hewson, L. I. Stone, A. M. MacGillivray.

HARRY—WILMOT EARL, of Winnipeg, Man. Born at Savanna, Ill., Sept. 26th, 1885; Educ: High School and private Study; 1902-05, rodman. instr'man and asst. engr. in chge. of grade reduction with Chicago, Burlington & Quincy Rly.; 1906, asst. engr. in chge. terminal constrn. Great Northern Rly., Grand Forks, N.D.; 1907, topog'r, levelman transitman, Milwaukee & St. Paul Rly.; 1910-11, asst. engr. City of Medicine Hat, and track work etc., Macklin Branch C.P.R.; 1911-13, asst. engr. constrn. and location C.N.R.; 1915-19, overseas, Officer Royal Engr., France, Russia, Siberia; At present with Peter Lyall Constrn. Co., on engr'g. work for new T. Eaton & Co. bldg., Winnipeg, Man.

References: W. Burns, J. Mason, A. J. Taunton, F. G. Haven, V. Michie, H. A. Dixon.

HENNEBIQUE—JULES JOSEPH, of New York City, N.Y. Born at Courtrai, Belgium, May 5th, 1873; Educ: Laureat de Sciences Industrielles, B.S. Bruxelles, 1895, Université de Gand, Laboratory of Testing Materials, Special Course, C.E. 1895-96; 1896-1902, co-operated with father F. J. Hennebique, Paris, France, Inventor of Hennebique System of reinforced concrete; 1902-04, First Vice-Pres. of the Hennebique Constrn Co., Contracting Engineers, New York City; Field engr. in charge of special reservoirs, water-towers and bridges; 1904-06, Civil and Consltg. Engr. Mobile, Alabama, designing and executing reinforced concrete Foundations on difficult soils; 1906-15, Chief engr. of the Interstate Constrn. Co., Contracting Engrs., Mobile, Ala., Designer and in executive charge Work included constrn. of many large concrete bldgs. and Lighthouse for U.S. Govt. built by means of floating reinforced concrete caisson; 1915-19, President and Senior Consltg. Engr. of Case Coast Protection Corpn. Consultg. Engrs., New York, Designer and in executive charge of important schemes of Sea Defence Work; Sept. 1919 to date, President and Senior Consultg. Engr. of the Tidal Engr'g. Corpn. (Successors to the Case Coast Protection Corpn.) Consultg. Engr. New York. Actively engaged in schemes of Coast Protection Work and Tidal Marshes Reclamation. (Member of the American Society of Civil Engineers.

References: The American Society of Civil Engineers.

LUCK—CECIL GEORGE JOHN, of Montreal, Que. Born at London, England, Nov. 1st, 1885; Educ: Central Tech. Coll., London, 1905; 1906-08, asst. to res. engr., Angus Shops; 1908-09, asst. to res. engr., G.T.Ry., Eastern Divn.; 1909-14, rodman, dftsman, instr'man and res. engr. C.P.R. location and constrn. Western Lines; 1914-16, Capt. Seaforth Highlanders, B.E.F. France; 1916-17, Chief Instructor, Railway Constrn, Reading, England; 1917-19, Capt. Royal Engineers, B.E.F., Italy; 1919, O.C., reconstrn. Murman Railway, with B.E.F., North Russia; At present Assistant, Instructural Dept., G.T.R.

References: F. L. C. Bond, F. B. Brown, J. L. Busfield, W. A. James, H. B. Stuart.

MACNAMARA—ARTHUR, of Winnipeg, Man. Born at Toronto, Ont., March 4th, 1885; Educ: Public School, night School & private study; Machinist apprentice, railway shops Montreal & Toronto; 7 yrs. with G.T.P. Ry. as Asst. to Master Mechanic on constrn, and later Asst. Supt. of Motive Power, built & organized all Repair Stns. for locomotives & cars from Ft. William to Prince Rupert; 2½ yrs. Technical Stores officer R.A.F.; 1915 to date, Chief Inspector Manitoba Bureau of labor.

References: D. Main, G. L. Guy, J. M. Leamy, J. G. LeGrand, H. A. Bowman, J. Rocchetti.

MADGETT—GEORGE HENRY, of Hamilton, Ont. Born at Hamilton, Ont., Feb. 14th, 1891; Educ: Collegiate Institute Hamilton, Ont.; 1908-18, tracing detailing & checking Structural Steel at Hamilton Bridge Works; 1918-19, in charge of designing & estimating, and 6 mos. designing engr. with Standard Steel Constrn. Co.; 3 mos. with E. H. Darling, Hamilton, Ont.; At present Designing Engr. with W. J. Westaway, Hamilton, Ont.

References: R. K. Palmer, C. H. Marrs, J. A. McFarlane, E. H. Darling, J. Erskine, P. M. Smith, G. Jack.

MANSBRIDGE—ALFRED SWATTON, of Walkerville, Ont. Born at Manchester, England, Dec. 17th, 1886; Educ: Public & Night School; 5 yrs. apprentice to machine shop (Scotland); 2½ yrs. rodman Vancouver, B.C.; 1909-13, dftsman & engr. B.C. Elec. Ry.; 1913-15, Asst. to Chief Dftsman Pacific Eastern Ry.; 1915-19, with C.F.A.; 1919, 2 mos. dftsman & 2 wks. Hydrographic Survey Vancouver Hbr. Comm.; At present dftsman, Trussed Concrete Steel Co., of Canada Ltd., Walkerville, Ont.

References: E. G. Matheson, H. W. Frith, A. E. B. Hill, A. J. Riddell, R. Snodgrass.

MARRYAT—GERALD, of Montreal (temporarily). Born at Redhill, Surrey, England, March 5th, 1876; Educ: Marlborough College, England; Acted as French Interpreter in France during late War; 1903-04, topog'r. and dftsman G.T.P. original surveys; 1905-06, transitman T.C. Ry.; 1907; Temiskaming & Nor. Ont. Rly. on location 100 miles from Sudbury to Port Arthur, all estimates etc.; 1909, in partnership with Arthur Cotton, O.L.S. in Elk Lake, as Surveyors, Engineers etc., and afterwards in business for self as Contractor for Mining Work; 1914-20, with C.E.F. in Can. Engrs. on Survey and Map work in France and Belgium; Wounded Jan. 1916; Later Res. Engr. for War Office for big Aerodrome Bldg., and afterwards with Can. Forestry Corps on grading work; Discharged from Ste. Agathe Military Hospital two months ago.

References: G. A. McCarthy, S. B. Clement, G. F. Hanning, C. J. Armstrong, J. H. Edgar, F. S. Drummond, H. K. Wicksteed, A. I. Stewart, T. H. White.

McKEAN—DAVID GARDNER, of Winnipeg, Man. Born at Coatbridge, Lanarkshire, Scot., Oct. 29th, 1887; Educ: Associate Coatbridge Tech. School, and Mining College 1902-06; Student Royal Technical College, Glasgow, 1906-10; 5 yrs. apprenticeship 1902-05, with Stewarts & Lloyds Ltd. Coatbridge, as apprentice and junior dftsman, 1905-07, apprentice machinist with Murray & Paterson Ltd. Coatbridge; 1907-08, Asst. Chief Dftsman, Robert Morton & Sons Ltd., Wishaw, Scotland; 1908-10, Asst. Engr. Dron & Lawson Ltd. Glasgow; 1910-14, Structural Steel Detailer, Manitoba Bridge & Iron Works Ltd., Winnipeg, Man.; 1914 to date, Dftsman, Office Engr. and Asst. Engr. of Design, and at present Asst. to Chief Engr., The Greater Winnipeg Water District, Winnipeg, Man.

References: W. G. Chace, D. L. McLean, M. V. Sauer, A. C. D. Blanchard, G. F. Richan, T. R. Deacon, H. A. MacKay.

McLAREN—ARTHUR ANTHONY, of Niagara Falls, Ont. Born at Mitchell, Ont., Jan. 17th, 1888; Educ. B.Sc. Queens 1911; Associate Member Amer. Society C.E.; 1909, rodman on constrn. Hydraulic Air Compressor, Cobalt, Ont., 1910, Asst. to millwight and mill foreman; 1911-12, Asst. to Dom. Land Surveyor, B.C.; 1912-13, with Viele, Blackwell & Buck, New York, as asst. on constrn. Power House etc., and asst. on prelim. survey for a Water Power; 1913-18, with Cedar Rapids Mfg. & Power Co.; 2 yrs. as supt. of constrn, 15 mos. as asst. engr. in charge of field work and 17 mos. as chief inspector; 1918 to date with Hydro-Electric Power Commission on Ontario till Sept. 1919 as chief of party on distribution & power house division, now Res. Engr.

References: H. G. Acres, T. Hogg, W. Jackson, J. C. Smith, A. M. Wilson, G. F. Hanning.

MILES—GEORGE ERNEST, of Winnipeg, Man. Born at Windsor, England; April 23rd, 1887; Educ: 1st Class, College of Preceptors, 1903; 1907-10, C.P.R. Engr'g. Dept., dftsman and electrical constr; 1910-11, Canadian Westinghouse Co., Power Constrn. Point du Bois; 1912, with same company as constrn. engr.; 1913, City Light & Power, constrn. of substations; 1914, Can. Westinghouse, Constrn. Engr.; 1915-19, overseas, Infantry Officer in chge. of Workshops; June 1919 to date, Sales Engr., Canadian Westinghouse Co.

References: A. W. Lamont, F. H. Farmer, E. V. Caton, W. M. Scott, G. L. Guy, J. Rocchetti.

MOORE—THOMAS OWEN, of Winnipeg, Man. Born at Chicago, Ill., Aug. 3rd, 1893; Educ: studied elec. engr'g. under R. N. Reynolds, E.E., London, England; 1914-15, overseas, connected with engr'g. dept., more especially plotting & survey work; Summer, 1919, topog'r. & Leveller C.P.R.; Intention is to combine Engr'g. Course I.C.S. with practical experience in dfting office. At present on strength of D.S.C.R. studying engineering, structural steel.

References: T. G. LeGrand, N. J. Wallis, G. C. Dunn.

WOOD FREDERICK MORRIS, of Kingston, Ont. Born at Bombay, India, June 30th, 1892 Educ , M A , B Sc , Queen's 1911-1914; 1913, Apr. to June, checking surveys on road divisions etc. for Sask. Govt. Regina, June to Oct. with topog'l branch Survey of Canada; 1914-19, Military Service, summer 1915 rodman & instr'man with Can. Engrs. Barriefield Camp; 1919-20, Lecturer in Math. 1st & 2nd year Practical Science Students, Queen's University; At present Res. Engr. with Lethbridge Northern Irrigation District, Lethbridge, Alta.

References: L. W. Gill, W.P. Wilgar, A. Macphail, L. Malcolm, H. B. Muckleston.

FOR TRANSFER FROM THE CLASS OF ASSOCIATE MEMBER TO THAT OF MEMBER

GRIMMER—A. K., of Temiskaming, Que. Born at St. Andrews, N.B., June 4th, 1882. Educ: B.A.I. 1905, M.Sc. 1907, University of N.B.; 1900-02, (summers) rodman and inspector N.B. Central Rly.; 1902-04 (summers), rodman and instr'man C.P.R. Western Lines; 1905, res. engr. York and Central Rys.; 1905-06, Lecturer Univ. of N.B.; 1906, res. engr. Filtration Plant, Fredericton, N.B.; 1906-09, City Engr. Fredericton; 1909-10, Lecturer, Univ. of Manitoba; 1910-15, City Engr. Medicine Hat; 1916-17, private practice, Consltg Engr., Fredericton; 1918-19, Supt., Bate, McMahon Co., on constrn Seaplane Stn., North Sydney, C.B. At present Town Engr. Temiskaming.

References: R. S. Lea, W. S. Lea, H. G. Hunter, R. DeL. French, L. A. Herdt, F. O. White, A. R. Crookshank.

REID—JOHN GARNET, of Lanigan, Sask. Born at Bruce Mines, Ont., May 13th, 1878. Educ., Ridley College, St. Catharines, Ont.; 1898-1902, rodman, C.N.R.; 1902-03, leveller, Algoma Central Rly.; 1903-08, instr'man (2 yrs.), res. engr. (3 yrs.), C.P.R. constrn. Western Lines; 1908-15, and May 1919 to date, asst. engr. C.P.R. constrn., Western Lines; 1915-19, overseas, joined C.O.R.C.C. as Major, promoted to Lt.-Col. Oct. 1916. Awarded D.S.O. 1918.

References: J. G. Sullivan, W. A. James, F. Lee, J. R. C. Macredie, J. A. Hesketh.

VAUGHAN—FRANK P. of St. John N.B. Born at Liverpool, England, June 3rd 1874., Educ: Regent College Southport, England, Lecture Courses at Institute of Technology Boston, Mass.; 1891-92 New Westminster & Barrard Inlet Tel. Co. Vancouver B.C.; 1892-95 B.C. District Telegraph & Tel. Co. Vancouver, B.C.; 1895-96 Yarmouth Street Rly. Co. Yarmouth N.S.; 1896-97 Northern, Electric Works St. John N.B.; 1897-99 G. M. Anglin & Co. Electrical Engineers, Boston Mass.; 1899-1900 Wilkinson & Co. Electrical Engrs. & Contractors Boston, Mass.; Lord Electric Co.; 1900-02 The General Electric Co., Schenectady, N.Y. Testing Dept.; 1902-06, Private Practice, Engineer and Contractor, St. John, N.B.; 1906 to date, Engineer and Manager, The Vaughan Electric Co. Ltd., Electrical Engrs., St. John, N.B. Has also done considerable experimental investigation in Wireless Telegraphy and Telephony and H.P. High Frequency Currents. (See Journal E.I.C., Dec. 1919.

References: R. W. Leonard, C. C. Kirby, G. G. Hare, A. Gray, C. McN. Steeves.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

LAMB—STANLEY ROMA, of Winnipeg, Man. Born at Edinburgh, Scotland, May 26th 1884. Educ: George Herriot's College, Edinburgh. Classes in gen'l engr'g subjects during ap'ticeship at Herriot Watt College Edinburgh; 1900-02, 3 yrs ap'tice in chief engr's office, North British Rly. Co., Edinburgh; 1905-09, with C.P.R. as rodman, field and office dftsman and instr'man on location and constrn.; 1910-14, and July 1919 to date, res. engr. in chge of constrn C.P.R. Western Lines; 1914-19, overseas, 2½ yrs Can. Engrs., 1 yr. special duty in chge all plans Ypres Salient buried cable system. Served 2½ yrs. as comm. officer Imperial Artillery.

References: J. R. C. Macredie, C. Flint, J. G. Reid H. W. Tye, C. R. Crysdale, W. A. James.

PRIEUR—HENRI, of Montreal, Que. Born at Montreal, Que., April 17th, 1893. Educ: 6 yrs. Classical Course St. Mary's College, 1 yr. 6 mos. Polytechnique School, Laval Univ.; 1910-12, with Boucher & Demers and Austen & Chapdelaine, Engrs. & Surveyors as rodman etc.; 1912-15, with City of Montreal, dftsman Sewerage Office; 1915 to date, with City of Montreal, Asst. Engr. Sewer Dept., General assistance on sewer constrn, estimating, investigating, preparing plans, reporting, etc.

References: E. F. Fusey, G. R. MacLeod, J. DeG. Beaubien, S. J. Fortin, R. E. Mercier, H. M. Goodman.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

CLARRY—ARTHUR REESER, of Kingston, Ont. Born at Locust Hill, Ont., Dec. 25th, 1891. Educ: B.A.Sc. Toronto, 1919; Inspector and Chemist for Imperial Ministry of Munitions during vacations 1916 and 1917; May to Oct. 1919, Asst. Chemist for Imperial Oil Co., Montreal Refinery; Instructor of Chemistry at the R.M.C. Kingston, term 1919-20.

References: P. Earnshaw, D. W. Munn, P. Gillespie, L. McK. Arkley, A. Macphail.

DEVERALL—EDWIN VICTOR, Capt. M. C., of Toronto, Ont. Born at Toronto, Ont., Aug. 19th, 1890. Educ: B.A.Sc. Toronto 1915; 1912 (5 mos.), dfting Russell Motor Car Co., Toronto; 1913 (5 mos.), structural detailing Hamilton Bridge Co. & Dominion Bridge Co.; 1914 (5 mos.), surveying, Dept. Roadways, Toronto; 1915-16, Structural Engr. Dominion Bridge Co., Toronto & Montreal; 1917-18, 62nd & 89th Field Co's Royal Engrs. as Lieut. & Capt., Awarded M.C. & Bar; 1919 to date, Structural Engr. with Dom. Bridge Co. Toronto.

References: P. Gillespie, C. R. Young, T. R. Loundon, G. E. Evans, J. W. Smith, W. W. Gunn.

EMREY—DESMOND JOSEPH, of Kingston, Ont. Born at Nevis, B.W.I., Oct. 19th, 1890. Educ: Undergrad. Queen's Univ., Cambridge Matric., I.C.S. (Railway Engr'g); 1911 (4 mos.), roding and levelling railroad constrn., St. Kitt's, B.W.I.; 1912, rodman and instr'man, Toronto Eastern Railroad Constrn.; 1912 (3 mos.), in chge reinforced concrete constrn St. Kitt's Nevis Sugar Factory Ltd.; 1913 transitman railroad location Hydro Electric Power Commission; 1914, dfting etc. with Sutcliffe & Neelands, Contractors, New Liskeard, Ont.; 4½ yrs. Can. Engrs.; At present attending College.

References: A. Macphail, W. P. Wilgar, W. L. Malcolm, K. Weatherbe, E. W. Neelands.

LYONS—EDWARD LESLIE, of Montreal, Que. Born at Kingston, Jamaica, Dec. 20th, 1892. Educ: B.Sc. McGill, 1915; 1913 (4 mos.), inspector on concrete constrn for Armstrong Whitworth & Co., Longueuil; 1914 (4 mos.), instr'man, Canadian China Clay Co., St. Remi D'Amherst, Que.; 1915-19, corporal with Can. Engrs., recommended for comm., March 1918 ,unable to return to England on account of March offensive; 1919 (June-Dec.), ass't. supt. on constrn & grading for Messrs. McDonald, Roy & O'Reilly, St. Remi D'Amherst.; At present with J. M. Robertson, Consltg. Engrs., Montreal.

References: J. M. Rolston, H. M. Mackay, C. M. M. McKergow, E. V. Gage, D. Bremner.

MacDONALD—CHARLES ALEXANDER, of Walkerville, Ont. Born at Duart, Ont., Oct. 15th, 1891. Educ: B.A.Sc. Toronto 1915; 1913-14, Junior Asst. on D. L. Survey north of Le Pas, Man.; 1½ yrs. District Fuse Gauge Inspector for Imperial Ministry of Munitions; 2 yrs. Comm. Officer in Royal Engrs.; At present factory engr. for Hiram Walker & Sons, Metal Products, Walkerville, Ont.

References: H. Thorne, J. E. Porter, C. R. McColl, M. E. Brian, F. S. Keith.

MacLEAN—NEIL JOHN, of Penticton, B.C. Born at Fourchu, N.S., Feb. h, 1879. Educ: 1 yr. Dalhousie University; 1900-01, instr'man on general municipal work, Sydney, N.S.; 1901-05, topog'r and instr'man on resurveys, location and constrn C.P.R. and other rlys.; 1906, transitman on location and res. engr. on constrn Kettle River Valley Ry., B.C.; 1907-09, mining and prospecting; 1910-14 and June 1919 to date, res. engr. on constrn Kettle River Valley Ry.; 1915-19, overseas with B.E.F.

References: A. McCulloch, H. L. Swan, H. Earle, C. J. McKenzie, F. R. Faulkner, A. P. Augustine.

WEIBEL—EMIL EDWIN, of Montreal, Que. Born at Philadelphia, Pa., Nov. 19th, 1896. Educ: B.Sc. McGill 1918; Summers, 1915-16-17, structural dfting Dom. Bridge Co., Lachine; Summer 1919, dfting, estimating and designing, Turbine Dept., D. B. Co., 1918 (4 mos.), private in U.S.A. Engr. Officers Training School; 1919 to date, estimating and designing on cranes, etc., mech. dept., Dom. Bridge Co.

References: G. E. Bell, F. Newell, E. C. Gaines, A. R. Roberts, E. Brown.

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Progress in Aviation

J. A. Wilson, A.M.E.I.C., Member of the Air Board of Canada.

Before dealing with developments in Canada, it will be as well to consider for a few minutes what has been achieved elsewhere.

The rate of progress of heavier than air machines has been that of the development of suitable engines. It is not too much to say that flying waited fifty years before accomplishment, for the development of a light enough engine to make it possible to fly. The principles of flight were fully known long before Langley and Wright made their first flights. Further progress is dependent on the same factor. Though the Wrights flew in 1903, yet it was 1908 before any progress was made. Earlier machines had to be launched, they could not get off unaided. In that year the Antoinette and Anzani engines were produced and real progress commenced. In July, 1909, Bleriot flew the Channel and in August the Gnome rotary engine was produced in France. This halved the weight per H.P. of any existing engine and though not very reliable at first and extremely wasteful of fuel and oil, it enabled anything in the shape of an aeroplane to fly as long as it kept running. Once the engine problem was solved progress became rapid and continuous. Engine weights of ten or even fifteen pounds per H.P. have been quickly reduced to 1.5 pounds or less and today a small fast machine will not weigh more all told with fuel and pilot up than did the pre-war engine alone, i.e., about five or six pounds per H.P.

"Rotary" Type Aero Engine Le Rhone 110 H.P.

Read before Ottawa Branch, The Engineering Institute of Canada, Feb. 12th, 19[illegible]

The Present-Day Aero Engine

Aero engines today generally are of two main types. The rotary in which the cylinders themselves revolve round a fixed crank and carry the air screw with them. This type is only suitable for small powers up to 150 H.P. at the most up to the present, is fairly reliable, very light, but not very efficient as regards fuel consumption or lubricants. The Gnome, Le Rhone and Clerget are the best known types. They are all air-cooled and were used in scout machines where lightness was the great object to be obtained. The weight per H.P. obtained from these engines today is: Gnome 2.7 pounds, Le Rhone 3 pounds, Clerget 3 pounds.

In the other group the cylinders are stationary, the pistons drive, through a connecting rod, a revolving crank shaft to which is fixed, either direct or through gearing, the air screw. The original stationary engine was the ordinary vertical automobile engine. In the endeavour to gain power per crank the "VEE" engine has been evolved with 2 cylinders working on the same crank, and the "Broad Arrow" having 3 cylinders acting on the same crank. Certain other types having 4 cylinders in the same vertical plane and, finally, the Radial Engine in which many stationary cylinders are arranged round a common crank. With the exception of the Radial which is air cooled, (though there is now a water cooled radial made by the Fiat Company on the market,) the others are water cooled. The best known types are Vertical, Beardmore, Siddely; "Vee" Rolls-Royce, Sunbeam, Liberty; "Broad Arrow", — Napier "Lion": Radial,—Cosmos, & A.B.C.

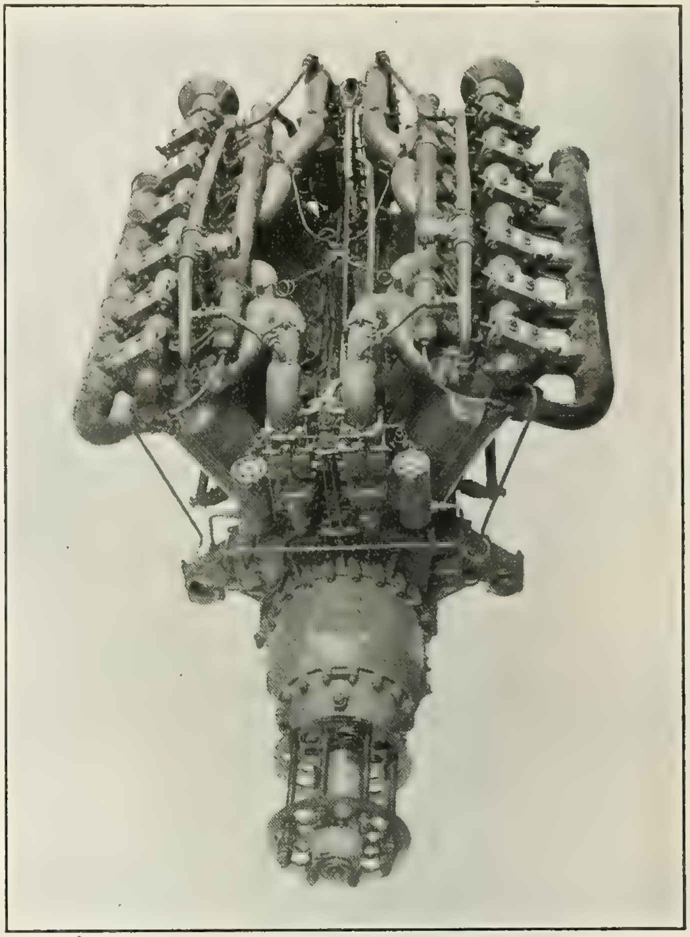
The water cooled engines weigh about an average of from 3-3½ lbs. per H.P.; the Radials are as light as 1.7 lbs. for the 300 H.P. "Cosmos", 1.4 lbs. for the 500 H.P. type. Another advantage of the Radial is its short shaft length as compared with the Vertical or "V" types. Air cooled engines save of course, not only the weight of the water, but of the radiator and somewhat complicated circulation system and have the advantage of simplicity and fewer "gadgets" to get out of order. Full economy varies a good deal, a really first class engine in good order uses about 1 gallon for every 15 or 16 H.P. per hour running at normal speed.

Factors in Design

Perhaps the heaviest loading per H.P. with which a modern machine could fly is about 40 pounds per H.P. This would leave no margin, however, for climbing and is extreme. About 25 pounds per H.P. would be the most which could be used in actual practice and that only with a large slow weight—carrying machine of considerable wing area.

The complementary factor to weight per H.P. is weight per square foot of flying surface. This also varies considerably, from as little as five pounds per square foot to as much as fifteen. Under present designs the maximum loading possible is about twenty pounds per square foot.

The third factor in design is the form and size of the wing area and the angle of incidence; all design is a compromise between these factors and resolves itself into how to design your machine so that you can carry the greatest weight the farthest distance at the best speed for the least H.P. That success has attended the solution of these problems in all directions will be seen from consideration of the following flights:—



"Vee Type Aero Engine
"Rolls-Royce" Eagle VIII 360 H.P.

Record Flights

Speed: Nieuport Biplane, 300 H.P. Hispano Suiza engine, 190 miles per hour. This speed was actually made, but the conditions are unknown. Speeds of 150 miles per hour in an enclosed circuit were officially recorded by an "Airco" Machine.

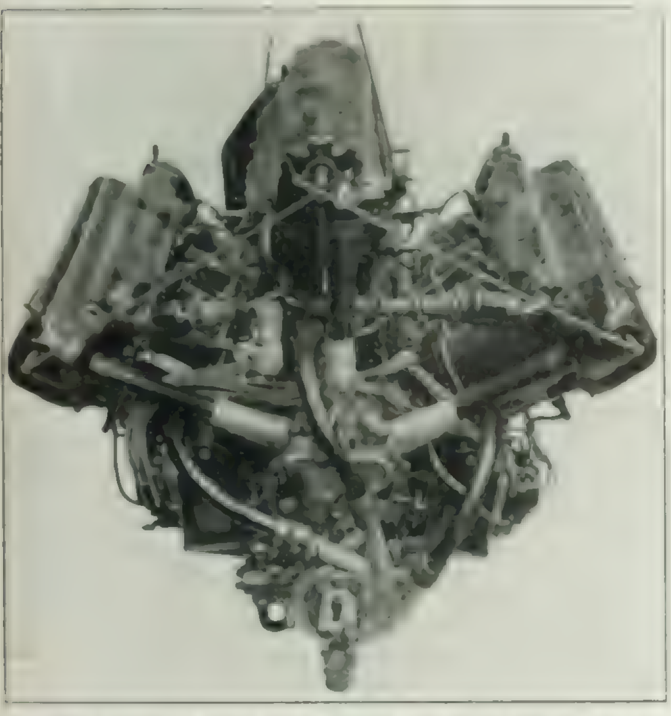
Height: "Airco" Machine, 450 H.P. Napier-"Lion" engine, 30,500 ft. A height of 34,600 has lately been reported by an American machine—Curtiss "Wasp"—but has not been officially authenticated so far.

Longest continuous flight: England to Australia, distance 11,500 miles.

Trans-Atlantic flight: Vickers' "Vimy", time 16 hours, distance 1,890 miles, non-stop, Rolls-Royce engines. It is understood that in this case enough fuel was left after that accomplishment to make another 600 or 700 miles. (This is not the greatest duration flight, the record for which was made by a Hun machine in pre-war days of over 21 hours. This performance has never to my knowledge been beaten.)

The Trans-Atlantic flight though proving the reliability of the engines and the skill of the navigator and pilot, was useless as regards showing commercial possibilities as the whole useful load was taken by fuel.

The Australian flight, taken by short stages, was a much more useful test as it showed the reliability of the machine to fly, day after day, moderate distances under varying conditions.



"Broad Arrow" Type Aero Engine Napier "Lion" 450 H.P.

Long Distance Flights in the Future

The long distance routes of the future will be covered in moderate sections of from 200 to 400 miles, each machine doing its own section, just as in railway locomotive practice today.

The pilots will also be confined to sections with which they will become thoroughly familiar under all weather conditions and the passengers and freight will be transferred from machine to machine at each stopping place. The endurance of the crews and machines will not, therefore, be put to any extraordinary strain and the service will be capable of being run at much greater speed and without lengthy stops. The time taken for the Australian flight was 28 days, but the actual flying time was, it is understood, about 6 days only.

With a proper ground organization and relays of machines available the flight could be made normally in that time.

The Vickers' "Vimy" weighs empty 7,100 pounds, fully loaded 12,500 and has a normal capacity for cargo or passengers of 2,100 pounds, the balance being fuel, oil, etc.

These records are the highest achievements which have so far been attained, but that they are by no means exceptional or that similar machines could not make equal records at any time is certain. What is holding back aviation is solely the lack of ground organization which takes time and money to provide. Once air routes are laid out and equipped, records such as these will become everyday performances. Where the ground organization is in existence regular services run with surprising regularity and safety.

London-Paris — London-Brussels Services

The London-Paris and Brussels mail and passenger services have been running for some months now. They have proved their ability to operate this service under most adverse weather conditions, and have made the cross channel flight several times when no steamers could cross. So far they have had one serious accident only with the loss of one life. The "Airco's" mileage is now over 60,000 miles, flown at an average speed of 100 miles per hour. The time taken is usually about 2¼ hours. This is by no means the record, however, as during the Peace Conference a Martinsyde machine crossed in 75 minutes with despatches. The time by train and boat service is about eight hours.

The Handley Page Services have carried during October, November and December 900 passengers, 45,000 lbs. of freight, and have a mileage of 62,000 miles. No accident has occurred during these flights. During the first six months of civil flying, in over 100,000 flying hours there were only thirteen accidents and two fatalities in Great Britain. Considering the lack of experience and imperfect organization this shows the comparative safety of modern flying. Accidents are known in other forms of transportation too. Even Canadian railways have been known to kill their passengers, and motor cars also.

These services were carried on at first by converted war machines, but special types designed for the service are now on all routes.

The new Handley-Page machine "W.8" with two 450 "Lion" engines on her trial trip made the passage in one hour and fifty minutes, flying to Paris to be exhibited in the Aero Exhibition there.

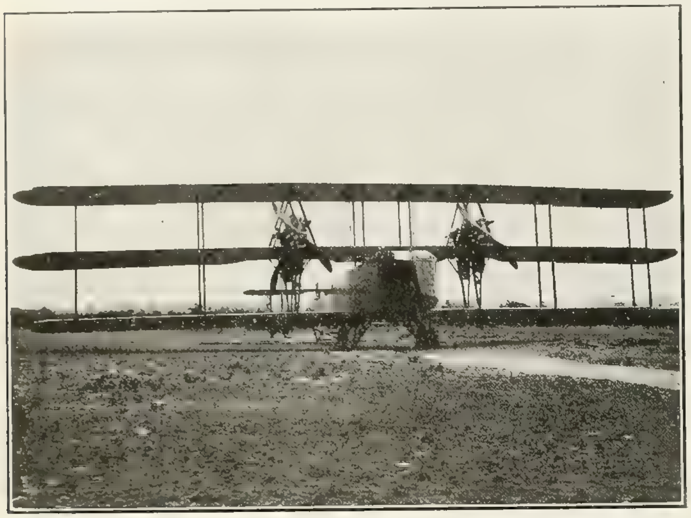
Other commercial machines are coming into use rapidly. One other excellent record might be cited, that of the Alliance "P.3", eleven seater, which made the London-Madrid non-stop flight recently, 900 miles in 7½ hours. This machine can carry eleven passengers or one ton of mail or express matter. The cost of fuel during this flight was 15 cents per mile.

The successful operation of the mail services in the United States show also what can be done in the way of regularity of service, freedom from accident and cheapness of operation.

Mr. Holt Thomas of the "Airco" is prepared to carry mails at one penny an ounce if guaranteed 400 lbs.

each trip, London-Paris, 250 miles in two hours; one halfpenny an ounce if guaranteed 800 lbs. per trip and Express matter at one shilling and four pence per lb. if guaranteed 2000 lbs. per trip. The present "grande vitesse" rate by train and boat is one shilling and six pence per lb. and takes 24 hours in delivery. This will give some idea of the commercial feasibility of air mails.

The progress up to date appears to show that with sound ground organization commercial flight has already a future. When one considers that flight itself is only really about fifteen years old and it has had only one year of real development, and that year one of re-organization, it is astonishing what has been done in the way of commercial progress.



"Bristol" Triplane Bomber, Four "Liberty" Engines.

Engine Improvement

Though progress has been rapid, yet there is no doubt that even greater progress will be made in the near future. Along what lines is progress most required? First, there is the question of engine reliability, efficiency and economy. With heavier than air machines which depend solely on their engines to keep them in flight, this is of course the first essential. There is no doubt but that progress is being made in this direction and that the aero engine will soon have attained the reliability of its parent the automobile engine. Further improvements are being sought along the lines of the use of a cheaper fuel, and in other directions. The development will be gradual and may be in a totally new direction. That it will come is undoubted.

Landing Speed

The next great drawback to be overcome is the high landing speed of present day machines. The average landing speed is perhaps from forty to fifty miles per hour, and faster machines require greater speeds. This means necessarily a large space for an aerodrome and also a perfect surface. The solution of this problem is urgent. Large prizes are already offered, for instance, M. Michilin has offered $100,000. for a machine with a flying speed range of from 6 to 125 miles per hour. The Imperial Government in their $350,000 prize competition make a feature of low landing speeds. This is largely a problem of varying the size or shape of the wings and angle of incidence.

The All-Metal Aeroplane

Another improvement which will be of great benefit to the progress of the aeroplane will be the substitution of metal for wood and fabric. Wood, though possessing so many excellent qualities is much affected by climate, and machines made of wood require constant re-rigging and adjustment.

The development of the all-metal plane is coming fast. A machine with a metal framework of rolled steel of suitable sections was shown by Messrs. Boulton and Paul at the recent show, which is 25% lighter than a similar wooden machine, and has a greater strength. The frame-work is filled in with a special fibre sheet which is water and fire proof. A great deal of work has been done by this firm and others, and there is no doubt that the present rapid rate of depreciation of machines could be greatly lessened by the adoption of metal and fibre structures.

Then too, there is the very old question of the Helicopter. The idea of rising vertically in the air by means of the lift of an air screw revolving horizontally is a very old one and is the subject of constant experiment. It does not seem very vital today, however, as it would appear that it is being solved naturally by the increased ability to climb of the modern machines. I think the official climb record stands at 10,000 ft. in six minutes 19 seconds, made by the Bristol-Rolls machine over a year ago. This must have been beaten many times by now, however, and I read the other day of a new machine doing 10,000 ft. in two minutes. If this is correct the helicopter has already arrived by natural evolution. My source in this case is not very trustworthy, I am sorry to say. I read it in an American flying paper!

The aeroplane of today beats the bird at its own game. It can climb and travel far faster and over much greater distances. It can loop, spin, roll and dive as no bird can. The best of our pilots have the flying instinct. Where the bird has the advantage is its power to fold and spread its wings and flex them at will. This power would give us what we still require, greater range of speed and manoeuvrability.

Until these problems are satisfactorily solved, it does not appear that much further development can be expected in the way of larger land machines. These were, of course, very highly developed during the war and the progress since made has been more in the line of the adoption of present designs to commercial work. Passenger bodies are now most comfortable, just as much so as a limousine body, and having in the larger types much more room.

The Flying Boat

The development of the flying boat had not reached so high a point in 1918, when the war stopped. Its development is of great interest to Canada, as in a great

"Phœnix Cork" Flying Boat, two Rolls-Royce Eagle Engines
The English Electric Co.

part of our country its use is most suitable because of our great inland waterways and many lakes. Its use for communication in the West Indies and South Pacific Islands would be of great benefit to these scattered communities. Three machines, larger than any existing heavier than air machines, are now under construction for the Air Ministry in Great Britain, of 160 ft. span with 60 ft. hulls and 2,400 H.P. engines. They are biplanes of wooden construction. A still larger all metal machine is being built. Its dimensions are: span 220 ft., length of hull, 100 ft., toal weight, 50 tons, useful load, 23 tons. H.P. 5,200, eight 650 Rolls-Royce engines, each pair driving an 21 ft. air screw. Its maximum speed will be 100 miles per hour and cruising speed 80, at which speed it will have a radius of 24 hours. This, of course, is very much the largest heavier-than-air machine ever attempted and its success will be watched with great interest. There is no doubt that a great future lies before the flying boat and with machines of this size and power under construction you will easily understand that it has passed its infancy and is no longer a toy or a fad, but a fact which has to be reckoned with in the transportation world so far as passenger and express matter is concerned.

The Airship

We will now consider for a moment lighter-than-air craft. The proportion of useful lift, that is lift available for fuel, cargo and crew, to the gross lift is much higher in Airships than in Aeroplanes. In the former about 60 per cent, in the latter 33 per cent. The unfortunate property of structures that their strength varies inversely as their length is true of both airships and aeroplanes. The latter, however, are dependent on their lift for an area, that is a square quantity, whereas the former is dependent for its lift on cubic capacity. For instance, a 10 million cubic foot dirigible would have five times the total lift of a 2 million foot airship, but the length of the structure would only be 1.7 times as great. The gross lift of a 10 million cubic foot airship would be in the neighborhood of 300 tons of which 200 would be disposable lift and at a cruising speed of 40 miles an hour would have an endurance of approximately three weeks. Its ceiling could be some 20,000 feet and range 20,000 miles. Great endurance and range can be achieved in a large type because, contrary to heavier than air machines, the characteristics of lighter than air machines are governed by two factors: (1) the lift is in proportion to its cubic capacity, (2) all fuel is used for propulsion and not as in the case of a heavier than air craft for maintaining the structure in the air.

It would appear to follow that the advantage of the heavier than air machine will remain in the future as at present, high speed, rendering it independent of all weather conditions except the very worst, moderate capacity and range and handiness, and that the characteristics of the lighter than air machine of the future will be moderate speed, great endurance and large lifting capacity.

R. 33 and R. 34 are the best known types of this class, as one of them made the Trans-Atlantic voyage last August. They are 640 ft. long, 79 ft. in diameter, and have a capacity of two million c. ft. They have five 275 H.P. engines. The net weight of the ship is 26.5 tons and the disposable lift for crew, fuel, cargo and ballast 29 tons. The maximum speed is 62 miles per hour and cruising speed 45 miles per hour.

These machines are no larger or more efficient than the German "Zeps", and credit must be given to the Huns to whom the progress made is largely due.

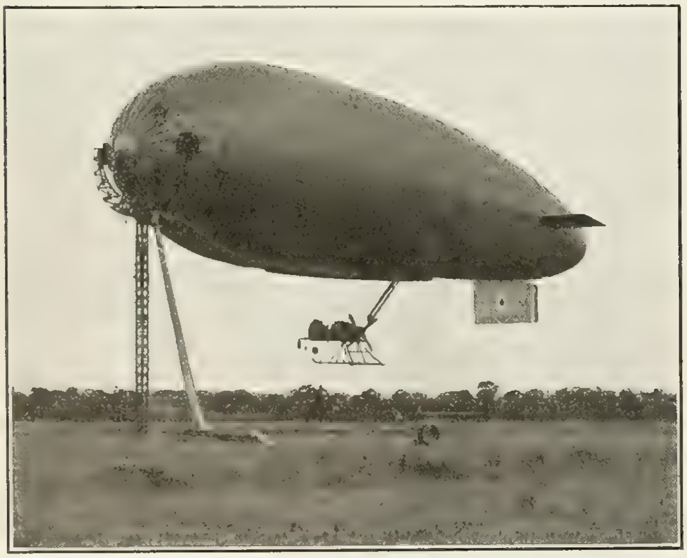
The cost of construction and operation of such machine is, of course, heavy, and this has led the Imperial Government to enter into negotiations for the continuance of the development of the type, which under present financial circumstances it does not wish to assume, to commercial firms, and for commercial purposes. That such services are not practical cannot be maintained. In Germany between 1910-1912 a German company ran a lighter-than-air ship service. In 800 trips lasting 1,600 hours and making a mileage of 102,000 they carried over 17,000 passengers. The capacity of these ships was 20 passengers and the fittings were most luxurious. The trips were of about three hours' duration and the fare was 100 marks, or about $20.00 a trip, including lunch served on board. They made a profit and the trips were booked days ahead, so popular was the service. The Hun has not been idle since the armistice and a new Zep. the "Boden See" was running passenger services last fall. Eight years have seen a tremendous development and modern machines are much more efficient.

Costs of Air Services

The estimated cost of a big rigid airship service with four 3½ million c. ft. ships has been worked out on the following basis:

Capital required £2,600,000. Taking 200 trips per year between London and New York the cost per passenger mile would be 4 pence, and mail rate 3 pence per ounce. Of the total cost 25% would be operating and 75% overhead. Overhead is a very big factor in all flying costs.

The expense of maintaining rigid airship stations is, of course, very considerable. Not only do they require very large landing grounds, but the hangars required for their building and housing are very large and costly structures. The operation of taking a machine from its shed, taking off, landing and rehousing requires at present a very large personnel. Experiments have been under way for many months with a view to lessening the numbers required and the difficulties and risks involved in handling machines from the ground. With this in view a mooring mast with a swivel top to which machines may be moored in the open has been designed by Vickers Limited. A series of experiments extending over many months have been made with these mooring masts with different types of machines, rigid and non-rigid. The results are extremely satisfactory and that both types of machines have remained out for months moored to such masts in all weather without accident and with remarkably little deterioration in the fabric of the machines. The process of mooring is accomplished by throwing out from the airship a cable which is connected with another leading from the top of the mast, the slack is then taken in and the airship drawn to her mooring at the swivel top, by means of a winch, where she is made fast. The bow only is made fast and the body swings with the wind, the swivel mast head allowing the ship movement in any horizontal direction. The trimming of the machine, of course, requires careful attention. This is accomplished by filling or emptying her ballast tanks. The problem of landing and taking off appears to have been satisfactorily solved by this device and the experience obtained to show that airships need not be taken to their hangars except for general overhaul just as at present ships are taken to drydock periodically.



Admiralty Small "S.S." type airship, Rolls-Royce "Hawk" Engine.
Illustrating method of mooring to steel mast in open.

Airships and Canada

The development of these large machines with a view to the establishment of a regular trans-Atlantic service is of course of very great importance to Canada. Owing to her northerly position the shortest routes across the Atlantic and Pacific Oceans are both via Canada. Very strong westerly winds prevail on the North Atlantic, amounting, it is said, to as much as an average all the year round of from 15 to 17 miles per hour. Westward flight from Europe to Canada will be handicapped to this extent and it may therefore pay to take a more southerly route and thus obtain more favourable winds, which will help rather than retard the progress of the airship and thus shorten the passage materially. Preliminary examination of the possibilities of the trans-Atlantic Service, it is understood, lead to the conclusion that southerly route from London towards the Portugese Coast, then westwards towards the Azores and striking the American continent in the neighbourhood of Florida or Virginia would prove the most feasible route for the westward journey, making it 600 miles further, i.e. equal to a contrary wind of 10 miles per hour on the direct route. Going eastward, of course, from New York, Montreal or any northern point the full benefit of the westerly winds would be obtained.

If, when the service is established, these proposals are carried out, no efforts should be spared to obtain the northern terminus for eastward passage for a Canadian Station; it follows, therefore, that it will be most desirable for Canada to follow very closely the development of lighter-than-air craft and to keep in close touch with the proposed commercial organization, with a view to taking the necessary action when the time comes to obtain the northern terminus of the service for Canada.

Turning now to Canada and conditions in this country; there has been up to date practically no civil flying in this country. Though a good deal of work was done in the early days by Mr. Graham Bell at Baddeck, N.S., and Messrs. Baldwin and McCurdy, there has been no continuous development. This was due to the war and the stoppage of all private effort while it lasted.

The year which has elapsed "since this devastating peace broke out" as a well known airman termed it, has not been an idle one.

The Air Board of Canada

Legislation was passed in June, 1919, creating an Air Board for the regulation of aeronautics in Canada. The Board was given undivided jurisdiction over the subject. This, undoubtedly, was the wisest solution in Canada of a rather vexed problem, discussion over which is raging at present in the United States and over which there has been in the past and still is much controversy in the Old Country. The alternative meant the creation of at least three bodies to deal with the military, naval and civil operations. The composition of the Air Board is as follows:—

A Chairman, who must be a Minister of the Crown, a Vice-Chairman, who will be the chief executive officer of the Department, a military and a naval representative, and from one to three other members.

The Vice-Chairman, Colonel Biggar, was a member of the Canadian delegation to the Peace Conference and represented Canada on the committee which drew up the International Air Convention and had a unique opportunity while on that Board of studying the legislation required for the proper regulation of flying.

The Board was instituted in July last, and since then has been active in all directions. The Air Regulations for Canada were promulgated last month, and I think I am correct in saying that the only other country in the world to adopt a formal Air Code is Great Britain.

Civil flying divides itself naturally into two branches: (1) the traffic end, including the carriage of passengers, mails, express matter and communications generally; (2) co-operation with existing Government services, forests patrols, auxiliary work in connection with surveys, North West Mounted Police, fishery protection, explorations, and so on.

It is felt that the first group, the traffic end, is already performed by agencies in the commercial world and should be left in the beginning at any rate to commercial companies which we desire to encourage in every possible way, and that the second group of operations, which are now almost wholly performed by the Government, would provide more than sufficient scope for a government flying service on civilian lines and in co-operation with existing government services. A preliminary survey of the whole of Canada has been made with a view to determining the most necessary and practical operations in which the Government was interested, in order that a start in operations might be made this spring. The result of this survey has already been the subject of a preliminary conference with the officers of other interested departments. The following extract from the agenda of the Interdepartmental Conference shows scheme of development considered by the Board most likely to give the best results:—

The Field for Air Service

"The immediate field for air service seems to lie rather in the direction of securing access by air to districts not easily reached by ground transport facilities, and of obtaining information not readily obtainable by investigations on the ground. It is therefore thought that the less well settled and less thoroughly explored parts of Canada offer the most favourable areas for the immediate development of air services. In most of these areas the number of bodies of water makes the provision of aerodromes unnecessary, except between seasons, and, where the water is not present, the surface of the ground is often of such a character that the landing of flying machines presents no difficulty.

In almost no part of Canada will winter conditions prevent flying. They will not even seriously interfere with it when operations are carried out from properly equipped stations. From the slender information now available it is thought that the number of non-flying days is not likely to exceed five in any month, but experiments have to be carried out to determine whether or not this estimate is too optimistic.

The range from a given air station will generally be somewhat in excess of 150 miles, but work this range will sometimes involve the establishment of sub-stations with re-fuelling facilities.

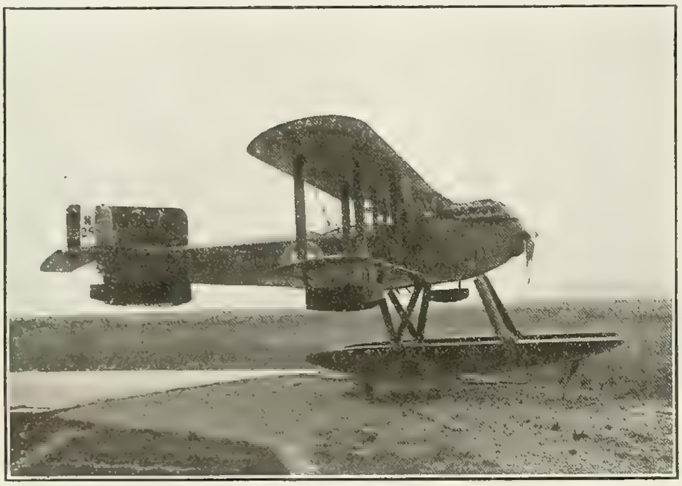
The question whether stations can usefully be opened and economically operated depends upon the combination of duties which can be carried on from them and the extent to which Departments of the Government can, in combination, provide the appropriations necessary for their establishment and maintenance."

The cost of flying is given by [illegible] at from $1.00 to $1.50 per mile; this covers the ground organization necessary, and overhead and depreciation as well. Discussions as to costs of operation and feasibility of the various proposals put before us are now under way and it is hoped that a beginning may be made at several of the stations during the coming season. Flying, of course, is at present expensive and the extent of the operations to be undertaken are limited by the amount of money which can be spared. This is, under present circumstances, probably a strictly limited amount. The opening of three or four stations for useful work this summer would enable the Board to gain experience in what, after all, is still an untried field and to ascertain definitely the cost of operating and the possibilities of successful operation. If the stations are found to operate to advantage, the service could be extended in later years as funds permit. Very many interesting proposals have been suggested by different branches of the Government Service for the consideration of our officers. Perhaps the most feasible is the work which might be done in co-operation with the present forestry services, Provincial and Dominion.

Forest Protective Service

An experiment in this work was carried out last year by the St. Maurice Forest Protective Association, thanks to the initiative of Mr. Elwood Wilson, and owing to the interest in the scheme of Mr. Ballantyne and Mr. Desbarats, Minister and Deputy Minister of the Naval Service, machines were lent free of charge for the purpose. They were not available until July, when the season of greatest fire hazard was already past, yet the experience gained there showed conclusively that with proper co-operation with existing ground patrols an air patrol could be of the greatest benefit in forestry work. Flying was carried out until well on in October, when operations were no longer required. The type of machine used was the H.S.2L Single Engine "Liberty" 400 H.P. Curtiss Flying Boat with a capacity of 1000 pounds useful load. Over 6000 miles were flown without accident and with only one forced landing during the season, and that, I think, on the first or second flight attempted. A range of vision of at least forty miles is easily obtainable on a clear day and as the machine can make seventy miles an hour, a flight out and home of 150 miles each way covers an immense area. A fire pump and 1200 feet of hose can be carried in the machine and landed near the seat of any fire. This type of machine is, of course, only suitable for use where there are lakes scattered throughout the territory to be patrolled. This condition of affairs exists practically throughout the whole of eastern and northern Canada and until landing grounds are provided there is no doubt that the flying boat and seaplane provide an immediate solution without waiting for the provision of aerodromes which is bound to be a slower business.

To show what can be done in cross country flying one only needs to instance the route taken by these machines from Halifax to Grand-Mere, across Nova Scotia from Halifax to Windsor, down the Bay of Fundy to St. John, up the St. John River and across the height of land to Fraserville on the St. Lawrence, then up the St. Lawrence to Three Rivers and up the St. Maurice River to Grand-Mere. The pilot informed me that he was never out of reach of a safe landing, the whole time at 5000 feet altitude. These two flights are perhaps the best cross country flights that have ever been made in water machines and show the possibilities of this type of machine for use in a country such as Canada very clearly.



"Fairey 3C" Seaplane (Rolls-Royce Engine "Eagle".)

Lumber Companies and the Aeroplane

I am glad to say that the lumber companies are taking an active interest in this experiment and that steps are being taken by several of the largest firms to obtain their own machines, not so much, I understand from the view of protection against fire, but for better transportation within their limits. Trips which took their superintendents, foremen and workmen days or even weeks to cover, can be performed by air in an hour or two. The companies are quick to realize the possibilities of increased control and better transportation facilities. Fire patrols will undoubtedly be carried on throughout all forest country within the next few years. It is not expected that they will entirely supersede the existing ground organization, but will supplement it. Patrolling huge areas of forest country from the ground is a difficult problem and lumberman are the first to admit that the present system is expensive and in the remoter parts of the country inefficient. A very well known lumberman told me the other day that last spring more than ten square miles of the finest timber in Eastern Canada was destroyed and that their company did not learn of its destruction for many weeks. The loss is estimated at many millions of dollars. That such a condition of affairs could exist with an efficient air patrol is inconceivable. The fire loss exceeds the growth in many forest reserves, and there is no doubt that the conservation of the forest resources, which are today one of the chief assets of Canada can be immensely strengthened by the installation of air patrols during the fire season.

There has been a lot of talk about aerial surveys. The problem has been dealt with by men more capable of judging its possibilities than I am. It appears to me, however, that aerial photography can never supersede the ground survey, but that it can, once ground control is established be of very great assistance in filling in the detail. It will undoubtedly come into use as has phototopography. In exploratory work it will be undoubtedly of great value in showing the nature of a country, the shape of its main physical features, even though it may be possible to fix them with absolute accuracy.

In opening up our north country, which is a task for the present and coming generation, the air will undoubtedly play an important part. No part of Continental Canada is more than one day's flight from present communications.

Gift from Imperial Government

That the Air Board can contemplate such operations is largely due to the generosity of the Imperial Air Ministry. They have made a gift to Canada of very great value indeed. Of their generosity, offers of assistance and sympathy in our endeavours, it is impossible to speak too highly. We have now being shipped from England machines and equipment, the value of which is not less than $7,000,000.

The possibilities of rapid inter-communication between our cities opens up a tremendous field for aviation. There is no doubt that in a few years' time when people become more accustomed to the idea of travelling by air, this will be a quite common mode of travel and will reduce very materially long tedious journeys. For instance, instead of taking the thirty hours required at present for the journey from Montreal to Halifax, a business man will save a day by taking the 500 mile direct trip by air in six hours, and as the Governor-General remarked the other day, one soon will be able to breakfast in Montreal, arrive in Winnipeg in time for supper, and go on to Vancouver next day if he does not care for night travelling by air. Safe, regular and efficient travel by air depends as much on a good ground organization as on a good flying machine and pilot. The necessity of providing Air Harbours and landing grounds throughout the country is obvious. Before regular services can be run, this is essential. It is hoped that once the public becomes educated to air travel just as it has become educated to motor travel "Good aerodromes" will be the slogan in ten years just as "good roads" is at present.

It is hoped that all municipalities will take steps to assist in the provision of air harbours. Their provision by the Dominion Government cannot be contemplated for a moment because of the cost.

Future Development

Air travel will always be more expensive than travel by land or sea, and the carriage of bulky and heavy freight and ordinary passenger traffic cannot be contemplated. That there is room for another though more expensive and quicker form of travel is undoubted and it will come in a very few years if present progress is maintained. A vast and undeveloped country provides an opportunity for useful and profitable experiment and there is every reason to hope that in a few years Canada will lead the world in flying. Certainly no other country presents such opportunities for aviation. We have a suitable climate, a suitable country; our pilots have shown themselves to be second to none and it is up to our engineers to take their part in the great development of aerial transport. The British Empire today leads the world in aerial work, in design, manufacture and operation. We must be first in the air, as we are at sea. Owing to the small extent and bad climate of Great Britain, her operations cannot be confined to the Old Country, but must spread over the world. The Dominions offer an unsurpassed field for air work. Canada's name is first in air war work. She has shown vision and boldness in her railway and canal development. She is now creating a mercantile marine and becoming a sea power. In the air she will also take that rightful place in time of peace her pilots earned in war.

Legislation in New Brunswick

(Retiring Address)

C. C. Kirby, M.E.I.C., Chairman, St. John Branch, 1919-20.

I wish to express my regret at being unable to be present at the Second Annual Meeting of the St. John Branch of *The Engineering Institute of Canada* and in doing so I also desire to acknowledge the honour which has fallen upon me during the past year of acting as Chairman of the Branch. The onerous duties of this office have been greatly lightened by the enthusiastic energy of the Secretary, Mr. Crookshank, and the members of the Executive Committee. The success of the Maritime Professionial Meeting in September last was in no small measure due to the activities of the Executive Committee and those other members who were called upon to act on the Special Committee. The support of the members of this Branch for the Maritime Meeting to be held in Halifax in October next is strongly urged, and any member who is willing to contribute to the programme of papers to be read at that meeting should advise the Executive Committee to that effect at the earliest possible date.

The formation of a Branch of *The Institute* at Moncton is to be urged by the General Secretary in the near future. All members of this Branch who come in contact with Moncton Members should support this idea by urging its fulfillment so that the activities of the Members in the Province may be more wide spread.

Since our last annual meeting, one of the main objects of recent years has been attained by the passing of Legislation in the Province creating the Association of Professional Engineers of New Brunswick vested with powers to regulate the practice of the engineering profession. The main objects of this Legislature are to improve the status of the engineer in the community and thereby obtain greater recognition and consequent better remuneration for services rendered, and to afford protection to the public by defining what a Professional Engineer is and who shall be entitled to act as such. It is of course, encumbent upon all engineers in this Province, as loyal citizens, to become registered members of this Association and to assist in every way in accomplishing the results aimed at. The Members of *The Engineering Institute* throughout the province will be looked to, to take the lead in this matter as it is a development of the spirit of loyalty to the profession which they have already displayed in the past by their membership in and active support of *The Institute.*

Just what effect the existence of the new Association, with its compulsory membership and annual dues, will have upon the future success of *The Engineering Institute of Canada* is problematical at the present time. A considerable number of Members, among whom are some of the leaders of the E.I.C., have expressed grave fears of the effect upon the fortunes of the E.I.C., which may result from the disposition of a large number of men to allow their membership to lapse with the idea that membership in the Provincial Association will be all that is required to give them a status as engineers. That this will be the case with some men is undoubtedly true but it should be borne in mind that the functions of the two bodies are quite different and do not conflict with one another. In my opinion the success of the E.I.C. has been in spite of its inability to confer status, as it has been in this last capacity that it has been most lacking. This is due to the fact that non-membership has never been recognized by the Public as in any way a reflection upon the merits or worth of any person. The chief function which the E.I.C. has played and will continue to play is that of—

> "Facilitating the acquirement and interchange of Professional knowledge among its members, the encouragement of its original research, the development and maintenance of high standards in the profession and the enhancement of the usefulness of the profession to the public."

Retiring address at the annual meeting of the St. John Branch, The Engineering Institute of Canada, May 6th, 1920.

That the development of the E.I.C. along the lines of Branch organization closely in touch with other branches throughout the Dominion and with the Head Office in Montreal, will be the means of its continued success is most likely, as it thus presents opportunities of great value for real service to its members in technical, social and financial ways.

The Provincial Association under the new legislation conveys the legal recognition of the Profession which is the backbone of the proper relationship with the public, whereas the E.I.C. provides for the desirable and necessary recognition among men of our own profession.

Both of these organizations deserve the support of all engineers. The great majority of engineers rely for their advancement upon engineers in the same service who are their superior officers. Membership in the Provincial Association is the minimum requirement which all must possess except in the junior positions; membership in the E.I.C. and advancement through its different grades will continue to be the standard of merit within the profession which will be looked for.

In conclusion I wish to thank the members of the Branch for their support during the past year and appeal for their continued support to the Branch even to a greater extent in the future.

The St. Maurice River Regulation and the Gouin Dam

Olivier Lefebvre, A.M.E.I.C., Chief Engineer of The Quebec Streams Commission.

The rivers of the Province of Quebec are generally subject to large fluctuations in the volumes of their daily discharge. The ratio between maximum and minimum discharges varies for each river. It is sometimes fifty to one, and has reached three hundred to one on the Chaudière river. On the river St. Francis, it is about thirty to one at Richmond. On the St. Lawrence river, owing to the natural reservoirs formed by the Great Lakes, the ratio between maximum and minimum is nearly two to one. On the St. Maurice river, at Shawinigan, it is about thirty-five to one under natural conditions.

The purpose of flow regulation is to decrease the maximum flow and increase the minimum. Perfect regulation, that is uniform flow throughout the year, is not obtainable, but is the aim of storage reservoirs.

This policy has been advocated in this province, both by the Government and by companies interested in the generation of hydro-power. The advantages to be derived from this policy were so plain that no opposition was shown towards it.

St. Maurice River

The St. Maurice River is one of the tributaries of the St. Lawrence river, into which it flows at Three Rivers. It runs from north-west to south-east, across the Laurentides, and takes its rise in a series of lakes located at an altitute of about 1,300 feet above mean sea level. The river is approximately 367 miles long. Its drainage area is 17,000 square miles,—most of it being under forest cover. Farming is carried out on a large scale in the lower part of the river valley, between Grand'Mère and the St. Lawrence. The country through which it runs is very mountainous, and it is cut up by numerous tributary streams and deep gullies.

Timber is the principal resource along this river, the cut this year will amount to 600,000 cords. When one mentions the fact that the average yield of an acre is six to ten cords, an idea may be had of the area over which such a large cut was made.

Read before Montreal Branch, The Engineering Institute of Canada, April 15th, 1920.

The river runs through the towns of Shawinigan, Grand'Mère and La Tuque. It is broken by numerous falls and rapids, the principal being—going up the river:

Les Forges	12 feet.
La Gabelle	10 "
Les Grès	44 "
Shawinigan	150 "
Grand'Mère	78 "
La Tuque	88 "
Rapid Blanc	212 "
Rapid des Coeurs	93 "
Rapid Allard	45 "

Two of the above mentioned falls are fully developed, namely: at Shawinigan, Grand'Mère, and a third at La Tuque is partially utilized. It is expected that Les Grès and La Gabelle will be developed in the very near future. All the other falls above La Tuque are still the property of the Crown.

Natural Flow of the River

The flow of the river has been measured at Shawinigan, by the Shawinigan Water & Power Company, and complete daily discharge records are available from the year 1900 to date. They show that the average low water discharge was 6,000 second-feet. The lowest discharge recorded was 5,200 second-feet for about one week in March 1901; the highest water recorded was 166,000 second-feet on the 6th of May 1904.

Duration curves plotted for the years 1900 to 1912 show that the flow was for—

	Highest year	*Lowest year*	*Average*
Seven months	24,500 s.-ft.	9,000 s.-ft.	13,200 s.-ft.
Eight months	16,700 "	7,800 "	11,300 "
Nine months	14,300 "	7,400 "	9,800 "

The average yearly run-off from the watershed at that point for the period 1900-1912 was 21.3 inches,—the maximum being supplied in 1907-08 when the depth was 26.9 inches, and the minimum was recorded in the year 1906 at 15.33 inches.

Manouan Reservoirs

As the demand for power increased, it was plain that additional power could be obtained in the cheapest way by attempting to regulate the flow of the river. The companies generating hydro-power were not alone to suffer from the water shortage. The lumber companies were also affected during the log drive, the driving season being extended later in the summer as the yearly cut was increasing and the wood taken from farther up the river. These interests combined in 1909 and formed The St. Maurice Hydraulic Company which was authorized by the Government to carry out certain storage schemes on the Manouan river. Three dams were constructed from 1909 to 1911, and the three reservoirs thus created have a total capacity of 890 square-mile-feet. Henri Desaulniers, Civil Engineer, was in charge of the building of these dams and he deserves great commendation for the energy and ability he displayed in face of great difficulties.

The water from these reservoirs was used during summer low water and during winter. The minimum flow at Shawinigan was thereby raised to nearly 8,000 second-feet, instead of 6,000 second-feet.

The Manouan reservoirs had proved the feasibility of getting water supplied from reservoirs located two hundred miles from the generating plant, even under most severe winter conditions. In 1912, the St. Maurice Hydraulic Company applied to the Legislature for authorization to carry out storage on a much larger scale in the series of lakes which form the upper reaches of the St. Maurice river. After due consideration of the matter, the Quebec Government decided that it would be a better policy to have the scheme carried out by the Province. There was fear that the different interests in the river might not agree in the future, and the Crown being still the owner of very important falls on the river, felt that the storage rights should be kept. So the Quebec Streams Commission was authorized to investigate and report upon the possibilities of storage in the upper lakes, and here begins the story of the Gouin Dam. The field work was carried out in the summer of 1912 and was in charge of Engineer J. V. Perrin. Two alternate schemes were considered: five small dams each controlling a series of lakes and giving partial control, or one big dam giving complete control. The latter scheme was favoured and recommended by Commissioner Wm. I. Bishop, after an inspection of the district. The Commission decided to control the water with one big dam.

Preliminary Work for the Gouin Dam

Contours were located in the watershed, special care being given to the lowest passes where it would be possible for the raised water to escape into adjoining basins. When this work was complete, it was found that by raising the water 47 feet above natural low water, by a dam near the head of La Loutre falls, the capacity of the reservoir would be 5,722 square-mile-feet. The watershed area, measured on the best available maps, was found to be 3,650 square miles. The proposed reservoir had a capacity to hold a run-off equal to nineteen inches on the basin. The location of the dam is at a point fifty miles from the National Transcontinental Railway at Parent, or forty miles from the Transcontinental Railway at Parent. The site may be reached from Manouan by canoeing on the St. Maurice river, and from Parent by trails and canoe across country. The Parent route was followed in the spring of 1913 when supplies and boring outfit were taken in for the boring. When the dam site had been fully surveyed and investigated, borings made on the bed of the river and plans were prepared.

Design

Several types of dams were considered, namely: the hollow concrete, gravity section, earthen dam. The gravity section type was recommended by Edward Wegmann, Consulting Engineer of New York. In recommending the gravity section dam as the proper type to build, Mr. Wegmann submitted what, in his opinion, was a suitable cross-section. In calculating this section, he made the following assumptions:

Weight of water $61\frac{1}{2}$ lbs. per cubic foot

Weight of concrete $150\frac{1}{2}$ lbs. per cubic foot

This was calculated after the weight of the rock to be used in the concrete had been ascertained.

Uplift pressure None

Ice pressure 50,000 lbs. per lineal foot and acting at the height of the spillway.

As is well known and generally accepted, the condition of safety of a gravity section dam is that the resultant of all the external forces must cross the base of the structure within the middle third of the section, either when the dam is under pressure or when the reservoir is empty. When the resultant force is thus within the middle third, there is no danger of overturning and the weight of the structure must be such that the coefficient of safety against sliding, the relation between the vertical forces and the horizontal forces, must be one and over in the case of concrete on rock, and two and a half to three and three and a half in the case of concrete on clay. At the Gouin dam, the coefficient of friction of concrete on the rock was taken as 0.6, and the weight of a section multiplied by 0.6 divided by the horizontal force is 1.20 as factor against sliding.

Ice Pressure

The question of ice pressure on dams is one upon which engineers do not agree, and upon which there is a lack of reliable data. What is certain is that the ice contracts with a lowering temperature and this results in cracks throughout the ice cover. These cracks fill with water from below. This water freezes and renews the continuous ice sheet. The whole mass expands when the temperature rises. This expansion creates pressure on the shore lines and structures across the ice field, the limit of pressure would be the crushing strength of the ice.

When a dam is built across a narrow stream, and the ice cover is confined between the structure and vertical shores, there is a heavy thrust acting horizontally against the dam; an example of failure in this way was at Minneapolis in 1899. Details of this failure were given in "Engineering News" of May 11th 1899 and in "Engineering Record" of May 13th 1899). However, where the body of water is large and the shore lines slope gradually, the ice expands along the shore lines and the structure is barely affected.

Another condition which a dam may be called upon to resist is the thrust due to an ice field at the time of the spring break-up. In large lakes, where the water rises, the area of the lake increases and the ice sheet becomes detached from the shores. The ice cover, under the action of a heavy wind, may be shifted bodily and damages do result. The ice pressures assumed in the design of some important dams are as follows:—

	Lbs. per lineal foot at the highest ice line.	
Wochusett Dam	47,000	
Croton Falls Dam	30,000	(Croton reservoir, New York Water Supply.)
Cross River Dam	24,000	
Olive Bridge	47,000	
Kensico Dam	47,000	

Since the building of the Gouin Dam, no ice has formed opposite the gate section for a distance of over fifty feet from the face of the dam. And it is very doubtful that any appreciable ice thrust has been exerted against the structure.

Uplift Pressure

When water penetrates between a structure and the foundation supporting it, there results a pressure which tends to lift the structure. This is uplift pressure. The water may reach the foundation of a dam through cracks in the rock, or through faulty joints, or through impervious soil.

The foundation of the Gouin Dam is upon a solid Laurentian Gneiss rock. It was considered by Mr. Wegmann that the water would not percolate and reach the foundation of the dam and he, therefore, assumed that no uplift pressure would take place.

Stress Diagram

An examination of the stress diagram shows that when water pressure on the upstream face is the only outside force taken into consideration, the line of resulting pressure is well within the middle third. When an ice thrust of 50,000 lbs. per lineal foot is assumed to act at the top of the dam in addition to the water pressure, the resultant force comes out of the middle third between elevation 1280 and 1320. When the water pressure is considered with an uplift pressure of 100% at the heel or upstream and gradually decreasing to zero at the toe, the resultant force still acts within the middle third. When the resultant comes out of the middle third on the downstream side, it means that the masonry of the upstream face is subject to tension. To take care of this tension, steel reinforcements located 9 inches from the face have been provided between the points where the resultant was outside of this middle third. The amount of steel was calculated for the maximum stress, supposing the steel to work at 16,000 lbs. per square inch.

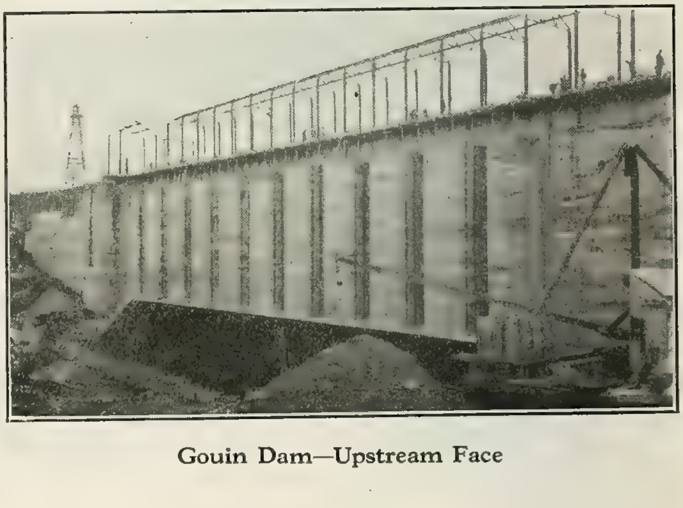
Dimensions

The plans for the Gouin Dam were prepared in the office of the Commission by J. W. Thurso and, when completed, submitted to A. St-Laurent, of Ottawa and J. M. McCarthy, of Quebec, for approval. The dam was built in a broken line of four parts,— the total deflection being 28 degrees,— to take advantage of the topography of the site and the island dividing the river into two channels. The dam is 1,646 feet long, 20 feet wide at the crest; the upstream face is vertical and the downstream face vertical at the upper part and, then, slopes 9 inches horizontal to 12 inches vertical. The width at any point is not less than seventy-five per cent of the height. The highest section of the dam is 90 feet, the width of the base at that point being 72 feet.

The contract was awarded to The St. Maurice Construction Company Limited, in July 1915. The firm of Fraser, Brace & Company, Limited, was connected with the contracting company and was in charge of the construction of the dam. Preparatory work was started in 1915 by improving the river to make it navigable between Sanmaur and Chaudière,—a distance of thirty miles,—making terminals at these points, locating a railroad between Chaudière and the dam site,—a distance of some twenty miles — and beginning its construction, building camps at the dam and at suitable points down the river.

After investigation, the company decided to develop hydro-electric power for the operation of the construction plant, sawmill, air compressor, stone crusher, etc. This development is located about two miles from the dam at the La Loutre Falls, where advantage was taken of a head of 15 to 25 feet, and two generators were installed having each a capacity of 550 KW. The power was transmitted to the dam by a pole line. Electricity was used in the lighting of all the camps and for the operation of the whole of the construction plant.

The railroad was operated with Dunkey engines which were outfitted to burn oil during the summer season and to burn wood in the early spring and fall. The railroad is of standard gauge, 4 feet 8½ inches, 56



Gouin Dam—Upstream Face

the rails laid on standard ties. The grades were as high as 3.75%, and the maximum curves about [illegible] degrees. A Lindsay engine could haul two standard carloads over the twenty miles in about two hours.

Start of Construction

The construction of the dam was actually started early in September 1916 when the east channel was unwatered. This part of the dam was brought to elevation 1300. Five temporary sluices were left in this section to take care of the river flow at the time the west channel would be closed by a cofferdam. These openings were controlled by stop logs. Their full capacity was about 11,000 second-feet.

The structure was made of concrete mixed in the proportion of [illegible] into which was embedded an average of a little over 15% of displacers or plums. The bed of the river was completely unwatered by means of a large cofferdam.

The construction of the dam was completed early in December 1917. The work was carried out in sections about forty feet long,—the vertical joints between the sections being continuous from the bottom to the top. The sections were made to interlock by means of bond boxes, (generally three inches deep and three feet wide) being provided inside the form of the first section erected.

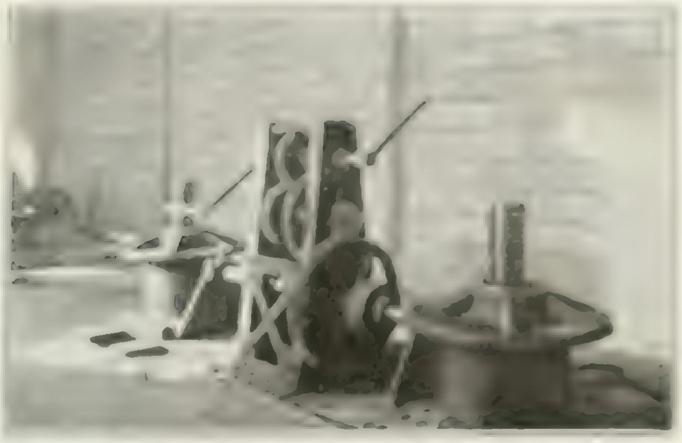
The rock required for the concrete was taken from a quarry on the west side of the dam, and the sand from a pit six miles from the dam alongside the railroad.

There is nothing extraordinary about the Gouin Dam, except that its location is very far away from any transportation facilities, and the big problem was to find the best way to reach the site and take the plant and materials to it. This problem was solved in a most economical manner by the contractors,—the transportation being done partly by water and partly by railroad. Navigation was very good during the whole season of 1917 when the river flow was maintained at a high level, by taking advantage of the partial storage which the upstream cofferdam provided. Although the natural low water level was 1278, the upstream cofferdam was built to elevation 1300 and a large body of water provided a regular flow through temporary sluices.

The top of the bulkhead section is at elevation 1335 above mean sea level and the top of the spillway is ten feet lower.

Spillway

The dam is provided with a spillway 840 feet long capable of discharging 15,000 second-feet under a head of three feet. This was calculated by using Francis formula: $Q = 3.33\, L\, H^{3/2}$. Its cross-section was designed so that the spilling water shall not leave the masonry, eliminating the possibility of a vacuum between the sheet of falling water and the masonry. The bulkhead section is provided with ten openings each 12 feet high and 7½ feet wide. The total area of the opening is 900 square feet. Each opening is closed with a steel gate 13 feet by about 9 feet. These gates slide on a brass metal frame and they are operated from the top



Gate Operating Mechanism

of the dam. The openings may be closed by stop logs both on the upstream and on the downstream face of the dam. The pressure on each gate, when the reservoir is full, figuring 100% friction, is about [illegible] lbs. The weight of the gate and lifting arm is about 10,000 lbs.

The machinery supplied for the operation of the dam may be operated by hand,—two men lifting any gate but, of course the operation is very slow as it requires 81 revolutions of the commanding shaft to make one revolution of the lifting screw,—that is 81 revolutions of the commanding shaft will open or close the gate one inch. The gates and the lifting machinery were designed by the Dominion Bridge Company.

The machinery for operating the gates had to be well anchored into the masonry to prevent its being lifted when a gate was being closed. This is provided by two vertical I beams, one on each side of the gate continuous from the bottom of the gate pit to the top of the dam. Although this machinery could be operated by hand, it is being operated by a pulley connected to a small electric portable motor arranged so that it may be adjusted to operate any of the gates.

Log Sluices

The plans of the dam provided originally for a log sluice opening 7½ feet wide and closed by a double leaf steel gate, 33 feet high, and a smaller log chute to pass the logs from the reservoir to the downstream reach. This sluice is rectangular at the upstream part and is gradually decreased until it has the form of a triangle at the outlet. The reduction in the cross section is provided to compensate for the increase in the velocity of the water, the depth of the water in the sluice being nearly constant. This sluice has not been operated as yet, no timber having been cut above the dam before this winter. The lumber companies interested in the timber limits above the dam thought that the log sluice provided in the dam would not be sufficient for their requirements, and an additional opening [illegible] feet wide was left at the west side of the gate section. This opening is closed with stop logs. No sluiceway has been built on the downstream side of this opening but, should it be necessary to sluice logs by that opening, works to take care of the logs downstream will have to be provided.

What the Gouin Dam Has Accomplished

The dam has now been in operation for over two years, comprising three winters and, during that time, the flow of the river has been maintained so that at no time the minimum at Shawinigan was below 12,000 second-feet. The water level in the reservoir is today forty-one feet above natural low water,—that is to say six feet below the crest of the spillway. Last summer, the water level reached 1322.25, or 2 feet 9 inches below the top of the spillway.

The benefits to be derived from regulation were calculated from the flow curve of the year 1906, which was the lowest year for the period 1900 to 1912. From the records of that year, a duration curve was made and the amount of water necessary to make up the deficit for a minimum flow of 12,000 second-feet was easily arrived at. This water being used at Shawinigan over a head of 150 feet, the number of horse-power figured at 80% efficiency on the wheels, was deducted at low water. This number was close to 81,000 horse-power for a short time, and the benefits were as the water required decreased. Distributed uniformly over the whole year, the benefits total 32,250 HP.

At Grand'Mère where the water is being used under a head of 75 feet, the benefits will be exactly half of those of Shawinigan.

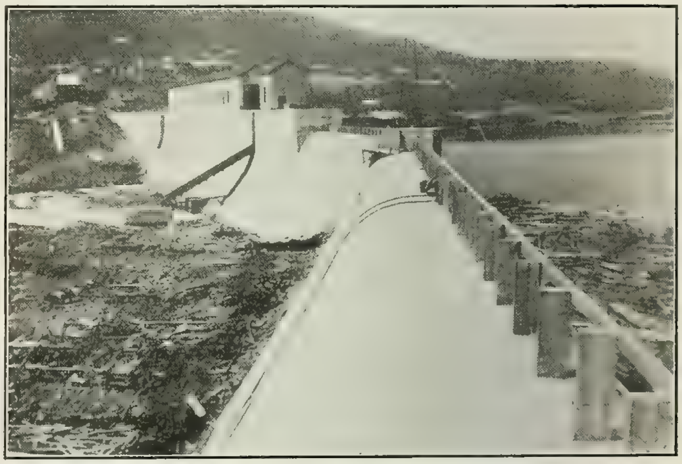
In order to ascertain that the amount of water available in the Gouin Reservoir would be sufficient for a regulation to 12,000 second-feet at Shawinigan, calculations were made since the latter part of April 1913, when flow records were kept at the Gouin Dam. The amount of water measured at the dam site was taken as being the supply from the watershed. The amount of water required at Shawinigan to bring the flow up to 12,000 second-feet was taken as being the demand and, accordingly, a diagram was made showing two curves: one being the supply curve and the other the demand curve. The supply curve is made up of the amount of water which was measured at the dam; the demand curve is made up with the amount of water required at Shawinigan to maintain the minimum flow at 12,000 second-feet, after deducting the natural flow from the proposed reservoir, that is to say—supposing, for example, that the discharge at Shawinigan was 15,000 second-feet and that, on the same day, the discharge at the Gouin Dam station was 5,000 second-feet, it meant that the discharge of the St. Maurice river, outside of the reservoir was 10,000 second-feet in that particular case, and that the demand was 2,000 second-feet and the supply 5,000 second-feet. The daily discharge is easily computed into square-mile-feet by multiplying by 0.0031.

The Gouin Dam is located about 220 miles from Shawinigan, which is the point of regulation. The water let out from the dam does not reach Shawinigan until ten to twelve days later,—that is, its full effect is not felt until after ten days in summertime and twelve days in wintertime. There must be a certain amount of loss by evaporation in this distance, and calculations were made entailing a loss of 25% in the amount of water let out from the dam. Similar calculations were made for a regulation to 14,000 second-feet. The curves show that a regulation to 14,000 second-feet is possible, but should there be a loss of 25% in the amount of water let out, the reservoir would not be sufficient.

Discharge Control

The discharge of the river is controlled at three different points, namely: at Weymontachingue, fifty miles below the dam where a gauging station was established by the Shawinigan Water & Power Company in 1915, and a flow curve determined for that point. A similar station was established by the same company at La Tuque, immediately below the falls, and a third station is that at Shawinigan. The water level at Weymontachingue and La Tuque is recorded daily and the information wired to the office of the Commission. Similar information is obtained from the Shawinigan Water & Power Company regarding the conditions at Shawinigan and Grand'Mère. The points of control are also provided with rain gauges and we are also informed of the amount of rainfall recorded. In this way, a pretty good idea may be had as to the period when it will be necessary to draw upon the storage.

Last winter, the run-off in the rivers of this Province was exceedingly low. In order to maintain a discharge of 12,000 second-feet at Shawinigan, it was necessary to supply from the Gouin reservoir 10,000 second-feet during the month of March. In the past winter, the reservoir level was lowered 4.2 feet, that is from 1322.2 to 1318: during the winter of 1919, the flow was maintained at the regulated figure of 12,000 second-feet by lowering the reservoir level three feet, from 1314 to 1311.



General View of Gouin Dam

The discharge from the gate is calculated by the usual formula $Q = AC\sqrt{2gh}$, in which

Q = volume of water in second-feet,

A = area of the opening,

H = difference between the level of the water upstream and the level downstream.

C = coefficient which varies according to size of the openings. It varies from 0.65 for small openings to 0.95 for full gate opening. This was determined by metering the river near the dam.

Reservoir

It is claimed that the Gouin Storage Reservoir is the second largest in the world, being exceeded only by the Gatun reservoir. It is the largest one used for flow regulation. The capacity of the most important reservoirs is as follows:—

	Height of dam	*Capacity in cubic feet*
Gatun, (Gatun river)	115	183,000,000,000
Gouin, (St. Maurice river)	90	160,000,000,000
Assouan, (Nile River)	111	78,000,000,000
Roosevelt, (Salt Lake)	276	53,000,000,000
Pathfinder, (North Platte)	215	45,000,000,000
Shoshone, (Shoshone river)	328	20,000,000,000

The reservoir is made up by a series of large lakes which have the following area:

	Square miles.
Kikendatch	2.6
Coutchiwastin	13.4
Traverse	14.
Aux Sables	21.5
Obidjuan	17.8
Onigamis	16.3
Perchaude	10.
Bureau	41.5
Du Mâle Matawa Sarana	55.

The total water area under natural conditions was 209 square miles.

Ground Storage

By raising the water forty feet above natural high water at La Loutre, the different lakes form one large body of water, the area of which is 304 square miles,—the flooded lands being therefore 95 square miles, more or less. Much of the land covered is pervious to water and a large amount of ground storage must take place. The natural run-off, as a rule, is a minimum in the month of March. Before the water was raised, the average for the winter months of three years was:—

January	291 square-mile-feet
February	246 "
March	215 "

Since the reservoir is being operated, the run-off or supply is much larger in March and February than it was under natural conditions:—

	1919	*1920*	*compared with*
March	450 sq.-mi.-ft.	785	215
February	284 "	751	219

We cannot explain this otherwise than by ground storage. At the beginning of the winter, the reservoir level is at the maximum height for the season, and the demand upon it increasing; the level is lowered when the demand is larger than the supply. When the lake level has been lowered a couple of feet, the ground which is saturated gives back some of its storage water and this ground flow increases as the lake level gets farther from the maximum.

Land Clearing

The area flooded by the reservoir has been estimated at roughly 100 square miles, the larger proportion of which is covered by forest. This flooded area was not cleared on account of the large expenditure which it would involve. Even at present prices of $50.00 per acre and, assuming that only 50% of the flooded area would have to be cleared, the cost would have been $16,000 per square mile, or nearly $1,000,000 for fifty square miles. It is not expected, however, that a large amount of the floating dead wood will reach the dam. We believe that most of it will drift to the shore of the numerous and large bays of the reservoir. It is certain that some of the débris from the flooded area in the vicinity of the dam will reach the latter. In fact, some trash of all sorts has already floated to it. Much of this material has been pulled to the shore and burned.

The question has been asked as to what proportion of the water discharged at the dam reaches the plant. It is almost impossible to get during the open season because weather conditions make the observations in that respect unreliable. A heavy rain, for example, defeats all measurements. But, in winter time, it is believed that nearly all the water discharged does reach the plant. Such a large volume is hardly affected by small losses over the ice or the covering snow. What may prove to be a serious loss in the case of a small reservoir is not felt when the water let out reaches as high as 5,000 to 10,000 second-feet.

Manouan Dams

Mention was made of the three dams on the Manouan river. These have been acquired by the Commission and are being operated together with the Gouin Dam for the regulation of the river St Maurice. These three dams are of the ordinary wooden crib type, filled with stone. Their sluice openings are controlled by stop logs. The combined capacity of the reservoir formed is nearly 590 square-mile-feet, or 16 billion cubic feet of water, or about 10% of that of the Gouin reservoir. The combined drainage area is 1250 square miles. The supply of water from the basin is therefore much larger than the capacities of the three reservoirs. These are overflowing in the spring and are generally emptied during the dry summer months. They usually fill up again in the fall.

Demand

Calculation made of the amount of water required at Shawinigan to maintain a minimum flow of 12,000 second-feet and the supply available in the Gouin reservoir watershed had disclosed the fact that the reservoir should not be full until the third year after completion. We hope that, this year, our calculation will be fully verified, as the water level in the reservoir is now within six feet from the crest of the spillway, and the spring waters from the whole basin will be completely held.

Revenue and Cost

The capital cost of the whole scheme has been $2,500,000, or $430 per square-mile-foot of water. The yearly revenue from same is at present $191,000. This revenue will be largely increased when any new water power development is carried out. It will also be increased from another source. The lumbering companies will be called upon to pay for the benefits which they derive in connection with the driving of their logs down the river. Negotiations are now under way and no figure can be mentioned.

This regulation work has been a great success and owing to it the amount of power now generated on the St. Maurice river is nearly 400,000 HP., and nearly 500,000 additional HP could be developed. We believe that these works will eventually make the St. Maurice one of the most important sources of hydro-power on this continent.

The Quebec Streams Commission does not claim all the credit for this achievement. A large share of it is due to the officers and engineers of the Shawinigan Water and Power Company. Their initiative for the collection of hydrometric data on the St. Maurice river and the pioneer storage works of the Manouan river have been very important factors to the success of the enterprise.

Mention must also be made of the good work performed by J. B. D'Aeth, who acted as engineer in charge during the construction of the dam and by his senior assistant H. Massue.

Engineering Progress in Nova Scotia

(Retiring Address)

F. A. Bowman, M.E.I.C., Chairman, Halifax Branch, 1919-20.

In December, 1913, at the close of my term of office as President of the Nova Scotia Society of Engineers, I made some remarks about the growth of the work of the engineering profession in this Province during the course of my own experience. I now propose to give some facts and figures which will show the growth that has taken place since 1913, especially in and about Halifax.

The Nova Scotia Society of Engineers carried on the work until the end of 1917. The transfer of its activities to *The Engineering Institute of Canada* in the early months of 1918 has been fully justified by the results. The most conspicuous of these are the very successful General Professional meetings held here and in St. John, and the preparation of Legislation for the protection of the members of the profession, which is now working its way through the Legislatures of most of the Provinces in the Dominion, and which has already passed into law in some of them.

The Secretary-Treasurer's report shows that this Branch now has a membership of 119.

At the time of the meeting in 1913, to which I have referred, No. 2 Pier was about half completed, and work had been begun in the previous June on the Ocean Terminals. The new Acadia Sugar Refinery at Woodside was well under way.

A real estate boom started with the work on the terminals, and some very rosy pictures were drawn of the future of Halifax. The outbreak of the war pricked the bubble, and our attention has been so concentrated on the war and the problems of reconstruction that have followed it, that we do not realize how much has actually been accomplished. The amount of work that has been carried on in and around Halifax during those years is so great that it is well to gather it together in a few short statements.

No. 2 Pier has been completed, and has made for itself a place in the history of the world which will always be known to those who follow the details of the history of the Great War. Not to repeat all that has been said about it, I will merely state that the records show that 569,000 troops sailed from, or were landed at that pier. The total cost of this pier was $1,250,000.

The Ocean Terminals have been carried to a point where they are in regular commercial use, although the permanent station and some of the other permanent buildings have not yet been erected. The total cost of the work to date has been about $15,000,000.

The Acadia Sugar Refinery at Woodside has been completed at a cost of about $3,000,000.

Following on the example set by the concrete pile construction of No. 2 Pier, a modification of this type was used in building the Furness-Withy Pier, at a cost of $250,000.

The Imperial Oil Company has erected works at Imperoyal, which have cost to date about $6,000,000, and it is understood that they propose to make very material extensions to them.

The city itself has carried out extensive work in the last few years, including an intercepting sewer built to prevent the sewerage from the western slope of the city from being carried into the North West Arm. This has cost $225,000.

Last summer a really substantial scheme of street paving was undertaken, at a cost of about $1,200,000, and the work on this is now being pushed forward rapidly.

This paving work involved other heavy expenditures by the city for replacing water mains on the streets about to be paved, and also work of new track laying by the street railway, and underground conduit work by the Telephone Company.

Retiring address at the annual meeting of Halifax Branch, The Engineering Institute of Canada, 13th May, 1920.

The Halifax shipyard has been under construction for about two years, and is now nearing completion. The cost of this work to date has been about $10,000,000. Five ships are now being constructed there, of which two are 10,000 tons and three 7,500 tons each.

The Maritime Telegraph & Telephone Company has spent in Halifax, in the last six years, about $700,000 on new construction work.

The Nova Scotia Tramways & Power Company have erected their gasworks, and have done other new work, and have extensive track work in hand. The amount already expended is about $1,700,000.

The Western Union Cable Company has erected a large wharf and cable storage plant, which cost approximately $100,000.

Building permits for the city, for the years 1913 to 1919 inclusive, has amounted to the sum of $12,952,[illegible].

I have omitted from the above any estimate of expenditures for direct military purposes made during the war. The exact figures are not available, but it is well known that they would represent a very large amount of money.

In connection with the terrible explosion of December, 1917: we have had an enormous amount of reconstruction work done. Much of this, of course, was simply the repairing of existing structures; but the construction of the hydrostone area represents a permanent improvement to the city.

The total expenditures under the above mentioned items amount to $22,000,000, and a great part of these works was done or contracted for in such a way as to not include the present inflation of prices.

Very conflicting statements are made regarding the present population of the City of Halifax and Dartmouth, but I think there are figures enough available from various sources, from which the population may be estimated, to make it a perfectly safe statement that the population of the two sides of the Harbour must today be very close to 90,000.

Turning now to the rest of the Province, we find that steady growth has gone on all over it. The Dominion Atlantic Railway has rebuilt all its bridges, and the work of laying heavier rails was begun, but stopped by the war. The Canadian National Railways has also done a good deal. The big steel and coal companies have made extensions and additions to their plants in Cape Breton and Pictou County.

But perhaps the most important event has been the work of the Water Powers Commission, which has resulted in convincing us that instead of being, as we thought we were, a Province almost devoid of water powers, we have at least 300,000 horse power available. Also a definite policy has been mapped out for developing these powers into what will probably be one day an interlocking system of tremendous importance to the industrial development of the Province.

All this means that the outlook for our own profession is most encouraging.

A Brief Account of the Seismological Work at the Dominion Observatory

with

Some of its Practical Applications.

G. W. F. Johnston, Jr.E.I.C.

The scientific study of seismic disturbance is of such recent date that seismology may be said to be among our newest sciences. We find mention of earthquakes in historical notes dating back to the almost mythical days of the great Chinese dynasties, but without exception the historians seem to accept the convulsions of the earth as a divine punishment for human frailties. It was not till about 1850 that attempts were made even to collect and tabulate these records; and actual scientific investigation was not directed to the subject till 1880, in which year the Seismological Society of Japan was founded.

The first step of these pioneers was to devise instruments which would not only record the fact that an earthquake had occurred, but would give a measure of the movements of the earth in amplitudes and periods. The history of the development of the seismograph from the first crude machine to the present delicate instrument which will record the slightest movement, is extremely interesting, but beyond the limits of this article. Suffice it to say that as the instruments became more sensitive, and especially more accurate in time determination, so the deductions from the facts of their records became more sure, until now, given a good record, we can definitely place the distance of a station from the source of the disturbance, or epicentre, within 40 or 50 kilometres.

Bosch 200 gramme horizontal Seismograph.
M— [illegible]
P— Pendulum.

It was in 1906 that the two Bosch 200 gramme horizontal seismographs at present in use in the Dominion Observatory were installed, and these were supplemented by a Spindler and Hoyer vertical seismograph in 1913. The principle of the modern seismograph, roughly speaking, is that of the pendulum, — its action being the exact reverse of its usual swinging motion. In other words, it is the heavy mass of the pendulum which remains still, and the earth which swings. These two Bosch horizontal instruments are identical and are placed on the same pier, — one in a N.S. direction and the other in an E.W., thus resolving any horizontal motion into its two components in an E.W. and N.S. direction respectively. Divested of all its delicate appliances for reducing friction, providing magnification and modifying the amplitudes, our apparatus is a simple horizontal pendulum to which is attached, in the axis of rotation, a small concave mirror. At the other end of the room is the recording drum and lamp. The record is photographic, the light being projected from a slit in the lamp to the mirror of the seismograph which reflects the ray into a horizontal slit in the box covering the drum. Behind this slit is a cylindrical lens which converges the ray to a point of light. On the drum, which revolves on a threaded axis and consequently moves laterally to the left, is a sheet of photographic paper on which the point of light traces out a line,—the result being a helix. It is at once apparent that any motion of the pendulum, or rather of its supporting pivots, will cause a corresponding movement of the spot of light from the mirror, and thus we have a very accurate method of registering the movements of the earth. The vertical seismograph depends on the inertia of a heavy mass supported by a spring, to record the vertical movements of the earth. This movement is changed to a horizontal one and magnified by a series of levers,—the record being traced out by an aluminium stylus on a sheet of smoked paper mounted on a revolving drum. It has been the experience at the Observatory that the horizontal movements are much more pronounced than the vertical, which is what one would naturally expect at a point distant from the 'quake. This condition happens to apply to Ottawa in almost every instance. If we were near the epicentre the reverse would be the case.

By reading these three records together,—N.S., E.W., and vertical, it is possible with sharp tracing to compute not only how distant is the source of the earthquake, but also its direction. For example:

The N.S. record being thus,—*See Fig. 1*——————
and the E.W. thus,—*See Fig. 2*——————————
we have an indication that there was a "thrust" or "pull" toward the S.W. at the first impulse. If we glance at the vertical and find,— *See Fig. 3* ——————

Fig. 1.

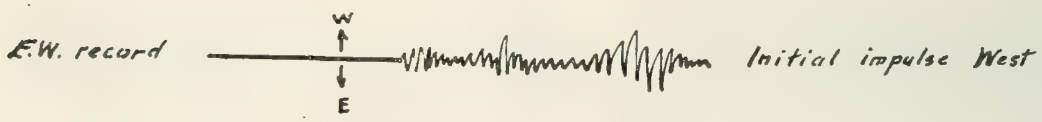


Fig. 2

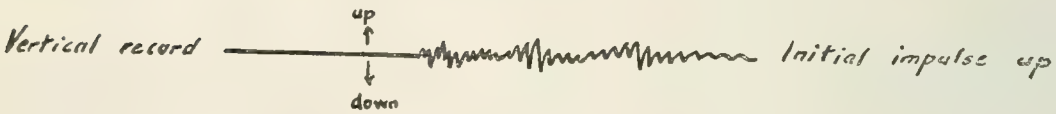


Fig. 3.

A Typical Seismogram, showing P, S, and L.

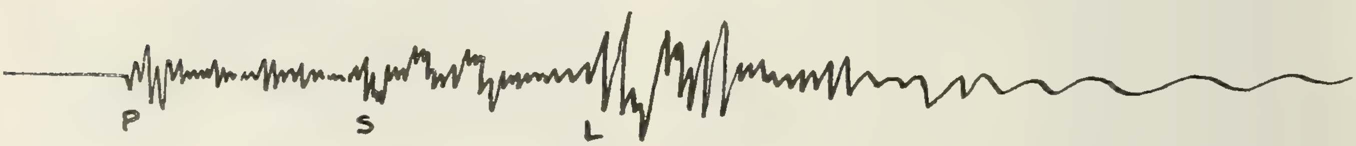


Fig. 4

we know that the first impulse was a thrust and consequently the source must lie to the N.E.

Before giving the method of computation of distances, it would perhaps be as well to describe briefly the characteristics of a seismic record. There are three main types of waves produced by an earthquake,—longitudinal waves travelling through the earth, (these are waves of compression or rarefaction like sound waves), transverse waves also travelling through the earth, (these are waves of distortion like light waves), and long waves travelling along the surface. Owing to the increased density and elasticity of the interior of the earth, the first two types have greater velocity and hence the waves arrive in the order named, being called for the sake of clarity, Preliminary and Secondary tremors and Long waves, or P, S, and L. A good seismograph shows these three types in this manner:— See Fig. 2.

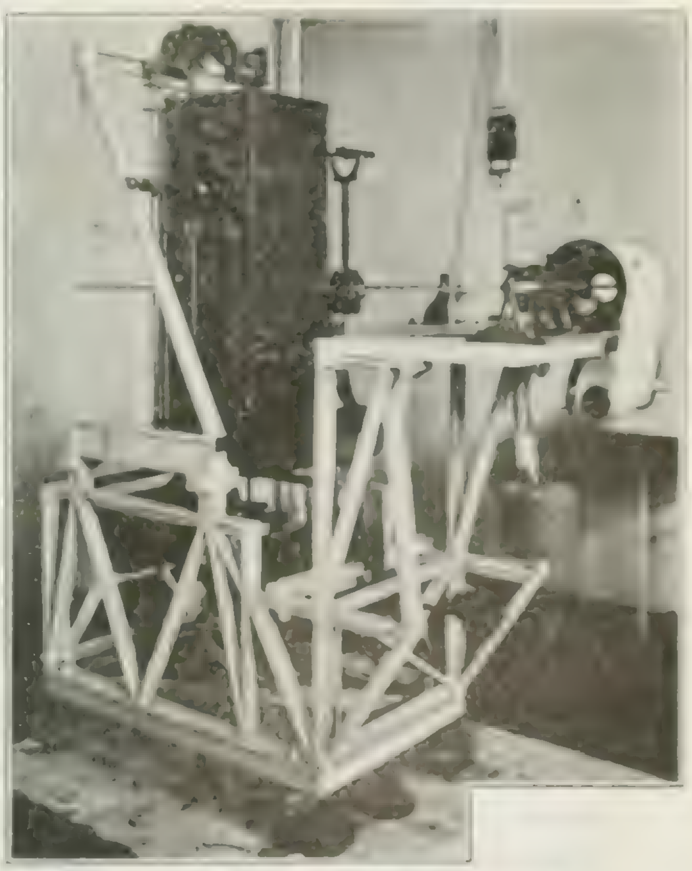
Now it has been found from observation that these waves have definite velocities and therefore the difference between the time of arrival of the preliminary and secondary tremors, or S-P, has a definite relation to the distance from the origin and also the time of occurrence at the epicentre. Tables have been computed by various seismologists, and under the direction of Dr. Klotz, Director of the Dominion Observatory, these have been collected and additions made, so that it is now a very simple matter to make the actual computation of the distance of station from epicentre, and the time of occurrence at the epicentre,— in symbols, Δ and O.

Bulletins are received by the Seismological branch of the Observatory from earthquake stations all over the world, and these are entered on comparison sheets so that, for example, for an earthquake in South America on a certain date, the reports from as many as fifty different stations are all together; and as all stations record in Greenwich Mean Time, the comparison of these records is rendered very simple. The O's and Δ's are computed for each, and it will be at once apparent that though the Δ's differ for each station the O's should be the same. In one particularly good instance in the 1917 computations, the O's of thirty stations ranging from Java to Scotland, agreed within ten seconds. When these computations are complete they are plotted in stereographic projection, with reference to the latitude and longitude of the stations and the Δ's, and the position of the epicentre graphically determined. Tables giving the stereographic co-ordinates for varying distances from every station have been issued by the Dominion Observatory, thus simplifying the work still further.

It is impossible of course, due to poor records, to accurately fix the epicentral position of every earthquake, but at least 90 per cent of the world shaking' quakes may be located with a very fair degree of accuracy, and as from 100 to 150 earthquakes are recorded every year, it will be seen that if only by supplying such information, seismology steps at once from the realm of pure science into that of practical life. The study and analysis of seismic disturbances has a greater significance to modern engineering than may be generally known. The classic example of earthquake disturbance on this continent in recent years is of course the San Francisco earthquake of 1906, which occupied the attention of engineers and builders as well as seismologists. In its preliminary report the State Earthquake Investigation Commission says: "A complete study of the phenomena will undoubtedly contribute greatly not only to our knowledge of the evolution of the earth's crust but also our knowledge of means of minimizing the calamities which arise from the destruction of buildings, water pipes and other structures when such shocks occur in the future," and such indeed has proved the case. A number of interesting and instructive reports were made by government commissions and others, which are well worth reading,— notably "The San Francisco Earthquake and Fire of April 18, 1906, and Their Effects on Structures and Structural Material", (Bull. 324 U. S. Geol. Survey 1907) and "The Effects of the San Francisco Earthquake of April 18, 1906, on Engineering Construction", (Trans. Am. Soc. C. E., Vol. LIX, Dec. 1907.)

The surveyor, too, will find earthquakes and their effects rather interesting in view of the movements of triangulation points and the consequent breaking of triangulation lines. In the earthquake mentioned above there were "relative displacements of the earth's surface of from 7 to 21 feet at points near the fault," extending for a distance of 185 miles. This necessitated a new triangulation to reestablish a control for subsequent surveys.

We have seen that epicentres may be plotted with a very fair degree of accuracy, and hence, by marking on a world map the epicentres for a certain year, we get what might be called a chart of seismic disturbances for that year. If it is desired the period may be extended to five, ten, or twenty years. Such a map shows at once the centres of seismic action, and may be used by the geologist as an aid in locating ancient fault lines. These fault lines, being old cracks in the earth's crust due to redistribution of loading, are still points of weakness and as such their location is of great practical importance. In a recent article Sidney D. Townley says: "There are two



Spindler & Hoyer Vertical Seismograph
W—Weight
S—Spring
A—[illegible]
P—Pointer carried Drum

methods of protection against earthquakes. The first method is to study the geology of the country and to locate the origin of the shocks and to find the fault lines along which shocks are likely to occur. Some of these active fault lines are readily known, and building construction of various kinds should be kept away from these active faults. This phase of the subject is of particular interest to engineers engaged in the location of reservoirs, dams, and pipe lines. If it is necessary that a pipe line should cross a known fault, then some means should be taken to guard against the possibility of its breaking. The Los Angeles aqueduct crosses a number of known faults, and has already been broken once by an earthquake. The method adopted in these cases is to place a valve in the line above the place where it crosses the fault so that the water may be shut off when the break occurs. Materials are also kept at these various places so that immediate repairs in the pipe line can be made......... Engineers are becoming more and more interested in this subject, and the Seismological Society of America has had many inquiries from engineers engaged in the construction of irrigation systems and power plants asking for information concerning the location of fault lines and the possibility of their works being damaged by earthquake." (Bull. Seis. Soc. of Am., Sept. 1919). The San Francisco earthquake was caused by a fault along an old line which has been traced for a distance of 400 miles to the point where it disappeared in the Pacific.

But the seismic chart shows that the greatest disturbances have their origin beneath the ocean, and here the geologist cannot follow them. Very recently, however, what was probably the first attempt at locating submarine faults by seismograms was made at this Observatory. Dr. Klotz had for some time been of the opinion that "with high class seismographs and expert readings of their records we could not only be able to obtain the average position of the epicentre but also the position and direction of the fault line itself." In 1917, by combining records of the same 'quake, from Perth, Australia; Zi-ka-wei, China; and Honolulu, he obtained an epicentre off the Island of Urup, while the Ottawa and other western stations gave the epicentre off the southern extremity of the peninsula of Kamtchatka, near Onekotan Island. Re-reading and plotting the various distances of other stations giving good records, to the nearest point along the line joining these two epicentres, he found that "better accordances were secured than if we attempted to join them all to one point, — to one epicentre. The conclusion was forced upon one that we have here to deal with a breakdown along a fault line 500 km. long running in a N.E.-S.W. direction, the trend of the well known Kurile Deep, and the seat of much seismic action." ("Locating Submarine Faults." O. Klotz, Journ. R. A. S. C., Feb. 1918.)

In time, as the science of seismology grows, there is no doubt that submarine faults will be definitely located throughout the world. When we consider the annoyance caused by the breaking of cables this knowledge has a very practical bearing. As far back as 1897, in his seismological report before the British Association, Prof. Milne stated that "there was an average of one dislocation per year for every 434 miles of cable" and that the majority of these breaks were due to earthquakes changing the surface of the ocean bed, and putting heavy strains on the cables. A knowledge of the fault lines would be valuable in determining the position of breaks and more especially in showing the lines of danger to be avoided when laying new cables.

Here in Canada we seem to be fairly immune from earthquakes, and for that reason the interest of the canadian engineer in matters seismological may not be as strong as that of his brother to the south. Though not generally known, however, it is a fact of at least academic interest that one of the fault lines referred to above runs right along the channel of the St. Lawrence, beginning at Lake Champlain, reaching the St. Lawrence at Quebec, and then following the channel to the Gulf; that in 1663 an earthquake occurring in this region did considerable damage according to the Jesuit historians. The possibilities of the recurrence of this disturbance are very remote, but in the light of the disastrous effects of the California and other earthquakes on bridges, one cannot help wondering how our famous Quebec bridge would fare, should the south of the river slip from 7 to 20 feet past the north one.

Some years ago an interesting application of seismometry was made in investigations into vibrations of locomotive engines travelling along a railway track. "By means of a not very delicate form of seismometer placed on the engine, tracings were obtained which varied in magnitude according to the position of the track, indicating at once where the less perfect parts were. The work has been continued by Omori (of Japan) with improved apparatus; and valuable results have been obtained bearing upon various questions, such as the relation between the vibration of carriages and the speed of propulsion, the comparison of the vibrations of the carriage as it passes across a bridge or travels on the ground, etc." ("Earthquake Phenomena", Knott.) The seismograph is also capable of being used to record the effects of wind on high towers and chimneys; to obtain accurate data for the study of the vibrations in bridges caused by moving loads, and to detect the subsidence to an unequal degree of the walls of a building whose foundations are suspected of slipping.

The continued study of earthquake phenomena is likely to result in the prediction of earthquakes for special localities in which they are more or less frequent, which will probably at least as accurate (if not more so) as the present day prediction of weather conditions. By the comparison of wave velocities and the systematic investigations of the distribution and geological effect of earthquakes, the seismologist is collecting a mass of facts which have an important bearing on the speculations about the interior of the earth. So far, the results have proved definitely that the interior of the earth is not liquid as formerly believed, but absolutely solid and fully of the rigidity of steel; and, as time goes on, and the new science develops, it is not unlikely that the trained student of seismology with more delicate and sure instruments, and a much larger and more accurate collection of data than he has at present, will wrest from the interior of our earth secrets which will prove of great value to practical geology and through it to mankind in general.

In concluding this article, the writer wishes to express his indebtedness to Dr. Klotz, Director of the Dominion Observatory, and E. A. Hodgson, Senior Seismologist for their valuable suggestions.

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOL. III. July 1920 No. 7

Dates of Professional Meetings

The Seventh General Professional Meeting will be held in Niagara Falls, September 16th, 17th, and 18th, and the Eighth General Professional Meeting will be held in Halifax, October 13th, 14th and 15th.

The Annual and Annual General Professional Meeting will be held in Toronto on February 1st, 2nd and 3rd, 1921.

Ontario General Professional Meeting

The Niagara Peninsula Branch is making great preparations for the Professional Meeting to be held at Niagara Falls in September.

Members on their arrival will register at the Clifton Hotel, and the proceedings will start with a luncheon at noon on Thursday, September 16th.

The morning of Friday will be taken up with professional papers and business of the Ontario Executive, having special reference to the younger members.

Excursions over the great engineering works now going on in the district are arranged for Thursday and Friday afternoons.

Thursday evening will be taken up with entertainment and there is to be a dance on Friday evening. Visitors will be the guests of the Branch at this dance.

Arrangements are being made for a variety of entertainments for Saturday morning. Golfers will discover their affinity at one of the various courses in the neighborhood, and those who desire to visit one of the power plants at Niagara Falls will have the opportunity to do so. A few motor cars will be available for drives on the Boulevard of the Queen Victoria Niagara Falls' Park Commission.

No special programme will be arranged for Saturday afternoon — opportunity being given for all to visit the various points of interest in the neighborhood and the shops on both sides of the river.

Those who stay over the week-end will have a chance of taking part in the informal dance at the Clifton on Saturday evening, although the formal programme will end with the luncheon on Saturday.

The programme has been arranged in such a way so that it will be interesting and entertaining to ladies accompanying the members, and it is hoped that there will be a large delegation of the fair sex at the meeting.

Western Professional Meeting

Following the decision of the Edmonton Branch that they were unable to take the responsibility of a General Western Professional Meeting, the zealous members of the Calgary Branch decided to take up the responsibility. Unfortunately there was not sufficient time to arrange for a General Western Professional Meeting of *The Institute,* consequently a Western Professional Meeting under the auspices of the Calgary Branch will be held at Banff, August 14th, to 18th. A novel feature of this gathering is that it will start on Saturday, arrangements having been made for the visitors to live in tents over the week end and during the meeting, the Professional Meeting commencing on Monday 16th. Sleeping accommodations will be available on August 13th, for any arriving on that date. Another interesting feature of this gathering is that an invitation is being extended to all professional engineers regardless of their membership in *The Institute,* the Association of Architects and Land Surveyers in Alberta, Saskatchewan, Manitoba and British Columbia.

The following committee has been appointed to make all arrangements:—

G. W. Craig, M.E.I.C., Chairman, city engineer of Calgary.

F. H. Peters, M.E.I.C., commissioner of Irrigation, Calgary.

J. M. Wardle, A.M.E.I.C., supt. Rocky Mountain Park, Banff.

A. S. Dawson, M.E.I.C., chief engineer Dept. Nat. Resources, C.P.R., Calgary.

A. I. Payne, M.E.I.C., engineer P. Burns Co.

G. N. Houston, M.E.I.C., asst. commissioner of Irrigation.

F. K. Beach, A.M.E.I.C., div. hydrometric engineer.

Wm. Pearce, M.E.I.C., statistician C.P.R. Dept. of Colonization and Development.

A. L. Ford, M.E.I.C., chief hydrometric engineer, Calgary.

R. C. Harris, A.M.E.I.C., div. engineer C.P.R.

F. E. Emery, A.M.E.I.C., Secy. Western Professional Meeting.

J. M. Wardle, A.M.E.I.C., Supt. of Rocky Mountain Parks at Banff, has kindly arranged with the Government for the use of military bell tents and clean blankets; cots and mattresses will also be supplied under arrangements of Calgary Branch.

Arrangements are being made to serve meals in camp, and therefore cost will be much less than at the hotels. Any who wish to make reservation at hotels are at liberty to do so. Camp is located on a beautiful spot about 500 yards east of the C.P.R. Banff Springs Hotel, on the bank of the Bow River and less than five minutes' walk from the golf course.

The tentative program provides for professional meetings mornings and possibly evenings, with afternoons devoted to pleasure and sight seeing.

The camp will be open on Saturday morning, August 14th, for any who wish to spend the week-end in Banff, but sleeping accommodation will be available Friday night, August 13th, for any arriving that date. Professional meetings will begin Monday morning, August 16th, and conclude Wednesday night, August 18th; camp will be broken up Thursday night, August 19th.

The members of *The Engineering Institute of Canada* and members of the Association of Professional Engineers, Mining Institute, Association of Architects and Land Surveyors of Alberta, British Columbia, Saskatchewan and Manitoba, with their families, are cordially invited to attend, providing the secretary is notified not later than July 25th in order that accommodation may be arranged for all.

Railway Fares—Regular summer rate on C.P.R. from following points to Banff and return are:—

Winnipeg – – –	$56.15	including War Tax
Regina – – – –	36.20	" " "
Saskatoon – – –	31.15	" " "
Edmonton, 14 days	14.55	" " "

Vancouver and Victoria through Banff to Calgary and return through the Crow's Nest Pass, good for stop-over in Banff, is $55.55.

Meals and accommodation at the camp will be provided at actual cost, which is expected not to exceed $[illegible] per day per person, and if at all possible will be kept lower.

Visitors are requested to bring their own bed linen and towels.

Golfers bring your golf clubs. Charges on Government Golf Course are [illegible] per round, $1.00 per day or $[illegible] per week.

Excursions will be arranged [illegible] walk. Boat trips for small parties can also be arranged and visitors may avail themselves of hot sulphur baths at the C.P.R. hotel, cave and basin or sanitarium baths. Charges are [illegible] at the C.P.R. Hotel, and [illegible] at Cave and Basin Baths, which includes bathing suit, towel and dressing room.

Rowboats, canoes and motor boats are available at the Boat House.

Bring warm clothing, as nights are usually chilly at Banff.

The Calgary Branch extends to you a cordial invitation to come and enjoy a delightful holiday and professional meeting combined.

Replying to Sponsor Forms

For the most part members of *The Institute* have a laudable pride in promptly acceding to the request for information regarding applications for admission and transfer and returning the forms provided for that purpose. It very often happens, however, that an applicant provides only five names, in which case, before the application can come before Council for consideration every sponsor must have replied and failure to do so on the part of one sponsor may delay an application for many months. The duties of the application clerk at headquarters are enumerated in the following instructions from the Secretary:—

Application Clerk, Responsible to Chief Clerk.

Shall receive all applications for admission and transfer [illegible] **The Journal** to be completed not later than the [illegible] of the month. [illegible]

The sponsor forms which have been going out from headquarters were forwarded under one cent postage but the Post Office department has declared this to be first class matter and consequently in the future full postage will be required adding considerably to the expenses of operating the application department and members are earnestly requested to co-operate in every way in connection with the return of sponsor forms.

Headquarters Property Valuation

The Valuation Committee of *The Institute,* appointed by the president, to place a re-valuation on the headquarters property of *The Institute,* consisting of James S. Costigan, M.E.I.C., A. F. Byers, M.E.I.C., and A. Sydney Dawes, A.M.E.I.C., presented the result of their investigations, in a report to Council, which was required in connection with a consideration of re-insurance. The report presented to the president and Council of *The Institute* is as follows:—

> Your Committee appointed to consider the valuation of *The Institute*'s buildings at 176 Mansfield Street, having met and considered the matter beg to report that in our opinion the replacement value of the buildings, exclusive of contents, is ninety-five thousand dollars ($95,000).
>
> Our valuation for insurances purposes exclusive of foundations is seventy-seven thousand dollars ($77,000), being twenty-four thousand, five hundred dollars ($24,500) for the front building, and fifty-two thousand, five hundred dollars ($52,500) for the reinforced concrete building.
>
> If insuring with an 80% co-insurance clause the buildings should carry an insurance of sixty-two thousand dollars ($62,000).

The question of re-insurance was referred to the Finance Committee together with the Valuation Committee's report.

Important Concrete Investigation

The value of the work being done by the Committee of *The Institute* appointed to investigate the action of alkali salts on concrete and the amount of labour that has been put into the investigation is not generally known nor thoroughly appreciated by the membership at large. Following the general professional meeting at Saskatoon in nineteen hundred and eighteen realizing that a serious situation obtained in respect to concrete when exposed to the action of alkali waters, the Council approved of the appointment of the committee to investigate and report on the situation.

The Winnipeg members together with Prof. C. J. MacKenzie of Saskatoon held an informal meeting at the Royal Alexandra Hotel, on June 4th with Prof. Duff Abrams, Lewis Institute, Chicago; G. M. Williams, Bureau of Standards, Washington, and Messrs. Van Scoyoc and Fleming, Canada Cement Company, Montreal. The chair was taken by B. Stuart McKenzie, Chairman of the Committee of *The Institute.* While informal, this meeting originated valuable suggestions which have been approved by Council and suggested that the scope of the work inaugurated by *The Institute* be broadened and more representative including, besides *The Institute,* the Honorary Advisory Council for Scientific and Industrial Research, The Society of Chemical Industry, The Association of Canadian Building and Contracting Industries, The Bureau of Standards at Washington, The Technical Bureau of the Portland Cement Association and others. The consensus opinion of this meeting was contained in the following:—

> The matter of alkali action was most important. Field and Laboratory experiments under efficient direction was essential.
>
> Arrangements should be made at once for the formation of an Advisory Council to superintend operations, this council to have representatives from all interested organizations.
>
> That formal request be made to the Research Council for the sum of $15,000, or if Canada Cement Company desire to contribute, this sum be divided between the two.
>
> That a field man be selected at once and that field experiments be undertaken without delay.
>
> That advisory council meet once a year at any convenient centre.
>
> That when funds are on hand a central laboratory be established with competent chemist in charge to devote his entire time to laboratory work in connection with the alkali problem.

It is proposed to call a general meeting of the Committee at an early date to discuss the proposals, and having already been approved by Council it is expected that the proposed investigation will be undertaken shortly and it is hoped that it will result in a solution of the difficulty.

Employing Canadian Architects

In the House of Commons on June 8th, the Honourable W. L. MacKenzie King asked whether the proposed new war memorial building was to be designed and built under the direction of British architects. Sir Robert Borden had no information on the subject. For a building of this type which will stand as a monument to future generations and serve as a repository of the glorious record of Canadian achievement in the war, an opportunity is offered for architectural genius of a high order. To secure this it is not necessary for the Government of Canada to go outside the borders of the Dominion. As in engineering so in architecture, any requirements demanded of the profession can be adequately met by the men who compose the profession in this country.

Following the precedent established in connection with the new Parliament Buildings it is hoped that the Federal Government will maintain this procedure as a definite policy. The architects of Canada given the opportunity, and during the war this profession was called upon for heavy sacrifices, will without doubt rise to the highest eminence that the occasion demands. Should any negotiations have been made to employ other than Canadian architects for this important undertaking, it is hoped that a re-consideration will be made in favour of the men of excellent professional character and standing who comprise the profession of Canadian architects.

The architects will have the sympathetic support of the engineering profession in any efforts they may make towards the recognition and adoption of this procedure by the Canadian Government.

Maintaining a High Standard

The Quebec Branch of *The Institute* has consistently advocated the maintenance of a high standard in the engineering profession and has been one of the foremost of the branches in adhering to the highest qualifications for admission to *The Institute*, both as to education and experience.

At a meeting of Council held on June 22nd a resolution of this branch was presented pointing out that in connection with appointments made by one of the Government railway boards, cases had come to its attention where it appeared that appointments had been made of men who did not possess the necessary qualifications and requested that the influence of *The Institute* be used in the case of admission to the engineering staff of the government railways of corporate members of *The Engineering Institute of Canada* or graduates of recognized engineering universities. This principle was approved and steps taken to lay the situation before those in authority in order that the public may be protected from the possibility of men receiving appointments where influence is a factor and the necessary standard apparently lacking.

President Canadian Good Roads Association

As is fitting in view of the most important position which the engineers of Canada occupy in the development of good roads, the President of the Canadian Good Roads Association is an engineer, A. E. Foreman, B.Sc., M.E.I.C., chairman of the Victoria Branch of *The Institute* and chief engineer of Public Works of British Columbia. In the last issue of *The Journal* personal reference was made to Mr. Foreman in his position as chairman of the Branch. The prominent part Mr. Foreman has taken in the past in public activities and the success which has attended his efforts previously are an ample guarantee that under his direction for the coming year the affairs of the Canadian Good Roads Association will be well presided. Mr. Foreman was a member of the class of naught three of McGill which has a proud significance for the naught three members of his own and other universities.

Co-Operation for Mutual Benefit

During the past two years, an almost complete revolution has taken place in the mind of the average professional engineer in Canada in his relation to his responsibility to himself and to the profession. The former situation whereby the interest was not universal was due largely to the fact there was not an intimate contact as between the members of branches and between the individual nor a knowledge of what was taking place throughout the country, by the average member, such as has been made possible through the circulation of *The Journal*.

Loyalty to the profession is a dominant feature of the lives of Canadian engineers today, which, coupled with a desire on the part of nearly every engineer to share in advancing his status and standard is bound to result in an entire changed condition of affairs, and now that engineers are appreciating themselves the public will inevitably be educated to the important place the engineer holds in the industrial, social and economic life of the nation.

A striking illustration of changed sentiment, both on the part of engineers and of the public is afforded in one Canadian county where a branch was established during the past three years. Before the establishment of the branch the engineers had not realized their common interests and their combined influence was almost negligible in the municipality. Following the establishment of the branch the majority of the members of which became enthusiastic as to the possibilities and their enthusiasm at their meetings made an impression upon the mind of the average citizen. The municipal engineer was, generally speaking, on the defensive before every interfering rate-payer and ordinary seeking local politician. With the assistance of the local papers and by co-operating as a unit the engineering society stands as one of the most influential bodies and the municipal engineer's position is one of prestige and influence such as was not dreamed of a short time ago.

It is only by such loyalty and of co-operation that the profession in Canada is going to achieve its desired end. When it was brought to the attention of Council at the May meeting that there was a prospect of chapters being started in Canada of the A.A.E. with the avowed object of carrying on the same work for the profession as has been undertaken by *The Institute* it was felt by Council that such would result in a duplication of effort and would not achieve the results possible under the influence of the combined membership of *The Institute*. A letter embodying this sentiment was sent to the Executive of all the Branches. Following the receipt of this letter came the decision of the Toronto Branch which reflects in general the feeling of the engineers throughout Canada. This resolution which follows, and has been approved by the Council, was forwarded by the Toronto Branch to the Executives of all the branches.

> "We concur with the suggestions of the Council of The Institute as forwarded in the General Secretary's letter. We emphasize the fact that The Institute, with its organization and resources, has now become definitely committed to the policy of promoting, as the second of its papers, the welfare of its members, as evidenced by the formation of Committees on "Policy" and "Remuneration" as shown by The Journal for May 1921.
>
> We call attention to the [illegible] years' history showing on the members of [illegible] such [illegible] as [illegible] into Canada as this [illegible] of the American Association of Engineers, or any other [illegible] organization, however commendable its aims and ambitions.
>
> We emphasize the privilege and duty of the members of The Institute [illegible] [illegible] the work of the Committees on Policy and Remuneration [illegible].
>
> We [illegible] that the membership may [illegible] an attitude of undivided loyalty to The Institute and co-operating [illegible] in the work of the above two Committees [illegible] and [illegible] not [illegible] to [illegible]."

There is no question as to the result: the committee on Remuneration and the committee on Policy have a most important work to do as well as a great responsibility to the profession. It is hoped that the Branches may lose no time in tabulating all possible data and information bearing upon these subjects so that their findings may be considered as soon as possible and put into effect for the benefit and added prestige of the profession in this country.

ELECTIONS AND TRANSFERS

Elections and Transfers.

At the meeting of Council on June 22nd, a ballot was canvassed and the following were declared elected:—

Members.

Willie Harry Baltzell, of Windsor, Ont. chief engineer, Can. Steel Corpn. Ltd., Ojibway, Ont.

Associate Members.

S. W. Bruce Black of Toronto, Ont. B.A.Sc., (Univ. of Tor. 1913) with Hydro Elec. Power Comm. on details of design and layout; Jacob Edward Buerk, of Winnipeg, Man. acting engr. for Carter Halls Aldinger Co., Frederick Josef Conradi, of St. Catharines, Ont. (C.E.) plant engr. Brit. Am. Shipbldg. Co., Welland, Ont.; Herbert James DeSavigny of Weyburn, Sask. Res. engr. C.P.Ry.; Alexander Syme Fraser, of Kamloops, B.C. city manager, Kamloops, B.C.; Samuel Wilson Gray of Halifax, N.S. B.Sc., (C.E.) industrial surveyer with Dept. of S.C.R. Halifax, N.S.; B. Henderson, of Brandon, Man. instr'man, Maintenance of Way, C.N.Ry. Brandon, Man.; John Bain Lambert, of Victoria, B.C. senior asst. engr. in District Engr's office, Victoria, B.C.; Robert Spencer Lawrence, of Lethbridge, Alta. asst. engr. C.P.Ry. Dept. of Nat. Resources, Lethbridge, Alta.; Jeffrey Burland Macphail, B.A., (McGill Univ. 1914) at present bdge major, civil engineers training centre, Seaford, Eng.; Richard Alexander Malloy, of Devon, N.B. asst. engr. in D.P.W. (Bridge Dept.) New Brunswick; Kenneth Duncan McDonald of Toronto, Ont. B.A.Sc. highway engr. Imperial Oil Co. Toronto, Ont.; Patrick Joseph McGarry, of Merritton, Ont. D. & O.L.S., at present D.L.S. with Dom. Govt.; Earl John McIntire, of Sandwich, Ont. constr, engr. Canadian Steel Corp. Ltd. Ojibway, Ont.; John O'Neil of Fredericton, N.B. B.Sc., (C.E. Univ. of N.B.) at present instructor and demonstrator Univ. of N.B.; Gordon McGregor Pearston, of Winnipeg, Man. res. engr. with C.N.Ry.; Leandre Pierard, of Winnipeg, Man. B.Sc., designing dftsman, chief engr's dftg office, C.P.R. Winnipeg, Man.; William Hoyt Snelson of Calgary, Alta. at present ch. agric. engr. Irrig. Branch, Dept. of Interior, Calgary, Alta.; Hugh Wakefield Tooker, of Prince Rupert, B.C., in charge of constr. of Car Ferry Slip, and responsible for all instrument and other engr. work at G.T.P. yds. Prince Rupert, B.C.; Earle Oliver Turner, of Fredericton, N.B., B.Sc., Professor of C.E. Univ. of N.B.; Hugh Stanley Van Patter, of Kingston, Ont., M.A., (Math. Queens Univ. 1912), B.Sc., (Queens Univ. 1915), lecturer in maths., Faculty of Applied Science, Queens Univ.; Thomas Lee Watt, of Brantford, Ont., asst. engr. Port Weller Hbr. Constrn. Welland Ship Canal.

Juniors.

Wilmot Bright Browett, of Peterboro, Ont., foreman draughtsman in chge. of Industrial Control Apparatus, etc. with Can. Genl. Elec. Co. Ltd.; Murray Frederick Cossitt, of Halifax, N.S., in charge of survey wk. and gen'l. engr'g. for Pickings & Rolland, Civil & Mining Engrs., Halifax, N.S.; Horace McNaughton Fraser, of Vancouver, B.C., at present asst. to E. A. Jamieson, A.M.E.I.C., on hydro elec. power surveys; William Evans Jefferson, of Halifax, N.S., asst. instructor E.E. Dept. of S.C.R. Halifax, N.S.; Malcolm James MacMillan, of Halifax, N.S., at present 3rd yr. N.S. Tech. College; Samuel George Newland, of Sandwich, Ont. engr. in charge of constrn. work Great Lakes Dredging Co., Ojibway, Ont.; William Ewart Ross, of Peterboro, Ont., dftsman. Can. Gen. Elec. Peterboro, Ont.; George Winston Templeton, of Vancouver, B.C., at present asst. to E. A. Jamieson on hydro. elec. power surveys.

Associate.

Charles Henry Taggart, of Kamloops, B.C., at present in charge of party making re-survey and investigations to soils etc. in Manitoba under the direction of surveyer general.

Transferred from Associate Member to Member.

Frank Goldie Haven, of Winnipeg, Man., Div. Engr. with C.N.R. Winnipeg, Man.; Jeremiah James MacDonald, of London, Eng., B.Sc., (McGill Univ. 1911) ch. engr. of design for W. Alban Richards, engrs. and contractors, London & Paris; Ellis Waymough, Reed-Lewis, of Toronto, Ont., at present on engr. staff of Super Cement (America) Ltd. Mt. Dennis, Ont.; William John Duane Reed-Lewis, of Orillia, Ont., Dist. Vocational Officer, Voc. Br. Dept. S.C.R. Orillia, Ont.

Transferred from Junior to Associate Member.

Maxfield Lea Boswell, of Halifax, N.S., B.Sc., (C.E. McGill Univ. 1914), at present engr. with Halifax Ocean Terminals; John Francis Cassidy, of Toronto, Ont., at present asst. engr. Dept. Public Highways, Ontario; John Arthur Dickinson, of East Angus, Quebec, ch. draughtsman, Brompton Pulp & Paper Co., on mill maintenance and new constr.; John Raymond Hamilton, of Sault Ste. Marie, Ont., B.A.Sc., field engr. Algoma Steel Corpn. Sault Ste. Marie, Ont.; Roy Alexander McLellan, of Saskatoon, Sask., B.A.Sc., engineer and surveyer for Murphy & Underwood, Saskatoon, Sask.; Robert Wynyard Powell, of Thorold, Ont., at present asst. engr. Welland Ship Canal; James Harold Ramsay, of Cameron Falls, Ont., in charge of surveys, Cameron Falls Development, H.E.P.C.; Arthur William Sullivan, of Valleyfield, Que., Q.L.S. (Laval 1908,) private practice and ch. engr. for Valleyfield.

Transferred from the class of student to that of Associate Member.

Joseph Charles Day, of Montreal, B.Sc., (civil) (McGill Univ. 1914), at present in charge of structural dept. including all designing, plans and specifications, Lockwood, Greene & Co., of Canada, Ltd.

Transferred from Student to Junior.

Robert Scott Eadie, of Montreal, Que., at present taking fourth year in civil engineering at McGill Univ.

NEW BRUNSWICK "ENGINEERING PROFESSION ACT"

[illegible]

Short Title

1. [illegible]

Interpretation

2. [illegible]

[illegible]

(h) "Board" means the Board of Examiners of the Association;

(i) [illegible] registry known as the "Register."

The Association

3. (a) [illegible]

(b) The Head Office of the Association shall be at the City of St. John.

4. [illegible]

5. [illegible]

(a) [illegible]

(b) The management of its property;

(c) The levying and collecting of annual and other fees;

(d) The examination and admission of candidates;

(e) [illegible] the acceptance of resignations therefrom.

AN ACT TO REGULATE THE ENGINEERING PROFESSION AND TO INCORPORATE THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF ALBERTA.

WHEREAS [illegible]

[illegible]

Short Title

1. [illegible]

Interpretation

2. [illegible]

1. [illegible] Professional Engineers of Alberta.

2. [illegible]

3. [illegible]

4. [illegible]

5. [illegible]

6. [illegible]

7. [illegible]

8. [illegible]

9. [illegible]

10. [illegible] of the association.

11. [illegible]

The Association of Professional Engineers of Alberta

3. [illegible] or otherwise, and [illegible] and may [illegible]

4. [illegible]

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(f) All other purposes pertaining to the management of the Association.

6. All by-laws and amendments thereto shall become effective only after ratification by two-thirds of the votes received from members of the Association in good standing.

Who May Practise

7. (a) Only those persons who are members of the Association hereby incorporated and registered as such under the provisions of this Act, or who have received a license from the Council of the Association as hereinafter provided, shall be entitled to take and use the title of "Professional Engineer," or any abbreviation thereof, or to practise as a professional engineer within the Province of New Brunswick;

(b) Any person residing in the Province of New Brunswick at the time of the passing of this Act, who has practised engineering for at least six, (6), years preceding the date of his application, and who during that period has had charge of engineering work, or has been employed as an assistant on engineering work for at least two, (2), years shall be entitled to be registered as a member of the Association without examination, provided that such person shall produce to the Council within one year from the passing of this Act satisfactory proof of having so practised. In case of a graduate in engineering from a University or College recognized by the Council, the period of engagement in engineering work required by this section shall include his prescribed term of instruction in such college;

(c) Any person who shall come hereafter to reside in the Province of New Brunswick, and who at the time of his so coming to reside in this Province is a duly registered member of an Association of engineers of some other Province in the Dominion of Canada, with a constitution similar to the Association hereby incorporated may upon application be registered as a member of this Association without payment of fee for the then current year; provided that he produce to or file with the Council a certificate of membership in good standing in said other Association and an application for transfer of registry endorsed by the registrar or other proper officer of said other Association;

(d) Any person residing in the Province of New Brunswick not qualified as hereinbefore mentioned, and who may desire to become registered as a member of the Association, may make application to the Council, and shall submit to such examination as the Council may require, or shall submit such other proof of qualification in lieu of an examination as the Council may decide, and such person shall be registered as a member of the Association on payment of the prescribed fees after the Council shall have certified in writing that such examination has been satisfactorily passed, or that such other proof has been found satisfactory. If the applicant be a graduate in engineering of the University of New Brunswick or other college of standing recognized by the Council, he will not be required to submit to a written examination, but the applicant will be required to give the necessary proof as to his other qualifications as required by this act;

(e) Any non-resident of the Province of New Brunswick who is a registered member of an Association of Engineers in any other Province of the Dominion of Canada, having a constitution similar to the Association hereby incorporated, may obtain from the registrar a licence to practise as a professional engineer in the Province of New Brunswick upon application to the registrar for that purpose, and upon production of satisfactory evidence of his being a registered member in any such other Association, and on payment of a fee of one dollar Such license when so issued shall entitle said person to practise as a professional engineer in New Brunswick during the then current year.

Upon submitting the evidence required by this sub-section, and upon payment of the said fee, said person shall be entitled to practise as a professional engineer in New Brunswick pending the disposal of said application;

(f) Any person who is not a resident of Canada, but who is a member of any engineering or technical organization or society of standing recognized by the Council, may obtain a license to practice subject to the like qualifications as are required for registration under section 17 of this Act, and any person who is not a resident of New

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(a) The election of the council;

(b) The government and discipline of the members;

(c) The management of its property;

(d) The appointment of such officers as may be necessary for carrying out the purposes of the association;

(e) The maintenance of the association and the fixing and collecting of annual and other fees;

(f) The admission of candidates to the practice and profession of a professional engineer;

(g) The time and place for, and method of conducting, the annual and other meetings of the association;

(h) All such other purposes as may be deemed necessary or convenient for the management of the association and the promotion of its welfare or the conduct of its business.

(2) No by-law or amendment thereto framed by the council shall become effective until it has been ratified by two-thirds of the members of the association in good standing and voting thereon:

Provided that no such by-laws or amendments thereto shall be valid or take effect until approved by the Lieutenant Governor in Council.

5. (a) There shall be an interim council consisting of the members hereinbefore mentioned.

(b) The interim council shall appoint an interim registrar why shall for not more than three months have all the powers of an ordinaro registrar.

(c) The interim council shall assist the interim registrar in his work by approving or disapproving of the credentials submitted to him by persons applying for registration.

(d) Within three months after the passing of this Act the interim council shall call a general meeting of the then members of the association and shall upon the appointment of an ordinary council by such meeting cease to have any powers.

(e) The interim council shall have such powers as are necessary to carry on the interim business of the association.

(f) A quorum shall consist of five councillors but no application for registration of any person in any branch of engineering shall be considered unless a representative of that branch is present at the council meeting.

6. Professional engineering shall for the purpose of examination and representation upon the council only, be subdivided into the following branches: civil engineering, electrical engineering, mechanical engineering and mining engineering. New branches shall be formed on petition of members and ratification by the association at a general meeting thereof.

7. Only a member of the association or a person who has received a license from the council so to do, shall be entitled to take and use the designation of "registered professional engineer" or any abbreviation thereof or to hold himself out or to advertise himself as a "registered professional engineer."

8. The following persons shall be entitled, subject to the conditions in this section set out, to be registered as members of the association:

(a) Any person domiciled in Alberta at the date of the passing of this Act, if he has for five years previously practised as a professional engineer, and produces to the board on or before January 1, 1921, satisfactory credentials.

(b) Any person domiciled in Alberta, if he is a registered member of an association of engineers having the same or similar powers in any other province of the Dominion of Canada and produces to the board a certificate of membership in good standing in such other association, and an application for transfer of registry endorsed by the proper officer of the first mentioned association.

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(e) The registrar and the secretary shall be appointed by the Council. The same person may be appointed to the office of both registrar and secretary;

(f) The secretary of the Association shall also be the secretary of the Council.

10. (a) The Council may on a two-third vote of all the members of the Council reprimand, suspend or expel from the Association any member guilty of unprofessional conduct, negligence or misconduct in the execution of the duties of his office, or convicted of a criminal offence by any Court of competent jurisdiction.

The Council shall not take any such action until a complaint under oath has been filed with the registrar and a copy thereof forwarded to the person accused. The Council shall not suspend or expel a member without having previously summoned him to appear to be heard in his defence, nor without having heard evidence under oath in support of the complaint and on behalf of the member charged if offered. The Council shall have the power to summon witnesses to attend and to answer under oath concerning the matter of the said enquiry. The president of the Council or any person acting in his behalf on the hearing of the said charge, or the secretary, is hereby authorized to administer oaths in such case. All evidence given shall be taken down in writing or by a stenographer duly qualified and sworn for the purpose;

(b) Any member so expelled or suspended may within thirty days after the making of the order of expulsion or suspension, appeal to a judge of the Supreme Court from such order, giving seven days' notice of appeal to the secretary of the Council, who shall thereupon file the evidence so taken with the registrar of the Supreme Court, whereupon such judge shall decide the matter of appeal upon the evidence so filed, or may in his discretion hear additional evidence, and shall confirm or set aside such order of expulsion or suspension, and the order of the said judge shall be final. The costs of such appeal shall be in the discretion of the said judge;

(c) Unless the order of expulsion or suspension is set aside on such appeal, or the said judge or the Council otherwise order, the member so expelled or suspended shall not practise thereafter except in case of suspension upon expiry of the period of suspension. Pending an appeal, the members so expelled or suspended may practise.

Penalties

11. Any person who not being a registered or licensed professional engineer in New Brunswick, or who is suspended or has been expelled under the proceedings of the next preceding section:

(a) Practises as a professional engineer, or

(b) Uses the title of professional engineer or makes use of any abbreviation of any such title, or of any name, title or designation which may lead to the belief that he is a professional engineer or a member of the Association, or

(c) Advertises himself as such in any way or by any means, or

(d) Acts in such manner as to lead to the belief that he is authorized to fill the office of or to act as a professional engineer,

shall be liable upon summary conviction to a fine of not less than $100.00 nor more than $200.00 and costs, and on failure to pay the same, to imprisonment for not more than three months for the first offence, and for any subsequent offence to a fine of not less than $200.00 and not more than $500.00 and costs, and on failure to pay the same to imprisonment for not more than six months.

Registration

12. It shall be the duty of the registrar to enter in the register the name of each person entitled to practise as a professional engineer. He shall keep his register correct in accordance with the provisions of this Act and of the rules, orders and regulations of the Council. The certificate of the registrar under the seal of the Association shall be prima facie evidence of registration or license as the case may be.

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(2) If any member omits to pay the prescribed annual fee within six months of the date upon which it became due, the registrar shall cause the name of such member to be erased from the register, and such member shall thereupon cease to be entitled to practise as a registered professional engineer, but shall, at any time thereafter, upon paying such fee as may be prescribed by the council, be entitled to all his rights and privileges as a member from the time of such payment.

14. A registrar shall be elected by ballot by the council as soon as possible after the first annual election of the council, and biennially thereafter.

(2) The registrar shall be the executive officer of the association under the direction of the council and shall have such powers as are necessary for the proper administration and enforcement of the provisions of this Act and the by-laws made thereunder.

15. A register of all registered professional engineers showing the dates of their certificates shall be kept and a list of registered professional engineers in good standing shall be published in the first issue of The Alberta Gazette on or before February 15, of each year.

(2) Every certificate of registration or license shall be signed by the president and the registrar, and shall bear the seal of the association and shall specify the branch or branches of professional engineering in which the professional engineer has been registered or licensed.

(3) Every person registered under this Act shall have a seal, supplied by the council at his expense with which he shall stamp all official documents and plans. The seal shall state upon its face the branch or branches of professional engineering in which he has been examined or otherwise admitted.

16. The certificate of the registrar under the seal of the association shall be **prima facie** evidence of membership of the association or licence, or non-registration or non-possession of license, as the case may be.

17. The board shall inspect all diplomas, certificates, and credentials presented or given in evidence for the purpose of obtaining admission to examination, and may require the holder of such credentials to attest to them by oath or affidavit in any matter involved in his application. If such evidence is not satisfactory to the board, the board shall refuse to admit such candidate to examination for registration.

18. From and after January first, 1921, every applicant for membership not qualified under subsections (b) and (c) of section 8 of this Act, shall, in addition to complying with the requirements of that section, pass such examinations as may be approved by the Senate and the said Senate shall appoint a board of examiners for the purpose of conducting such.

20. Regular examinations of candidates for registration shall be held at Edmonton or such other place or places as the Senate may direct.

(2) The scope of the examinations and the methods of procedure shall be prescribed by the Senate with special reference to the applicant's ability to carry on the particular branch or branches of professional engineering which he desires to practise in the province.

(3) Every candidate for examination shall give at least one month's notice in writing to the registrar of his intention to present himself for examination and with such notice shall forward the fee prescribed by the by-laws of the association and before receiving his certificate of registration the prescribed entrance fee, the prescribed annual fee and a sum of not more than five dollars for the publication of his name in The Alberta Gazette.

(4) In case the candidate should fail in his examination he may present himself at any subsequent regular examination by paying the prescribed examination fee.

21. Notwithstanding any other provision of this Act, no person shall be registered or licensed unless at least twenty-five years of age, and unless he has been engaged for eight years in some branch of professional engineering, except in the case of a graduate from an engineering college or university approved by the Senate in which

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such person to be erased from the register, and such person shall thereupon cease to be deemed to be a professional engineer, but such person shall at any time thereafter upon payment of all fees in arrear be entitled to all his rights and privileges, as a professional engineer from the time of such payment;

(c) Any person registered under this Act may resign from membership in the Association upon giving notice in writing to the secretary, whereupon the name of the said member shall be erased from the register, and such member shall be relieved of the liability for further annual fees.

21. In case the Council neglect or refuse to register the name of any person as a member of the Association, or to issue a license to practise, the person aggrieved shall have the right to apply to a judge of the Supreme Court, who, upon due cause shown, may make an order directing the Council to register the name of such person or to grant to such person a license to practice, or make such other order as may be warranted by the facts, and the Council shall forthwith comply with such order. Such order when so made shall be final.

22. If the registrar makes or causes to be made any willful falsification in any matters relating to the register, he shall forfeit the sum of $100.00.

23. If any person shall willfully procure or attempt to procure himself to be registered or licensed under this Act by making or producing or causing to be made or produced any false or fraudulent representation or declaration, either verbally or in writing, every such person so doing, and each person knowingly aiding and assisting him therein, shall forfeit and pay the sum of $100.00.

24. Any and all penalties imposed under this Act and any and all sums of money forfeited shall be recoverable with costs under the provisions of the law respecting Summary Convictions.

25. Any information for the recovering of any such penalty or forfeiture may be laid by any member of the Association appointed by the Council.

26. Any sum recovered as a penalty or forfeit under this Act shall upon being recovered belong to the Association for the use thereof.

27. No proceeding shall be commenced for any violation of the provisions of this Act but within one year from the date of such violation.

28. No person practising as a professional engineer shall be entitled to recover any charge in any court of law for any service included within the practice of a professional engineer as defined in section 2, sub-section (b) of this Act unless he shall be registered under this Act.

29. The following persons are hereby constituted a Provisional Council of the Association: President—Charles C. Kirby, of the city of St. John; vice-president—Geoffrey Stead, of the town of Chatham; councillors—R. Fraser Armstrong, of the town of Woodstock; Collingwood B. Brown, of the city of Moncton; Burton M. Hill, of the city of Fredericton; David F. Maxwell, of the town of St. Stephen; R. J. Sandover-Sly, of the town of Campbellton; Alexander R. Dufresne, of the city of St. John; Charles O. Foss, of the city of St. John; Joseph A. Grant, of the city of St. John; Gilbert G. Murdoch, of the city of St. John.

30. The duties of the Provisional Council shall be to provide the register called for by this Act, to enter therein the names of those who are entitled to registration, and who apply therefor under the provisions of section 7, sub-section (b), and to call within six months from the coming into force of this Act the first general meeting of the Association for the said purposes; and for the purposes of organization of the Association they shall have the powers conferred by this Act on the Council of the Association. The powers of the said Provisional Council shall cease on the election of the first regular Council of the Association.

31. No provision of this Act restricting the practice of the profession or imposing penalties therefor shall take effect until one year after the passing of this Act.

32. Every person registered under this Act may have a seal, the impression of which shall contain the name of the engineer and the words "Registered Engineer, Province of New Brunswick," with which he may stamp all official documents and plans.

33. The activities of the Association are hereby restricted to the functions necessary to the administration of this Act.

ALBERTA

26. Where any person, after conviction under this Act or who, not being a registered professional engineer, uses, or purports to use the designation or title of "Registered Professional Engineer," or who holds himself out as such, the association may apply to a judge of the Supreme Court for an injunction restraining such person from using, attempting or purporting to use such designation or title, and such judge or court shall, on being satisfied that such person has so been convicted, or has used, or attempted or purported to use designation or title, in the province grant the said injunction.

27. If any person shall wilfully procure or attempt to procure himself to be registered or licensed under this Act, by making or producing, or causing to be made or produced, any false or fraudulent representations or declarations, either verbal or in writing, he, and every person knowingly aiding or assisting him therein, shall be liable on summary conviction thereof to a fine of one hundred dollars.

29. The activities of the association are hereby restricted to the functions necessary to the administration of this Act.

SCHEDULE A.

Transportation work, roads, railways, waterways, and all detail works connected therewith, such as bridges, tunnels, yards, docks, lighthouses, rolling-stock and vessels, also aeroplanes and airships.

Public utility works, such as telegraph systems, telephone systems, electric light systems, waterworks, gasworks, irrigation works, drainage works, sewerage works and incinerators.

Steel, concrete, reinforced concrete structures.

Mechanical works, such as steam boilers, engines, turbines, condensers, pumps, internal combustion engines, and other motive power machinery and accessories.

Electrical machinery and apparatus and works for the development, transmission, and application of all forms of electrical energy.

Mining and metallurgical works, such as mining properties, mine and concentrator machinery and apparatus, oil and gas wells, smelters, cyanide plants, acid plants, metallurgical machinery, equipment and apparatus, and works necessary for the economical winning or preparation of metals, minerals or rocks.

All buildings and structures necessary for the proper housing of operation of the above mentioned works.

The mechanical, electrical, chemical, electro-chemical mining, or metallurgical treatment of the inorganic elements and combinations thereof for all industrial purposes.

Investigations relating to the examination, exploration and development of rocks and minerals, mineral deposits, rock structures and the application of geology to the industries of arts, or to engineering.

EMPLOYMENT BUREAU

To make this department more valuable it is proposed that in future advertisements of situations vacant should state salary, and give details of requirements.

Situations Vacant

General Foreman for Municipal Work

General foreman for municipal work. Applicant must be able to secure results and have had previous experience. Salary approximately $150.00 a month to start. Apply stating salary desired and give references. Box No. 120.

Mechanical Foreman

Young graduate mechanical engineer with shop experience wanted for machinery company. Box No. 121.

Graduate for Railway Engineering

Young graduate wanted for railway engineering, Montreal, Box 123.

Engineer for Railway

Engineer wanted for unit prices and construction work etc. Railway engineering. Box 124.

Field Draughtsman

Field draughtsman for St. Lawrence Ship Canal Survey, $100 and $110 and expenses per month. Box 125.

Mechanical Engineer

First class mechanical engineer, familiar with machine and pipe layout and general maintenance work; pulp and paper mill experience desirable; speed and accuracy essential; salary $150.00 to $200.00 a month. Box 127.

Town Engineer

Town engineer wanted for small municipality in northern Quebec, to have charge of the various town departments. Salary $200 to $250 a month. Box 128.

Rodman-Chainman.

Young engineer experienced in instrument work wanted as rodman-chainman for lumber company in New Brunswick to work on surveys for large hydro-electric development; $75.00 to $100.00 a month and board for rodman-chairman or $100.00 to $150.00 a month and board for instrument-man depending upon qualifications. Box 129.

Draughtsmen

Two draughtsmen wanted for general plant layout work, etc., for Montreal. Salary $160.00 per month. Box 130.

Electrical Engineer

Electrical engineer for electric light and water works systems, Ontario municipality. Box 131.

Mechanical Engineer

Engineer with mechanical experience for appraisal of machinery and equipment. Salary about $[illegible] per month with expenses, depending on qualifications. Box [illegible].

The Civil Service Commission of Canada hereby give public notice that applications will be received from persons qualified to fill the following positions in the Civil Service of Canada:—

Shipyard Superintendent, Sorel, P.Q.

1164. A Shipyard Superintendent for the Government Shipyard at Sorel, P.Q., at an initial salary of $3,000 per annum, which will be increased upon recommendation for efficient service at the rate of $180 per annum until a maximum of $3,540 has been reached. This initial salary will be supplemented for the present fiscal year by the bonus provided by law.

Duties.—Under executive direction, to have charge of the Sorel shipyard; to be responsible for the design, estimates for construction, and repair of ships; to supervise safekeeping of stores and stock and the work of all employees; and to perform other related work as required.

Examination.—Subjects and weights as follows: Education, training and experience, [illegible]; Oral Interview, if necessary in the opinion of the Commission, [illegible].

Hydraulic Engineer.

1165. An Hydraulic Engineer, at an initial salary of $2,700, which will be increased upon recommendation for efficient service at the rate of $120 per annum until a maximum of $3,180 has been reached. This initial salary will be supplemented for the present fiscal year by the bonus provided by law.

Duties.—Under direction, to have charge in a district or division of survey parties engaged in power development, hydrometric, reclamation, river regulation and other hydraulic engineering works; to prepare plans, specifications and estimates for, and supervise construction of various hydraulic engineering works; and to perform other related work as required.

Examination.—Subjects and weights as follows: Education, training and experience, [illegible]; Oral Interview, if necessary in the opinion of the Commission, [illegible].

A list of eligibles will be established in this class, but the only vacancy at present is in the Chief Engineer's Branch of the Department of Railways and Canals, Ottawa.

Situations Wanted

Civil Engineer

Graduate Civil Eng'r. Jr.E.I.C., with good experience in construction, surveys, etc. is open for position with contracting firm or manufacturing company. Box 33-P.

Civil Engineer

Situation wanted by graduate civil engineer. A.M.E.I.C., experienced in coal tar products, especially benzol recovery; also good construction man. Box 37-P.

OBITUARY

Past President Kennet William Blackwell

The fourteenth President of *The Institute* Kennet William Blackwell, M.E.I.C., vice president of the Canadian Steel Foundries, Limited, died at his home at 103 Crescent Street, Montreal, on Friday, June 11th, after a brief illness.

KENNET WILLIAM BLACKWELL, M.E.I.C.

In addition to occupying a prominent place in engineering circles Mr. Blackwell's name will be remembered in connection with the prominent place he occupied in building up the steel casting industry in Canada. A son of the late Thomas E. Blackwell, he was born in Wiltshire, England in 1850, and came to Canada as a youth with his father who was the first general manager of the Grand Trunk Railway. He was educated at Bishops' College School, Lennoxville, and was apprenticed as a mechanical engineer in the G.T.R. shops, Point St. Charles. He was later appointed mechanical superintendent of the G.T.R. for the division between Montreal and Toronto with headquarters at Belleville. Subsequently he became mechanical superintendent of the Chicago and Grand Trunk Railway and later joined the Canadian Pacific Railway as mechanical superintendent. In 1882 he went into the manufacturing business under the name of K. W. Blackwell, manufacturing railway car springs, etc. This business later became a joint stock company of which Mr. Blackwell was president, the firm subsequently becoming Montreal Steel Works, Limited, of which Mr. Blackwell was president and managing director. The company was absorbed by the Canadian Car & Foundry Co. under the name of Canadian Steel Foundries, Limited, Mr. Blackwell being vice president up till the time of his death. Mr. Blackwell was vice president of the Merchants' Bank of Canada, and a director of several prominent business concerns.

He is survived by Mrs. Blackwell, two sons and one daughter, E. G. Blackwell, Vancouver, K. G. Blackwell of Martintown, Ont. and Mrs. A. E. Blake of Somersetshire, England.

PERSONALS

Edward Hughes, Jr.E.I.C., has accepted a position as mine surveyor for the C.M.P.C. Co. Fernie, B.C.

*

George G. Anderson, M.E.I.C., consulting civil engineer has moved his office to 533 Consolidated Realty Building, Los Angeles, California.

*

John S. Brisbane, A.M.E.I.C., has resigned his position with the Imperial Oil, Ltd., to accept a position with T. Pringle & Sons of Montreal.

*

J. Howard Wheatley, A.M.E.I.C., has accepted a position as sales engineer with the Blashill Wire Machinery Company Ltd., 307 St. James St. Montreal.

*

Harry L. Bunting, A.M.E.I.C., since March 1st, 1920 has held the position of municipal engineer in the district of Ste. Anne, Manitoba, under the Manitoba Good Roads Board.

*

Albert Holland, A.M.E.I.C., has sailed for Africa on the R.M.S. "Abinsi". He has been appointed an executive engineer in the Public Works Department, Gold Coast Colony.

*

W. D. Proctor, Jr.E.I.C., has accepted a position as resident engineer on waterworks construction in Scarboro Township with the E. A. James Co. Ltd., 36 Toronto St., Toronto.

*

D. L. Derrom, M.E.I.C., sailed for Brazil on the 26th of June and his present address is C/o Trading Engineer, Inc., Rua da Assemblea, 8, Rio de Janeiro, Brazil.

Axel Rath, M.E.I.C., late of Copenhagen is at present engaged in municipal work in Java and his present address is Ingenieur Burgerlyke Openbare Werken Dept., Batavia, Java.

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W. P. Near, M.E.I.C., the newly elected chairman of the Niagara Peninsula Branch, read a paper before the Canadian Good Roads Congress at its meeting in Winnipeg early in June. The title of Mr. Near's paper was "The Cement Concrete Road."

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Charles E. Henderson, M.E.I.C., has accepted an appointment with Morris Knowles, Ltd., engineers, of Windsor, Ont., as manager. Mr. Henderson was formerly principal assistant engineer with the United States Housing Corporation, Washington, D.C.

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Romeo Morrissette, A.M.E.I.C., has resigned his position as principal assistant district engineer for the Department of Public Works, Canada, and has accepted a position on the staff of the National Shipbuilding Company, Three Rivers.

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John H. Ryckman, A.M.E.I.C., has recently passed examinations for registered structural engineer under the law of the State of Illinois and now holds a license to practice structural engineering in that state. Mr. Byckman is at present designing engineer, Department of Public Works, Chicago.

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The marriage took place early in June of R. G. Bangs, A.M.E.I.C., to Miss U. E. Plant of Westmount, at St. George's church, Montreal. After the honeymoon Mr. Bangs expects to reside in St. Catharines where he will continue in the government service in connection with the Welland Ship Canal.

•

A. A. Dion, M.E.I.C., general manager of the Ottawa Electric Company and the Ottawa Gas Company has been raised to the grade of full membership in the Illuminating Engineering Society of the United States. He has also been elected member of the Engineering Section of the National Safety Council of the United States.

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Frank Peden, B.Sc., A.M.E.I.C., formerly of the architectural firm of Peden and McLaren, Montreal, who has for several years past been connected with the engineering staff of The Steel Company of Canada in the capacity of engineer, has opened an office at 65 McGill College Avenue, Montreal. He will resume his practice as architect and constructional engineer.

Colonel J. L. R. Parsons, D.S.O., B.A., M.E.I.C., who has recently been elected to membership in The Institute is president of the Parsons Engineering Co., engineers and surveyors of Regina. With him are associated in business, W. R. W. Parsons, M.E.I.C., vice-president, J. N. deStein, M.E.I.C., sec.-treas. and manager, [illegible], A.M.E.I.C., R. S. Cowdery, A.M.E.I.C., and C. H. Iuddell, A.M.E.I.C.

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F. E. Emery, A.M.E.I.C., secretary of the special committee to make arrangements for the Western Professional Meeting at Banff, August 16 to 18th, made a trip to Banff on June 10th to make preliminary arrangements and look over the site of the camp which will be used on that occasion. Mr. Emery brings back a very favourable report on the camp site and camping facilities provided by the Dominion Government, near the mouth of the Spray river, immediately adjacent to the town and railway station at Banff.

•

S. J. Chapleau, M.E.I.C., resident engineer of the Department of Public Works, has been appointed to act as representative for Canada on the board of control, the formation of which was recommended by the International Joint Commission, for the construction of compensating works in St. Mary's river by the Michigan Northern Power Corporation and the Algoma Steel Corporation. Mr. Chapleau will act on the board of control during the absence in Europe of W. J. Stewart, M.E.I.C., who was formally appointed in June 1914 as Canadian representative.

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G. H. Duggan, M.E.I.C., President of the Dominion Bridge Company of Montreal, who graduated with the class of '83 from the University of Toronto, was given the honorary degree of D.Sc. at the convocation held in Toronto on Thursday, June 3rd. Dr. Duggan has not only played a prominent part in engineering development in Canada, as, for example, in the design and construction of the Quebec Bridge, but he has for some time taken an increasingly important part in financial undertakings. He is a director of the Royal Bank and a member of other well-known institutions.

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J. L. Busfield, A.M.E.I.C., the newly elected Secretary-Treasurer of the Montreal Branch, is a graduate of London (Eng.) University, and has been an active member of The Institute for a number of years. He has presented several papers on engineering subjects to the members, and during the past year was Chairman of the Reception Committee of the Montreal Branch. Mr. Busfield was for some time connected with the construction of the Mount Royal Tunnel, but for some years has been principal assistant to Walter J. Francis & Company, consulting engineers.

H. S. Philips, A.M.E.I.C., who has recently been appointed to the staff of H. A. Brazer, A.M.E.I.C., city engineer, London, Ont., in connection with special drainage work including pumping stations and sewage treatment works, enlisted in the Canadian Engineers in February 1917 and served in Canada until he was appointed assistant to the District Vocational Officer, Montreal with the Dept. of Soldiers Civil Re-Establishment. Mr. Philips entered the Dept. of Works, Toronto, in August 1911 and was appointed engineer-in-charge of sewer design. From July to December 1915 he was assistant district engineer, Buffalo District in connection with the Pollution of Boundary Waters Reference for the International Joint Commission when complete studies were made for sewerage treatment works for all the towns and cities on the Niagara River. During the early part of the war Mr. Philips was with the Canada Nitro-Products Ltd., Toronto on munition plant design.

*

Brig.-Gen. H. T. Hughes, C.M.G.,D.S.O.,A.M.E.I.C., chief engineer of the Battlefield Exploit Memorial Commission, sailed on June 16th on the Empress of France for France and Belgium where he expects to remain for the years, perfecting plans and carrying on the work in next there connection with the Battlefields Memorials. He was accompanied by three Canadian officers, all returned men, namely, a finance officer, an assistant engineer and a landscape architect. The sites have been definitely fixed as follows: St. Julien, Passchendael, Hill 62, in front of Sanctuary Wood, Vimy, Dury Cross Road, Bourlon Wood, Courcelette Hospital Wood, and a site just north of Lequesnal. Brig.-Gen. Hughes, upon his arrival, will take steps to secure the right of way from the main roads up o each of these sites, and will build roads leading to them. Then in the fall or early winter, plans will be prepared for the memorials themselves, and the honorary commission in Canada will call for competitive designs from the architects and sculptors in Canada.

*

Tyrrell Ferrier, Jr.E.I.C., who returned to Canada in June 1919, sailed from Canada to join the Imperial Forces on February 27th 1915 and was gazetted as an inspector of ordnance machinery, third class and Hon. Lieut. A.O.D. on March 15th 1915, taking thereafter a three months' course on field and fortress armament etc., with another three months at Stirling, Scotland. Lieut. Ferrier left for France on September 20th, 1915 and spent the next three years with the B.E.F. with a light ordnance mobile work shop, superintending repair and maintenance of guns, carriages, optical instruments and all manner of war-like stores. Lieut. Ferrier returned to England in July 1918 and was stationed at Harwich, Sheerness and Chatham looking after fortress and anti-aircraft armament and was demobilized as Captain and I.O.M. 2nd class, from the Royal Army Ordnance Corps when he reached Canada in June 1919 and was demobilized. Finally Captain Ferrier retu ned to work or the Hydro-Electric Power Commission of Ontario on July 2nd, 1919 with whom he is at present engaged.

Colonel W. H. Magwood, M.E.I.C., who has recently been elected vice-chairman of the Ontario Provincial Division, was born in the township of Mornington, Ont. in 1870 and was educated in public schools and Collegiate Institute with matriculation. From 1891 to 1897 he devoted his time to chain and compass survey and attended lectures on topography, fortification, explosives, etc. Later he studied under T. H. Wiggins, and F. D. McNaughton, municipal engineering. In 1902 Colonel Magwood formed a private business which in 1905 was extended to Magwood and Walker and in 1912 the name of the firm was changed to Magwood and Stidwill.

Colonel Magwood was engaged in municipal engineering in eastern Ontario in the design and construction of reinforced concrete bridges and buildings etc.; during this period he was acting resident engineer, Ottawa Division, New York Central R.R. In August 1915 to June 1917 Colonel Magwood was in the Canadian Expeditionary Forces in Canada, England and France (77th, 154th and 28th Brit. Inf.) returning in 1917 to his former occupation of professional engineer. At present Colonel Magwood is town engineer for Cornwall, Alexandria, Maxville, and several rural municipalities in charge of the survey and construction of five miles of railway in the Adirondack Mountains, drainage of extension swamp lands in Caledonia and Alfred townships, and general municipal work.

*

Chief Whip of British Columbia Government

F. W. Anderson, B.Sc., A.M.E.I.C., son of the late Wm. Anderson, a well-known lumberman of the Ottawa Valley and late manager for J. R. Booth Co., Ottawa, is

F. W. Anderson, B.Sc., M.L.A., A.M.E.I.C., Chief Government Whip, British Columbia.

responsible more than any other member of the profession for the successful passing of the act to incorporate the Association of Professional Engineers of the province of British Columbia. In his capacity as a member of the Legislative Assembly and as an ardent advocate of the status of the engineering profession, he protected the cause of engineers through the stress of heated debate and succeeded against considerable opposition in having the act made law.

Mr. Anderson was born in 1883 at Ottawa, Ont., educated at Ottawa Collegiate Institute and McGill University, Montreal (Bachelor of Science in Civil Engineering) and started as instrumentman with the Temiskaming & Northern Ontario Railway in 1903. In 1905 he was in charge of hydrographic work, stream gauging etc. of the Georgian Bay Ship Canal Survey and in 1906 he was inspector on plants for T. Pringle & Sons of Montreal. In 1907 he was engineer for the Eastern Construction Company on a fifty-two mile contract on the National Transcontinental Railway. In 1908 Mr. Anderson was resident engineer for the Grand Falls Power Company, Ltd., of Grand Falls, N.B. After spending some time on construction and other work he went to Kamloops and is now largely interested in live stock, farming and irrigation developments. He holds the commission of Lieutenant, Canadian Engineers, C.E.F. Mr. Anderson was first elected to the Legislative Assembly of B.C. for Kamloops in 1916 and he was elected first deputy government whip in 1917 and chief whip in 1918.

Enthusiastic Champion of Profession

C. E. W. Dodwell, B.A., M.E.I.C., President of the Association of Professional Engineers of the Province of Nova Scotia, and Chairman of the Halifax Branch of *The Institute* occupies a premier position in the development of the affairs of professional engineers in the Dominion. For over twenty years he has worked assiduously in order that engineers might occupy a higher place in national affairs and enjoy greater prestige individually and professionally. When the application was forwarded to Council for permission to establish a Branch of *The Institute* in Halifax his was the first signature. In all the efforts to secure legislation for engineers at Ottawa Mr. Dodwell has been a leader, and the zealous interest he has taken from the time that many of the present members of *The Institute* were in their boyhood has never waned.

When the committee was appointed by Council to prepare a model act for engineers it was natural that Mr. Dodwell should be a member of this committee, of which as Chairman he was the guiding spirit. On this occasion his fellow committee members presented him with a suitably engraved silver cigarette holder.

Writing of the Legislation situation present and past in a recent communication Mr. Dodwell says:—

> "In our Act, as finally passed, there are, as was to have been expected, several amendments which, while they certainly do not improve it, cannot be regarded as seriously detrimental or poisonous to its spirit and intent. There will be interest in a comparison between the draft as prepared by the general committee in Montreal in April 1919 and the final Act.
>
> Our local Legislation committee early decided to [illegible] in accepting the best of less objectionable amendments, feeling that any Act, so long as it was not emasculated beyond recognition, was better than none, because if in local [illegible] it proves inadequate or insufficient to the realization of the legitimate aspirations of the Profession, it would not be a difficult matter to have further and favorable amendments made as conditions may arise in the future.

C. E. W. DODWELL, B.A., M.E.I.C.

> The history and progress of our Legislation campaign for the past two or three years, or since the Annual Meeting of the E.I.C. in Ottawa in February 1919 have been set forth very fully in the columns of *The Journal*, but a few words regarding its conception may not be out of place here because the account of our early struggles and strivings for the establishment and recognition of our profession by Legislative enactment may not be lacking in historic interest for future generations of engineers throughout Canada.
>
> The general subject of improved status was pretty fully discussed in the ranks of the C.S.C.E. and in the Council in [illegible] and [illegible]. At the Annual Meeting of the Society in Montreal in the latter year a resolution was passed providing for the appointment by the Council of a central committee of five in Montreal and sub-committees of three each in Ottawa and Toronto. The members of the central committee of five were Alan MacDougall, chairman,

W. T. Jennings, Walter Shanly, G. H. Webster, A. J. Hill and C. E. W. Dodwell, and of these I am the sole survivor. The sub-committee for Nova Scotia, appointed in February 1896, comprised Dr. Murphy, M.E.I.C., convenor, W. R. Butler, M.E.I.C., W. G. Matheson, M.E.I.C., and C. E. W. Dodwell, M.E.I.C. all of whom are still in the land of the living.

A Bill drafted conjointly with the Central Committee in Montreal and the Nova Scotia Committee was presented to the Legislature in Halifax in February 1887. It was passed by the House of Assembly, but "deferred" by the Legislative Council, and the whole matter lay dormant in this province from that date until the present year.

A few words now about the conception and birth of the E.I.C.

R. O. Wynne-Roberts, M.E.I.C., chairman of the Toronto Branch of the E.I.C. in his excellent inaugural address on January 22nd, 1920, "A Generation of Engineering in Canada" said:—"The late Alan Macdougall of Toronto appears to have been one of its active organizers....". Here I rise with due diffidence and respect to prefer my claim to be associated with the late Mr. Macdougall in the credit for the joint fatherhood of the Society for in 1884 and 1885 he and I earnestly debated the matter in Toronto, when I was there (1882 to 1885) in charge as division engineer of the construction office of the Ontario and Quebec Railway, from Toronto to Smiths Falls, (C.P.Ry.). Subsequently committees were formed in Toronto, Ottawa and Montreal to discuss details and design the framework of the proposed organization.

The Montreal delegates, John Kennedy, M.E.I.C., P. W. St. George, M.E.I.C., and H. G. Bovey,—to meet those from Ottawa and Toronto—were elected at a meeting at Mr. Kennedy's house on Thursday, November 11th, 1886. Later a larger central committee virtually forming the nucleus of the C.S.C.E. was set up in Montreal, the members being, John Kennedy, M.E.I.C., E. P. Hannaford, G. H. Henshaw, H. Wallis, M.E.I.C., P.W. St. George, M.E.I.C., H. T. Bovey, K. Blackwell, P. A. Peterson and C. E. W. Dodwell, M.E.I.C. The final meeting of this committee at which the C.S.C.E. was born, took place in the Board Rooms of the Harbour Commissioners in Montreal on the 20th of January 1887. It was a notable and successful achievement in obstetrics. The infant that first saw the light on that memorable occasion throve from the first, and now, in its thirty-fourth year has reached a healthful and useful maturity.

The Society was duly incorporated by Royal Charter on the 23rd, of June 1887, and the first section of that historic document gives the names of nineteen engineers as constituting the Society with others. In this list my name should have been included, though I was of mature age (33) and an Associate Member of the Institution of Civil Engineers, and I was thus robbed of an honor to which I felt that I was entitled. At that time I was division engineer in charge of the construction of the C.P.Ry. from Windsor Street, Montreal to Vaudreuil, the late Mr. Peterson being my immediate chief."

That Mr. Dodwell may be spared many years of useful effort, and that he may live to see his untiring efforts in the interests of the engineering profession bear fruit in a greater measure is the sincere wish of his host of friends in the profession which includes not only Canada but the United States and Great Britain.

BRANCH NEWS

Montreal Branch

J. L. Busfield, A.M.E.I.C., Secretary-Treasurer.

The Annual Meeting of the Montreal Branch was held on Thursday, May 27th, and was attended by about 100 members of the Branch. The Chairman of the Branch, Walter J. Francis, M.E.I.C., presided.

The report of the scrutineers, Messrs. Beique and Hannaford, was read and the result of the elections was as follows:—

Chairman,	Arthur Surveyer, M.E.I.C.
Vice-Chairman,	J. H. Hunter, A.M.E.I.C.
Secretary-Treasurer,	J. L. Busfield, A.M.E.I.C

all by acclamation. Messrs. John T. Farmer, M.E.I.C., O. O. Lefebvre, A.M.E.I.C., and G. R. MacLeod, M.E.I.C., were elected to the vacancies on the Executive Committee.

The Secretary read the Annual Report of the Branch which, he explained, was really "a bringing-up-to-date" of the Annual Report to *The Institute* covering the previous calendar year. The accounts of the activities of the Branch since January are to be found in *The Journal* as follows:—

March, 1920,	page 155,
April, "	" 19,
May, "	" 274.

The report deals at some length with the financial standing of the Branch and particular reference is made to the fact that the Branch will be placed on its own financial footing similar to all the other branches.

The retiring Chairman in a brief valedictory expressed appreciation on behalf of himself and of the retiring officers and Executive Committee for the hearty co-operation of all committees and members of the Branch, and also expressed his personal pleasure at having been chairman of the Branch since its formation. Continuing, he proceeded to introduce briefly each of the elected officers and committeemen to the meeting, giving their university degrees, affiliations, and so forth.

The Chair was then taken by Mr. Surveyer as the new Chairman of the Branch, who, in a few well-chosen words thanked the Branch for the honour conferred on him and promised the faithful services of himself and the Executive Committee during the coming year.

Votes of thanks were passed to the members of the Executive and of the committees, special reference being made to the work of the Chairman and Secretary-Treasurer.

At the first meeting of the new Executive Committee a quantity of routine business was transacted and in addition the following appointments were made for the year 1920-21:—

ARTHUR SURVEYER, M.C.E., M.E.I.C.
Chairman Montreal Branch.

Chairman, Papers and Meetings Committee, J. A. Burnett, A.M.E.I.C,

Vice-Chairman, Papers and Meetings Committee, V. I. Smart, M.E.I.C.

Chairman,	Civil Section,	O.O.Lefebvre,A.M.E.I.C.
"	Mechanical Section,	John T.Farmer,M.E.I.C.
"	Electrical Section,	G.K.MacDougall,M.E.I.C.
"	Industrial Section,	S.F.Rutherford,A.M.E.I.C.

In addition to the above it is confidently expected that a Chemists' and a Physicists' Section will be formed and be in operation before the commencement of the winter sessions.

Arthur Surveyer, M.C.E., M.E.I.C., the newly elected Chairman of the Montreal Branch, is one of the best known consulting engineers in Montreal. He is a graduate of Ecole Polytechnique (now the Applied Science Faculty of the Université de Montréal) of twenty years standing, and has been associated with many important works throughout the eastern part of Canada. He has been very active in hydraulic engineering particularly, and his services are in great demand in connection with arbitrations, expert evidence and other matters in this branch of engineering. He has been a member of *The Engineering Institute of Canada* for over twenty years and has been one of its most whole-hearted supporters. His work in connection with the Legislation Committee and other committees of *The Institute* has been of great value. Mr. Surveyer is a member of the Society of Consulting Engineers of France, and is also a member of the Honorary Advisory Council for Industrial and Scientific Research in Canada, in which capacity he has given unsparingly of his time and effort to the furtherance of this most important branch of Canadian development. He is also one of the governors of the Université de Montréal and a valued member of the Faculty.

James H. Hunter, M.E.I.C., the newly elected Vice-Chairman of the Montreal Branch, is a civil and mechanical engineer of high standing who has been actively associated with *The Engineering Institute of Canada* for many years. He is chief engineer of the Canada Starch Company and has under his charge plants in different parts of the country. He is a strong supporter of the high ideals of the engineering profession and of what is best in its practice.

John T. Farmer, M.E.I.C., who has been elected to the Executive Committee of the Montreal Branch is engaged in mechanical engineering in private practice in Montreal. During the past year, as Chairman of the Papers and Meetings Committee, he provided a splendid programme of meetings for the Branch.

O.O. Lefebvre, A.M.E.I.C., recently elected to the Executive Committee of the Montreal Branch, is Chief Engineer of the Quebec Streams Commission and one of the best known French engineers in Montreal. He is a frequent contributor to the literature of *The Institute.*

George R. MacLeod, M.E.I.C., who has recently been elected to the Executive Committee of the Montreal Branch, is a graduate of McGill University and engineer of lines and levels for the City of Montreal. He is well known to the members of *The Institute* through holding the position of Assistant Secretary for some years in conjunction with the late Professor McLeod.

Peterborough Branch

E. E. Dobbin, M.E.I.C., Secretary.

At a meeting of the Executive Committee of the Branch the following Standing Committees were appointed:

Membership—P. L. Allison, (Chairman), A. L. Killaly, P. P. Westby, G. R. Langley.

Meetings and Papers—E. R. Shirley, (Chairman), W. G. Montgomery, J. A. G. Goulet, L. D. W. Magie

Entertainment—C. H. Rogers, (Chairman), A. B. Gates, G. O. Cameron, Geo. Perks.

Legislation—Jas. Mackintosh, (Chairman), B. L. Barnes, A. P. Millar.

Junior — C. E. Sisson, (Chairman), W. M. Cruthers, R. C. Flitton, R. E. Stavert.

The activities of the Branch will be suspended for the Summer months, except for the annual picnic in July.

Niagara Peninsula Branch

R. P. Johnson, A.M.E.I.C., Secretary-Treasurer.

The last meeting of the season was held at the Thorold Engineer's Club, May 28th, when a very interesting talk and pictures were presented on "Modern Concrete Road Construction,—Machinery and Methods," by G. A. Sherron, eastern manager of the Koehring Machine Co. of Philadelphia.

The speaker discussed the machinery used for all conditions of concrete road building and followed this with an extremely interesting series of lantern slides and two reels of moving pictures. The last reel consisted of an animated blue print of the operation of various plants and was the result of fifteen thousand drawings. The drawings showed how construction plant works and operates, each unit in step with the others, and the spasmodic and ludicrous actions of cranes and locomotives gave the audience several good laughs.

W. P. Near, M.E.I.C., the new Branch Chairman, presided at this meeting and was received with applause by the members. The attendance was thirty.

At the first meeting of the new Excutive Committee all Branch committees were re-appointed with the exception of the Publicity Committee. This Committee will be appointed after the General Professional Meeting in September when the Executive will have discovered those members who prove most efficient on the Professional Meeting Sub-committee on Publicity.

The whole energies of the Branch are now centered upon preparations for the General Professional Meeting in September. Each week sees several meetings of Committees and Sub-committees and a large proportion of the Branch membership is actively at work making many arrangements and deciding what seem to be almost endless details. However, all this is going to be a very fine thing because the Branch is going to find itself by drawing many members intimately together. Also we are going to discover a lot of prospective chairmen and secretaries and committee men and thus develop our big store of latent ability and enthusiasm.

Members will help along if they will make use of every opportunity to tell the members of other Branches about the General Professional Meeting so that everybody will be keen to come. The great success of the Annual Meeting of the Branch augures well for what is to come.

Calgary Branch

Arthur L. Ford, M.E.I.C. Secretary.

At a meeting of the Branch held on May 22nd to consider the question of holding the Western Professional Meeting under the auspices of the Calgary Branch this summer, the special committee reported in favour of holding this meeting at Banff, in July or August.

After the reading of messages from the western Branches promising support, the meeting instructed the committee to go ahead with the arrangements and indicated the middle of August as the date most acceptable.

However, as the committee found that the parent Society would be unable to assist in a Western Professional Meeting this year as two professional meetings had already been arranged for in the east, it was decided to refer the matter back to the Branch before making final arrangements.

The meeting of the Branch held on June 5th was unanimously in favour of putting on the meeting at Banff about August 15th with the Calgary Branch assuming full responsibility but counting on the other western Branches for their hearty support. Communications were received from the several western Branches favouring the idea and promising attendance and assistance in the program.

The committee has since been hard at work making the preliminary arrangements and getting out an invitation which it intends to distribute to western members through the Branch secretaries. For the engineering readers of *The Journal* whom it is impossible to reach otherwise the invitation to attend this meeting as issued by the Committee is appended.

Vancouver Branch

J. N. Anderson, A.M.E.I.C., Secretary-Treasurer.

L. L. Brown, B.Sc., A.M.E.I.C., late lieut. C.E.F., superintendent of the Vancouver Laboratory, Forest Products Laboratories of Canada (Dominion Government), has been appointed lumber commissioner, representing the Province of British Columbia in the Eastern Provinces, with Headquarters in Toronto.

On the eve of his departure to take up his new duties, Mr. Brown was the guest of honour at a dinner tendered by his engineering friends in Vancouver, and he was the recipient of a silver cigarette case, suitably engraved, in appreciation of his services in connection with the finances for the British Columbia Professional Engineers' Act.

E. P. Labelle, Jr. E.I.C., has been promoted from the position of chief engineer of the British Columbia Telephone Co., to that of general superintendent of Plant.

The Association of Professional Engineers of the Province of British Columbia

In accordance with the provisions of the British Columbia Engineering Profession Act the Lieut.-Governor in Council has appointed the following gentlemen to act as a Provisional Council.

E. G. Matheson, M.E.I.C., Prof. of Civil Engineering, University of B.C., Representing University of B.C.

D. O. Lewis, M.E.I.C., Division Engineer C.N.R., Victoria, B.C.; A. E. Foreman, M.E.I.C., Chief Engineer, Dept. of Public Works, Province of B.C., Victoria, B.C.; W. H. Powell, M.E.I.C., City Surveyor, Vancouver, Civil Engineers.

S. S. Fowler, General Manager, The New Canadian Metal Co., Ltd., Riondel, B.C.; J. M. Turnbull, Professor of Mining, University of B.C., and consulting mining engineer; Angus Davis, consulting mining engineer, Vancouver, Mining Engineers.

J. Peck, chief inspector of machinery for B.C. New Westminster, Mechanical Engineers.

W. R. Bonnycastle, M.E.I.C., consulting engineer, Vancouver, Electrical Engineers.

J. A. M. Dawson, Chief of Dominion Trades and Commerce Laboratory, Vancouver, Chemical Engineers.

H. L. Robertson, consulting engineer, Vancouver, Structural Engineers.

At the first meeting of this Provisional Council held at Vancouver on 2nd June, Professor Matheson was elected President; D. O. Lewis, Vice-President; H. L. Robertson, 502-3 Yorkshire Building, Vancouver, B.C., was appointed Registrar and Secretary-Treasurer.

At this meeting a form of Application was drawn up, and it was decided to circularise all interested persons, at the same time sending them the necessary form and a copy of the Act.

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Canadian Good Roads Association

At the successful meeting of the Canadian Good Roads Convention, held in Winnipeg on June 4th, the following members were elected as the executive for the coming year.

A. E. Foreman, M.E.I.C., chief engineer, Public Works Dept., B.C. as president; Dr. E. M. Desaulniers, M.L.A., of Montreal, first vice-president; Hon. Sam. J. Latta, Minister of Highways, Saskatchewan, second vice-president; George A. McNamee, Montreal, secretary-treasurer. The advisory committee consists of: J. H. Dandurand, Montreal; W. A. McLean, M.E.I.C., Deputy Minister of Highways, Ontario; B. Michaud, Deputy Minister of Highways, Quebec; J. E. Duhamel, Outremont; S. L. Squire, Toronto, past president; A. F. MacCallum, M.E.I.C., Ottawa, past vice-president. The following directors were elected: J. R. Douglas, president Automobile Club of Canada, Montreal; L. J. Tarte, Montreal; Hon. Frank Carrel, Quebec; Mayor Gale of Vancouver; S. R. Henderson, president Manitoba Good Roads Association, Winnipeg; Capt. Lamar Allen, president Ontario Good Roads Association, Belleville; G. F. Pearson, Nova Scotia; W. Findlay, Toronto; C. R. Wheelock, Orangeville, Ont.; Russell T. Kelley, president Hamilton Board of Trade; H. S. Carpenter, Deputy Minister of Highways, Saskatchewan; A. M. Rankin, M.P.P. Ontario; T. P. Regan, president New Brunswick Auto Association, St. John, N.B.; H. H. Shaw, A.M.E.I.C., chief engineer Public Works Department, Charlottetown, P.E.I.; L. C. Charlesworth, M.E.I.C., Deputy Minister of Public Works, Edmonton, Alta. To this Board of Directors will be added the presidents of the provincial motor leagues and automobile associations of the Dominion.

The Governor-General is to be asked to be the honorary patron of the association, with the provincial Lieut. Governors as honorary vice-patrons, and Sir John Eaton as the patron of the association.

Extract from the minutes of the annual general meeting of the Canadian Good Roads Association, held in the Royal Alexandra Hotel, on Thursday evening, June 3rd, 1920.

> UNANIMOUSLY RESOLVED: "That the
> "Canadian Good Roads Association in annual Con-
> "gress at Winnipeg, Acknowledges with pleasure
> "the message of the Council of *The Engineering Insti-*
> "*tute of Canada*, and desires to endorse the view
> "expressed by the Council that the supervision and
> "inspection of highway work of all descriptions
> "should as far as practicable be entrusted by
> "municipal and provincial authorities to qualified
> "engineers, and young men with technical qualifi-
> "cations in order that the experience thereby
> "obtained may be usefully conserved and expanded
> "to the future national advantage in this important
> "public undertaking."

Corporation of Professional Engineers of the Province of Quebec

The first meeting of the Corporation of Professional Engineers of the Province of Quebec was held at the headquarters of *The Engineering Institute of Canada*, 176 Mansfield St., Montreal on Thursday, May 27th, 1920. The meeting was a lively one with considerable discussion. The majority of members wished to elect the provisional council, which had undertaken all the work of preparing the legislation authorizing the incorporation of the association and compiling the by-laws as the first formal council of the corporation. A small minority objected to this and this objection led to several amendments being suggested and a proposition that the nominations be thrown open to a vote by ballot. The amendments were voted down one by one and eventually the provisional council was elected by a very large majority for the ensuing term as the first council of the new Corporation of Professional Engineers.

It was decided to elect a council of eight members, five from the district west of Three Rivers, and three from that east of the same city, chiefly from Quebec City. The following members were elected:—West of Three Rivers:—Arthur Surveyer, M.E.I.C., W. F. Tye, M.E.I.C., Walter J. Francis, M.E.I.C., K. B. Thornton, A.M.E.I.C. and Frederick B. Brown, M.E.I.C., of Montreal. East of Three Rivers:—A. R. Decary, M.E.I.C., A. B. Normandin, A.M.E.I.C. and J. Gibeau, A.M.E.I.C., of Quebec City. A. R. Decary of Quebec City who had presided over the deliberations of the provisional council, presided at the meeting with Frederick B. Brown as Secretary. Mr. Decary recounted the work done during the past year for the organizing of the Corporation of Professional Engineers of the province, affiliated with *The Engineering Institute of Canada*, with headquarters at Montreal. The Act, he said, was simply transferred from *The Engineering Institute of Canada* to the new Corporation of Professional Engineers, making the usual provisions for membership and by laws. Annual meetings will be held at the headquarters of the Corporation in Montreal. Continuing, Mr. Decary said that this movement had been started by the Quebec engineers, after the formation of *The Engineering Institute of Canada*, and every province of Canada, with the exception of Ontario and Saskatchewan, had followed suit. Following the election of the council, of whom half are to remain in office for two years and half for one year, the meeting settled down to the work of adopting the by-laws of the corporation which were read and adopted with some minor amendments.

At a subsequent meeting of the council the following officers were elected:—President, A. R. Decary, Quebec; Vice-President, Walter J. Francis; Honorary Secretary-Treasurer, Frederick B. Brown.

* * *

EMPLOYMENT BUREAU

Supplement to Situations Vacant

Designers, etc.

Four designers for reinforced concrete work, two instrument men, two electrical engineers. Box 133.

Chemical Engineer

Chemical engineer. Montreal industrial company requires services of a young chemical engineer aquainted with fuel and steam problems. Salary $3,000 to $3,500. Box 134.

Municipal Engineer

Engineer wanted for Ontario city with municipal experience. Must be thoroughly qualified and in possession of P.L.S. certificate. Population of city 33,000. Box 135.

Preliminary Notice

of Applications for Admission and for Transfer

[illegible]

The By-laws now provide that the Council of the Institute shall [illegible] from one grade of membership to another.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a [illegible] statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, [illegible].

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in July, 1920.

FRASER S. KEITH, Secretary.

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* The professional requirements are as follows:—

Every candidate for election as MEMBER must be at least thirty years of age, and must have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. The term of twelve years may, at the discretion of the Council, be reduced to ten years in the case of a candidate who has graduated in an engineering course. In every case the candidate must have had responsible charge of work for at least five years, and this not merely as a skilled workman, but as an engineer qualified to design and direct engineering works.

Every candidate for election as an ASSOCIATE MEMBER must be at least twenty-five years of age, and must have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in some school of engineering recognized by the Council. In every case the candidate must have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years.

Every candidate who is not a graduate of some school of engineering recognized by the Council shall be required to pass an examination before a Board of Examiners appointed by the Council, on the theory and practice of engineering, and especially [illegible] Railway, Municipal, Hydraulic, Mechanical, Mining, or Electrical Engineering.

This examination may be waived at the discretion of the Council if the candidate has held a position of professional responsibility for five years or more years.

Every candidate for election as JUNIOR shall be at least twenty-one years of age, and must have been engaged in some branch of engineering for at least four years. This period may be reduced to one year at the discretion of the Council if the candidate is a graduate of some school of engineering recognized by the Council. He shall not remain in the class of Junior after he has attained the age of thirty-five years.

Every candidate who is not a graduate of some school of engineering recognized **by the Council, or has not passed the examinations of the first year in such a course,** shall be required to pass an examination in the following subjects: Geography, History [illegible] Arithmetic, Geometry [illegible] Books I-IV and VI, Trigonometry, Algebra up to and including quadratic equations.

Every candidate for election as ASSOCIATE shall be one who by his pursuits [illegible] or practical experience is qualified to co-operate with engineers in the advancement of professional knowledge.

> The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

[illegible]

[illegible]

FREEMAN—GEORGE LEONARD, of Mattawa, Ont. Born at Gray, U.S.A., Sept 6th, 1881; Educ., B.S in C.E., Maine Univ., 1903; June 1903-Apr. 1906, dftsman, designer & fieldman for I.W. Jones, Milton, N. H., hydro. elect. & steam power plants, paper-pulp, leather board & fibre mills; Apr. 1906-Oct. 1909, designer & asst. engr. for Elk Tanning Co., Ridgway, Pa.; Oct. 1909-1918, with Moulton Engr'g. Corpor., Portland, Maine, as chf. engr., also engaged at different times with Winchester Repeating Arms Co., New Haven, Conn., Rundlitt & Verrill, Co., & Shipbuilding Co., Portland, Maine, in constrn. work; 1918-1919, with The Foundation Co., New York as asst. engr. i.c of all design & est. in Eng. office; 1919 to date, with Kipawa Co., Ltd., Mattawa, Ont., as mgr. of engr'g.

References: F. O. White, A. K. Grimmer, R. F. Davy, C. B. Thorne, S. Wang.

FRIEDMAN—FERDINAND J., of Montreal: Born at New York, May 19th, 1887; Educ., B. S., M. I. T. 1908, spec. course on power plants at Brooklyn Poly. Inst.; 1908-13, engr. with Walker & Chambers, N.Y. City, designed & superintended heating, ventilating & power plants; 1913 to date, (Private practice) as consltg. and mech. engr., designing & supervising power plants, heating & ventilating plants.

References: G. K. McDougall, G. R. Heckle, E. R. Pease, J. C. McDougall.

GOODCHILD—RALPH HENRY, of Calgary Alta. Born at Montreal, Que. Apr. 30th, 1884; Educ., (3½ terms) McGill Univ., B. A. Sc., 1905-07-09-10; 1906, timekeeper with C. P. Ry.; 1907-08, timekeeper, rodman & asst. engr. with Can. White Co., on Power Ho. constrn., & Soulanges Power House, P.Q.; 1909, i/c of making of reinforcement for Waterman Pen Factory, St. Lambert; 1910-11 i/c reinforced concrete constrn. & also dftsman & instrman for C. P. Irrig. Dept.; 1911-Mar. 1916, & Aug. 1919 to date, with Dom. Govt. making irrig. insptn. & surveys in Sask. & Alta.; Apr. 1916-July 1919, overseas service, Can. Pioneers, & Can. Engrs.

References: A. S. Dawson, H. B. Muckleston, M. H. Marshall, P. M. Sauder, P. J. Jennings.

KENNEDY—FRANK WHITE SMITH, of St. Catharines, Ont. Born at Parry Sound, Ont., Dec. 19th, 1885; Educ., High School; Jan. 1906-May 1907, rodman on constrn. C. N. Rly., May-Dec., 1907, concrete inspector, C. N. Que. Rly.; 1908-12, with Transc. Rly., rodman on survey, (Sept. 1908-July 1909), concrete inspt.; July-Dec., 1909), instrman (Jan. 1910-Feb. 1912); Mar.-Dec., 1912, res. engr., C. N. Rly.; Feb. 1913-Mar. 1914, with C. P. Rly., instrman (Feb.-June, 1913), res. engr., supr. div. (June 1913-Mar. 1914); Apr.-Oct., 1914, instrman, Intercolonial Rly. Survey; July-Dec. 1916, cost accountant, Welland Ship Canal; Jan. 1917 to date, sr. instrman, with Hydro-Elect. Power Commission on Chippawa Development Scheme.

References: A. C. D. Blanchard, F. W. Clark, G. H. Lowry, R. P. Johnson, J. R. MacKenzie, H. L. Bucke.

KIRKPATRICK—ROBERT ALONZO, of Nelson, B.C. Born at Parrsboro, N.S., Nov. 15th, 1890; Educ., Undergraduate, McGill Univ., (2 yrs. C. E. course); 1907-08, with Lardeau Light & Power Co., Ferguson, B.C., power plant operating & small installations; 1909, transmission line for Ferguson Mines, Ltd.; Apr. 1911-Oct. 1911, instrman on municipal work, A. S. Dickinson, St. Lambert; Dec. 1912-Mar. 1913, with J. J. Watson & Son, Calgary, Alta., i/c of lime quarry & kilns; March 1913 to date, with D. P. W. Kootenay Dist., B. C., as jr. asst. engr., & at present, sr. asst. engr., having superv'n. of dredging, river improvements, wharf constrn., etc.

References: J. P. Forde, W. Ramsey, W. J. E. Biker, W. F. Richardson, H. F. V. Meurling.

LAWSON—WILLIAM JOHN, of Fredericton, N.B. Born at Hopewell Hill, N.B., May 26th, 1894; Educ., B.Sc. in C. E., Univ. of N.B., 1915; 1914-1919, On active service, 2nd & 6th Brigade C.F.A., (Aug.-Nov. 1919) transitman forest survey; May 1920 to date, Provincial Road Engineer's Office, Fredericton, N.B.

References: B. M. Hill, H. M. Armstrong, D. W. Burpee, B. H. Kinghorn, S. B. Wass.

MARROTTE—LOUIS HENRY, of Montreal, Que. Born at Montreal, Dec. 23rd, 1882; Educ., B.Sc., McGill Univ., 1904; (Summers) 1901-02, Royal Elect. Co., Shops; (Summer) 1903, Mont. Str. Rly. Co., rail bonding; May 1904-Apr. 1910, with Montreal L. H. P. Co., gen. testing, i.c of meter & instr. tests, asst. to supt. of constrn. & later asst. supt. of stations, (mtce & operation); Apr. 1910-11, with Central Georgia Power Co., U.S.A., i/c of bldg. distrib. systems, operation of substations in Macon, Forsyth & Griffin, Ga., also designed & installed Barnesville St., Ga; 1911-13, i/c of bldg. transmission line, South Porcupine Ont.; May 1913 to date, with Mont. Public Service Corp. & Can. Light & Power, Co., i/c of layouts, installations, & asst. to ch. engr., at present, supt. of operation Mont. Public Service Corp. & asst. to Gen. Mgr.

References: K. B. Thornton, R. M. Wilson, F. B. Brown, J. A. Shaw, G. K. McDougall, J. A. Burnett, J. S. H. Wurtele.

McEWEN—HAROLD JAMES, of Calgary, Alta. Born at Brantford, Ont., May 18th, 1891; Educ., B.A.Sc., E.E., Toronto, Univ., May 1st, 1912; 1912 to date, with Canadian Westinghouse Co., in various capacities, since 1913, sales engr. & since June 1919, mgr. i/c of Calgary & Edmonton offices & Prov. of Alta.

References: G. W. Craig, W. Pearce, A. S. Dawson, H. B. Muckleston, A. Ingraham.

MONTGOMERY—MELVIN ALAN, of Prince Rupert, B.C. Born at St. Paul, Minnesota, Feb. 17th, 1894; Educ., 3½ yrs. C.E., Arts. High School, St. Paul; 1912-13, with N. P. Rly., rodman, inspt. mtce. of way, etc.; 1914-June 1916, G. N. Rly., resurvey of Winnipeg lines, as rodman & computer; Sept. 1916-1918, Aug. 1919 to date, with G. T. P. Rly., as follows; rodman, line inspt., instrman i/c of party, Can. Ferry Ship Constrn., At present, i/c of mtce. party, Mt. Div., April, 1918-July 1919, Overseas Rly. Constrn. Bn.

References: W. H. Tobey, W. S. Fetherstonhaugh, J. A. Heaman, G. C. Dunn, R. W. Ross R. P. Graves, P. E. Thian.

MORRIS—JOHN WILLIAM, of St. John's Nfld. Born at Wallace, N.S., Sept. 2nd, 1872; Educ., B.A.Sc., McGill Univ. 1894; 1894, with St. John, N.B. & Halifax, N.S., Str. rlys.; 1895-96, Mont. Str. Rlys.; 1896-98, Royal Elect. Co.; 1898, Cataract Power, Co.; 1899-1900, Str. Rly. Constrn., Kingston, Jamaica, B.W.I., Georgetown, Demerara, B.G.; 1901 to date, Supt. Elect. Dept., Reid Nfld, Co., St. John's, Nfld.

References: W. Scott, F. W. Angel, H. Holgate, A. R. Chambers, J. B. Baird, F. H. Balfour.

MOUNT—WILFRED ROWLAND, of Edmonton, Alta. Born at Reading, Eng., Dec. 5th, 1888; Educ., (Tech.) Camborne School of Mines, Cornwall, Eng.; 1910, ch. asst. to J. S. Henderson, Camborne, Eng.; 1910-11, gen. asst. Broomassie Mines, Gold Coast, W. A.; 1911-14, asst. to dist. engr., C. N. Rly., Lac St. Anne Div. Alta., and various surveys for A. & D. L. S., also instrman, city engrs. dept., Edmonton, Alta.; 1914-19, in command of units & i/c of surveys, location, etc., later maj. of Royal Engrs., (awarded M.C.); 1919 to date, with city engr., Edmonton, Alta.

References: E. K. Hall, R. J. Gibb, A. W. Haddow, D. Lyell, D. Hillman.

PATERSON—WILLIAM BRUCE, of Toronto, Ont. Born at Denfield, Ont., Oct. 30th, 1889; Educ., B.A.Sc., Toronto, 1919; May to Aug. 1916, dftsman, & Nov. 1917 to June 1918, asst. engr. with Sheldons, Ltd.; Sept.-Oct. 1916, operating traction engine; May-July, 1917, Gauge Insptn. Laboratory, Imp. Munitions Board, Ottawa; May-Dec. 1919, sales engr., American Blower, Co.; Dec. 1919 to date, office mgr., with Can. Sirocco Co., Ltd., Toronto Office.

References: L. M. Arkley, C. R. Young, P. Gillespie, H. E. T. Haultain, J. R. Cockburn.

PUTMAN—CLARENCE VICTOR, of Ottawa, Ont. Born at Anncaster, Ont., 2nd October, 1888; Educ., B.Sc., Queen's Univ. 1915. 1912, on geological survey; 1913, summer, Geodetic Survey of Canada, chief, plane table survey; summer 1914, building insp. under W. B. Garnock, City of Ottawa Public Schools; 1916, 8 mos., draftsman and gen. engr. asst., Ottawa waterworks, 1916-18, asst. engr., Ottawa waterworks, in chg. of survey, design, estimates and constrn. of water mains etc.; and in full chg. of all petometer water waste survey work, office records and drafting; Nov. 1918-Apr. 1919, investigator on class'n of Civil Service, engr. and tech. branches of service; 1919 to present acting and asst ch., organization br. C.S.C. in responsible chg. of all class'n matters.

References: J. B. McRae, W. F. M. Bryce, A. F. Macallum, L. W. Gill, L. Malcolm, G. G. Gale.

QUAIL—JAMES, of Winnipeg, Man. Born at Downpatrick, Ireland, March 17th, 1889; Educ., Diploma Toronto Univ., S. P. S., 1909; 1909-10, detailing & designing steel & concrete work for Hamilton Bridge Works, Can. Foundry Co., & Smith, Carey & Chace, Toronto; 1911-12, with C. N. R. Bridge Dept., designing concrete & timber; 1912-15, detailing squad boss, and sales engr., Man. Bridge & Iron Works; 1915 to date, mgr. of Winnipeg office, Can. Bridge Co. Ltd.

References: F. C. McMath, T. R. Deacon, J. G. LeGrand, J. Rocchetti, W. M. Scott, E. V. Caton.

STROME—IVAN ROY, of Calgary, Alta. Born at Brandon, Man., July 6th, 1889; Educ., B.A.Sc., Toronto Univ., 1914; Seasons 1912-13, rodman & 1st., asst. on location survey, for So. Alta. Land C., Medicine Hat; 1914 to date, with the dept. interior, Calgary, in various capacities, starting as dftsman, dist. hydrom. engr. and at the present time asst. hydraulic engr. reclamation service, irrigation div., served overseas, 1916-19, as lieut. in Can. Pioneers and tr. to R.A.F.

References: F. H. Peters, B. Russell, Jr., N. M. G. Sutherland, G. N. Houston, A. L. Ford, D. W. Hays, P. M. Sauder, V. M. Meek.

WAIN—JOHN BERNARD, of Montreal. Born at Bradford, Yorks, England, March 11th, 1890; Educ., 3 yrs. course in C.E. Bradford Tech. Coll., 1908, I.C.S. course in Bridge Engr.; 1908, Summer, Field instructor of surveying, Bradford Tech. Coll. 1908-11, with G.T.P. as rodman, dftsman & estimator; 1911 to date, with G.T.R. as field dftsman, instman, estimator, senior dftsman, chief dftsman & land accountant Montreal, Office engr., Detroit; At present chief dftsman Valuation Dept., Montreal.

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WAYCOTT—RICHARD LEWIS, of New Glasgow, N.S. Born at St. John, N.B., Feb. 22nd, 1886; Educ., High School, Private tuition (Math.); 1906-07, chainman & rodman, G. T. Ry.; 1907-08, asst. dftsman, G. T. Ry., Dist. "F."; 1908-10, dftsman G. T. Ry. constrn; 1910-12, transitman, G. T. Ry. constrn.; 1912-13, acting res. engr. G. T. Ry. constrn; 1913-15, transitman, C. N. Ry., preliminary & location work; 1915 to date, field engr., Nova Scotia Steel & Coal, Co.

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WHYTE—KEITH OGILVIE, of Montreal, Que. Born at Nazara, India. July 1885; Educ., Dollar Acad. Scot., & spec. classes in math., mech. & mech. engr., Armstrong College, Eng.; 1903-06, apprentice to W. Jackson & Co., mech. engrs. Aberdeen, Scot.; 1906-08-11, aptce. & jr. dftsman, E. Scott & Mountain, mech. & elect. engrs., Newcastle, Eng. also journey-man erector of machinery on site; 1912-16, elect. contractor, in Oshawa, & Dist., Ont.; 1916-19, On Active Service, with different Bns. in Eng. & France, gazetted Nov. 1919; Aug. 1919-Mar. 1920, demonstrator in mech. dftg. in S. C. R., Tor. Univ.; At present, dftsman, Dom. Bridge Co., Montreal.

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Naval Gunnery

Lord Congleton, Jr.E.I.C.

The sailor branch of the Royal Navy is split into two rival classes—The Gunnery men and the Torpedo men. The former are positive that the war was won by gunnery and the latter will point out that the war if not won, was very nearly lost owing to torpedoes and mines.

However both gunnery and torpedo are branches of engineering, and it is the gunnery case which I wish to advance here.

The term naval gunnery is an exceedingly broad one and so in the short space available I must confine my attention to one or two features of particular interest.

The material side of naval gunnery may be divided roughly under five headings:—

1 — Gun construction,

2 — Hydraulic, electric and hand worked gun mountings,

3 — Gun sights and gun directors,

4 — Fire control,

5 — Ammunition.

The Influence of the Director on Naval Gunnery.

It is the gun director system that I shall attempt to describe in this paper, as this is one of the most interesting recent developments of naval gunnery. The director was only just in its infancy on the outbreak of war and at the armistice its perfection was only just complete.

Our Greatest Warship, H.M.S. "Hood."

Read before Montreal Branch of The Engineering Institute of Canada, April [illegible], 1920.

Much of the gun director work is necessarily still confidential and on this account I was unable to obtain any photographs of it from the Gunnery School at Portsmouth.

Before dealing with the director however, a short description of gun sights and fire control must be given as all three are intimately connected.

It is obvious that naval gunnery is distinguished from field gunnery by several complicating factors, the chief of which are:—

1. The enemy and your own ship are both moving rapidly. Both are free to alter course and speed, and so the relative course and speed is continually changing.

2. The enemy and your own ship are moving irrespective of their speed due to the motion of the sea:

This second factor requires no further comment. Now in consequence of these two factors, conditions are never constant but vary rapidly from minute to minute. Thus the human factor which is slow and liable to error must be eliminated as far as possible and fool-proof machinery substituted instead.

All the movements of the gun platform and the enemy can be resolved into horizontal and vertical movements at the gun and in modern practice it is usual to have a gunlayer to deal with movements in the vertical and a trainer to deal with movements in the horizontal plane. These movements are continuous; and consequently all firing at sea must be "direct"; i. e. the gunlayer and trainer in order to keep their telescope cross wires on the target must be able to see the target.

Ashore the gun can be laid by angles; indirect fire can be used and the same can be done when bombarding a fixed object from the sea, but at sea firing must be "direct", if the target is moving.

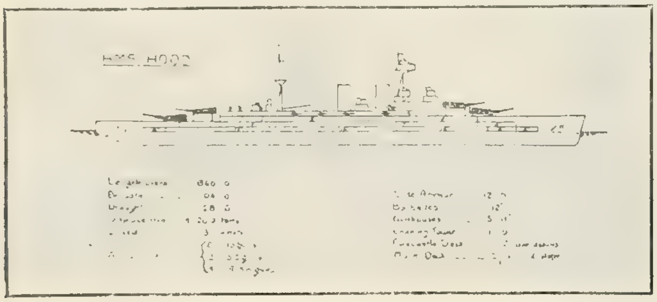
As long as the telescopes are on the enemy, the line of sight from telescope to enemy is horizontal.

The gunlayer is the senior rating and fires the gun when his horizontal cross wire is on. The trainer has to keep his vertical wire on.

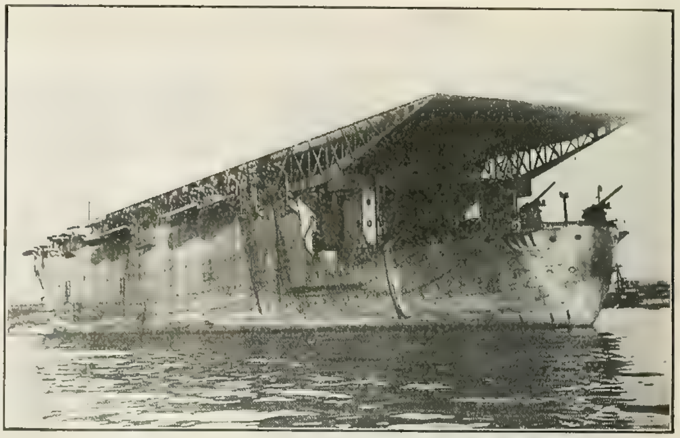
The Sight

Now the piece of machinery that carries the telescopes is the sight.

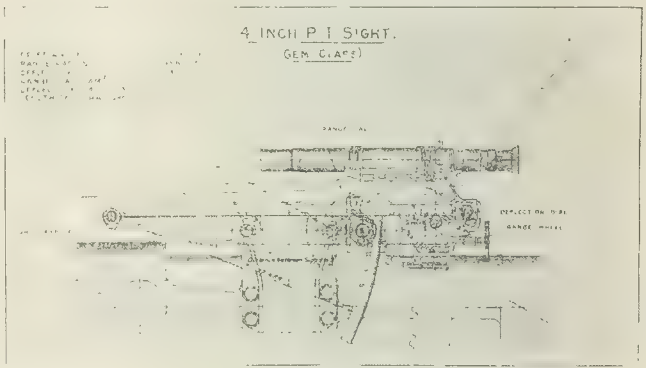
The theory of sighting affords a fascinating study of ballistics and trajectories into which we have no time to



go. It is sufficient to say that owing to the resistance of the air to the passage of the projectile there is an appreciable interval, called the Time of Flight, between the moment when the gun is fired and the moment when the projectile reaches the target. With heavier guns it may be anything up to a minute or more. It is during this interval that all sorts of bad influences have time to act on the projectile and drag it from the straight and narrow path leading to the target.



The Royal Navy and Aviation, H.M.S. "Argus"



Errors in Sighting

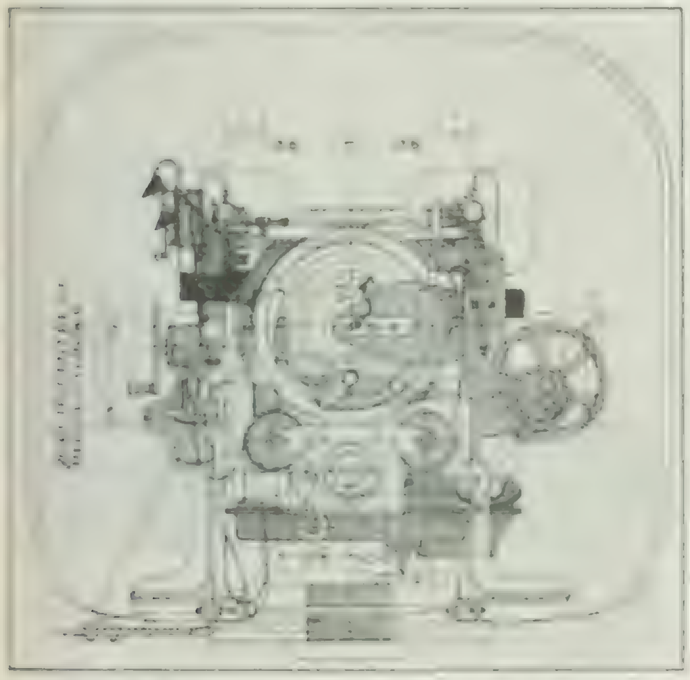
There are two sorts of errors, those in the vertica plane which make the projectile fall "over" or "short," and those in the horizontal plane which make the projectile wander to the "right" or to the "left".

In the former we class gravity, the worst offender; as every one knows, a certain angle of elevation must be given to the gun to counteract the effect of gravity on the projectile. This angle depends primarily on the range of the enemy and the muzzle velocity of the gun, but also to a certain extent on the shape and weight of the projectile, the density of the atmosphere and the wind.

The errors that make the projectile miss to the "right" or "left" are caused by the wind across the range, the sideways motion due to the fact that the ship is moving as the projectile leaves the gun, and the drift of the projectile due to its spin. All these are classed under the heading of deflection.

Now coming back to the question of the sight. It can be seen that there are two functions which an efficient type of gun-sight must perform. Firstly it must give the gun the correct elevation in the vertical plane and secondly it must give the gun the correct deflection in the horizontal plane to counteract all these errors. At the same time it must be borne in mind that there is a rapid relative movement between the enemy and your own ship and a prediction of the elevation and deflection must be made. It is these predicted values which must be on the sight at the moment of firing, so that fifteen or twenty seconds later, or whatever the time of flight may be, when the projectile is about to score a bull's eye, it will not find that the target has moved out of the way.

Of all the causes just enumerated which affect the elevation and deflection none are constant, and so the sights are continually being reset and the gun is continually moving.



All modern gun sights are bolted to the cradle of the gun, so as to be unaffected by the recoil. They consist of:

Sight bracket;
Sight carrier;
Telescope holder
Telescope or periscope.

The trainer has a duplicate sight so that one sight-setter sets both layer's and trainer's sight.

In order that range in yards may be passed to the sight setter the angles of elevation for a standard set of conditions are worked out and the corresponding ranges are scribed on the sight dial, which is then geared to the carrier. Any abnormal alteration of conditions from the standard is corrected for by an automatic sight corrector fixed to the sight, which, depending on its setting, adds or subtracts the correct amount for each range.

Originally, as in this sight, the carrier was raised by pinion gearing, but a cam has now been substituted, as it was found that the cam could be cut and the range dial marked so as to do away with the complicated sight corrector.

A further improvement was the introduction of the "follow the pointer" sight. In this type pointers worked by small step by step electric motors inside the range and deflection dials, indicate the correct setting and all the sight setter has to do is to keep his pointers in line with fixed marks on the body of the sight. These small motors are worked from down below in the transmitting station.

Fire Control

And now a word must be said on Fire Control to indicate how the range and deflection which finally arrive on the sight are obtained.

Up aloft in the control top is the controlling officer, there are generally two others in different spots, but he is the primary control officer. He is in direct communication with the transmitting station, which is situated well below the water line and behind armour, and he gives all orders to the guns via the T.S. (Transmitting Station), and "spots" the fall of shot.

The range is obtained from the range finders. These number up to eight or ten in some and there is talk of more. They are coincidence range finders and are now built with a forty foot base. They pass down a constant stream of ranges and bearings of the enemy to the transmitting station.

Finally there is the transmitting station which is the hub of the whole system. Down here a staff of thirty officers and men are at work, working out and correcting the range and deflection, and passing them on by electric transmitters, telephones and voicepipes to the sight setters at the guns.

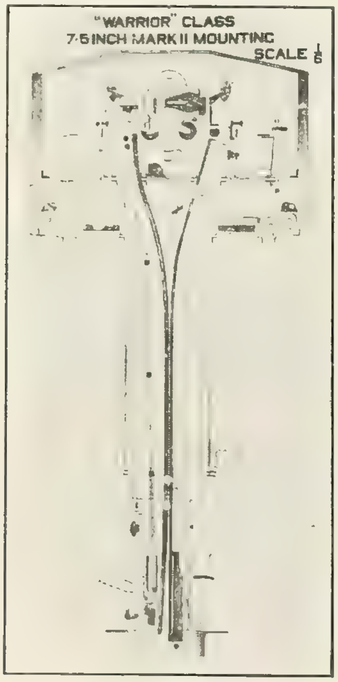
Control Top—Transmitting Station—Gun positions. This constitutes the primary control system. In the event of a break-down in the control top, there are at least two other positions ready to take on the job at once; and finally if all communications are shot away and the guns isolated, each turret is a self contained unit and can "carry on" in local control with its own complete set of instruments and its own control party.

The Director

Such very roughly is the control system at present in use. It will be seen that except for the control officer at one end and the gunlayers and trainers at the other, nobody in the system has much excuse for making a mistake, their duties are purely mechanical. By the introduction of the gun director, the gunlayers and trainers are turned into machines and another human factor is eliminated.

The director can be considered as a dummy gun, i.e. A mounting without any gun in it, but fitted with ordinary elevating training and sighting mechanism, and placed aloft in or near the control top.

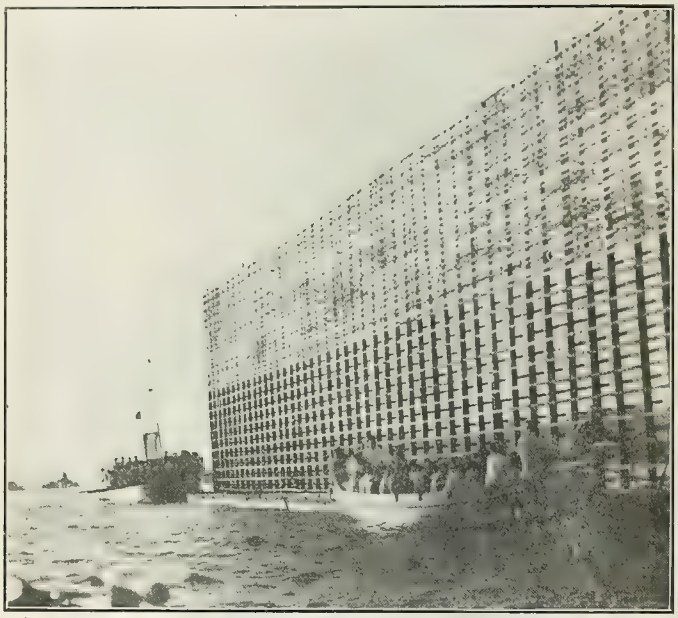
This dummy gun is layed and trained in the usual way and its movements are transmitted to all the guns in the ship by electric transmitters.



The idea is not a new one; as far back as 1900, Admiral, then Captain Percy Scott, was experimenting with such an arrangement of his own, with home-made and very rough materials. After a great deal of opposition it was decided in 1914 to fit all ships with the gun director. By Aug. '14 six ships only had been fitted, but by May '16 all the big ships were fitted, and the destroyers were just completed when the armistice was declared. The chief factor which influenced the Admiralty was the introduction of the long range torpedo which enormously increased the fighting gun range and it came to the point that some type of director firing must be used or the gun would go under before the torpedo. The first successful director was fitted in H.M.S. Orion in the early part of 1914, and one of the many remarkable results obtained from her gun trials was that the director was very much better in rough than in fine weather.

The system is simply an application of the "follow the pointer" principle.

On receiving the order to "fire" from the control officer who is usually just above the director, the director layer brings his telescope cross wires slightly above the target and waits a pause until the roll of the ship brings him on. This pause of about five seconds enables every gunlayer and trainer to bring his two pointers accurately into line. As soon as his crosswire rolls onto the target the director layer presses the firing key and every gun in the ship goes off instantaneously.



A Naval Floating Target.

Results with the Director

Remarkable results have been obtained with director firing. Firing at 15,000 yards salve spreads of 100 yards and under are usually obtained and the shot fall so closely in line with one another that the salvos have to be spread out by throwing the guns slightly out of adjustment with the director. The director is in fact too accurate.

With good visibility, not often obtainable in the North Sea, hits can be registered at 25,000 yards, as compared with an outside range of 12,000 before the war using individual firing.

This has been achieved only as the result of an enormous amount of calculation and practical experiment. To mention two firms outside the Naval Service, Vickers on the mechanical and Elliot Brothers on the electrical side, are largely responsible.

The system appears simple enough but when one realises that fifteen or twenty degrees is the limit of elevation and ranges of from 0 to 22,000 yards have to be accounted for between these limits, it will be seen that the instruments have to be extremely accurate and no backlash can be allowed to creep in.

Night action has been revolutionized by the introduction of the director.

German Control and Gun Director

The Germans had some type of gun director but no details have ever been published. When the German fleet came into the Firth of Forth and they were inspected it was found that the whole of the director system had been stripped even to the wiring.

General Design of a Lock and Approaches

J. B. [illegible], M.E.I.C., Chairman Sault Ste. Marie Branch.

In considering the general design of a lock and its approaches the first consideration is the safety of the lock and the vessels passing through, but where the traffic is great and is liable to become congested the consideration of the ease with which vessels may move, and the speed with which they may be passed through, is an important one.

The traffic through the Canadian canal at Sault Ste. Marie, (of which the writer has had charge for over twelve years,) has always been heavy, but reached its maximum in the year 1913, when 42,696,143 tons of freight or 55% of the total traffic of the St. Mary's River, passed through in 8,[illegible] vessels. During the years 1909-1914 the traffic was so heavy that congestion occurred about once a week, when anywhere from ten to forty vessels were at anchor waiting for the lock, and these delays proved costly to the vessels.

A record was kept, during the season of 1912, of delayed down bound vessels, as practically all of the delays took place above the canal, and of 4,358 vessels, 3,216 were delayed on an average of three hours and thirteen minutes each, or a total delay for the season of 10,345 hours. This delay at $21.00 per hour, the earning capacity of an average sized vessel, represented a total loss for the season of $217,245.

In addition to the regular congestion mentioned above there have been several much more serious periods of congestion caused by one of the locks being put out of operation by an accident, or from some other cause.

On one of these occasions when the Poe lock, of the United States Canal, was put out of operation by an accident, in November, 1909, the Canadian lock was in continuous operation for 264 hours, passing 460 vessels with a total registered tonnage of 1,372,145 tons.

On this occasion the blockade was so serious that at one time there were 87 vessels at anchor above the canal; and the delay to each vessel was from sixty to one hundred hours. The total financial loss to the vessels through the delay amounting to $250,000.

In the following Spring the opening of the Poe lock was delayed, by some construction work, until May 5th, (or for twenty-three days after the Canadian lock was opened) and a very heavy congestion occurred, there being at one time 140 vessels at anchor, about equally divided between the upper and lower river.

On this occasion the Canadian canal was in continuous operation for [illegible] hours, passing 1,140 vessels with a total registered tonnage of 2,871,[illegible] tons.

The above cases are cited to show how immensely important it is to vessels, in times of traffic congestion, that there be as little delay as possible in locking.

Records were kept which show the time taken by vessels in making a lockage, as follows:—

DOWN BOUND VESSELS

AVERAGE TIME IN MAKING A LOCKAGE

Time from Stop Post to Lock	Moving into Lock	Lowering Vessel	Moving out of Lock	Clearing Lower Stop Post or Waiting Vessel	Total Time
7 min.	8 min.	11 min.	7 min.	4 min.	37 min.

UP BOUND VESSELS

AVERAGE TIME IN MAKING A LOCKAGE

Time from Stop Post to Lock	Moving into Lock	Raising Vessel	Moving out of Lock	Clearing Upper Stop Post or Waiting Vessel	Total Time
7 min.	10 min.	10 min.	7 min.	2 min.	[illegible]

SPECIAL CASE

UP BOUND VESSEL.

Time from Stop Post to Lock	Moving into Lock	Raising Vessel	Moving out of Lock	Clearing Upper Stop Post or Waiting Vessel	Total Time
7 min.	50 min.	15 min.	8 min.	7 min.	87 min.

The up bound vessel which took fifty minutes to move a little more than her own length in getting into the lock was four feet narrower than the lock and her draft was six inches less than the depth of the water in the lock. She was unable to use her own power as the action of her propellor would draw the water from under

Read at the annual meeting of the Sault Ste. Marie Branch of The Engineering Institute of Canada, June [illegible].

her and she would settle on the bottom of the lock. She was, therefore, heaved into the lock by her bow lines, and could only move very slowly owing to the difficulty of getting the water in the lock past the vessel.

While the lock can be filled or emptied in six minutes it is to be noticed that in actual practice it usually takes ten minutes or more. This is necessitated by the surging ahead of the vessel or vessels in the lock, with a chance of a collision or danger to the vessels when the water is let in or out too rapidly. It would only be possible to use the valves to their full capacity by making the flow of water uniform at all parts of the lock, when filling or emptying.

Factors in Design

In considering the design of a lock and its approaches it is necessary to note certain conditions which occur in the operation of the lock and in the handling of the vessels.

Figs. 1, 2, 3 and 4 show curves which indicate the movement of the water in and above the lock when making a lockage. The two quadrilateral figures in each diagram represent the valve action. The oblique lines represent the opening of the valves, the horizontal lines represent the percentage of opening, and the vertical lines represent the moment when the valve action ceases by the opening of the lock gates. Fig. 1 represents the filling of the lock by throwing the valves wide open. The water in the lock immediately commences to rise and the water above falls 1.8 feet, then commences to rise slowly at first, then more rapidly, passing and rising

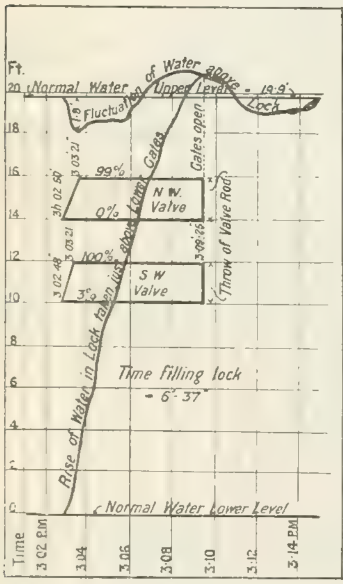


Fig. 1. — Showing filling of lock by throwing valves wide open.

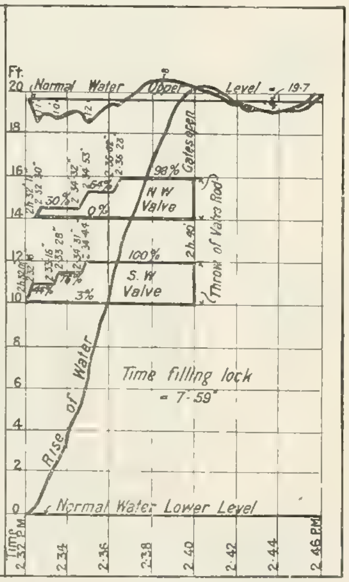


Fig. 2. — Showing filling of lock by operating valves gradually.

1.2 feet above the normal upper level. The water in and above the lock come together at a point one foot above normal, and the lock gates are opened. The water continues to surge up and down until the motion gradually dies away. It is to be noticed that it is necessary to put a foot more water in the lock than is indicated by the difference in the normal levels; and that had there been no surge above the lock the gates might have been opened one minute sooner.

Fig. 2, represents the filling of the lock by operating the valves more slowly, taking longer to fill the lock, but with less surge in the upper level. The effect of each valve movement may be noticed in the fluctuation of the upper level.

When the water suddenly drops in the upper level, as shown in Fig. 1, it may be imagined what effect this would have on a vessel lying moored above awaiting her turn to lock down. The vessel is caused to surge violently ahead and then back, and if the linemen are not standing by the mooring cables they will break, allowing the vessel to get out of control.

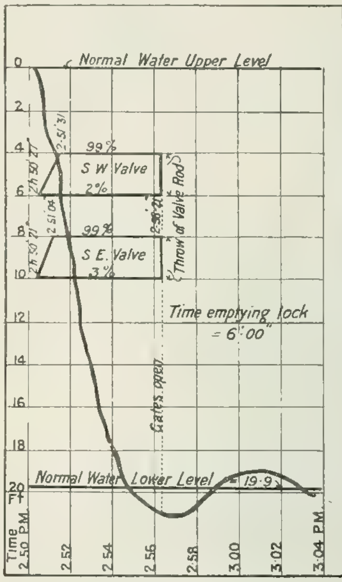


Fig. 3. — Emptying of lock with valves wide open.

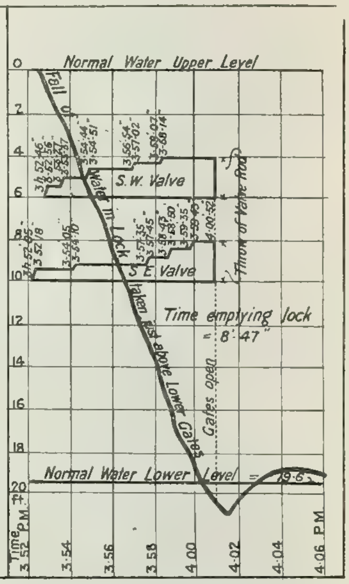


Fig. 4 — Emptying of lock by gradual operation of valves.

Figs. 3 and 4, represent the emptying of the lock, Fig. 3, with the valves wide open, and Fig. 4, by a gradual operation of the valves. The curves for the lower levels were not obtained, owing to the agitated condition of the water, but it is to be noticed that the water in the lock fell 1.1 feet below the normal level of the lower entrance before the gates could be opened, indicating the surge that was caused in the lower level by the rush of water from the lock.

It is also to be noticed that it was necessary to empty 1.1 feet of water out of the lock, more than is indicated by the difference between the normal levels, and had the surge not occurred, the lock gates might have been opened one minute and thirty-three seconds sooner.

If the draft of a vessel being locked down was equal to the full draft of the lock, she would rest on the bottom of the lock when the gates were opened, until her water marks were one foot out of water, and she could not move out of the lock on her own steam until the return surge lifted her off, or about three minutes later. It will be seen, then, that the depth of the water in the lock should be a foot or more greater than the allowed draft of the vessels.

The surge in the entrances could only be got rid of by taking the water supply from some other source than the upper entrance, and discharging in some other place than the lower entrance, a condition that rarely occurs. It might however be greatly reduced by widening the entrances, and where a large quantity of water is required to fill a lock as in the New Welland Ship Canal, a large pond must be provided to furnish the water without unduly drawing down the level. A pond seventy acres in area would be lowered one foot in filling one of these locks.

Fig. 5.—Action of vessel moving ahead engines suddenly reversed.

Fig. 6.—Vessel effecting landing on port side.

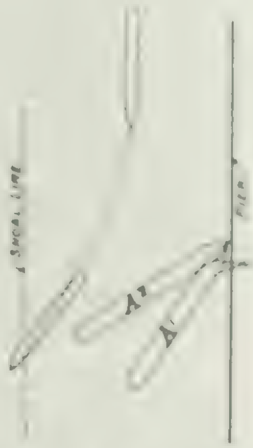


Fig. 7.—Vessel attempting landing on starboard side, causing accident.

Fig. 5, represents the action of a vessel when moving ahead and her engines are suddenly reversed to stop her, the rudder remaining amidships. The action of the vessel's propeller causes the bow to swing to startboard and her stern to port. This is an important point when designing the approaches, as it is evident that it would be easier for a vessel to land on her port side than on her starboard side. Fig. 6 represents a vessel making a landing on her port side; she approaches the pier in an oblique direction and reverses her engines so that she will come to a stop before striking the pier. When her bow comes close to the pier a bow line is put out and her engines continuing to reverse her stern is thrown towards the pier making it easy to get out a stern line. Fig. 7, represents an actual case of a 600 foot vessel 'A' attempting to land on her starboard side. The reversing of her engines caused her stern to swing away from the pier 'A2' so that they failed to get a stern line out in time and the vessel swung across the canal. An upbound vessel, which was moving at a fairly rapid speed, was unable to stop and attempted to pass around the stern of the other vessel, but was forced ashore on the other side of the canal.

Fig. 8, represents an accident which actually occurred on the Sault Ste. Marie Canal. A and B are waiting vessels moored to the piers. C is an outgoing vessel moving six or seven miles an hour. C was forced to hold close to the side of the canal to avoid A and when her bow passed the angle in the pier, D, the suction on the bow of the vessel was released, allowing the vessel to swing to starboard, C2, her helm was put over the moment this motion and a few moments later when her stern cleared the angle in the pier, C3, the combined action of the helm and the letting go of the suction on the stern of the vessel caused her bow to swing violently to port, C4, and collide with B before her direction could be corrected. This accident caused a vertical hole to be cut in the bow of B, about twelve feet long.

Fig. 8.—Sketch showing accident on S. S. Marie Canal.

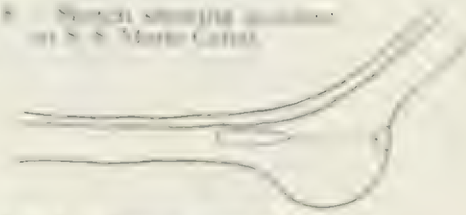


Fig. 9.—Sketch showing accident at Morrisburg.

Fig. 10.—Sketch showing accident narrowly averted, S. S. Marie Canal.

Fig. 9 illustrates an accident which occurred on the canal at Morrisburg, some years ago. The vessel was moving up the canal, which had a sudden turn to the left at this point. A construction scow was moored, for safety, in the bay on the opposite side of the canal. The vessel held too close to the canal bank on her port side and when she attempted to turn to port her bow refused to come round as the suction held her stern to the bank, with the result that the vessel went straight ahead and cut the scow in two.

This accident suggests the danger of two vessels attempting to pass one another on a curve of a canal. The vessel on the inside of a curve should hold back, allowing the vessel on the outside to have the right of way. This point should be covered by the canal regulations.

What was nearly another accident of this kind is illustrated in Fig. 10, which shows the lower entrance to the Sault Ste. Marie Canal. The vessel leaving the lock, when her bow cleared the end of the lock wall, began to swing to starboard and threatened to collide with the waiting vessel. The captain realized that if he reversed the engines the vessel would not be stopped in time to avoid a collision and that the bow would surely be thrown further to starboard, making a collision certain, he therefore signalled full speed ahead, put the helm hard over to hold the bow to port, and succeeded in clearing the waiting vessel by a very narrow margin. These three cases are given to illustrate the important influence that suction has on the movement of vessels in confined waters.

Fig. 11. — Upper entrance S. S. Marie Canal showing difficulty of large vessel passing another waiting vessel.

Fig. 12. — Suggested improved entrance.

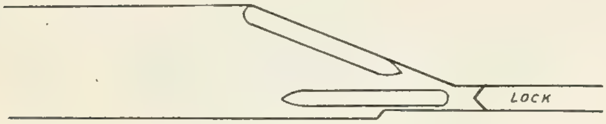


Fig. 13. — Suggested wider entrance.

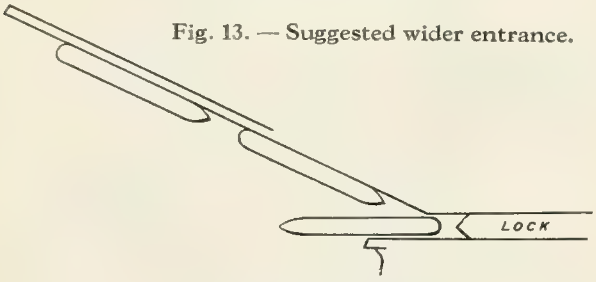


Fig. 14. — Suggested entrance opening on wide expanse of water.

When the Canadian Lock at Sault Ste. Marie was designed it was thought that the dimensions, 60 feet by 900 feet, were ample for many years to come. When the canal was opened in 1895 there were very few vessels over 400 feet long and their greatest beam about 50 feet. Ten years later there were 23 vessels over 500 feet long and the greatest beam was not much less than the width of the lock. To-day there are 121 vessels between 500 and 600 feet long and 42 over 600 feet long while their beam has increased to 64 feet or four feet wider than the Canadian Lock.

The special case given above of the time of an up-bound vessel to enter the lock, (50 minutes), shows the difficulty experienced in not having sufficient space for the water in the lock to pass the vessel. It would have been almost impossible to lock the larger vessels, (58 x 600 Feet), that have been passing through for many years, without opening the valves behind down bound vessels and allowing water in to fill the space behind the vessel as she moved out. The average time mentioned above, 7 minutes, taken by down bound vessels to move out of the lock, would have been increased by ten times.

It is, therefore, evident that a lock should be designed as to width and depth so that the largest vessel likely to use it for many years to come could move in and out of the lock freely on her own steam. That is to say that the lock should be at least ten feet wider and a foot deeper than the largest loaded vessel. The additional foot in depth is required on account of the surge in the lower entrance when emptying the lock, (See Figs. 3 & 4).

Fig. 11, shows the upper entrance to the Sault Ste. Marie Canal and indicates the difficulty that the large six hundred foot vessel has in passing a waiting vessel of the same size; and it can be imagined how much delay occurs, as the outgoing vessel has to move so slowly so as to avoid a collision.

Fig. 12, shows an improved entrance. The incoming vessel is moored on her port side, which is the side easiest for her to land on; and she is lying outside the line of the lock so as to be as far as possible removed from danger of collision with the outgoing vessel. The lock wall on the port side of the outgoing vessel is carried straight ahead to a point about opposite the middle of the waiting vessel so that that the outgoing vessel may move rapidly without danger of swinging towards the waiting vessel. If this wall were not carried so far ahead the outgoing vessel would have to move slower so as not to swing towards the waiting vessel when the suction released her bow.

Fig. 13 shows a wider entrance in which the waiting vessel lies in an oblique line. The lock wall on the port side of the outgoing vessel would not be carried so far ahead. The incoming vessel when about to enter the lock moves ahead until her bow comes to the end of the lock wall, then snubs with her bow line while her propellor still works ahead, causing her stern to swing out so that the axis of the vessel becomes parallel with the axis of the lock, when she lets go her bow line and moves into the lock.

The incoming vessel in figure 12, takes longer to move into the lock, as she has first to snub with her stern line and back her propellor to throw her bow out, then to go ahead and when her bow comes to the end of the lock wall, snub with the bow line, and still moving ahead throw her stern out. This vessel has two movements to make before entering the lock, whereas the vessel in Figure 13, only has one movement to make.

Figure 14, shows an entrance which opens on a wide expanse of water. This entrance would allow vessels to move with the greatest ease and would give the best dispatch. It must however, be remembered that local conditions would have to be considered in adapting any one of these entrances.

The depth of the water in the approaches should be at least two feet deeper at low water than the draft of a vessel, as records have been obtained where vessels have settled as much as one foot when running at full speed.

In the above paper the writer has endeavoured to show how costly it is to vessels to be delayed, to show the causes of delay insofar as canals are concerned, and to show how these delays may be overcome to some extent in the design of a lock and approaches.

A Study of Definitions of "Professional Engineer" and "Engineering"

By Alfred D. Flinn, Secretary Engineering Council

With the Collaboration of Alfred W. Kiddle and Harrison W. Craver

Introduction

When Engineering Council's Committee on Licensing of Engineers early in 1920 began the task of framing a model bill for the registration of engineers, it seemed desirable to include in this bill a definition of "engineer" and "engineering". Many attempts at such definition were made by the Committee and by the Secretary of Engineering Council, aided by several other persons, the chief contributors being Alfred W. Kiddle, Esq., of Kiddle and Margeson, New York, patent attorneys, Associate of the American Institute of Electrical Engineers, and Director Harrison W. Craver, of Engineering Societies Library. The results of these labors are worth recording for the convenience of future inquirers.

Many definitions of "engineer" and "engineering" were found in dictionaries, encyclopedias and engineering literature. Others were drafted. None proved adequate for the purposes of a statute, for none was found sufficiently comprehensive for the modern profession of engineering which did not also include architecture and possibly other professions of the applied sciences. The Committee on Licensing of Engineers concluded that it was impracticable to write a definition suited to its purposes. Furthermore, a definition did not seem essential to a law providing for the registration of engineers. It was deemed sufficient to assume that courts, commissions, and juries would know what an engineer was for the purposes of any case just as they would know what a doctor or a carpenter was. Therefore the recommended bill was drafted without a definition of "engineer" or of "engineering".

For the purposes of legislation a suitable definition should be so worded as to stand the test of trial in court; should include all branches of the engineering profession, to be regulated by the law, but not other professions, and should exclude those men who, by an unfortunate duality in the English vocabulary, are also called engineers, although engaged in a different vocation. In other words, the legal definition should include all the varieties of professional engineers to be governed by the given law, and comprise all the functions constituting their professional practice; but should exclude the men who run engines, an equally worthy but different vocation. Definitions of "engineer" and "engineering" have been essayed by many persons. In framing them it should be remembered that definitions written for the purpose of a statute must be somewhat different from those to be placed upon tablets or included in laudatory statements about the profession. Both kinds of definitions should be stated in such terms that they would not soon become obsolete.

Both Mr. Kiddle and Mr. Craver made many helpful suggestions and aided in this compilation in more ways than one. Mr. Kiddle compiled from numerous dictionaries and encyclopedias a most interesting "Bibliography on Definition 'Engineer' and 'Engineering'" and drafted tentative definitions as bases for discussion. He suggested, also stating in detail, as fully as possible, all the functions included in all branches of modern professional engineering, exclusive of military engineering, so that this statement could be used in testing and revising the drafts of definitions. Director Craver made a search of engineering literature and selected a number of definitions which it seemed worth while to place in one collection. Others have been added from reports of committees and from laws for licensing of engineers. During the past few years the expression "Engineer" has attained great currency and breadth with corresponding indefiniteness. It is frequently used in the popular press to mean any or all of the applications of science to industry and commerce. Many adjectives are now often used with "engineer" which only a few years ago would not have been granted the privilege of such company.

This study is not exhaustive of the subject. It is simply a product of the available time and facilities.

Tentative and Miscellaneous Definitions

1. *Engineer.*—One who is engaged in practicing the art or science relating to the discovery, investigation and utilization of the principles, forces, properties and substances of Nature and to the methods, means, devices, machines, apparatus and structures for employing the same.

NOTE: This is concise in its expression but comprehensive in its meaning and application.

Alfred W. Kiddle.

2. *Engineer.*—One who is engaged in utilizing or in directing or instructing others in the utilization of the principles, forces, properties and substances of nature in the production, manufacture, construction, operation and use of things; or who utilizes or directs or instructs others in the utilization, production, manufacture, construction and operation of means, methods, machines, devices and structures for utilizing or employing the principles, forces, properties and substances of nature.—Alfred W. Kiddle.

3. *Engineering.*—Is the art or science of utilizing, directing or instructing others in the utilization of the principles, forces, properties and substances of nature in the production, manufacture, construction, operation and use of things; or of utilizing or directing or instructing others in the utilization, production, manufacture, construction and operation of means, methods, machines, devices and structures for utilizing or employing the principles, forces, properties and substances of nature.—Alfred W. Kiddle.

4. *Engineer* — He who practices the art or science of engineering.

Engineering — The art or science governing the application of the forces and materials of nature to the use of man. — J. V. Davies.

5. *A Professional Engineer* is a man informed in the principles of engineering, and professionally engaged in the practice of engineering, as hereinafter defined.

Engineering is the art which applies science and scientific methods to develop and control resources of Nature for the use of Man; it involves measuring, directing of forces, inventing of processes, instructing and directing of men, and organizing of human efforts, for the fabrication of machines, the erection of structures, the production and transportation of articles of commerce, and the maintenance, operation or demolition of machines and structures; its purpose is the advancement of the welfare of Mankind. — Alfred D. Flinn.

6. *Engineering* — Definition in large letters on the wall of Engineering Societies Library, New York; "Engineering, the art of organizing and directing men and controlling forces and materials of nature, for the benefit of the human race." — Henry Gordon Stott, Presidential address 1908, to American Institute of Electrical Engineers.

7. *Engineering* — S. E. Lindsay, engineer for the Puget Sound Traction, Light and Power Co., Seattle, has recently proposed the following:

"Engineering is the practice of safe and economic application of the scientific laws governing the forces and materials of nature by means of organization, design and construction, for the general benefit of mankind."

"An Engineer is one who is properly qualified to engage in the practice of engineering."

8. "If the phrase, 'for the general benefit of mankind' is eliminated, Mr. Lindsay's definition is similar to the one first given in Gillette's Handbook of Cost Data ten years ago, namely, 'Engineering is the conscious application of science to the problems of economic production.' Mr. Gillette pointed out that since management had become a science it was unnecessary specifically to mention the management of men in defining engineering. In the new Handbook of Mechanical and Electrical Engineering, by Gillette and Dana, Mr. Gillette's original definition is slightly changed, and it reads: 'Engineering is the systematic application of science to the problems of economic production.' "

9. "A definition is a brief specification. A definition of engineering specifies what human activities are of an engineering nature. Most of the older engineers at first refused to revise the Tredgold definition so as to admit 'management engineers', 'industrial engineers,' 'efficiency engineers,' 'cost analysis engineers,' and the like, to the brotherhood of technical engineers. Even yet the requirements for membership in many of the great engineering societies are so worded that, if taken literally, a management engineer could not become a full member without qualifying as a designing or constructing engineer. Thus the old, narrow conception of engineering still survives in the by-laws of engineering societies, even though a modern definition 'is written in large letters on the wall of the engineers' library in New York' " — "Engineering and Contracting," October 8, 1919.

10. *Definitions of Engineering: Committee of Development American Society of Civil Engineers, October 1919.*

(a) Engineering is the science and art of directing the great sources of power in Nature to the use and convenience of man.

(b) Engineering is an art and science. It is a science in so far as physical laws are its basis, and an art in so far as in the application of these laws the things designed and constructed develop the spirit of progress, the creation of wealth, and the well-being of all peoples.

Engineering is generally divided into four major divisions, viz., civil, mechanical, electrical and mining.

The practice of engineering requires knowledge of physical laws, forces, and the materials of Nature.

The professional engineer is one who by reason of special training, education, and experience is qualified to design and direct the construction of engineering work in one or more of the major divisions of engineering.

(c) Engineering is the creative science and art of applying economically the materials and forces of Nature to the use and convenience of man.

(d) Engineering is the science of industrial effort, and the science and art of applying this effort for the welfare of the public.

An engineer is one versed in the science and art of industrial effort made for the purpose of public welfare.

11. *Definition of Engineering, from a Typical Law for Registration of Professional Engineers, Drafted by a Joint Committee of* American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Institute of Mining Engineers, Society of Naval Architects and Marine Engineers, American Institute of Consulting Engineers, *February, 1915.*

"A person practises professional engineering within the meaning of this act who practises any branch of the profession of engineering other than military engineering. The practice of said profession embraces the design and the supervision of the construction of public and private utilities, such as railroads, bridges, highways, roads, canals, harbors, river improvements, lighthouses, wet docks, dry docks, ships, barges, dredges, cranes, floating docks and other floating property, the design and the supervision of the construction of steam engines, turbines, internal combustion engines and other mechanical structures, electrical machinery and apparatus, and of works for the development, transmission or application of powers, the design and the supervision of mining operations and of processes and apparatus for carrying out such operations, and the design and the supervision of the construction of municipal works, irrigation works, water supply works, sewerage works, drainage works, industrial works, sanitary works, hydraulic works and structural works and other public or private utilities or works which require for their design or the supervision of their construction such experience and technical knowledge as are required in Section 8 of this act for admission to examination. The enumeration of any public or private utilities or works in this section shall not be construed as excluding any other public or private utilities or works which require such experience and technical knowledge for their design or the supervision of their construction. The execution as a contractor of work designed by a professional engineer or the supervision of the construction of such work as a foreman or superintendent for such a contractor shall not be deemed to be the practice of professional engineering within the meaning of this act.

"Professional engineer" means any person who practises professional engineering.

12. *Engineer*.—"By the engineer I mean the man who can apply imagination to facts — the planner, the one who sees his way through, the one who deals with realities in the light of possibilities. The men who drafted the constitution of the United States were engineers. They did not attempt to do the impossible, they tried to do the best possible with the facts as they knew them. Our great pieces of legislation, such as the Federal Reserve Act, are matters of engineering just as definitely as an irrigation project on which we gather into one great reservoir the waters of a score of streams and then distribute these waters again over the thirsty lands by tunnel, canal and ditch. ——— More and more we will find use for the man who thinks ahead with the sure background of facts. This is statesmanship; this is engineering." — Extract from letter of Hon. Franklin K. Lane, Secretary of the Interior, January 31, 1920, to John R. Dunlap, Editor and Proprietor, "Industrial Management", published in February, 1920, issue of that paper.

Definitions of "Art", "Science", "Profession"

13. "*Art*.— In the most extended and popular sense of the word, means everything which we distinguish from Nature. Art and Nature are the two most comprehensive genera of which the human mind has formed the conception. Under the genus Nature, or the genus Art, we include all the phenomena of the universe. ——— We designate familiarly as Nature all which exists independently of our study, forethought, and exertion—in other words, those phenomena in ourselves or the world which we do not originate but find; and we designate familiarly as Art, all which we do not find but originate — or in other words, the phenomena which we do add by study, forethought and exertion to those existing independently of us.———If, though, we were called upon to frame a general definition of Art leaving room for every accepted usage of the word, it would run thus:—Every regulated operation or dexterity by which organized beings pursue ends which they know beforehand, together with the rules and the result of every such operation or dexterity."—

14. "*Science* — consists in knowing. Art consists in doing. What I must do in order to know, is Art subordinate to or concerned in Science. What I must know in order to do, is Science subordinate to or concerned in Art." — Encyclopædia Britannica, 9th Edition.

15. *Profession*.—"A learned profession may be defined as a vocation in which scholarly accomplishments are used in the service of society, or of other individuals, for a valuable consideration. Under such a definition every new vocation in which a very considerable amount of scholarship is required for its successful prosecution, and which is placed in the service of others, must be held as a learned profession, and as engineering now demands fully as great an amount of learning or scholarship as any other, it has already taken a high rank among these professions, although as a learned profession it is scarcely half a century old. Engineering differs from all other learned professions, however, in this that its learning has to do only with the inanimate world, the world of dead matter and force. The materials, the laws and the forces of Nature, and warranty to any extent to life, are the peculiar field of the engineer. I am here using the term engineer as including the large class of modern industrial workers, who make the new applications of science to the needs of modern life their peculiar business and profession. A man of this class may also be called an applied scientist."
— Extracts from "Two Kinds of Education for Engineers", Prof. J. B. Johnson.

16. A *Profession* is defined as being "a vocation founded upon specialized educational training, the purpose of which is to supply disinterested counsel and service to others, for a direct and definite compensation, wholly apart from the expectation of other business gain".

17. *Art* — Practice as guided by the correct principles in the use of means for the attainment of a certain end. (1) Skill in applying knowledge or ability to the accomplishment of a concrete purpose. (2) A system of rules devised for procuring some scientific, aesthetic or practical result; also, the mastery of such rules. By extension, a branch of learning to be studied in order to be applied, as the art of arithmetic, the seven liberal arts of the Schoolmen. (3) Facility resulting from practice; dexterity; knack; power. New Standard Dictionary, 1919 edition.

18. *Science* — (1) Knowledge gained and verified by exact observation and correct thinking, especially as methodically formulated and arranged in a rational system; also, the sum of universal knowledge.

Science in the wide sense includes (1) science proper embracing (a) exact knowledge of facts (historical or empirical science), (b) exact knowledge of laws obtained by correlating facts (comparative science), and (c) exact knowledge of proximate causes (rational science); and (2) philosophy. In the narrow sense of positive science, the word is used as including only the first two divisions of science proper.

(2) Any department of knowledge in which the results of investigation have been worked out and systematized; an exact and systematic statement of knowledge concerning some subject or group of subjects, especially a system of ascertained facts and principles covering and attempting to give adequate expression to a great natural group or division of knowledge; as, the sciences of astronomy, botany, chemistry and medicine.

The sciences are divisible into (1) the mathematical, treating of quantity; (2) the physical, treating of matter and its properties; (3) biological, treating of the phenomena of life; (4) the anthropological, treating of man; (5) the theological, treating of the Deity.

In the progress of human knowledge a science, in its earliest and simplest form, is usually a mere collection of observed facts, like the knowledge of the movement of the heavenly bodies possessed by the ancient Egyptians. The next step is to correlate or generalize these facts, forming a system like that of Ptolomy, or Copernicus; the next, to formulate these generalizations as laws, as was done by Kepler; the final step, to proceed to some principle or force accounting for these laws, usually by the aid of mathematical analysis, as was done by Newton in his theory of universal gravitation. The tendency of modern physical science is toward this more complete generalization, its goal being the discovery of a principle that shall connect all physical phenomena. New Standard Dictionary, 1916 edition.

19. *Profession* — 1. An occupation that properly involves a liberal education or its equivalent, and mental rather than manual labor; especially, one of the three so-called learned profession.

2. Hence, any calling or occupation involving special mental and other attainments or special discipline, as editing, acting, engineering, authorship, etc., also, the collective body of those following such vocation. New Standard Dictionary, 1916 edition.

A Test of the Adequacy of Tentative Definitions

NOTE: Additions should be made to the columns below, if they do not cover all branches of modern professional engineering, exclusive of military engineering.

20. *Engineer:* One who is engaged in:

discovering investigating developing controlling measuring conserving adapting utilizing and/or instructing others concerning	the principles forces powers properties substances elements and/or resources OF NATURE:

And/or one who is engaged in:

Inventing discovering devising investigating developing designing constructing erecting producing making operating employing practising and/or instructing others concerning	means methods processes machines apparatus devices and/or structures	for utilizing employing controlling directing rendering available adapting transforming generating distributing and/or transmitting	the principles forces powers properties substances elements and/or resources OF NATURE.

Alfred W. Kiddle

Detailed Description of Professional, Civilian* Engineering to Include Members of all Branches of the Profession

(*Exclusive of Military Engineering.*)

NOTE: Emendations may be made, if the following statement is not sufficient. It is intended to be used as an aid in framing definitions of "engineer" and "engineering".

21. *A professional, civilian engineer* is one who, being informed in the natural, mathematical and sociological sciences and the industrial arts, is engaged in:

1. discovering and developing forces, materials and other resources of Nature;
2. measuring forces and the properties of materials (substances);
3. utilizing resources of Nature for the benefit and convenience of Man;
4. inventing machines, structures, processes and devices;
5. organizing men, equipment and facilities for construction or production or demolition;
6. designing, constructing and/or maintaining or demolishing structures;
7. designing, constructing and/or maintaining or demolishing machines of all kinds, and/or directing their operation;
8. designing, constructing and/or maintaining or demolishing ways and means of communication, transportation, illumination, heating and ventilation, and/or facilities therefor, and/or directing their operation;
9. designing and constructing vehicles, vessels and other means for transporting persons and/or goods on, in, through, over, under land, water, air;
10. investigating properties, projects, prospects and routes;
11. investigating methods, efficiency and economy of construction, production and/or operation;
12. surveying land, bodies of water, mines, structures, and quantities of materials, incidentally to other functions of professional practice;
13. excavating, embanking, grading, tunneling;
14. inspecting and testing materials, methods, processes, machines and structures;
15. generating and/or transmitting power, light, heat and intelligence;
16. regulating, surveying, conserving and utilizing water and other natural resources;
17. regulating streams for prevention of floods or improvement of navigation;

**Used with the early broad meaning of "civil", as the opposite of "military".*

18. designing, constructing, maintaining and/or operating harbors, harbor works, dry docks, canals, lighthouses and other aids to navigation;

19. reclaiming waste lands by drainage, irrigation and other methods of improvement;

20. supplying communities and industries with water;

21. draining or sewering cities, towns or other areas;

22. disposing of sewage and other wastes;

23. demolishing structures and machines;

24. developing and improving forests, parks, and public and private grounds;

25. preparing plans, specifications, contracts, drawings, and other documents for purposes of construction, production or demolition;

26. and or directing, instructing, supervising others in any of the above functions;

27. and or giving advice in regard to any of said functions;

28. and/or directing, instructing, supervising, or superintending those performing the skilled or unskilled labor involved in engineering operations.

29. In the foregoing paragraphs, "construction" is meant to include assembling, erection, re-construction, alteration, improvement and repair.

30. With all the machines and structures mentioned above are included their appurtenances.

31. In all the functions of the professional engineer the mental elements predominate, including the ability to originate, adapt, analyze and apply; in contradistinction to the functions of the mechanician, technician, constructor, computer, craftsman, or operative, in which predominate physical or mental skill gained by instruction and repetition.

22. Some Designations of Modern Engineering Specialities

Aeronautical Engineering
Agricultural Engineering
Automotive Engineering
Bridge Engineering
Cadastral Engineering
Cartographic Engineering
Ceramic Engineering
Chemical Engineering
Civil Engineering
Commercial Engineering
Consulting Engineering
Drainage Engineering
Efficiency Engineering
Electrical Engineering
Electric Railway Engineer'g
Electrochemical Engineering
Experimental Engineering
Fire Prevention Engineering
Forestry Engineering

Irrigation Engineering
Landscape Engineering
Management Engineering
Marine Engineering
Materials Engineering
Mechanical Engineering
Metallurgical Engineering
Military Engineering
Mill Engineering
Mining Engineering
Municipal Engineering
Nautical Engineering
Naval Architecture or Engineering
Ordnance Engineering
Petroleum Engineering
Power Engineering
Radio Engineering
Railroad Engineering

Gas Engineering
Harbor Engineering
Heating and Ventilating Engineering
Highway Engineering
Human Engineering
Hydraulic Engineering
Hydrographic and Geodetic Engineering
Illuminating Engineering
Industrial Engineering

Rapid Transit Engineering
Refrigeration Engineering
Research Engineering
Safety Engineering
Sanitary Engineering
Signal Engineering
Structural Engineering
Telephone Engineering
Topographic Engineering
Valuation Engineering
Water Supply Engineering

Historical Notes on "Engineer" and "Architect"

23. Historically the builder of fortifications, the military engineer, and the builder of dwellings and temples, the architect, were [illegible] on the ground. The distinction was then between military and civilian, and between engineer and architect. All of us who have translated him, remember that Julius Caesar built a bridge — and we know of the military Roman roads of England. In his illuminating lecture on "The Romance of Engineering", Professor C. J. Tilden, of Yale, states that Vitruvius, in his treatise written about the beginning of the Christian Era, divides the field of architecture into three main divisions as follows:

1. The Art of Building.
   a. The construction of fortified towns and of works for general use in public places —
      I. For defensive purposes — the planning of walls, towers and gates, permanent devices for resistance against hostile attacks.
      II. For religious purposes — the erection of fanes and temples to the immortal gods.
      III. For utilitarian purposes — the provision of meeting places for public use, such as harbors, markets, colonnades, baths, theatres, promenades, and all similar arrangements.
   b. The putting up of structures for private individuals.
2. The Making of Time-pieces. (Sundials, water clocks, etc.)
3. The Construction of Machinery —
   a. Civil — water wheels, screw pumps, hydraulics, etc.
   b. Military—balistae, catapults, rams, siege machines, etc."

The very considerable Avignon bridge across the Rhone River (about 1200 A.D.), with eighteen clear arch spans of from sixty-five to eighty feet each, in a swift-flowing river subject to ice jams, was regarded as a work of architecture. The term Architect of Bridges is authentic. Michel Angelo (1475-1564) was not only the architect of St. Peters, but he designed the fortifications of Rome.

Leonardo da Vinci (1452-1519) not only made plans for Milan Cathedral, and painted the "Last Supper" and "Mona Lisa", but he was a chief military engineer, and a hydraulic engineer dealing with irrigation, river control and harbor works, and designed a flight of six vessel-locks. He styled himself engineer as well as architect.

The term Architect in its etymology means "Master Builder".

In the evolution of construction, two classes of builders have by some vagary of word-growth been verbally torn apart in their kinship sometimes questioned. It is odd that in this juggling of old terms and the emergence of new terms, one class of engineers, — and a class whose work is of the highly-specialized, technical kind which deals with the direction of great mechanical forces, — has kept the old family name, the Naval Architects. An accident of name-evolution has tended to segregate one class of master-builders, from the other classes of master-builders. It may be thought that initiative and imagination are the qualities of architects, while engineers deal with the prose of construction. Analysis will, however, reveal the fact that eighty per cent of the architectural structures of our cities are commonplace, with no peculiar beauty or originality. Now and again a Woolworth building springs sky-ward, worthy of the phrase "frozen music", and we recognize again the master-builder of the sixteenth century. But the same quality of mind went into the wireless telegraph, the airplane, the Panama canal and hydro-electric developments and transmission at Niagara. Engineers without creative imagination are as mediocre as architects without this same vital and indispensable attribute of the master-builder. Architects must recognize that scientific imagination is on the same high plane as their own best creative brought; and engineers must concede the esthetic contribution of architects in adding to the durable satisfactions of life. Both are creative workers. — Francis C. Shenehen, M. Am. Soc. C. E.

Definitions of "Engineer" and "Engineering" as Written into State License Laws

Note: Eleven States have laws regulating the practice of engineering.

24. A person shall be regarded as practising *structural engineering* within the meaning of this act who is engaged in the designing or supervising of the construction, enlargement, or alteration of structures, or any part thereof, for others, to be constructed by persons other than himself. Structures within the meaning of this act are all structures, having as essential features, foundations, columns, girders, trusses, arches and beams, with or without other parts, and in which safe design and construction require that loads and stresses must be computed and the size and strength of parts determined by mathematical calculations based upon scientific principles and engineering data. A person shall also be regarded as practising structural engineering with the meaning of this act who is engaged as a principal in the designing and supervision of the construction of structures or of the structural part of edifices designed solely for the generation of electricity; or for the hoisting, cleaning, sizing or storing of coal, cement, sand, grain, gravel or similar materials; elevators; manufacturing plants; docks; bridges; blast furnaces; rolling mills; gas producers and reservoirs; smelters; dams; reservoirs; waterworks; sanitary works as applied to the purification of water; plants for waste and sewage disposal; round houses for locomotives; railroad shops; pumping or power stations for drainage districts; or power houses, even though such structures may come within the definition of "buildings" as defined in any act in force in this state relating to the regulation of the practice of architecture.— *Illinois Law, 1920.*

25. *Civil engineering,* within the meaning of this act, is the practice of any branch of the profession of engineering other than mining, metallurgical and military. Said profession embraces the design and supervision of the construction of all public or private utilities except those in connection with mining operations exclusively, and other works which require experience, and the same technical knowledge as engineering schools of recognized reputation prescribe for graduation.— *Idaho Law, 1919.*

26. *An Engineer,* within the meaning of this act, is a person who is engaged in the practice of the profession of engineering in any of its branches, except military engineering.— *Colorado Law, 1919.*

27. *Joint Committee Definition* of 1915* was written into *Florida Law, 1917, Oregon Law, 1919,* and *Iowa Law 1919. Florida Law* omits sentence, "The enumeration of any public or private utilities or works in this section shall not be construed as excluding any other public or private utilities or works which require such experience and technical knowledge for their design or the supervision of their construction." *Iowa Law* omits the same sentence and inserts after the words "such a contractor,"—"or the construction, improving, or extending of private drains or drainage works, private irrigation works, private water supply works, or other works of a private nature shall not be deemed to be the practice of professional engineering within the meaning of this act."

Louisiana, Michigan, New York, Virginia and Wyoming license laws contain no definition.

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*See page 388.

NOTE.—Mr. Flinn follows with definitions taken from a number of catalogues of American universities and engineering schools which are omitted here.

Inundation Work with the British Expeditionary Force in France

[illegible], A.M.E.I.C., Lieutenant, Inundation Section R. E., G.H.Q., B. E. F.

War, on a large scale in a civilized country between two forces about evenly matched, requires a vast amount of scientific effort on the part of the victor to overcome an intelligent, energetic and ever alert enemy. Medicine, of course, assumes a very important role and pure science again demonstrates its usefulness in blazing new trails in the forest of learning, but unquestionably the most important work is performed by the applied scientist or engineer. It seems to be axiomatic that the larger the war the more the engineer has to do with it. Indeed the late war, the Great War, the greatest of all wars in history, has been publicly called the engineer's war, by no less a personage than Lloyd George, than whom there is no person better qualified to speak with authority.

Take the chief weapons of modern warfare, battleships of all sizes (especially submarines), airships, aeroplanes, tanks, heavy artillery (and explosives in general), and what are they but children of an engineer's brain? Poison gas stands in a class apart as a product of pure science but in its actual use it is ineffective and in fact dangerous without the engineer's skill.

The above named weapons are all agencies of destruction but it must not be assumed that the engineer in warfare is of value only when devising and operating destructive forces. Practically all of his peace time activities are duplicated in warfare with this fundamental and all important difference — in peace time the engineer is called upon to produce results as economically as possible, in war he must produce results at any cost, if necessary.

The civil engineer, though perhaps less directly concerned than his mechanical and electrical brethren, nevertheless played an important part in the Great War. In the forward areas bridging and water supply remained his peculiar work, while at the bases harbor and dock work were looked upon as his specialty.

No Army in the recent war, except probably the German Army, developed its engineer service to anything like the proportions or to include anything like the variety of work that the British Army did. As an illustration of this; it should be mentioned that the War Office in London is preparing official records on "The Work of the Royal Engineers in the European War 1914-1919", under the following synopsis.

Part 1. General. Development of the Corps. Causes that led to the formation of new branches and units. Charts to show organization and strength of the Corps in August 1914, and November 1918, etc.

Part 2. Work under the Director of Fortifications and Works. (This includes harbor and defence work around the coast of the British Isles and at interior posts).

Part 3. Work in the Field under the Commander-in-Chief, B.E.F. (France).

Section 1—General.
2—Engineer Intelligence.
3—Defences.
4—Bridging.
5—Water supply.
6—Machinery, workshops, electricity.
7—Mining, [illegible] and tunnelling.
8—Geology.
9—Inundations.
10—Camouflage.
11—Anti-aircraft searchlights.
12—[illegible]
13—[illegible]
14—Experimental section.
15—Hutting and Encampments.
16—Schools.

Part 4. Work in the Field under other branches of the Staff (France).

Section 1—Maps.
2—Gas services.
3—Forestry.
4—Postal services.
5—Meteorological.

Part 5. Work in the Field in other theatres of War.

Section 1—Egypt.
2—Gallipoli.
3—Mesopotamia.
4—Salonika.
5—West Africa.
6—East Africa.
7—Miscellaneous.

Part 6. Work under the Director of Works — France.

Part 7. Work under the Director General of Transportation.

Part 8. Supply of Engineer Stores and Materials.

To the above should be added other sections on the work of the Railway and of the Inland Water Transport services. It can thus be seen what a great field was covered by engineering activity.

The subject of Inundations will now be dealt with and it is hoped will prove of interest to members of the Institute. This is one of a small group of subjects ([illegible]) included in the above list which developed during the Great War from nothing to quite respectable proportions. [illegible]

Read before Montreal Branch of The Engineering Institute of Canada, March [illegible].

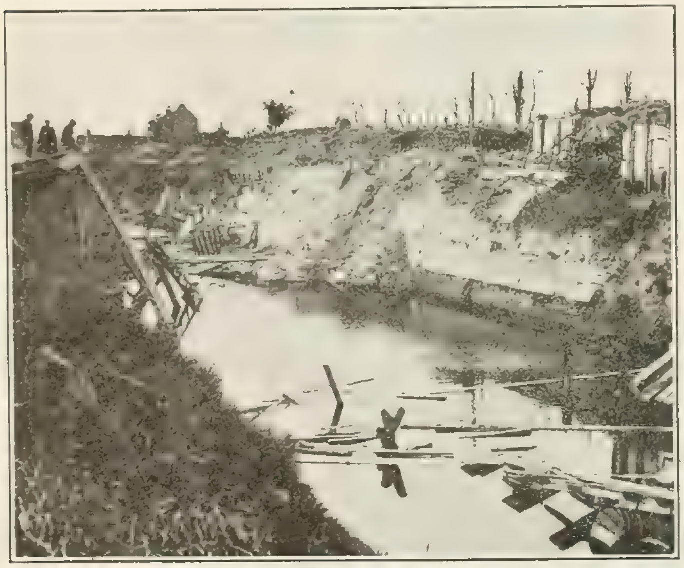
Inundation work with the British Armies in France may be divided into four distinct phases or periods:—

I Preliminary — 1914-1917
II 1918 — Defensive
III 1918 — Offensive
IV Reconstruction

I.—Preliminary — 1914-1917

The first (preliminary) period covers the trench warfare period from roughly the First Battle of Ypres (in the Winter of 1914-1915) to the Winter of 1917-18. Looking back in the light of present knowledge it was a very disappointing period from the inundation standpoint, — so much remained undone or was never even thought of, that could easily have been done. The very first stand of the British force to come under fire (General Smith-Dorrien's II Corps along the Mons-Condé canal) was made at the place of all places in Northern France, (the Condé-Quievrain-Valenciennes marsh) where inundation work on the part of the Germans some time afterwards proved so effective, yet nothing was ever attempted. A few hours work at certain critical points along the bank of the Mons-Condé canal, which is mostly above the level of the surrounding country, would have released a large volume of water, and seriously impeded the advance of the Germans at a time when a day's time was invaluable. The blame for this lack of foresight must rest with the British General Staff at the War Office, since the French General Staff and Staff College, years before, (as will be shown later) had prepared detailed defence plans covering all features of this work in case of a German invasion.

Detailed hydraulic studies did not start until the retirement of the Allies in 1914 and the race to the sea had ended in the trench warfare deadlock, and both sides settled down to more or less permanent residence. Naturally, the first district to be critically examined was the low-lying Flanders coast from Ypres to Nieuport. German attempts by shelling to destroy the water gates at Nieuport and hence British control over the canal water-levels, first drew (it is believed) attention to the seriousness of the problem and its possibilities for defence. All available Belgian records were obtained and carefully studied and in addition precise check levels were run and canal and stream discharge measurements were taken wherever possible. This work was put in charge of Capt. A. P. McDermid R.E., afterwards Inundation Officer to the Engineer in Chief at General Headquarters, and credit must be given to him for the first scientific attempt to develop inundation work in a tactical sense. The chief difficulty in effecting any decisive result along these lines in this area during the early years of the war lay in the fact that the important canal control points were fairly evenly divided between the British and Germans, due to the complicated nature of the canal system in this part of Belgium and France, and neither side could do anything important of an offensive nature without imperilling its own defences. So both Armies remained fixed in position but watching each other for the first signs of weakness. During the summers of 1916 and 1917 the British brought from England into this area a large pumping plant on a shallow draft barge and this was used at a critical point to pump canal water from one low level behind the British line to another low level behind the German line over a high level stretch (which both armies controlled) and so keep flooded an area of country which the Germans especially wanted dry.



A typical canal view in the area subject to inundations as the Germans left it. To regain control on such stretches was often a difficult matter.

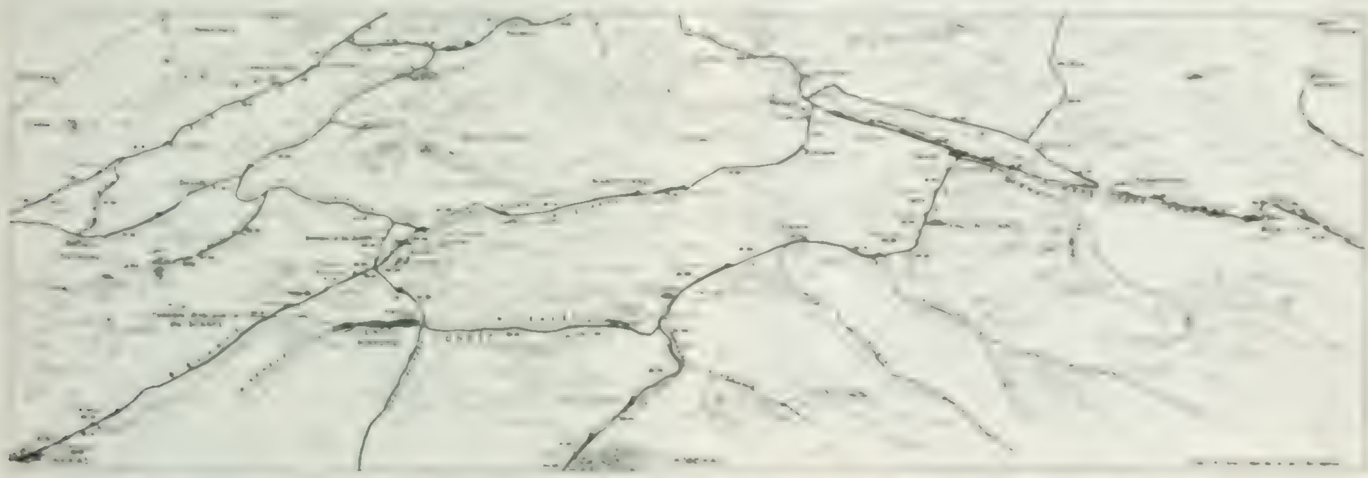
On the balance of the British front during this period, the situation was considerably different and there is nothing of special interest to report. Any inundation problems that arose were small and local and easily handled by local units and personnel without reference to more than Corps or sometimes Army Headquarters. During this period, however, the British Expeditionary Force grew from the original "Contemptibles", some 160,000 strong, to five British Armies. Over the five Chief Engineers of the Armies was appointed an Engineer-in-Chief who gradually collected about him a staff of specialists and serious attention was devoted to such technical and tactical problems as inundations, and canal and river control. It was in this period that Brig. General Liddell, Deputy Engineer-in-Chief, made a memorable trip to the French War Office in Paris and obtained invaluable information as to the possible defence value of inundating the low-lying parts of the chief river valleys in North-East France. The most interesting and valuable document, a copy of which was obtained, was the proceedings of a conference held in 1897 at the instigation of the French Staff College, in conjunction with Engineers from the Department des Ponts et Chaussées, the Department of Navigable Waterways, and Engineers from the Belgian General Staff, for the purpose of considering all possible defence measures in case of a German invasion over the Belgian frontier. The inundation part of this report contained practically all the hydraulic and topographical data necessary to develop schemes for flooding low-lying areas at the most feasible points, with estimates of time, volume of water needed, etc., and a full list of control points. This report became the basis for all the future work done by the Inundation Section R.E. One copy was known to have been lost at Lille at the time of the German advance in 1914 and, it is feared, fell into the enemy's hands as all the future work seemed to show a great resemblance to the schemes and principles laid down in that report. Inundation warfare in the latter stages of the war (September-November 1918) thus became a game of chess, as it were, between two opponents who each knew fully the rules of the game and what the other could do. The advantage lay with the Germans, however, as they had the actual ground and stream control points to work with.

As evidence that the Germans early grasped the tactical value of inundations in defence operations may be mentioned the fact that aerial photographs in 1916 of the lower Scarpe River Valley (North-West of Valenciennes) showed large tracts of flooded country around St. Amand which were not understood until a prisoner confessed that the German engineers had been practising an inundation stunt, and had obtained valuable information as to proper size of water openings, run-off time, evaporation, etc.

The four chief rivers behind the British line during the period, were: First, The Somme, running through Amiens, Abbeville, etc.; Second, the Authie, running through Auxi-le-Chateau; Third, The Canche, running through Hesdin to Etaples past General Headquarters at Montreuil; and Fourth, The Aa, running through St. Omer to Gravelines on the Channel coast, East of Calais.

The topographical and hydraulic features of these river valleys were not known sufficiently accurately to plan or lay out any areas to be flooded as it became necessary to make hurried surveys. With Canadian-built British theodolites, these were eventually made all the way back to the coast, on each of the above mentioned rivers. After several unsatisfactory attempts to work with detached personnel it was decided to organize a new unit (Inundation Section R.E.) directly attached to the staff of the Engineer-in-Chief, General Headquarters.

The writer joined the Section on June 7, 1918 as Senior Subaltern, and was immediately assigned to the Somme Valley work between Amiens and Abbeville. It may be of interest to describe the work on this stretch



Birds eye view of the intricate canalized river system of Northern France, showing the inundated areas mentioned in this article.

II.—Defence Period — March to August 1918.

This period covers the time from the great German offensive on March 21, 1918 until August 8, 1918 when the great British offensive was launched at Amiens and the final decisive stage of the war entered into. The initial success of the German attack made it absolutely imperative to develop every means of defence to the utmost, and inundation work began to assume considerable importance, especially in the Somme River valley behind Amiens. Control of the work, along with other special defence schemes, was assumed direct by General Headquarters and the Deputy Engineer-in-Chief, Brigadier General McInnes, C.M.G., D.S.O., R.E., a Canadian in the regular British Army, was put in charge. Unfortunately he died shortly after. Capt. A. P. McDermid R.E., was then given control, under the Engineer-in-Chief, and he remained in charge until the end of the war.

in some detail, as the field methods first worked out here were used subsequently, on all the work on the other three rivers.

The Somme is a canalized river flowing in an old, well-eroded valley about a mile wide with fairly high ground (50-100 ft.) on both sides of the valley. The average water slope is two feet per mile, and single locks are spaced approximately six miles apart. Barge traffic is fairly heavy in peace time and the size of the barges is governed by the size of the lock chambers, which are all a standard size, 17' x 125'. During the war the Inland Water Transport Section R.E. operated the barges on all these canals in Northern France and at each lock the old French regular lock-keeper (éclusier) was retained to operate the by-pass control gates, and so regulate the water level in the upstream and downstream reaches. The minimum depth of water was about eight feet, the average width at water level was approximately fifty feet, the sides were sloped one and one-half to one, and there was always a six foot tow-path for horse locomotion.

At this stage of the war the Germans were within six miles of Amiens, so the first work done in the Somme Valley was to develop hastily what control points in and around the City of Amiens were obviously seen to be available for flooding large areas of low-lying land above the city towards the German line. All culverts, control gates, by-passes and small openings were blocked by sand bags (or stop-logs) or otherwise prepared for immediate closure. This naturally increased the flow in the two main channels of the Somme flowing through the city. At the upstream end of two of the largest bridges stop-log control dams were built and hung by tackle so that at a minute's notice they could be dropped into place. Everything was ready for immediate and effective action should the Germans advance further, but fortunately the scheme was not needed.

Next a hurried reconnaissance survey was made of all the existing water-pools and marshes (old peat cutting grounds) in the Somme Valley all the way back to Abbeville, a distance of twenty miles. These were sketched in by eye, together with all small streams emptying into them. Then a more detailed and thorough instrument survey was started on the "spot-level" method over the same area, starting from Amiens and working downstream. Taking the best and largest scale French map of the valley that could be obtained (r.f. 1/80000) as a basis, level readings were taken on *such* points from side to side of the valley and on as *many* points as were considered necessary to give sufficient topographical data. Great accuracy of lineal measurement was not essential so distances were paced, or more often, estimated by eye. Accuracy of elevation was, however, essential and all rod readings were read to the nearest tenth of a foot except those on Bench-Marks and Turning Points which were read to the nearest hundredth of a foot. The level bubble of a five inch English transit was used for the work and all work was based on Bench-Marks of the French Nivellement General. Each and every lock, by-pass control, sluice, bridge, culvert, etc., in the area was measured and indexed, and the inundation scheme for the valley, when completed, contained detailed instructions for handling each of these control points.

The Aa River, like the Somme, is a canalized river, but the Authie and the Canche are not. Numerous mills along the banks of these streams, however, furnish control points by means of their barrages (dams) and weirs. Wherever possible, the stream discharge was measured at these weirs, otherwise the cross-section and surface-float-velocity method was used.

In all cases, the underlying idea was to so obtain control that a large volume of water might be quickly applied over as large an area of land as possible but *not* to a great depth. Experience proved that a shallow pond or marsh is desired for inundation purposes rather than a lake. A lake is navigable by rafts or other craft but a marsh furnishes just as valuable an obstacle and is in addition, absolutely impassable to all arms except aircraft.

Canadians making emergency repairs to lock-gates in an effort to regain control of water level.

III.—Offensive Period—September to November 1918.

This period, in its variety and difficulty of work is of far greater interest than any of the other three periods. The Hun, by this time in retreat, had learned his inundation lessons, and was proceeding, as far as he could, to put into effect the different schemes that had been so carefully worked out by the French Staff College back in 1897. It therefore became the function of the Inundation Section at General Headquarters to advise the Enginer-in-Chief in advance, (and through him the Chief of the General Staff) what to expect as the British Armies advanced and to act in a consulting capacity regarding any and all river and canal technical problems as they arose. A typical case in point is as follows: — One morning an aerial photograph was brought in which showed the Germans starting a dam across an important canal far behind their front line. On examination it was soon apparent that when the stream was dammed and a cut made through the canal bank a short distance above the dam a large area of country would be flooded. The Chief of the General Staff was immediately advised, through the Engineer-in-Chief, of the seriousness of the work. Next morning another aerial photograph of the same spot was brought in which showed how effectively the British bombing planes had spoilt the German's little scheme.

Of the four main rivers, the Sambre, The Escaut (Scheldt in Belgium) the Scarpe and the Lys, followed by the British Armies in the final advance, the Escaut and the Scarpe with their lateral connecting canals (Sensée and Haute Deule) were by far the most susceptible of being developed as serious tactical obstacles by means of inundations, and it is an interesting point to notice that the Canadian Corps (as the centre Corps of the First Army) happened to be on the part of the Front opposite these obstacles and was the direct means of overcoming same.

The writer was posted for duty as Inundation Officer to the Chief Engineer of the 1st Army on October

15, 1918 and immediately attached to the Staff of Maj. General W. B. Lindsay, Chief Engineer of the Canadian Corps as General Headquarters Inundation Officer, remaining there until Mons was captured on November 11th.

The only three districts in which it was possible for the Germans to develop any large inundation areas and cause any serious tactical obstacles were: First, the lower reaches of the French Escaut River (especially around Condé). Second, the lower reaches of the Scarpe River from Lallaing to St. Amand. Third, Part of the Haute Deule Canal from Lille upstream to Wavrin.

The Escaut, a canalized river from Cambrai down to the sea has three important tributaries (La Selle River, L'Ecaillon River, and la Rhonelle River) below its junction with the Sensée canal at Estrun (or Bassin Rond) and a large flow, which the Germans used to the utmost in developing their Conde marsh inundation scheme.

The Scarpe River, starting at Arras, is joined at Corbehen by the Sensée canal, and, under dual control, flows through Douai, from where it splits, part of the flow going down the Scarpe River (canalized) to join the Escaut at Mortagne and the rest going down the Haute Deule canal through Lille. The only possible source of water for the Lille inundation scheme is from this supply.

The Sensée canal, joining the Scarpe and the Escaut, is fed by the famous Arleux-Palluel marsh, at Palluel, the junction of the Sensée and the new canal du Nord. This marsh is six feet above the water level in the Sensée canal and furnishes a constant supply of water, but was fairly low in the autumn of 1918. There is no lock in the Sensée canal between Goeulzin and Iwuy, (on the Escaut), and the water level at both these locks falls away towards the Scarpe and Escaut Rivers respectively so it is self evident that this high level Sensée Canal is really a feeder to either the Scarpe or the Escaut, depending on the lock manipulation. It was thus very important in the inundation problem.

Below Corbehen, the Scarpe flow, (or the Scarpe and Sensée) could be sent down either by the diversion canal to the west of Douai or down the old river channel through the city itself. The two locks (one on the Scarpe proper and one on the Haute Deule at its junction with the Scarpe) at Fort de Scarpe below Douai, were probably the two most important locks dealt with on this work. By proper manipulation, the whole flow of the Scarpe (or Scarpe and Sensée) can be choked off from going on down towards St. Amand and can all be diverted down the Haute Deule canal. This was actually done by the Canadians immediately after Douai was captured (by the VIII Corps on October 17th) and was undoubtedly the means of preventing any serious floods along the lower Scarpe, where they might have been expected. Lille, by this time, was in British hands.

But the first serious problem confronting the Canadians, before Douai was captured, was to choke off the Scarpe River flow and prevent any water from reaching Douai to form local inundations there. This was solved partly by ponding in the headwaters around Arras, but chiefly by reviving an old trick of the Duke of Marlborough, when defending Douai in 1670. The lock and by-pass at Vitry were blocked as much as possible and a cut made upstream in the river bank of the Canal at Biache with the result that the Scarpe water found its way down a small valley into the Arleux-Palluel marsh, which was low and could absorb a large quantity. As soon as Douai was captured the break was repaired and the Scarpe resumed its natural course.

By means of blocking the lock on the Escaut at Pont Malin (below Bassin Rond) and opening the lock at Goeulzin on the Sensée, the whole flow of the Escaut above Pont Malin can be diverted down the Scarpe and Haute Deule canals through Lille and this was also done by the Canadians, in due course, to prevent all water possible from reaching the already large inundation obstacle between Valenciennes and Condé. This marsh had already been completed, however, in a tactical sense

Aerial view of La Folie Lock No. 11 below Valenciennes in the Condé Marsh inundated area along the Escaut River.

and functioned perfectly in that it forced the Canadians to stand and capture the city of Valenciennes by a direct attack instead of by their previously successful method of flanking envelopment. It was the outstanding example in the War of the value of inundation, scientifically carried out, as a means of defence.

IV.—Reconstruction Period—After the Armistice.

As the result of a conference held at Roubaix on November 12, 1918, between representatives from the Belgian Army, French Army, the First, Second and Fifth British Armies, and British General Headquarters, the control of all canals and rivers on the first, fifth and second British army fronts from Cambrai to Oudenarde (on the Scheldt above Ghent) was put in the hands of Brigadier General C. J. Armstrong, C.B., C.M.G., Chief Engineer VII (British) Corps, formerly Chief Engineer Canadian Corps and a Member of this Institute. The writer was attached to his staff as Inundation Officer.

The chief problems were: — First, to devise ways and means of regaining control of the Escaut and Scarpe rivers since practically all the locks and control points had been destroyed by the Germans and the two streams were in effect free-running rivers. Second, to drain the inundated areas. Third, to clear away all channel obstructions. Fourth, to rebuild as many of the locks and by-passes as the available labor and material would permit and in so far as this rebuilding scheme was agreeable to the French and Belgian Governments.

Practically no rebuilding was done, but a serious attempt was made to regain control of the streams at critical points by means of stop-logs, etc. A detailed survey was made, on foot, of the Scarpe, the Sensée, the Haute Deule, the Escaut from Cambrai to Oudenarde, the Mons-Condé, the Pommeroeul-Antoing, and the Blaton-Ath canals, to obtain some idea of the work to be done, and the report on the Mons-Condé canal is quite typical of conditions as the Germans left them in this part of France.

The attached appendices, are self explanatory. They explain in greater detail some of the more important points and problems mentioned in the preceding summary. The VIII Corps being situated on the left of the Canadians, or downstream on the Escaut, the inundation situation as developed on its front is almost of equal interest with that on the Canadian Front.

The War Diary Extract, is of special interest as it shows the great amount of important work that was done in two critical weeks in October during the final advance of the Canadian Corps.

(COPY)

First Army No. G.S. 1406/4

VIII Corps.
Adv. XXII Corps.
Adv. Canadian Corps.

The Army Commander, (Genl. Sir Henry Horne,) directs that the following principles be followed in dealing with the inundation in the Scarpe and Sensée Valleys:—

Canal scene in French town, showing bridge demolished by the Germans. Control of the water level is very important in such stretches as these.

(a) Regain control of the flow of all canal water —
1. by immediately regulating water to normal flow at all locks captured.
11. by replacing damaged locks and dams with temporarily built adjustable barrages.

(b) Drainage of the valley of the Trinquis brook as far as l'Ecluse and allowing water to impound in the reservoirs in the vicinity of Palluel as far as possible.

(c) Prevention of any abnormal flow of water being sent down the Haute Deule Canal or the lower Scarpe Canal, or any inundations being formed in the valley of the Sensée between Arleux and Estrun.

2. Corps will be responsible for the immediate regulation, when possible, of captured lock gates. The Canadian Corps will be responsible for all work on the Scarpe and Sensée Canals up to Corbenham inclusive.

3. To carry out the principles enumerated above the following courses are suggested:—

(a) The breaks in the banks of the Scarpe Canal should be repaired and locks at Biache, Vitry and Corbenham should be controlled.

(b) All dams and obstacles to drainage in the valley of the Trinquis River should be removed, and an adjustable dam built at the entrance to the Malderez Canal at Palluel and any other openings from the Palluel lagoons.

(c) If the lock at Goeulzin has been destroyed, the lock at Estrun should be regulated so that no abnormal amount of water flows from the Escaut into the canals north of Douai.

Later a regulator may be possible at the disused lock at Pont de la Redoute (L.31.a.3.3.)

4. A precis of information re inundations is attached for information.

5. A special inundation officer from General Headquarters is being attached to the Canadian Corps to give technical advice, and to see that General Headquarters are kept in close touch with all action taken by the First Army and co-ordinate it with the rest of the British front.

First Army, (sd) S. H. J. NICHOLSON,
13th October 1918 Lt.-Col. for Major-General,
General Staff, First Army.

(COPY)

Precis of Information re Inundations

(Checked with General Headquarters Inundation Officer, 7th October, 1918)

1. Canal du Scarpe.

The lock at Vitry has been closed, and the south canal bank cut at 1.18.a.7.8. All the Scarpe water has inundated the low ground down to Palluel and filled up the reservoirs and lakes known as Sequestre, l'Ecluse, Palluel, and Arleux. The flow of these marshes is controlled—

(i) West of l'Ecluse at Mill L.36.b. (destroyed by us)

(ii) Road bridge L.36.d. (destroyed)

(iii) Palluel Q.11.a.9.8. where Sensée River runs into Mallebrux Canal. This barrage was destroyed by the enemy and the water is reported, on 6th October, to be flowing through a 10 feet span, 4 feet drop, into the Marbayn Canal, which leads to the Canal du Nord.

(iv) Lock and barrage at Pont de Pronnon — Q.5.a.8.2. — which is under close machine gun fire of enemy.

(v) Possibly sluices on the Rivière de Moulins at Arleux — K.35.d.2.1. — but this is said to be unimportant.

All the water enters the Canal du Nord at Q.6.c.1.3. Where it is going is unknown, but is discussed in para. 4.

2. Canal du Sensee.

This Canal flows from the Escaut at Estrun to the Scarpe Canal at Corbenham. One lock exists at Goeuzin with a fall of 16 feet. The locks at Fressies and Pont de Redoute (L.31.2.3.3.) are reported as having been done away with, but, from the air photo, the latter can be blocked.

By blocking this point, or closing the Goeulzin lock, water from the Palluel marshes can be sent down the Sensée Canal to Estrun, and thence into the Canal de l'Escaut.

If the lock at Estrun is closed and dammed, the Valley from Palluel to Estrun could eventually be inundated. If the lock on the l'Escaut Canal at Bouchain were dammed, and the lock at Estrun open, more formidable inundations could be made, as the waters of the Canal de l'Escaut would be available.

At present, it seems as if a dam might exist at Pont Rade — M.18.b. — as air photos show signs of flood on the south side of the Canal.

It may further be noted that the River Sensée ceases as such West of the Canal du Nord at Palluel — there is no through connection. It commences again east of the Canal du Nord in two branches:—

(a) Flows from the vicinity of Palluel in the marshes east of the Canal.

(b) Leaves the Canal at Le Moulinet — K.17. central — through sluices in the Canal bank, and flows into the Scarpe Canal at Lambres.

3. If we could now open the dam at Vitry, stop the cut in the bank, allow the Scarpe water to flow down the Scarpe Canal, and keep the dam at Palluel open, it is probable that the marshes would be drained from Biache to l'Ecluse in a few months. These marshes would then act as an empty reservoir, and if we again reconnected the dams on the Scarpe and Sensée and the Sensée River at [illegible], no water would go into the enemy's canals at the Lower Scarpe or Haute Deule, south for a month or two, while these [illegible] were filling the marshes. This should prevent [illegible] in the [illegible] possibly stop navigation and possibly embarrass the enemy.

4. The main control we could have at present is at Palluel — Q.11.a.9.8. Arrangements have been made to dam this if required.

(a) The water entering may be going down the Canal towards the Haute Deule Canal, if the lock at Courchelettes has been opened, but it seems that if the enemy was to [illegible] most of the Scarpe water, he would open the dam at Vitry and close the cut he made at L.18 b. the inundations necessary to guard his flank along the Trinquis Brook having been made; but it is also possible that if the flow from the Scarpe Canal is stopped, the inundations as far east as Sailly will drain away in 3 or 4 days.

(b) If he has closed the Goeulzin lock, or made a dam at Pont de la Redoute to send water down towards Estrun, there are little signs of inundations at present. The photographs show he had a control at Q.[illegible], and the water is now flowing through a [illegible] at the end of the control. If he had intended this control to send the water from the Palluel marshes towards the l'Escaut he would have put it at Q.6.b.3.9.

By closing the dam at Q.11.a.9.8., we will further fill up the inundations on the defensive flank from Biache to Palluel, but will not, probably, do much additional flooding. We will insure the enemy cannot use the water for flooding in the Haute Deule Canal or Lower Scarpe Canal, or Sensée Canal, but the area of the Sensée Canal from Arleux to Estrun could be flooded by the enemy from the l'Escaut.

(Copy)

Canadian Corps War Diary

Field Engineer, Inundations
October, 1918

Oct. 11th. Took over Inundation work in Scarpe and Sensée Valleys from XXII Corps.

Oct. 12th. Engineer Instructions No. [illegible] issued regarding control of water in Canal System near Douai.

1st Bde C.E. advises lock in Scarpe at Biache blocked by enemy with concrete; also canal banks cut on S. side above and below same lock.

1st Bde C.E. advises lock on Scarpe at Vitry destroyed but stop-logs holding 3ft head.

Oct. 13th. 1st Bde C.E. instructed not to open Vitry dams until waterways further down is under control.

Oct. 14th. First Army Order No. G.S.1406/4 received regarding control of water in Scarpe and Sensée Valleys. Canadian Corps to be responsible for all work down to Corbenham, inclusive. Precis of information re inundation possibilities on First Army front attached to above order. Precis made by Maj. Genl. Atkinson and checked by Capt. MacDermid, G.H.Q.

Oct. 15th. Received Order No. G.435/21-1 from Canadian General Staff to direct Scarpe River into Sensée marshes; also to prevent Escaut from flowing West into Sensée Canal.

Oct. 16th. 4th Bde. C.E. take over reading of water gauges in Sensée marshes near Palluel from 56th Division.

C.R.E. 56th Division reports that damming of Arleux–Palluel crossing floods the road and his G.O.C. ordered dams lowered to leave road crossing dry.

Reconnaissance made of storage capacity on Scarpe Valley at Arras with view to impounding upper Scarpe water there to prevent enemy using same for defensive inundations above Douai.

Oct. 17th. 8th Division closed gaps in Canal bank below Biache lock. This had effect of increasing flood over roads in Sensée Valley down to Arleux–Palluel, so 1st Bde C.E. were ordered to open same immediately, thus keeping greater part of Scarpe flow down Scarpe Valley.

1st. Bde C.E. report W.L. in Sensée Canal N. of Goeulzin lock dropped 8 ft.

Oct. 18th. Reconnaissance made on Scarpe, Scarpe deviation, and Sensée Canals near and through Douai by Major Goldie, Major Fetherston haugh, and 2nd Lieut. Shanks, R.E. showed that the Germans, before retiring on the 17th, had with two exceptions demolished all locks and control points. The two exceptions were the two locks (Sud and Nord) on the Scarpe Deviation W. of Douai, which were blocked with earth, stones, etc. The effect of all this demolition was to pull the Scarpe and Sensée water with the retiring Germans for possible use in inundations in the Lower Scarpe Valley. First Army orders VIII Corps to put in stop-log dam at Fort de Scarpe lock on the Scarpe to prevent more water escaping into Lower Scarpe.

Oct. 19th. First Army Orders (1) Canadian Corps to put in stop-log dam at Courcelettes in Middle Scarpe and to clear out obstruction at Sud lock on Scarpe Deviation.

(2) VIII Corps to clear out obstruction at Nord Lock on Scarpe Deviation and to close breach in west bank of Scarpe Deviation between Sud and Nord Locks. 2nd Bde. C.E. ordered to put in Stop-log dam at Pont Malin Lock on Escaut and to close breach in East Canal bank above same lock.

Dams at Arras closed and "G" and "Q" Branches notified.

First Army advise that Fifth Army want water in Haute Deule Canal and order Canadian Corps to pass as much water down as possible.

G.H.Q. policy at this stage in the operations was to prevent any water flowing down lower Scarpe or Escaut Rivers and to divert Escaut, Sensée, and Scarpe flow into Le Haute Deule Canal via the Scarpe Deviation West of Douai.

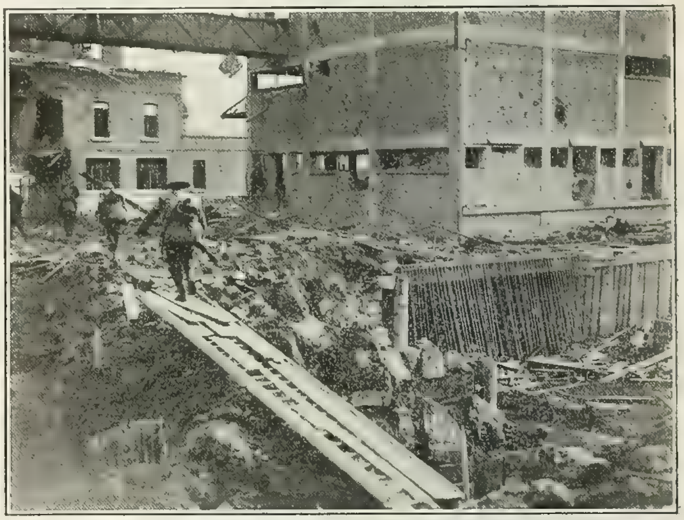
Oct. 21st. 1st Bde. C.E. ordered to lower stop-log dam 3 ft. in by-pass at Biache Lock.

Oct. 22nd. 2nd Bde. C.E. finished at 10.00 hours putting in stop-log dam at Pont Malin Lock and closing breach in Canal bank.

Capt. Curry, I.W.T., arrived to take over control of work in back area up to Fort de Scarpe and Pont Malin Locks inclusive.

Oct. 23rd. 4th Bde. C.E. report dam put in at Neuville sur l'Escaut where lock was destroyed by enemy on retiring.

2nd Army Troops Coy. C.E. takes over control of water levels at Goeulzin, Sud, and Courcelettes Locks.



Canadians crossing one of the control gates at Notre Dame lock No. 11 in Valenciennes. This was wrecked in order to develop inundations above the city.

4th Bde. C.E. reports condition of Escaut locks at Neuville, Denain, Haulchin, and Trith St. Leger after enemy retirement.

Oct. 24th. Engineer-in-Chief advises that rising water in Haute Deule in danger of overflowing and orders diversion into lower Scarpe.

First Army orders closing of sluices at Arleux-Palluel crossing.

Oct. 25th. C.E. VIII Corps advises floods in Haute Deule endangering bridges and requests diversion of Scarpe water into Sensée marshes.

Discharge of Ecaillon River at Thiant measured by Major Fetherstonhaugh and 2nd Lieut. Shanks as 25 cub. ft. per. sec.

Oct. 26th. Discharge of Selle River at Denain measured by 2nd Lieut. Shanks as 70 cub. ft. per sec.

2nd Army Troops Coy. C.E. take over gates and dams at Lecluse and Palluel from 1st Bde. C.E.

3rd Bde. C.E. report reconnaissance of flooded area in Escaut Valley near Lock No. 14 at Fresnes.

2nd A.T. Coy. C.E. put in dams at Blache and Arleux Palluel crossing.

Oct. 27th. First Army orders flow down Haute Deule to be kept down to a minimum as Fifth Army not ready yet to receive any more. E-in-C and First Army advised that Canadian Corps holding back all water possible.

Reconnaissance made of lock at Trith St. Leger and flooded area near there by Major Goldie and 2nd Lieut. Shanks. Canal W.L. North of Valenciennes reported falling rapidly. 2nd A.T. Coy. C.E. put in dams at Arras.

Oct. 28th. Engineer in Chief orders no more water sent down Haute Deule and to impound in Sensée Marshes.

Received circular order from Chief Engineer First Army No. 3465 8 14 of 27-10-18 re control of waterways.

First Army orders lock opened at Fort de Scarpe to allow flow down lower Scarpe and so relieve flow down lower Haute Deule. Also orders upper gap at Blache opened again and Scarpe Canal dammed to divert all Scarpe water to Sensée marshes, even if road crossings flooded.

Oct. 29th. Engineer Instructions No. 42, 42a, 42b, 44, 44a, 44b, issued re action to take in order to gain control of Escaut Canal waterway in Valenciennes-Condé Area during and after pending corps operations to take Valenciennes and high ground east of same.

Issued detailed instructions to 4th Bde. C.E. to lower inundations at Trith St. Leger in order that a road crossing may be established there.

Issued instructions to 3rd BDE. C.E. to clear as soon as possible Locks 13 and 14 on Escaut and all obstructions between them, and if possible drain flooded area near them back into canal.

Oct. 30th. Engineer in Chief advises Escaut water being shut off above Cambrai for 30 hours.

(Sgd) E. C. GOLDIE, Major
F.E. Inundations, for
C.E., Canadian Corps.

(COPY)

Canadian Corps Inundation Situation
(Nov. 8, 1918.)

1. Normal flow of Escaut diverted into Sensée Canal by means of dam at Pont Malin lock.

2. The Sensée River, however, contributes its normal flow into the Escaut Canal below Pont Malin lock, and the Selle River also has free entry into the Canal at Denain. The Rhonelle River, which had been diverted by the Germans into the flood between Maing and Trith St. Leger has been blocked and now resumes its normal course into the Escaut below Thiant.

3. At the following locks which are demolished there is no control over the Canal flow:

Lock No. 7 at Neuville sur l'Escaut.

Lock No. 8 at Denain.

Lock No. 9 at Haulchin.

4. The following locks (and accompanying barrages) are intact but blocked by masses of earth and road metal.

Lock No. 10 at Trith St. Leger

Lock No. 11 at Valenciennes

Lock No. 12 at Anzin

Lock No. 13 at Bruay.

5. Lock No. 14 at Fresnes, now in VIII Corps area, is believed to be intact and blocked also.

6. The key control points for the inundations above Valenciennes are (1) Lock No. 11, (2) Enemy earth dam. E.14.d.3.5.

7. The drainage problem in the City of Valenciennes was, for a time, serious on account of

(1) Lock No. 12 being blocked.

(2) Sluices at E.8.d.7.4. being partly closed.

(3) Bridge debris dam at E.4.c.1.0.

Sluices (2) have been opened full and the dam (3) has been cleared so that the city is now free from any danger of streets being flooded.

8. Locks 12 and 13 hold the Escaut Canal to approximately normal level but there is no flow. 90% of the water passing through Valenciennes flows down the Canal de Decharge and reaches the Escaut Canal again below Lock 13 at Bruay after passing over low dams at W.23.c.1.9. and W.17.a.9.1. The other 10% flows down the old Escaut River and formerly was diverted East at W.11.d.25.00. into the floods in W.12. etc. It is now taking its normal course again into the Canal de Decharge.

9. The Escaut Canal W.L. between locks 13 and 14 is rising and may soon overflow its banks at the lower end unless relieved by opening the control points at Lock 14.

(COPY)

VIII Corps Inundation Situation
(Nov. 11, 1918.)

1. Fresnes lock No. 14, R.20.d.3.9. and accompanying barrage intact but blocked. Drop in waterlevel-1′ 6″.

Enemy earth dam in old river, R.20.c.7.6.—No drop in water level.

2. Bridge debris dams in Condé

1. R.8.d.90.25 has drop of 1′ 6″

2. R.8.d.45.25. has drop of 6″

3. The floods South East of Condé in E.15.16. etc., are emptying into the Haisne River.

Valenciennes railway station as the Canadians found it; note the inundations in the right foreground.

(i) Through 10′ gap in S. Canal bank R.10.c.9.5.

(ii) Through two sluice gates in S. canal bank R.9. c.8.2., partially opened.

There is only a 6″ head at these openings, so that complete drainage is impossible through these openings, as the main flood is deep

4. The Haisne River has a heavy flow and is blocked as follows:—

(i) Bridge debris dam R.9.c.45.10 — 1′ drop

(ii) 4-way siphon under Ascaut Canal at R.15.a. 15.85 — partially blocked by floating debris, etc.

(iii) Large enemy earth dam at R.7.d.8.6. just above junction with Escaut. Immediately above this dam there is a 50′ gap in the South Bank, through which the river is pouring and flooding R.7., Q.12, 6,5, etc. There is also a gap 20′ wide, through the South bank immediately below the dam and part of the flood finds its way back into the river through this gap.

There is a 2′ drop in water level at this dam.

5. Hergnies lock No. 15 and accompanying weir are intact as far as the masonry is concerned. Both gates are partially damaged and there is no water control there or at the weir. The drop in water level at this lock is 6″.

6. Crown of metalled road at Hergnies-Odonez crossing only 18″ above water level on each side. There is no obstruction in the Escaut canal at this point but any increase in the canal discharge from above might flood the road.

There is a bridge debris dam in the Jard canal on this road crossing holding up 18″ of water.

7. Photographs show Rodignies lock No. 16 apparently intact, but holding up a small head of water.

8. Lock in Condé R.9.c.2.3. on Mons-Condé canal intact, but blocked. Water level in Mons-Condé canal 2′6″ lower than water level in Escaut canal and escapes into Jard canal around North end of Condé.

RECOMMENDATIONS. In order to clear the inundations from the Valenciennes-Condé area and so prepare the channels for the expected winter floods, the following steps seem necessary, provided the channel is clear further downstream in Fifth Army area:

(a) Demolish earth dam at R.7.d.8.6. and close upper gap, leaving lower gap open as long as flood flows into Canal.

(b) Clear away all obstructions in locks at Rodignies, Hergnies and Fresnes (in that order) taking care to retain water control if needed.

(c) Clear away the bridge debris dam in Condé (mentioned above) and also the siphon obstructions.

(d) Open fully the sluice gates at R.9.c.45.15. and leave these open, as well as the gap at R.10.c.95.45. as long as the flow is towards the Canal.

(e) Clear away bridge debris dam in Jard Canal at Hergnies-Odonez crossing and any other obstructions in either Jard or Escaut Canals which may be found.

G. L. SHANKS, Lieut. R.E.,
Inundation Officer,
att'd. Canadian Corps.

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOL. III. August 1920 No. 8

Dates of Professional Meetings

The Western Professional Meeting will be held under the auspices of the Calgary Branch, at Banff, on August the 14th to 18th inclusive.

The Seventh General Professional Meeting will be held in Niagara Falls, September 16th, 17th, and 18th, and the Eighth General Professional Meeting will be held in Halifax, October 13th, 14th and 15th.

The Annual and Annual General Professional Meeting will be held in Toronto on February 1st, 2nd and 3rd, 1921.

Tentative Program, Western Professional Meeting at Banff

August 14th to 19th, 1920

His Honour the Lieutenant-Governor, R. G. Brett of Alberta has been asked to give the opening address, which will be replied to by S. G. Porter, M.E.I.C., Lethbridge, Alta., and P. Turner Bone, M.E.I.C., Chairman of the Calgary Branch, and each Chairman of the Western branches has been asked to be present or send a representative, and say a few words on behalf of their respective branches.

Paper on "Concrete in Alkali Soils" by A. S. Dawson, M.E.I.C., chief engineer, Department of Natural Resources, C.P.R., and a member of the Special Committee on Concrete and Alkali Soils. The entire committee will also be present and take part in a general discussion of this subject.

An Illustrated Lecture on "Power Development at Niagara Falls" or "Hydraulic Turbine Design" by F. H. Martin, designing engineer, Winnipeg River Power Company.

A paper on "Architectural Engineering" by R. P. Blakey, provincial architect of Alberta; discussion will be led by G. Fordyce, architect of Calgary, Alta.

A paper on "Legislation effecting Engineers" by F. H. Peters, M.E.I.C., Commissioner of Irrigation, Calgary. Discussion of this very important matter will also take place.

Illustrated Lecture on "Banff in Winter" by J. M. Wardell, A.M.E.I.C., superintendent of road construction, Parks Branch, Department of the Interior, headquarters at Banff.

Papers by Major W. G. Swan, D.S.O., M.E.I.C., chief engineer Vancouver Harbour Commission, on "Vancouver Harbour and Proposed Development", and "Railway Construction of the Royal Engineers in Palestin" by Major Walkem, M.E.I.C., of Vancouver, B.C. have also been promised.

A paper is expected on "Powdered Coal" by H. A. Mackay, M.E.I.C., chief engineer, Manitoba Bridge and Iron Works, Winnipeg.

Many prominent members have been asked to attend, but as yet a full return has not been received of those who will be present and other addresses will be asked for from among those who attend.

An invitation has also been sent to the American Society of Civil Engineers, who are holding their annual convention at Portland, Ore., from August 10th to 12th inclusive, asking as many of their members who are able to return via Banff to stop off and attend our meeting. It is hoped that perhaps a few speakers may be obtained from among their number.

Mr. Pat. Burns has kindly offered to donate a steer, which will be roasted at a barbecue one afternoon and evening of the meeting.

It is also expected a trip will be arranged to the Bank Head Coal Mine, which is only a short distance from

Banff, also a trip to Johnson Canyon, and perhaps to Lake Minnewanka.

The attractions at Banff need no advertising, and it goes without saying that any who attend will have a pleasant time from the standpoint of pleasure as well as professional advancement.

Ontario General Professional Meeting

September 16-17-18, 1920. Niagara Falls

While the programme of the meeting is still incomplete, the membership of *The Institute* will be pleased to learn that many interesting features have already been definitely arranged for.

Thursday, September 16th

Registration, 10 a.m. The events are scheduled to commence on Thursday morning with registration of member in attendance, introductions and renewal of old acquaintances.

Luncheon 12.15. Welland Ship Canal 2.00 p.m. After the opening luncheon there will be given an illustrated talk on Canadian Inland Waterways and the construction of the Welland Ship Canal, followed by a trip over the works now partly completed returning in time for dinner; after which a brief entertainment will be put on by the Niagara Peninsula Branch closing in sufficient time for visitors to view the magnificent illumination of the Canadian Falls from the Power House of the Ontario Power Company.

Friday, September 17th

Professional Session 9.15 a.m. Friday morning will be taken up with hydraulic and electrical professional papers and reports of progress of the Executive of the Ontario Provincial division conducted by its officers. The Executive reports will deal with subjects of special interest to younger members of whom it is sincerely hoped there will be a large representation.

Luncheon 1 p.m. Adjournment will be made to the Administration Building in Queen Victoria Park for a complimentary luncheon kindly tendered by the Department of Highways of the Province of Ontario.

Queenston Power Development 2.30 p.m. A trip of inspection over the Construction work of the Queenston Power Development is planned for the afternoon. Visitors will see in operation some of the largest excavating units of their kind in the world.

Formal Dinner Dance, 7.00 p.m. There will be a formal dinner at the Clifton in the evening. This will be followed by an Institute dance, given by the Branch.

Saturday, September 18th

Continuation of Professional Session, 9 a.m. Continuation of Professional papers, visits to neighbouring power houses, side trips to points of scenic interest, golf, and indoor and outdoor baseball will constitute the programme for Saturday morning, with a closing luncheon at one o'clock.

Week End Dance, 9 p.m. Those who remain over for the week end will enjoy the regular Saturday evening dance at the Clifton.

The programme has been arranged throughout so that it will be specially interesting to ladies as well as to members young and old. Ample accommodation has been secured for all visitors and there is all prospect that the meeting will be most successful in every way.

It is expected that several different types of bridges will be in the course of construction on the Niagara Power Development of the Hydro-Electric Power Commission of Ontario at the time of the Ontario General Professional Meeting at Niagara Falls, September 16th, 17th and 18th.

Perhaps the one of greatest interest to engineers is the reinforced concrete arch bridge which carries the main line of the Grand Trunk and the Niagara Division of the Michigan Central Railroad over the power canal.

This bridge, when completed, will provide for six tracks—four for the Grand Trunk and two for the Michigan Central Railroad.

It is designed for Cooper's E-70 loading and contains 10,000 cubic yards of concrete and 300 tons of steel. The span is 72 feet on a skew of 47 degrees. The total length is 172 feet and the total width 136 feet.

Among the other bridges, attention is drawn to the bascule type of bridge at Chippawa. This is a highway bridge over the Welland River and has a lift-span of 100 feet. The piers and abutments were carried to rock about 35 feet below the water surface.

There are several temporary timber and timber and steel bridges carrying highway and railway traffic, pending the construction of the permanent bridges.

Baseball Challenge

The spirit of the Niagara Peninsula Branch is reflected in the letter which follows and which shows that the members of the Branch, in addition to assuming the responsibility of a general professional meeting, are willing to compete for athletic supremacy against any Branch in Canada.

As there will be a sufficient number from many of the Branches to provide several baseball teams, it is hoped and fully expected that the challenge of the Niagara Peninsula Branch will be met by a number of the other Branches. Hamilton, Toronto, Montreal and possibly Peterboro' should not let this opportunity pass. Acceptances of this challenge are now in order.

Niagara Peninsula Branch,
16th July, 1920.

My Dear Mr. Keith:

The Niagara Peninsula Branch hereby challenge any branch of *The Institute* to a game of "in-door out-door baseball" to be played at the time of the professional meeting to be held in Niagara Falls, September 16th, 17th and 18th. It is probable that the game will be played on Saturday morning. If a sufficient number of teams wish to play, a tournament can be arranged; and there is room for several games playing simultaneously on the grounds of the Queen Victoria Park Commission.

I hope that I am not too late to have this challenge in the August issue of *The Journal.*

Thanking you in advance,

I am, Yours very truly,

(*Sgd.*) F. W. CLARK, A.M.E.I.C.,
For Athletic Committee.

Alberta Association of Professional Engineers

A copy of an Act assented to by the legislature of Alberta on April 10, 1920, appeared in last month's number of *The Journal.*

Pursuant to this act, a meeting of the members of the association formed under its provisions was called and met in the Board of Trade rooms at Calgary on July 10 with thirty-three members present.

F. H. PETERS, M.E.I.C.
President Alberta Association of Professional Engineers

F. H. Peters, M.E.I.C., whose efforts are largely responsible for the passing of the Alberta Act as well as for promoting the similar acts in other provinces throughout the Dominion, addressed the meeting, pointing out that the first stage of organization has been successful beyond the hopes of those who were responsible for its inception.

Over one hundred members have been admitted and it is hoped the membership will reach double that by the end of the year. A number of applications have been received in addition to those of the members admitted, which have not yet been dealt with. It remains for the membership to make efforts to get every qualified engineer in Alberta into the organization, and to pull together to uphold the ideals common to the profession, building up the prestige of the calling and securing such further protection by law as may seem necessary.

Mr. Peters gave a historical sketch showing that the development of the separate profession of engineering has not as long a history as some of the other professions and that consequently the engineers have been somewhat belated in securing recognition at law. This condition is rectifying itself through our efforts, and it remains for its members to prove themselves by their ability and touch with public matters, to be worthy of a recognized legal position as Professional Engineers.

Following the talk by Mr. Peters, on a suggestion from A. S. Dawson, M.E.I.C., the members present made themselves known individually by rising in turn, giving name, business and place of residence.

A draft of by-laws was discussed, item by item, and suggestions as to desirable amendments were made, so that the final draft met the ideas of the members present and conforms to the legal requirements.

During this discussion, great evidence of unity of purpose and desire to avoid situations which might work hardships on minorities appeared among all present. This feeling was pithily substantiated in a short talk by R. A. Brown, supt. of Calgary Municipal Railway, who pointed out that helpful co-operation, and a desire that the stronger branches should yield to weaker branches on points affecting the weaker, would be a pre-requisite to the success of the association as a whole and if ever this spirit should leave us, we might as well shut up shop as an effective organization.

The result of a ballot was made known, and the following were declared elected.

President, Fred H. Peters, M.E.I.C., commissioner of irrigation, Calgary, (Civil).

Vice-President, Lawrence E. Drummond, manager of Mountain Park Colliery, Edmonton, (Mining).

Secretary-Treasurer and Registrar, R. S. L. Wilson, A.M.E.I.C., professor of civil engineering in the University of Alberta, Edmonton.

Members of Council:

Civil: Sam. G. Porter, M.E.I.C., superintendent of C.P.R. canals, Lethbridge.

R. J. Gibb, M.E.I.C., city engineer, Edmonton.

Mines: O. E. S. Whiteside, manager of International Coal and Coke Co., Coleman, and President of Canadian Mining and Metallurgical Institute.

N. C. Pitcher, professor of mining engineering at the University of Alberta, Edmonton.

Electrical: R. A. Brown, superintendent of Calgary Municipal Railway, and power superintendent.
R. B. Baxter, superintendent of plant, Alberta Government Telephones.

Mechanical: W. G. Gray, chief engineer, Medicine Hat, power plant.

F. W. Hobson, chief boiler inspector for Alberta.

A nominating committee of one member from each of the four branches was named. In accordance with the by-laws this committee must place on the ballot any name suggested by ten members. They must provide at least two names for each vacancy. The by-law providing this method of nomination was framed in the hope that no one could ever feel that a small coterie was trying to run the association.

Meeting of Concrete Investigation Committee of the Institute

A special meeting of the members of the concrete committee of *The Institute* and others interested in the subject of concrete in Alkali Soils, will be held at the Paliser Hotel, Calgary, on Saturday morning, August 14.

Consideration will be given at the meeting to the matter of procedure in the formation of a Research Bureau for the investigation of the effect of alkali on concrete structures, as suggested at a meeting held in Winnipeg on June 4.

The following express the results of the consideration of this subject as taken from the minutes of the Winnipeg meeting:

1. The matter of alkali action was most important.
2. Field and laboratory experiments under efficient direction was essential.
3. Arrangements should be made at once for the formation of an Advisory Council to superintend operations, this council to have representatives from all interested organizations.
4. That formal request be made to the Research Council for the sum of $15,000, or if Canada Cement Company desire to contribute this sum that it be divided between the two.
5. That a field man be selected at once and that field experiments be undertaken without delay.
6. That Advisory Council meet once a year at any convenient centre.
7. That when funds are on hand a central laboratory be established with competent chemist in charge to devote his entire time to laboratory work in connection with the alkali program.

At the special meeting to be held in Calgary further consideration will be made on the subject in an endeavour to draft definite recommendations to be presented by *The Institute* Committee of the Western Professional Meeting to be held at Banff on the following Monday.

It is specially requested that any who are unable to attend this meeting send in their comments by mail to A. S. Dawson, M.E.I.C., chief engineer Dept. Natural Resources, C.P.R. Calgary, who will present same to the meeting.

D. Stuart McKenzie, M.E.I.C.

Winnipeg, July 13/20. *Chairman, Institute Committee.*

Thanks of the Ontario Provincial Division

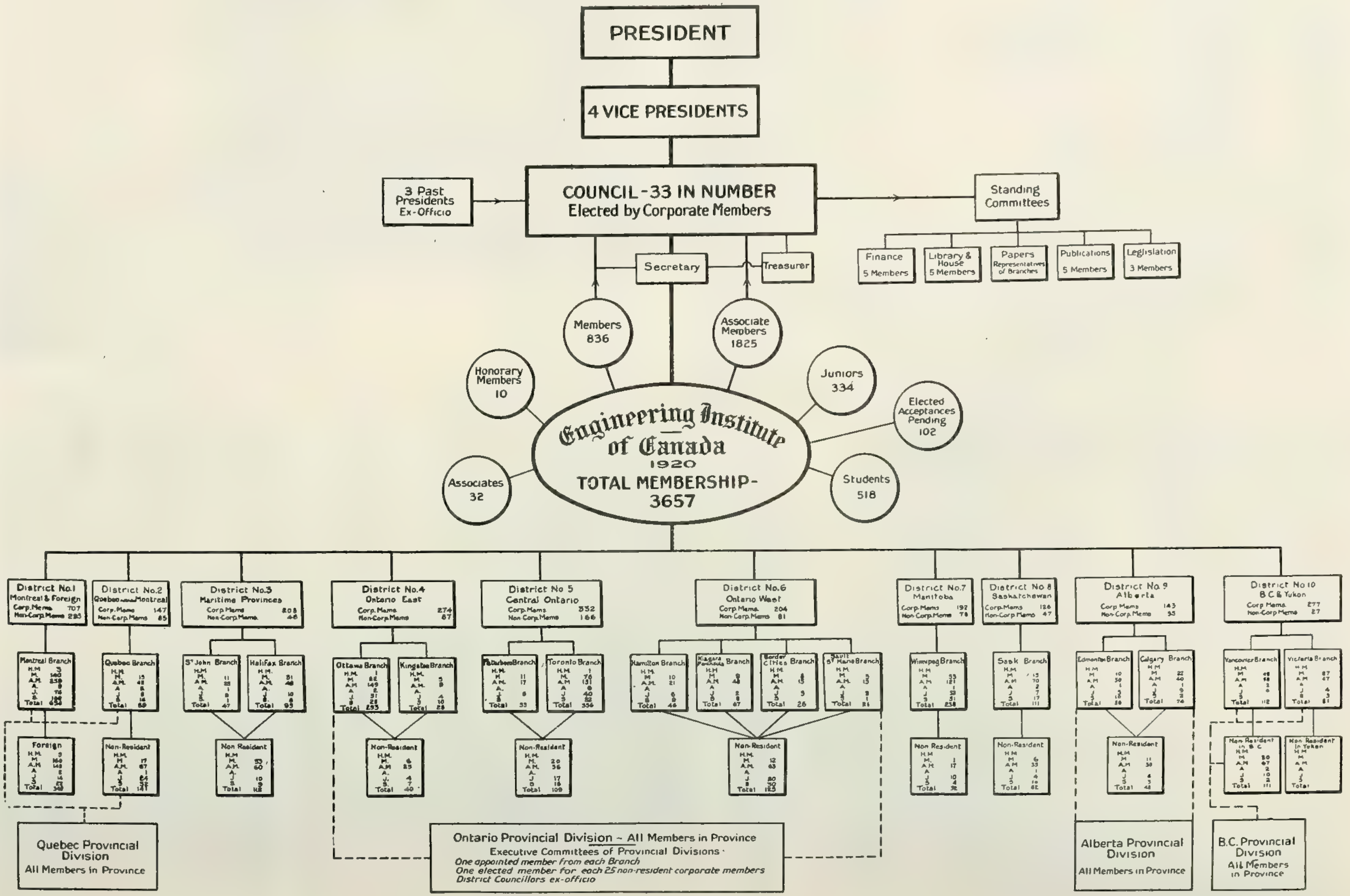
The Executive Committee of the Ontario Provincial Division desire to thank the members for their response to the Executive's circular of June 1st, asking for a contribution towards the financing of the work of the Executive for this year. At the present writing about $300. has been received.

The Secretary-Treasurer has endeavored to send an acknowledgement to every remitter, but owing to the great number of changes in addresses which have occurred lately, besides the possibility that some remittances have never reached Mr. Lambe, any gentleman who has not received an acknowledgement is asked to advise the Secretary to that effect.

Quebec Bridge Report

The final report on the design and construction of the Quebec Bridge by the board of engineers of the Canadian Government, C. N. Monsarrat, M.E.I.C., Chairman, briefly referred to in a previous issue of *The Journal* is worthy of further reference and is a compilation of which both the board of engineers and the Government through the Minister of Railways and Canals may well be proud. It is issued in two volumes, volume one being devoted to the history of the bridge, a general narrative regarding the construction, the erection of the super-structure and the substructure, in all two hundred and fifty nine pages on heavy coated stock. Volume two contains one hundred and eleven plates of details, the whole making a complete and consistent record of this monumental undertaking. These two bound volumes will occupy a worthy place in the official records of the Dominion Government, and constitute a record of achievement of which all concerned may well be proud.

Organization Chart
of the
Engineering Institute of Canada



ELECTIONS AND TRANSFERS

Elections and Transfers

At the meeting of Council on July 29th, the following elections and transfers were effected:—

Members

Duff Andrew Abrams, of Chicago, Ill. (B.S. Univ. Ill.) Professor in chg. of research Laboratories Lewis Inst., Chicago; James Rawson Anglin, of Westmount, (B.Sc., Arch. McGill Univ.) President, Anglin-Norcross Limited, Montreal; Archibald Welch, of Welland, Ont., Managing Director, The British American Shipbuilding Co. Ltd., Welland, Ont.

Associate Members

Romeo Sadi Amiot, of Chicoutimi, Que., Engineer on Construction of Highways, Provincial Government; Bowman Shepard Atkins, of Shawinigan Falls, Que., (Mass. Inst. of Tech.), City Engineer, Shawinigan Falls, Que.; Arthur Westendale Barker, of Winnipeg, Man., Supt., Fire Service Water Works, Winnipeg; Harold Arthur Bowden, of Edson, Alta., Instrumentman Maintenance G.T.P.Ry.; Fred Aubrey Burgar, of Niagara Falls, Ont., (C.E. Rennslaer Polytech. Inst.), Supt., of Construction on Water Power Developments, H.E.P.C. Toronto, Ont.; John Gordon, of Winnipeg, Man., (E.E., Armstrong Coll., Newcastle), Asst. Electrical Engineer, Can. Gov. Rlys. (Western Lines); Harry Louis Hayne, of Alberni, B.C., Asst. engineer on constrn. of E-N.Ry. extension of Great Central Lake; James Bertram Hayes, of Halifax, N.S., (B.Sc. Dalhousie Univ.) Field Engr., in charge of constrn., N.S. Tramways & Power Co. Ltd., Halifax, N.S.; Harold Chapman Johnston, of Montreal, (B.A. Sc. Univ. of Toronto) Vice President and Gen. Mgr. H. C. Johnston Co. Ltd., Montreal; David Gardner McKean, of Winnipeg, Man., Asst. to Chief Engr. The Greater Winnipeg Water District, Winnipeg, Man.; Arthur Anthony McLaren, of Niagara Falls, Ont., (B.Sc. Queen's Univ.) Hydro Electric Power Commission, Res. Engr.; William George Quade Munn, of Peterboro, Ont., Chief Draughtsman Hamilton Co. Ltd., Peterboro, Ont.; Harold Storey Nicklin, of Guelph, Ont., (B.A.Sc. Univ. of Toronto) Asst. Loans Officer Dept., S.C.R., Guelph, Ont.; Philip Carleton Perry, of Regina, Sask., Asst. Res. Engineer, Regina, Sask.; Frank R. Purvis, of Prince George, B.C., with S. S. Magaffin Co. as Camp Foreman; Léon Alfred St. Pierre, of Outremont, Que., (B.A.B.Sc. (C.E.) Laval) Designing and erecting work Dominion Bridge Co.; Gordon J. Smith, of Kingston, Ont., (B.A., B.Sc. Queen's Univ.) at present engaged in commercial enterprise; Victor Hugo Todd, of Vancouver, B.C., Granby Cons. Mining, Smelting & Power Co. Ltd., Vancouver, Exploration & Surveys & Estimate on harbour power sites, hydro electric plants; George E. Warren, of Chicago, Ill. (B.S. (C.E.) Univ. of Illinois) engineer-manager of American Concrete Pipe Association.

Juniors

Andrew Matthew Abram, of Prince Rupert, B.C., Instrumentman, maintenance of way, G.T.P. Ry.; Earl Gaynel Asker, of Peterboro, Ont. (B.Sc. Univ. of N.B.) Draftsman Can. Genl. Electric Co. Peterboro, Ont.; Thomas Havelock Dickson, of Halifax, N.S. (At present attending Dalhousie Univ.); Maurice Frank Ferling, of Chester, N.S. (B.Sc., B.E.) Queen's Univ.) Can. Land Surveyor; Ian Macdonald Machum, of Timmins, Ont., (B.Sc. Univ. of N.B.) taking Students' Test Course with C. G. E. Co. Ltd.; Arthur K. McIntosh, of Kingston, Ont., Attending Queen's Univ.; Melvyn Lattham Wilson, of Montreal (B.Sc. McGill) Demonstrator in Mech. Eng'g Dept., McGill University.

Associate

Arthur Lewis Clark, of Kingston, (B.Sc., Worcester Polytech. Inst., Ph.D.) Dean of Faculty of Applied Science, Queen's University.

Transferred from the Class of Associate Member to that of Member.

Charles Jules Desbaillets, of Montreal, Que., (Elec. Eng., Bienne, etc.), Engr. in chg., Montreal Water Board; Henri Augustin Dupré, of Ottawa, Ont., (Assoc. Civil & Mech. City & Guilds, London Inst., and Tech. Coll. Darmstadt, Germany) Asst. Director, Supt. Electricity and gas insp. Dept. of Trade & Commerce; J. E. Grimmer, of Temiskaming, Que., (B.A.I., M.Sc. Univ. of N.B.) Town Engineer, Temiskaming, Que.; Robert Alexander Cecil Henry, of Ottawa, Ont., (B.A., B.Sc. McGill Univ. 1912) Asst. Engr. Dept. Rys. & Canals, Ottawa, Ont.; John Garnet Reid, Lieut. Col. (D.S.O.), of Lanigan, Sask., Asst. Engr., C.P.R. Constr. Western Lines; Frank P. Vaughan, of St. John, N.B., Engr. and Mgr. The Vaughan Electric Co. Ltd., Electrical Engrs. St. John, N.B.

Transferred from the Class of Junior to that of Associate Member.

Cecil B. C. Donnelly, Lt.-Col. R.G.A., of Victoria, B.C., (D.L.S. & M.L.S. Undergrad. Univ. of Manitoba); Herbert Dixon Fyfe, of North Vancouver, B.C., (S.P.S. Toronto) structural engr. J. Coughlan & Sons, Vancouver, B.C.; Stanley Roma Lamb, of Winnipeg, Man., res. engr. in charge of constrn. C.P.R. Western Lines; James Kenneth McKay, of Clyde River, N.S., charge of party on road survey with N.S. Board of Highways in Yarmouth & Shelburne; Hugh Peters, of Esquimalt, B.C., (R.M.C. Kingston) Asst. Eng. [illegible] P.W.D.

Transferred from the Class of Student to that of Associate Member.

Frederick Owen Hodgins, Lt. Col., of Camberley, England, Grad. (Honors) R.M.C., not yet demobilized.

Transferred from Class of Student to that of Junior.

Leo. B. Brown, of Camrose, Alta., (B.Sc. Univ. of Alberta) Hydrometric Engr. Irrigation Branch, Dept. of Interior, Calgary, Alta.; Kenneth Neil Cameron, of Marion, Mass. (B.A.Sc. Toronto) Asst. Eng. Marconi Wireless Tel. Co. of America on installation of equipment.

AN ACT RESPECTING THE ENGINEERING PROFESSION

PROVINCE OF NOVA SCOTIA

WHEREAS, It is considered advisable to establish by legislation the qualifications necessary to permit persons to act or practise as Professional Engineers in the Province of Nova Scotia.

NOW, THEREFORE, Be it enacted by the Governor, Council and Assembly, as follows:—

Short Title.

1. This Act may be cited as the "Nova Scotia Engineering Profession Act."

Interpretation.

2. In this Act, unless the context otherwise requires the expression:—

(a) "Professional Engineer" means any person registered as a Professional Engineer under the provisions of this Act.

(b) The practice of a Professional Engineer within the meaning of this act embraces advising on making measurements for, laying out and the design and supervision of the construction, enlargement, alteration, improvements or repairs of public and private utilities, railways, bridges, tunnels, highways, roads, canals, harbours, harbour works, river improvements, lighthouses, wet docks, dry docks, dredges, cranes, floating docks, and other similar works, steam engines, turbines, pumps, internal combustion engines and other similar mechanical structures, airships and aeroplanes, electrical machinery and apparatus, chemical and metallurgical machinery and works for the development, transmission or application of power. Buildings for the housing and installation of machinery and appliances for the development of hydraulic or electric power, engine sheds, freight houses, coal pockets, warehouses and factories, machine shops, the steel frames of large buildings, and other buildings and structures of Engineering character or for Engineering purposes, mining operations and apparatus for carrying out such operations, municipal works, irrigation works, water works, water purification plants, sewerage works, sewage disposal works, drainage works, incinerators, hydraulic works, and all other engineering works.

(c) Subsection (b) shall only apply when the work to be done involves an expenditure of at least twenty-five thousand dollars.

(d) The execution as a contractor of work designed by a Professional Engineer, or the supervision of the construction of work as a foreman or superintendent, or as an inspector, or as a roadmaster, track master, bridge or building master, or superintendent of maintenances shall not be deemed to be the practice of a Professional Engineer within the meaning of this Act.

(e) "The Association" means the Association of Professional Engineers of the Province of Nova Scotia.

(f) "Council" means the Executive Council of the Association.

(g) "President" means the President of the Association.

(h) "Registrar" means the Registrar of the Association.

(i) "The Secretary" means the Secretary-Treasurer of the Association.

(j) "Board" means the Board of Examiners of the Association.

The Association of Professional Engineers of the Province of Nova Scotia.

3. (a) All persons registered as Professional Engineers under the provisions of this Act shall constitute the Association of Professional Engineers of the Province of Nova Scotia and shall be a body politic and corporate with perpetual succession and common seal.

(b) The head office of the Association shall be at Halifax.

4. The Association shall have power to acquire and hold real estate not producing at any time an annual income in excess of ten thousand ($10,000) dollars, and to alienate, mortgage, lease or otherwise charge or dispose of such real estate or any part thereof as occasion may require, and all fees, fines and penalties receivable and recoverable under this Act shall belong to the Association.

5. The Association may pass By-Laws not inconsistent with the provisions of this Act for:—

(a) The government, discipline and honour of the Members.

(b) The management of its property;

(c) The maintenance of the Association by levying and collecting fees not in excess of $5.00 per annum;

(d) The examination and admission of candidates to the study and practice of the profession.

(e) All other purposes reasonably necessary for the management of the Association.

6. All By-Laws or Amendments thereto shall become effective only after ratification by two-thirds majority of the votes received from the members of the Association in good standing, and after approval by the Governor-in-Council.

Who May Practise.

7. (a) Only those persons who are members of the Association hereby incorporated and registered as such under the provisions of this Act, or who have received a license from the Council of the Association as hereafter provided, shall be entitled, within the Province of Nova Scotia, to take and use the title of "Professional Engineer," or any abbreviation thereof, or to practise as a "Professional Engineer."

(b) Any person residing in the Province of Nova Scotia at the date of the passing of this Act, who is at that date and has been for three years previously practising Professional Engineering as defined in this Act shall be entitled to be duly registered as a member of this Association without examination, provided that such person shall produce to the Council within one (1) year of the passing of this Act, satisfactory credentials of having so practised. Persons who at the time of the passing of this Act have been acting for a period of not less than three years as Mechanical Superintendents of Industrial, Manufacturing or Mining plants having an installation of one hundred (100) or more horsepower shall be deemed to be Professional Engineers and eligible for registration as such.

(c) Any person who comes to reside in the Province of Nova Scotia and who at that time is a duly registered member of an Association of Engineers similarly constituted of any other Province of the Dominion of Canada, may become a duly registered member of the Association without payment of fee for that year, providing he shall produce to the Council a Certificate of membership in good standing in such other Association and an application for Transfer of Registry endorsed by the Registrar of that Association.

(d) Any person not otherwise qualified as hereinbefore mentioned, residing in the Province of Nova Scotia and who may desire to become a registered member of the Association shall make application to the Council and shall submit to an examination, or shall submit credentials, in lieu of examination, whichever the Council may decide, and shall be admitted to Registry as a member of the Association on payment of prescribed fees after the Council shall have certified in writing that such examination or credentials have been found satisfactory to it.

(e) Any person not residing in the Province of Nova Scotia who is a registered member of an Association of Engineers similarly constituted of any other province of the Dominion of Canada can obtain from the Registrar a license to practise as a Professional Engineer in the Province of Nova Scotia, and upon payment of a fee of one dollar. In the event of such person being unable, by reason of emergency or neglect on the part of the Registrar or for any other good and sufficient reason, to obtain such license within three (3) months of his making application therefor, he shall be entitled to practise as a Professional Engineer in the Province for such period of three months without holding such license.

(f) Any person who is not a resident of Canada, but who is a member of any Engineering or Technical Organization or society of

[illegible]

service.

[illegible]

Partnership.

[illegible]

Administration

[illegible]

(b) The President shall be elected annually and shall hold office [illegible]

[illegible]

Suspension for Misconduct

[illegible]

Penalties

[illegible]

Evidence

[illegible]

Examinations

[illegible]

(d) As soon as possible after the close of each examination the members of the Board who shall have conducted such examination shall make and fyle with the Secretary a certificate stating the result of such examinations, whereupon the Council shall notify each candidate of the result of his examination and their decision upon his application.

(e) A candidate failing on examination may after an interval of not less than six months be examined again;

(f) The Council shall, from time to time, prescribe the fees payable by candidates for examination.

Registration Without Examinations.

15. The Council shall consider an application for registration or license from any person who submits proof of qualifications possessed by such person by virtue of experience, training or examination by another examining body of recognized standing.

16. The Council shall have power to establish conjointly with any Council of any Association similarly constituted in one or more of the Provinces of Canada, a Central Examining Board, and to delegate to such Central Examining Board all or any of the powers possessed by the said Council respecting the examination of candidates for admission to practise, provided that any examination conducted by such Central Examining Board shall be held at least in one place within this Province.

17. The Board shall examine all degrees, diplomas, certificates and other credentials presented or given in evidence for the purposes of obtaining registration or license to practise, and may require the holder of such credentials to attest by oath or by affidavit on any matter involved in his application.

18. The Registrar shall issue a certificate of registration or a license to practise to an accepted candidate upon written instructions from the Council, and upon payment in advance of the prescribed fee by the candidate. The certificate or license shall state the specialty or specialties of the person to whom it is issued.

19. The Registrar shall keep his register correct in accordance with the provisions of this Act and the rules and regulations of the Council.

20. (a) Each person who is registered or licensed to practise shall pay in advance to the Secretary-Treasurer or any person deputed by the Council to receive it, such annual fee as may be determined by the By-Laws of the Association, which fee shall be deemed to be a debt due by the practitioner and to be recoverable with the costs of same in the name of the Council in any court of competent jurisdiction.

(b) If any registered practitioner omit to pay the prescribed annual fee within six months of the date upon which it became due, the Registrar, after ten days notice by registered letter, shall cause the name of such practitioner to be erased from the register, and such practitioner shall thereupon cease to be deemed to be a registered practitioner; but such practitioner shall at any time thereafter, upon paying such fee, be entitled to all his rights and privileges as a registered practitioner from the time of such payment;

(c) The Registrar shall not be required to issue a license to practise to any non-resident practitioner otherwise entitled to such license unles the fee provided for by the By-Laws of the Association shall have been previously paid.

21. Any person entitled to be registered under this Act who shall neglect or omit to be so registered shall not be entitled to any of the rights and privileges conferred by the provisions of this Act so long as such neglect and omission shall continue.

22. In case of any refusal by the Council to register the name of any person as a member of the Association, or of refusal to issue a license to practise, the person aggrieved shall have the right to apply to a Judge of the Supreme Court, who, upon due cause shown, may issue an order to the Council to register the name of such person, or to grant him a license to practise, or to make such other order upon such appeals as may be warranted by the facts, and the Council shall forthwith comply with such order. Such order when so made shall be final.

23. If the registrar makes or causes to be made any wilful falsification in any matters relating to the register, he shall forfeit a sum of not less than one hundred dollars ($100.00) nor more than two hundred dollars ($200.00).

24. If any person shall wilfully procure or attempt to procure himself to be registered or licensed under this Act, by making or producing, or causing to be made or procured, any false or fraudulent representations or declarations, either verbally or in writing, every such person so doing, and every person knowingly aiding and assisting him therein, shall forfeit and pay a sum of not less than one hundred dollars ($100.00) nor more than two hundred dollars ($200.00).

25. All penalties imposed under this Act, or any of them, and all sums of money forfeited shall be recoverable with costs under the provisions of the law respecting summary convictions.

26. Any information for the recovery of any such penalty or forfeiture may be laid by any member of the Association or by any person appointed by the Council.

27. Any sum forfeited under this Act being recovered shall belong to the Association for the use thereof, under this Act.

28. No prosecution shall be commenced for any offence against this Act after one year from the date of committing the offence.

29. The following persons are hereby constituted a Provisional Council of the Association:—

President — C. E. W. Dodwell, Halifax.

Vice-President — D. H. MacDougall, New Glasgow.

Councillors — Allan, J. L., Dartmouth; Bowman, F. A., Halifax; Brown, T. J., Sydney Mines; Doane, F. W. W., Halifax; Dyer, A. F., Halifax; Faulkner, F. R., Halifax; Macnab, I. P., Halifax; Matheson, W. G., New Glasgow; Morrison, W. P., Dartmouth; Odell, C. M., Glace Bay; Robb, D. W., Amherst; Roland, J. W., Halifax; Sexton, F. H., Halifax; Smith, K. H., Halifax; Wheaton, L. H., Halifax.

The duties of the Provisional Council shall be to provide the register called for by this Act, to enter therein the names of those who are entitled to registration and who apply therefor under the provisions of Section 7, clause "b," and to call within six months from the coming into force of this Act the first General Meeting of the Association for those purposes and any other organization purposes of the Association; they shall have the powers conferred in this Act on the Council of the Association. Their powers shall cease on the election of the regular Council of the Association.

30. No provisions of this Act restricting the practice of the profession or imposing penalties shall take effect until one year after the passing of this Act.

31. Every person registered under this Act shall have a seal, the impression of which shall contain the name of the Engineer and the words "Registered Engineer, Nova Scotia," with which he shall stamp all official documents and plans.

32. The activities of the Association are hereby restricted to the functions necessary to the administration of this act.

33. Nothing in this Act contained shall be construed as affecting the rights and privileges of any person who has been granted any certificate or who may hereafter be granted any certificate pursuant to any provision of the Coal Mines Regulation Act, Chapter 10 of the Acts of 1918.

* * *

Note

In the Alberta Act as printed in the July number of *The Journal* enclosed, Page 363 No. 22, first section, the phrase "Who has been convinced of a criminal offense" should read "Who has been convicted of a criminal offense".

CORRESPONDENCE

Appreciation from Chemical Engineers

Editor, *Journal*:—

Dear Sir:

I take pleasure in enclosing copy of the resolution of thanks passed by our Council in recognition of the cordial reception and generous entertainment which you accorded us while in Montreal. We especially appreciate the use of your hall for our meetings after our unfortunate experience at the Hotel.

Very truly yours,

J. C. OLSEN,
Secretary.

American Institute of Chemical Engineers,
Office of Secretary, Polytechnic Institute,
Brooklyn, N.Y.
July 24, 1920.

*

At a special meeting of the Council, held July 4th, 1920, on board the Steamship Saguenay, it was unanimously RESOLVED that the thanks of *The Institute* be transmitted to

R. N. Monk, and Fraser S. Keith
and
The Engineering Institute of Canada

for the cordial reception and generous entertainment of *The Institute* at MONTREAL, CANADA, June 28th and 29th, 1920, and it was further

RESOLVED that this resolution be spread upon the minutes and a copy be sent as a token of esteem and appreciation.

DAVID WESSON,
President.

J. C. OLSEN,
Secretary.

* * *

A Tribute to the Institute

Editor, *Journal*:—

"I have been away nearly four months nearly the whole of which time I spent in Mexico and the Southwestern United States, and hence got out of touch with things in Canada. On my return I was greatly pleased to hear of the success of *The Institute* in its campaign for Legislation; from what I can learn Ontario is the only important province that remains doubtful and it for self protection will soon be forced to join the others.

Permit me to express my opinion that *The Institute* has done more to advance the welfare of the engineering profession than any similar body on the Continent. Please accept my sincere congratulations for the remarkable results so far achieved and my best wishes for the future."

J. A. REID, M.E.I.C.

Cobalt, July 14th, 1920.

EMPLOYMENT BUREAU

To make this department more valuable it is proposed that in future advertisements of situations vacant should state salary, and give details of requirements.

Situations Vacant

Four Designers

Four designers for reinforced concrete work, two instrumentmen, two electrical engineers. Box 132.

Chemical Engineers

Chemical engineer.—Montreal industrial company requires services of a young chemical engineer acquainted with fuel and steam problems. Salary $2000 to $[illegible]. Box 134.

Two Draughtsmen

Two draughtsmen for reinforced concrete design or general construction work required by Montreal construction firm. Box 1[illegible].

Mechanical Draughtsman

Mechanical draughtsman wanted for metal working industrial concern in Ontario. Salary $150.00 per month to start. Box 137.

Three or Four Young Engineers

Three or four young engineers wanted for Water Board, situated in the Province of Quebec. Must have had office experience. Salary $125.00 to $175.00 per month. Box No. 139.

Mechanical Engineer

Mechanical engineer for experimental work in large pulp and paper mills in province of Quebec; salary $200 per month, depending on qualifications, state training, experience, age, and references. Box 141.

Designer

Designer wanted for general civil engineering designing, in Montreal. Salary about $200.00 per month. Box 142.

Construction Engineer

Engineer or superintendent familiar with construction work in connection with construction of dam 400 feet long and 30 feet high; work will take at least twelve months. Applicant should be used to handling men, rock work, etc. Salary $300 per month and board. Box 143.

Young Engineer

Young engineer with some experience in designing and with more than the average ability at computing. Steady position with good prospects. Box 145.

Two Assistant Structural Engineers Wanted

Two Assistant Structural Engineers for the Welland Ship Canal, Department of Railways and Canals, at a salary of $175 per month and bonus, to assist in the design and construction of lock gates, valves, safety appliances and operating machinery.

Applicants to be graduates in engineering, with experience in structural and mechanical design, estimate.

and construction; preferably experience in the design of hydro-mechanical appliances.

Application forms to be forwarded to The Secretary, Civil Service Commission, not later than August 14th.

* * *

The Forests Products Laboratories of Canada, Dept. of the Interior, invite applications for the following positions, through *The Engineering Institute:*—

Chief Division of Timber Tests

To be responsible under the direction of the Superintendent for the work of the Division of Timber Tests, to plan, lay out and conduct scientific investigations and research relating to the mechanical properties of timber and timber products, to design special apparatus for use in such research, to supervise laboratory tests and analyze results, to act as a representative of the Laboratories at meetings of technical societies, etc., and to present papers, etc.

Salary $2700 per annum with bonus of $240 per annum if married. Annual increase of $120 per annum to maximum of $3180.

Assistant Chief Division of Timber Tests

To assist the Chief of the Division of Timber Tests, to assume responsibility during the absence of the chief, to supervise the work of the staff, the preparation of materials for testing, the making of laboratory tests and the computations of the results, to be responsible for the condition and accuracy of testing apparatus, to design special apparatus, to prepare articles for publication, etc.

Salary not yet determined.

Timber Testing Engineer

Under direction to discharge the duties of a Timber Tester, and to be responsible for the efficient performance of such duties by Timber Testers and Assistant Timber Testers, as an assistant supervisor in the testing laboratory or in charge of a computing staff, to conduct minor investigations, etc.

Salary not yet determined.

* * *

Applications are invited from persons possessing the necessary qualifications for the position of

Junior Radio Electrical Engineer or Junior Electrical Engineer

in the Radiotelegraph Branch of the Department of the Naval Service at a commencing salary of $1680 per annum, rising by annual increments of $120.00 to $2040. per annum. Also Cost of Living Bonus as authorized by law.

Qualifications required: — Education equivalent to High School graduation and either 1. Graduation in electrical engineering from a school of applied science of recognized standing with two years of experience in Radio telegraph or Electrical Engineering work or, 2. Four years of experience in Radio telegraph or Electrical Engineering work; supervisory ability, good hearing. Preference will be given to applicants with Radio Engineering experience.

Applications must be in the handwriting of the persons applying (or if otherwise the reason therefor to be given) and on forms supplied by the Commission, which may be obtained at any Post Office or from the Secretary of the Civil Service Commission, and are to be mailed to the Deputy Minister, Dept. of the Naval Service, Ottawa, immediately.

Length of residence in the locality must be stated. Applicants must describe the position as indicated above and must not vary description in making application.

In considering application, preference will be given to persons who have been on active service Overseas in the recent war, in the Military or Naval Forces of His Majesty or of any of the Allies of His Majesty, who have left such service with an honourable record, or who have been honourably discharged. Returned soldiers must produce their Discharge Certificates or a certified copy of the same.

W. Foran,
Secretary,
Civil Service Commission of Canada.

*

The Civil Service Commission of Canada hereby give public notice that applications will be received from persons qualified to fill the following positions in the Civil Service of Canada:—

Air Certificate Examiners

Two Air Certificate Examiners for the Air Board at an initial salary of $2,940 per annum, which will be increased upon recommendation for efficient service at the rate of $180 per annum until a maximum of $3,300 has been reached. This initial salary will be supplemented by whatever bonus may be provided by law.

Note: If board, lodging, or ordinary clothing is supplied, the value thereof shall be deducted from the above compensation.

Duties.—Under the direction of the Superintendent of Certificate Branch, Air Board, to examine, approve, and recommend the issue of licenses to air pilots, navigators, and engineers; to examine, approve, and recommend the issue of certificates of airworthiness of flying machines; to examine, approve, and recommend the issue of licenses to aerodromes; to assist in the selection of, and make recommendations in connection with air routes; to conduct examinations in the theory and practice of air pilotage and air navigation; and to perform other related work as required.

Qualifications.—Education equivalent to graduation from a university of recognized standing; two years of experience in flying various types of flying machines; commercial air pilot's and air navigator's certificates; extensive knowledge of the theory of flight and the piloting and design of flying machines and of the construction rigging, and overhauling of all types of flying machines and of the construction and maintenance of aerodromes; ability to conduct examinations in the theory and practice of air pilotage and air navigation and to make through inspections and investigations into the proper construction and rigging of aeroplanes and engines; and to supervise such work.

Examination.—Subjects and Weights as follows: Education, Training and Experience, 4; Oral Interview, if necessary in the opinion of the Commission, 1.

(*Sgn.*) W. Foran, *Secretary.*

Situations Wanted

Industrial Plant Engineer

Industrial plant engineer, A.M.E.I.C., sixteen years experience, design and construction, of industrial plants, steel plants, coal mining plant etc. desires executive engineering position. Will be pleased to furnish full particulars as to experience and references. Box 38 P.

Civil Engineer

Civil Engineer, S.P.S. graduate, war veteran, with twelve years' practical experience in field and office on railroad, hydraulic, sewerage and general municipal work wishes permanent position as township or municipal engineer within hundred miles of Toronto. Box 20-P.

Members' Exchange

FOR SALE.—Keuffel & Esser Railroad Transit 6½" hor. circle and 5" Vert. circle in good condition, complete with case. Price $120.00.

Aneroid barometer 3" diameter. In leather case in good condition. Price $30.00.

Stadia Rod in good condition. Price $20.00.

Box 2-A.

FOR SALE.—Set of Transactions of Institution of Civil Engineers, Great Britain, from the year 1881 to the present time. About one dozen volumes in this set (which comprises most valuable engineering record for past 40 years) are bound. This should be worth $100 to any member who is acquiring an engineering library. Box 3-A.

Capital or Partner Wanted

"Firm of consulting engineers require small capital for development of interests already established, with partnership if desired.

"Could amalgamate advantageously with commercial interests. Box 4-A.

Trade Inquiries

Engineer Canadian municipality requires names and addresses of firms manufacturing 60", and under, concrete sewer pipe. Full information from the Secretary.

OBITUARIES

Lieut. John Macdonald, Jr.E.I.C.

Late JOHN MACDONALD, Jr.E.I.C.

Word has been received from his brother George A. Macdonald, Vancouver, of the death on May 13th, of Lieut. John Macdonald, Jr.E.I.C. in West Africa due to maleria. The late Mr. Macdonald served his apprenticeship in the engineering profession in Inverness, Scotland, and on coming to Canada was engineer with the Central Alberta Railway, and at the time of the war with the Canadian Pacific Railway. He enlisted in 1915 and was for sometime district officer at Quebec, and subsequently camp engineer at Valcartier, serving overseas with the Canadian Engineers, being demobilized in March 1919. Following demobilization he proceeded to London, England at his own expense and offered his services to the British Government volunteering to go to Russia. His offer was not accepted however, as at that time all Canadians were withdrawn from Russia. He was offered and accepted the offer of assistant maintenance engineer on the Government Railway at Sierra Leone, and left for West Africa in November 1919 where his untimely death occurred. The late Lieut. Macdonald joined *The Institute* as a Junior in April 1913.

*

C. T. Evans, Jr.E.I.C., of Windsor, Ont., died on May 9th, 1920. Mr. Evans was born at Windsor in 1888, studied mechanical engineering at the University of Michigan for two and a half years. During the University vacations in 1909-11 he was employed as layout man in the Tool Designing Department, Cadillac Motor Car Company, Detroit, Mich.; checker Chassis Department, Packard Motor Car Company, 1911; designer, General Motors Company, Experimental Department, 1911-1912.

PERSONALS

F. P. Adams, A.M.E.I.C., who returned from overseas recently, is now city engineer of Chatham, Ont.

*

E. Blake Allan, S.E.I.C., has accepted the position of junior assistant to the road engineer, Hamilton, Ont.

*

H. H. Charles, A.M.E.I.C., has been appointed division engineer of construction for St. Louis County, Minnesota.

*

Gerald M. Ponton, A.M.E.I.C., has opened offices in Montreal as a consulting mining engineer and metallurgist at 14 Place Royale, Montreal.

*

J. C. Ball, A.M.E.I.C., of the Niagara Peninsula Branch, has recently resigned from the Welland Ship Canal staff and has taken up contracting.

E. P. Muntz, A.M.E.I.C., of the Niagara Peninsula Branch, has the congratulations of the Branch upon the arrival of a baby girl on June 28th.

*

Major G. L. Mattice, M.E.I.C., has joined the staff of Lockwood, Greene and Co., of Canada, Limited, Industrial Engineers, taking charge of a new department, that of selling engineering service.

*

N. A. Pearson, A.M.E.I.C., formerly with the Dept. of the Interior Irrigation Branch, Calgary, Alta. has accepted a position as draughtsman and designer with the Braden Copper Co. Sewell Rangua, Chila, S.A.

*

Chas. L. Archibald, A.M.E.I.C., consulting engineer and architect, St. John, N.B. has been retained by the International Construction Company Limited, St. John, N.B. as consulting engineer.

*

E. C. Little, S.E.I.C., has accepted a position with D. G. Loomis and Sons, Limited, engineers and contractors in connection with their work for the Nova Scotia Power Commission.

*

Brig. Gen. C. H. Mitchell, D.S.O., M.E.I.C., Vice-President of *The Institute*, has been appointed a member of the Commission appointed by the Ontario Government to investigate the Hydro-Radial situation.

*

A. L. Ford, M.E.I.C., W. Pearce, M.E.I.C., and L. C. Charlesworth, M.E.I.C., have been appointed representatives of *The Engineering Institute of Canada* at the forthcoming convention of the Western Canada Irrigation Association to be held at Lethbridge.

*

L. N. Seaman, A.M.E.I.C., Chief of the Division of Timber Tests (Forestry Branch Dept. of Interior Canada) Forest Product Laboratories of Canada, has been appointed timber testing expert for the Indian Govt., Headquarters at Dehra Dun, United Provinces, India.

*

John F. Cassidy, A.M.E.I.C., has joined the organization of J. O. Giroux and Co., general contractors of 6 Spadina Road, Toronto, as secretary-treasurer; Mr. Cassidy took an active part in the organization of the company.

*

Capt. W. S. Lawson, M.E.I.C., has resigned from the Militia Headquarters Staff, Ottawa, to accept a position as inspecting bridge engineer, Canadian Northern Railway, Eastern Lines, covering the territory between Port Arthur and Lake St. John.

*

Alex. Milne, A.M.E.I.C., of the Niagara Peninsula Branch and Superintendent of the St. Catharines water works, has been elected first President of the newly formed Canadian Branch of the American Water Works Association; R. L. Dobbin, M.E.I.C., of the Peterboro Branch has been elected Secretary of the Canadian Section.

C. E. Fraser, Jr.E.I.C., has left the employment of the County Highway Department of the United Counties of Stormont, Dundas & Glengarry, Finch, Ont., where he was employed as chief assistant engineer and is now with the Morin Brothers Bituminous Paving Company on street paving in Brockford, Ont.

*

A. Frigon, A.M.E.I.C., professor of electrical engineering at the Ecole Polytechnique, also consulting engineer, is leaving for two years in Europe and will stay some time at the Ecole Supérieure d'Electricité of Paris and the Institute Electro-Technique of Grenoble. The Cercle Universitaire gave him a dinner before leaving.

*

C. O. Foss, M.E.I.C., chief engineer, St. John and Quebec Railway, has been appointed by Premier Foster of New Brunswick as one of the three members constituting the personnel of the newly created Hydro-Electric Commission of New Brunswick, the object of which is to proceed with the development of water powers in that Province.

*

Captain R. D. Thexton, Jr.E.I.C., is now section engineer with the Federated Malay States Railway on construction work at Kuala Lumpor. Captain Thexton was formerly a member of the Ottawa Branch; he hopes to write an article for *The Journal* on railway construction as carried out in the Far East, and such an article would be of interest to our many railway engineer members.

*

C. B. Thorne, M.E.I.C., in addition to being elected to the first Board of directors of the new Riordon Company, Limited, occupies the position in the new company of vice-president and technical director. Since joining *The Institute* Mr. Thorne has evinced a keen interest in the engineering profession and has taken an active part in discussing and assisting in promoting the welfare of *The Institute.*

*

E. C. Gaines, M.E.I.C., of the Mead Morrison Mfg. Co. of Chicago, will sail on August 24th, for Sydney, Australia to have charge of the above Company's interests in Australia and New Zealand.

The Company has several contracts for coal handling equipments to be erected in those countries, and as the work will require a considerable amount of structural steel it is the intention to have all of the structural work fabricated in Australia.

*

Major W. H. Hunt, A.M.E.I.C., was gazetted lieutenant Royal Engineers in June 18th, 1915. appointed second in command 156 Field Coy. R.E. and attached 16th Division, and served in France 1915 and 1916; was gazetted captain on the 6th of January 1916; was wounded at Loos. He served through the Somme Offensive in September 1916 with the 16th Division at the capture of Guillemont and Ginchy. Captain Hunt was in hospital for four months after being gassed, and afterwards was O.C. "B". Company, R.E., Training Centre at Newark, England, during 1917. During 1918 until the evacuation of the Allied Forces on September 28th 1919 he served with the North Russian Expeditionary Force. On November 1st, 1918 he was gazetted major. Major Hunt's last position was with the C.R.E., Volunteer Force North Russia. He was also awarded the Military Cross. For two years Major Hunt served in the South African War as O.C. Machine Gun Section, 15th Batt. Imperial Yeomanry.

•

A. F. Macallum, M.E.I.C., has been appointed a member of the Ontario Government Commission to investigate the Hydro Radial situation. Mr. Macallum graduated from the University of Toronto in [illegible] as civil engineer, later obtaining the degrees of B.A.Sc. and C.E. After experience with the Toronto, Hamilton and Buffalo, Minneapolis and St. Paul, and Canadian Pacific Railways, Mr. Macallum was appointed engineer in charge of waterworks at Midland, Grimsby, and Bridgeburg, and later was consulting engineer to New Toronto and North Toronto in connection with sewer construction. In 1909, Mr. Macallum was appointed city engineer of Hamilton, Ont., and during his tenure of this office, till 1916, was in charge of many important public works, including the rebuilding of the water works system, construction of new asphalt plant, construction of sewage disposal system, etc. In 1916, Mr. Macallum was appointed to his present position of Commissioner of Works, Ottawa.

•

H. R. Safford, M.E.I.C., President of the American Railway Engineering Association and Assistant to the President of the Chicago, Burlington, and Quincy Railroad, has recently been highly honoured by his alma mater, Purdue University, Lafayette, Indiana; the degree of Doctor of Engineering, honoris causa, being conferred. As their distinction has only been conferred by the University three times previously in the whole course of its history the distinction is the more notworthy. A splendid tribute was paid to Dr. Safford by the Dean of the University.

•

R. H. Murray, A.M.E.I.C., engineer of the Bureau of Public Health has been appointed Director of the Division of Sanitation of the Provincial Bureau of Public Health of Saskatchewan recently formed to co-ordinate those activities of the Bureau which aim at providing a healthy environment for the people of the Province. He will be responsible to the Commissioner of Public Health for the direction of the work on water supplies, milk supplies, treatment and disposal of sewage and trade wastes, refuse destruction, and all sanitary matters concerning which the individual looks to a central authority for protection.

The organization and construction of Union Hospitals will also come under the Division of Sanitation for the present.

Mr. Murray, who graduated as a civil engineer twelve years ago has specialized in public health engineering.

Before going to Regina in 1912 as engineer to the Bureau of Public Health, Mr. Murray was assistant engineer on the main drainage works of Glasgow, Scotland, and Toronto, Ont.

He joined the overseas forces in 1915 and served for four years as Sanitary Officer with the Egyptian Expeditionary Force, and with the [illegible] Division of the Imperial Forces in France.

Mr. Murray is an Associate Member of the Institution of Civil Engineers, and a member of the Royal Sanitary Institute.

BRANCH NEWS

Toronto Branch

H. A. Goldman, A.M.E.I.C., Secretary-Treasurer.

In accordance with the policy recently adopted to broaden the activities of the Branch, the Papers Committee has made arrangements for the members to visit the following engineering works:

Saturday, July 17th, 2.30 p.m.—*The New Union Station.*

Members will please assemble at the main entrance of the new station.

Tuesday, July 20th, 2 p.m. — *The Toronto Harbor Works.*

Members will assemble in front of the Harbor Commission Building at the foot of Bay Street, at 2 p.m.; they will board the Harbor Commission Steam Yacht Bethelma, and will be taken around to the various parts of this important engineering work. The trip will take about three hours.

Thursday, July 29th, 2.30 p.m.—*Baldwin's Canadian Steel Corporation, Ltd.*

Members will assemble at the main entrance of the plant at Ashbridges Bay district.

Tuesday, August 24th, 2.30 p.m. — *The Island Filtration Plant.*

Members will assemble at the front of the Harbor Commission Building where transportation to the Island will be provided for them.

It is anticipated that all members of the Branch who can possibly do so will avail themselves of this opportunity to take in these visits, as they are likely to prove very pleasant and interesting as well as instructive and useful.

For another series of visits announcements will be sent out later.

Hamilton Branch

J. A. McFarlane, A.M.E.I.C., Secretary-Treasurer.

At a meeting of the Branch Executive held on July 15th, a Branch Committee on Policy was appointed with the following members: [illegible], M.E.I.C., Hamilton Bridge Works; H. U. Hart, M.E.I.C., Canadian Westinghouse Company Limited; [illegible], M.E.I.C., consulting engineer, Hamilton.

This committee will act in conjunction with the central committee on this important subject.

Niagara Peninsula Branch

Rex P. Johnson, A.M.E.I.C., Secretary-Treasurer.

There will be no further regular meetings of the Branch till after the Professional Meeting in September.

The shortness of the "Branch News" column in this issue is not an indication of a period of quiet in Branch affairs. On the other hand, there are a large number of members working hard, individually and as committee men, in preparation for the Professional Meeting. Members are referred to the news items prepared by the Publicity Sub-committee of the Professional Meeting Committee for advice about the Meeting.

R. T. Gent, M.E.I.C., is the hardest working "Institute" man in Canada these days. He is Chairman of the Finance Sub-committee. S. R. Frost, A.M.E.I.C., Secretary of the Professional Meeting Committee; A.D. Heuther, Secretary of the Entertainment Sub-committee and D.T. Black, A.M.E.I.C., Secretary of the Publicity Sub-committee are also doing some very good work.

Saskatchewan Branch

J. N. de Stein, M.E.I.C., Secretary-Treasurer.

The fourth Annual Summer Meeting of the Saskatchewan Branch was opened in Saskatoon, on July 15th, Dean Dr. P. H. Ling welcoming the assembled Members on behalf of President C. H. Murray of the University of Saskatchewan, who unfortunately had to be absent. Dean Ling expressed his appreciation of our profession keeping in close touch with the University, especially owing to the recent donation of a scholarship by the Branch to the Engineering Faculty of the University of Saskatchewan. He welcomed the members as a body of scientific men and assured them of the co-operation of the University in all their problems, a co-operation further demonstrated very splendidly in the large amount of assistance that our Concrete Committee is getting from the University.

At the conclusion of this address the regular business meeting convened with the Chairman, Professor A. R. Greig, M.E.I.C., presiding.

The question of legislation which unfortunately has not been obtained yet in Saskatchewan occupied the members and a report was on hand about a recent interview with the Premier of the Province. It appears that the Government might be inclined, owing to the fact that other Provinces have obtained legislation, to submit this matter to the next session of the House, and copies of the several bills enacted so far in other Provinces were requested by the Government. The whole question was left in the hands of the Executive Committee to further confer with the Government in this difficult question.

The next point of interest taken up by the meeting was the report of the Committee on Salaries of Engineers. Owing to the fact that none of the members of the Committee were engineers in private practice the arranging of a schedule of fees for consulting engineers was handed over to a newly formed Committee. A comprehensive schedule for engineers on municipal employment and Government was arrived at, which proposed schedule, it is hoped, will be published in the next number of *The Journal.*

The question of non-support of the parent Council of the coming Western meeting at Banff was touched upon and it was the opinion of the majority of the members that the explanation made by the Secretary was sufficient in this matter and that the action of the Council should not be criticized. The Executive was instructed to appoint the Committees for the various sessions of the next Annual Meeting to be held in Toronto so that the proposed sectional meetings would be taken care of.

A resolution regarding the appointment of a commission to enquire into the question of irrigation in the Province was passed and forwarded to the Government.

Professor C. J. MacKenzie, A.M.E.I.C., Chairman of the Concrete Committee of the Branch reported concerning contributions from the Research Council and our committee intends to take up this question at the coming Banff meeting.

At the conclusion of the business session the Members adjourned to a luncheon served in the large dining room of the University and tendered by the local members to the visiting members. After this the regular session was resumed at which R. W. E. Loucks, A.M.E.I.C. gave a splendid paper on the Natural Resources of Saskatchewan. Mr. Loucks outlined the resources of our Province in the various branches and created a very favorable impression of the wealth of our Province.

Professor C. J. MacKenzie, A.M.E.I.C., opened the discussion and complimented Mr. Loucks on the paper outlining the fact that we should certainly know the assets and liabilities of our Province.

Wm. T. Thompson, M.E.I.C., followed with an illustrated lecture on the "Great North Land" paying special attention to the Hudson route the completion of which he most earnestly emphasizes, as being of incalculable value for our western Provinces.

The meeting then adjourned and the visiting members were entertained by the local members in a splendid way at the Provincial Exhibition.

Altogether a splendid and very satisfactory meeting was held and it was only very regretfully that everybody parted with the promise to try and attend the Banff meeting.

C. W. Craig, M.E.I.C., of Calgary, had promised to be present but excused himself by wire urging our members to attend the Banff meeting.

Calgary Branch

Arthur L. Ford, M.E.I.C., Secretary-Treasurer.

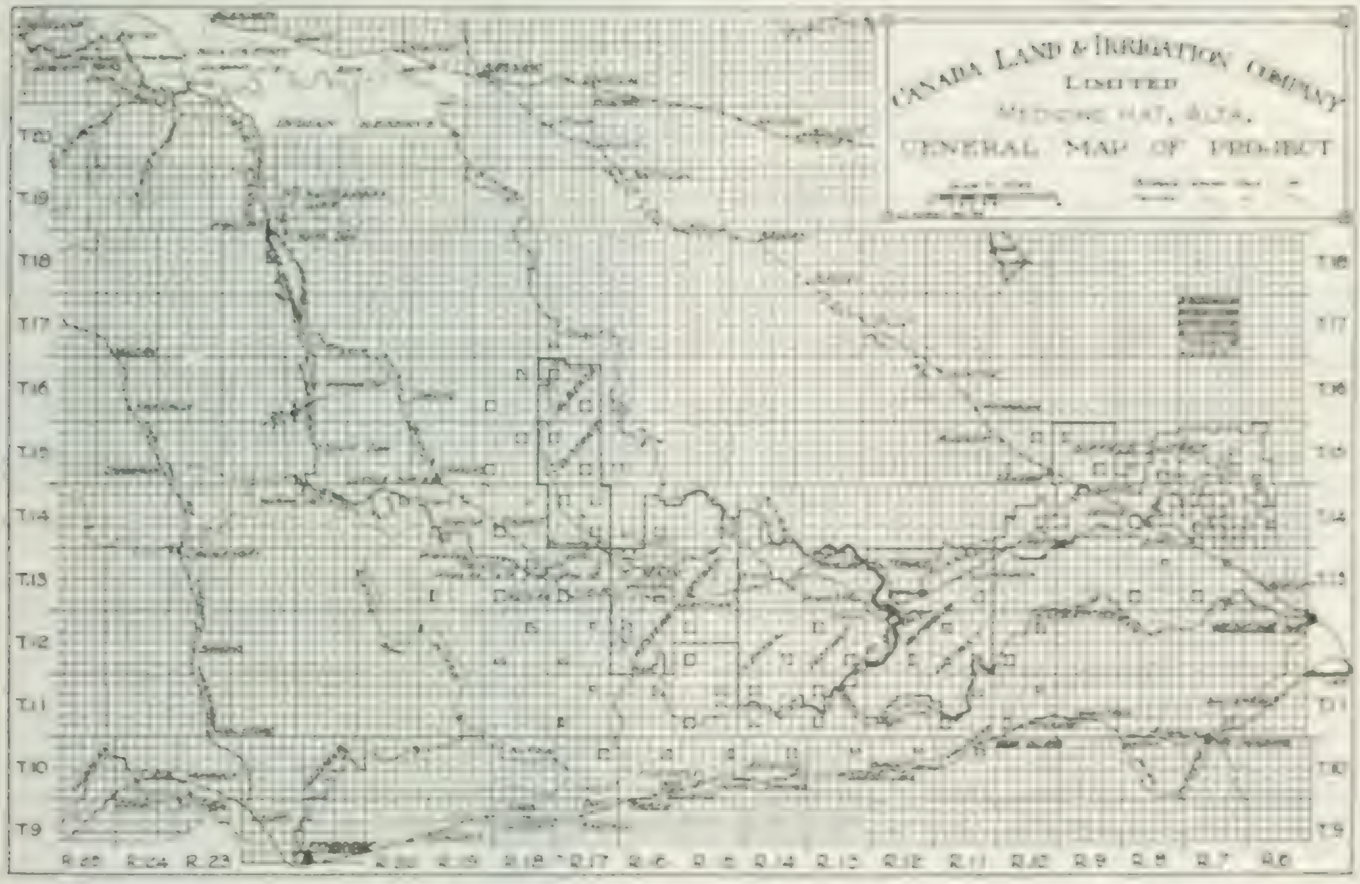
The new Hillhurst bridge which is being built for the City of Calgary has been interesting many of the members of the Calgary Branch. This is a reinforced concrete structure of five spans, of 102 feet each in the clear, carrying a 40 foot roadway and two 6 foot sidewalks over the Bow river from Ninth street to Tenth street west. The type is the earth filled arch and the arches are elliptical with an 18 foot rise. The work is progressing favorably and the south abutment is now poured and work proceeding on pier one.

The river is at the high water stage during July, but as soon as it starts to recede, work will be pushed on the other piers. The foundations for the bridge are noteworthy as the south abutment had to be carried to a depth of 40 feet below water level before bed rock was struck. The estimated cost of the bridge was $210,000, and it is being built by the Fegles Construction Co., of Fort William, under the supervision of G. W. Craig, M.E.I.C., city engineer, and J. F. Greene, M.E.I.C., consulting engineer.

The Irrigation Project of the Canada Land & Irrigation Company, Limited, is now in operation.

It is over a year ago since water was first turned from the Bow River through the intake gates south of Carseland, and since then, whenever weather conditions would permit it, the Inlet Canal has been steadily filling up Lake McGregor, the first and largest reservoir in the Company's system. This reservoir is 23 miles long and from a half mile to two miles in width, and contains, at full capacity, 300,000 acre feet of water, enough to supply the entire tract with water for a full irrigation season.

This spring the water passed through the outlet gates at the south dam of Lake McGregor, and after partially filling a smaller basin, the Little Bow Reservoir, it was brought on to the first unit of the project, and is now irrigating about four thousand acres of land near the Town of Vauxhall. The distance from the intake to the edge of the irrigated tract is 110 miles, and considering that water is running in the canal for the first time, the results have so far been entirely satisfactory. Very few breaks of any kind have occurred, and the loss from seepage is very small. The Canal banks and fills have had ample time to properly settle and it is undoubtedly due to this fact that so little trouble with breaks and seepage has been experienced. Evaporation losses have been comparatively large, especially during the short spell of hot weather recently experienced. At present there is no way of measuring these losses, but a system is being installed by way of which it will be possible to determine them with some degree of accuracy.



Canada Land & Irrigation Company, Limited

On account of the slow grades in the Main Canal no cutting of any kind takes place, and the water, after standing for some time in the reservoirs, arrives on the land well warmed, entirely free from silt, and able to give the most beneficial results when used to irrigate growing crops.

*

J. F. Greene, M.E.I.C. of C. O. Howe & Co., consulting engineers, and a member of the Manitoba Branch of *The Institute*, is a sojourner among the residents of the Calgary Branch this summer. Mr. Greene brought his family with him to recuperate amid the Alberta sunshine from the rigours of the savage Winnipeg winters which they have been enduring for the last few years.

When not engaged in strenuous games of tennis, Mr. Greene may be found around the new Hillhurst bridge, for which structure he is consulting engineer, or around other works of reinforced concrete, or works presenting problems which require an engineering solution.

Vancouver Branch

J. N. Anderson, A.M.E.I.C., Secretary.

At the general meeting of the Branch held on July 5th, A. D. Creer, M.E.I.C., was elected to fill the vacancy in the Vancouver Branch Executive caused by the resignation of L. L. Brown, M.E.I.C. At the same meeting a resolution, moved by A. D. Creer, M.E.I.C., and seconded by Major G. A. Walkem, A.M.E.I.C., was passed as follows:

"That the Secretary (of the Branch) be instructed to write all members of this Branch pointing out to them the great desirability of all members of this Branch applying for membership to the 'The Association of Professional Engineers of the Province of British Columbia', and further that they be urged to make this application at once." In accordance with this resolution a letter quoting the resolution and giving the address of the Registrar of the Association has been sent to all Branch members.

Victoria Branch

H. M. Bigwood, A.M.E.I.C., Secretary.

Members of the Victoria Branch of *The Engineering Institute of Canada* were the guests of the B.C. Electric Railway Company at Jordan River on Saturday, when the party, about 30 strong, including engineers well known to the public of Victoria, were conducted over the works from which the district obtains its main supply of electrical energy.

Leaving Victoria at 8 a.m. by motor cars, Jordan River, a distance of 43 miles by road, was reached at 10 o'clock, which is an indication of the excellent condition in which the roads were found.

Upon reaching its destination the inspection was commenced at the power house, situated near sea level, and in which the 4,000 h.p. Pelton wheels are installed and driven by water under a head of 1,150 feet.

After inspecting the power house, the visitors ascended by means of the inclined railway to the forebay, or balancing reservoir, and after admiring the wonderful outlook across the Straits to the Olympic Mountains and to the Pacific Ocean, sat down for lunch.

After the appetites had been satisfied, A. E. Foreman M.E.I.C., public works engineer and Chairman of the Victoria Branch of *The Engineering Institute of Canada*, rose in his place to express the thanks of the visitors to the company whose guests they were, and particularly to those officials present, A. T. Goward, manager, and G. M. Tripp, A.M.E.I.C., E. N. Horsey, A.M.E.I.C., and C. A. Cornwall, M.E.I.C. (of the engineering staff), who were so ably entertaining them and making them acquainted with the details of a most interesting engineering undertaking.

The remarks of the chairman were heartily endorsed by the gathering in the usual way, and Mr. Goward replied for the company and officials, who, he said, were only too pleased to be given the chance to show the undertaking to the public through the gentlemen present, who could appraise at its proper value, and who would be able to speak of the immense amount of capital sunk in the work by the company.

Victoria Branch visit to Jordan River Power Development

After lunch, aboard motor and horse-drawn cars on a narrow gauge railway, the trip was made to the concrete dam, six miles away. A six-mile scenic railway journey following the contour of the hillside and alongside the flume through which the water flows from the dam to the forebay; up the narrow valley, with its steep and thickly timbered slopes, a new view exposed as each corner was rounded, to the huge concrete construction which holds back the water, thus making a lake some three or four miles long, at an elevation of 1,450 feet above the sea.

One remark was very general by all those attending, that both the company and the public were losers by the lack of knowledge of the work done at Jordan River to provide the energy, which, after being received through the forty odd miles of transmission lines and adapted to public needs, is so unconcernedly switched on to drive a vacuum cleaner or similar convenience.

The return journey was commenced after a most enjoyable day, everyone feeling that it had been worth while making the trip, both to appreciate properly the magnitude of the undertaking from an engineering standpoint, and also to realize the very large amount of money that had been spent by the company to develop natural resources within a few miles of the city, and about which little was known.

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Preliminary Notice

of Applications for Admission and for Transfer

22nd July, 1920

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in August, 1920.

FRASER S. KEITH, Secretary.

*The professional requirement are as follows:—

Every candidate for election as MEMBER must be at least thirty years of age, and must have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. The term of twelve years may, at the discretion of the Council, be reduced to ten years in the case of a candidate who has graduated in an engineering course. In every case the candidate must have had responsible charge of work for at least five years, and this not merely as a skilled workman, but as an engineer qualified to design and direct engineering works.

Every candidate for election as an ASSOCIATE MEMBER must be at least twenty-five years of age, and must have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineers' office, or a term of instruction in some school of engineering recognized by the Council. In every case the candidate must have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, shall be required to pass an examination before a Board of Examiners appointed by the Council, on the theory and practice of engineering, and especially in one of the following branches at his option Railway, Municipal, Hydraulic, Mechanical, Mining, or Electrical Engineering.

This examination may be waived at the discretion of the Council if the candidate has held a position of professional responsibility for five years or more years.

Every candidate for election as JUNIOR shall be at least twenty-one years of age, and must have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the Council, if the candidate is a graduate of some school of engineering recognized by the Council. He shall not remain in the class of Junior after he has attained the age of thirty-five years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects Geography, History (that of Canada in particular), Arithmetic, Geometry Euclid (Books I.-IV. and VI.), Trigonometry, Algebra up to and including quadratic equations

Every candidate for election as ASSOCIATE shall be one who by his pursuits scientific acquirements, or practical experience is qualified to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ALISON—JOHN GARDNER ROBB, of Niagara Falls, Ont. Born at Toronto, Ont., March 18th, 1880; Educ., Graduate S. P. S., 1903; summer 1901, sewer system, Cobourg, Ont.; summer 1902, D.L.S. party, Sask.; 1903-12, with Riter-Conley Mfg. Co., Pittsburg, Pa., office and field duties, dfting, survey and constrn.; 1913, with Havana Elect. Rly. Light and Power Co., Havana and Cuba, office and field duties etc.; 1915-17, Quintan and Robertson, Ltd., Toronto, Ont., office and field duties, etc., 1918 to date, with Niagara, St. Catharines and Toronto Rly., Michigan Central Rly. Co., and G. T. Rly. system, inspecting concrete arch. being built by Hydro. Elect. Power Com., Niagara Falls, Ont.

References: A. C. D. Blanchard, T. U. Fairlie, E. W. Oliver, N. D. Wilson, T. T. Black.

BIGNELL—HILARY VIVIAN of Montreal, Que. Born at Toronto, Ont., Nov. 9th, 1889; Educ., B.Sc., McGill Univ., 1915; 2 summers, C. P. Rly. survey, 6 mos. drafting office; 1913, Can. Light and Power Co., on constrn.; 1916-19, on active service, lieut. and acting capt., Royal Engrs.; 1920 to date, asst. engr., G. T. Rly., Montreal.

References: W. Walker, H. M. Lamb, C. M. M. McKergow, K. B. Thornton, C. Batho, K. R. Ayer, C. Thomson.

BOOKER—HARVEY D., of Fort William, Ont. Born at Hamilton, Ont., 3rd November, 1886; Educ., 3 yrs., McGill Univ. (1910-13); 1907-10, operating in municipal power house, Kenora, Ont.; 1912-14, students' course and asst. to engr., Canadian Westinghouse Co., Hamilton; 1914-16, operating for Northern Ontario Light & Power Co., Cobalt; at the present time, erecting engr., service dept., Canadian Westinghouse Co., Fort William, Ont.

References: F. H. Farmer, A. W. Lamont, R. B. Chandler, K. C. Berney, G. R. Dawson G. R. Duncan, Geo. Blanchard, A. J. Lawrence.

BROWN—DONALD WALLACE JAMES, of Sydney, N.S. Born at Low Point, N.S., Sept. 11th, 1896; Educ., high school and 1 yr. engr'g. St. Francis Xavier College, Antigonish, N.S., 1914-15, taking complete mech. engr'g., I. C. S.; Nov. 1915-Feb. 1919, with Nova Scotia Steel & Coal Co. Ltd., Sydney Mines, N.S., in general drafting office; Feb. 1919 to date, with Dominion Iron & Steel Co. Ltd., Sydney, N.S., in mech. drafting office, i/c of mech. sketch room, covering entire plant.

References: D. H. McDougall, T. J. Brown, A. W. McMaster, K. G. Cameron, C. M. Odell.

CHISHOLM—WILLIAM HAROLD, of Halifax, N.S. Born at Halifax, N.S., Aug. 27th, 1895; Educ., B.Sc.M.E., N.S. Tech. Coll., 1916; summer 1914, N.S. Tram. and Power Co., repair shops motorman; summer 1915, Halifax Ocean Terminals; June-Nov. 1916, Canadian General Electric Co., Peterborough, students' course; Nov. 1916-18, on active service, lance corporal in Can Engrs.. engaged in trench and bridge work in France; May 1918 to date, with Northern Elect. Co., Halifax Branch, in sales dept., telephone, transmission and power work.

References: F. A. Bowman, F. R. Faulkner, J.W. Roland, I. P. MacNab, R. L. Nixon, K. H. Smith, W. P. Morrison.

CLOUSTON—NOEL STEWART, of Ottawa, Ont. Born at Dublin, Ireland, Feb. 19th, 1887; Educ., B.A. B.A.I., Dublin Trinity Coll., 1909, (A.M. Inst. C.E. 1920), D.L.S. 1915; prior to 1911, improving pupil on Dublin and South Eastern Rly., engr'g. office, bridge testing, etc.; 1911, instr'man on Prince Albert Br. of G.T.P. Rly., 1912-15, asst. on D.L.S. Dept. of Interior, 1916-March 1919, on active service with Royal Engrs., lieut., acting capt. and adjutant, officer i/c of workshops, field engr. in chg. of ruined dugouts and light railways, awarded O.B.E.; March 1919 to date, D.L.S. asst. on survey party, Peace River District.

References: A. J. Gayfer, G. B. Dodge, L. J. M. Howard, J. F. Fredette, S. E. McColl.

CONDON—FREDERICK OXLEY, of Moncton, N.B. Born at Moncton, N.B., July 21st, 1878; Educ., Common School; 1893, jr. in chf. engr's office; 1895-98, office asst. clerical work, etc.; 1898-1912, dftsman and asst. engr., mtce dept.; 1913-16, res. engr., mtce. and constrn. of rly.; 1916 to date, div. engr. and at present, dist. engr. Can. Nat. Rly.

References: W. B. MacKenzie, C. B. Brown, W. A. Duff, F. B. Fripp, C. W. Archibald.

DENOVAN—JOHN ALEXANDER, of Copper Cliff, Ont. Born at Dalkeith, Ont., Oct. 18th, 1880; Educ., Queen's Univ., in Elect. Mech. 1902-06; 1906-07, with Modern Steel Structural Co., Los Angeles, Cal. as jr. dftsman; 1907-08, with Llwellyn Iron Works, Los Angeles Cal. structural steel detailer; 1908-Sept. 1909, with Northwest Steel Co. Portland, Oregon, as checker and designer on highway bridges and office bldgs; Sept. 1909-Aug. 1910, with Hamilton Bridge Works, Ltd., Hamilton, Ont., detailer and checker; Aug.-Dec. 1910, with Anaconda Copper Mining Co., Anaconda, Mont.; 1911-12, with Alta. Engr'g. Co., Calgary, Alta., designing dftsman; 1912-13, and Aug. 1914-Mar. 1916, with J .Coughlan and Sons, Vancouver, B.C., asst. engr. i/c of dfting room and design and later chief engr.; 1913-Aug. 1914, with Westinghouse, Church, Kerr and Co., Vancouver, B.C. Office, designing dftsman on constrn. C. P. Rly. terminal; May-Sept. 1916, with Can. Copper Co. Copper Cliff, Ont., designing dftsman and checker; Sept. 1916-Feb. 1918, with Dom. Bridge Co., Winnipeg, Man., designer, detailer and checker; Feb. 1918-Apr. 1920, Can. Northwest Steel Co. Ltd., Vancouver, B.C., asst. engr. and designer on mill bldgs, tanks and bridges; at present, with International Nickel Corp. of Can. Ltd., Copper Cliff, Ont., designing dftsman on smelter work.

References: J. F. Greene, A. B. Weeks, K. C. Berney, J. A. McFarlane, O. K. Peck, E. H. Darling, A. J. Dostert, J. P. Hodgson.

FIFIELD—ALBERT F., of St. Catharines, Ont. Born at Lowell, Mass., 8th February, 1876. Educ., Tilton Seminary, 1896. Conducted general machine shop; Gen. mgr., Asquam Lake & Trans. Co., for three years, which company he organized and was manager of electric light and power plant, of the municipality and designed and built two steamboats; 1906, supt. in Asbestos Mill; 1907, with Jenckes Machine Co., first as mechanic and later became supt. at Sherbrooke and later at St. Catharines, installing hydraulic machinery; later in business buying and selling machinery and formed Reo Sales Co. for Reo Motor cars; at the beginning of war organized Metal Drawing Co. for mfg. of munitions; installed second plant for the mfg. of brass cases in Canada and handled ten contracts through the Imperial Munitions Board. At close of war, managing director, T. F. Shurly Saw Co., Ltd.

References: R. W. Leonard, A. S. Cook, A. Milne, W. P. Near, F. N. Rutherford.

FLINT—CHARLES, Major, D.S.O., of Winnipeg, Man. Born at Toronto, Ont., Oct. 12th, 1888; Educ., B.A.Sc., University of Toronto, 1910; 1907-09, during the months, May-Oct., with C.P. Rly., western lines, res. engr. on constrn.; 1910-1911, with Macdonald Engr'g. Co., Chicago, Ill., asst. supt.; 1911-Apr. 1915, with C.P. Rly., res. engr., western lines, also asst. and locating engr. at Winnipeg, and alter res. engr., mtce Edmonton; Apr. 1915-March 1919, on active service, with C.E.F. France, (C.O.R.C.C., Can. Rly. Troops. and R.N. Siege Guns, Major, D.S.O.) May 1919 to date, with C.P. Rly., locating and asst. engr., Winnipeg, Man.

References: J. G. Sullivan, W. A. James, J. R. C. Macredie, F. Lee, E. G. Hewson.

MACGILLIVRAY—ANDREW, of North Sydney, N.S. Born at Antigonish Harbour, N.S., Dec. 21st, 1878; Educ., B.A. 1904 and B.Sc. 1912, Univ. of St. Francis Xavier, Grad.Course in Astronomy, Howard, 1907; also N.S.L.S., 1912; 1908-10, with N.T.C. Rly., rodman; 1910 to date, P.W.D. of Canada, employed in supervising public works, surveying, designing, etc. in Antigonish Dist. and at present, engaged in the same capacity in the Cape Breton Dist. (Became a life member on admission as A.M.).

References: G. A. Bernasconi, L. H. Wheaton, R. H. Cushing, C. O. Foss, D. H. McDonald, W. C. Ewing.

MULLEN—CHARLES AUGUSTINE, of Montreal, Que. Born at Chapel Point, Maryland,U.S.A., Dec. 29th, 1883; Educ., High School and Fordham University School of Law; In responsible chg. of work since 1905, with Barber Asphalt Paving Co., New York, designing, specifications and direction of paving construction, and other public works in New York and Schenectady; 1908-10,private practice as paving contractor; 1910-11, Supt. of street constr'n. and repairs, city of Milwaukee; 1912-13, comm'r of pub. works, New York and Schenectady; 1914-15, contractor,New York; 1916 to date, director of paving dept. and ch. consulting paving engr., Milton Hersey Co., Montreal.

References: F. S. Keith, R. A. Ross, A. E. Doucet, W. D. Baillairge, V. J. Melsted, P. E. Mercier.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

McCORT—CECIL ROY, of Grand'Mere, Que. Born at Bolton, Ont., July 18th, 1893; Educ., B.A.Sc. (C.E.) Univ. of Toronto, 1915; 1912 (5 mos.) with Can. Fairbanks-Morse Co. Ltd., Toronto, testing gasoline engines; 1913-14, P.W.D., Canada, asst. engr., Breakwater constrn. and harbour improvement work; 1915 (9 mos.) Forest Products Laboratories of Canada, McGill Univ., research work investigating strength values of structural timbers; 1915-March 1919, on active service, officer in Canadian and Imperial Artillery, 3 yrs., since Dec. 1917 rank of capt., commanded a battery Royal Garrison Artillery, 7 mos.; March-May 1919, organized the office of Professional and Business section, D.S.C.R., Montreal and served as officer i/c; May 1919 to date, with Laurentide Co. Ltd., Grand'Mere, Que., as field engr., and at present, supt. i/c of constrn.

References: J. M. R. Fairbairn, W. J. Francis, P. Gillespie, H. O. Keay, F. B Brown, C. R. Young, F. C. Mechin, F. S. Keith.

MORRISON—JOHN HILYARD TABOR, of Dartmouth, N.S. Born at Woodstock, N.B., Nov. 22nd, 1889; Educ., B.Sc., N.S. Tech. Coll. 1918; May-Aug. 1913, in elect. repair shop of Dom. Iron and Steel Plant; Sept. 1913-May 1914, on constrn. work on Dandurand Bldg. Montreal; May-Oct. 1914, i/c of plane table under B. R. McKay, on New Glasgow topographical sheet; May-Oct. 1915, on plane table work on Sudbury sheet, Sudbury,Ont.; Oct. 1915-May 1916, and Dec. 1916-Feb. 1917, on constrn. work at Halifax Ocean Terminals; May-Dec. 1916, asst. to E. E. Freeman, on exploration work for Can. Geological Survey; June 1917-Oct. 1918, with Prof. F. R. Faulkner, M.E.I.C., on accurate survey for N.S.S. and C. Co., Wabana, Nfld; Aug. 1918-Jan. 1919, lieut. Can. Engrs., in England; Jan. 1919, (11 mos.) i/c of survey party and constrn. of road for N.S. Highway; at present, placement office for D.S.C.R.

References: J. W. Roland, F. R. Faulkner, W. P. Morrison, J. E. Belliveau, R. P. Freeman, F. H. Palmer.

PLUMMER—ALEX. ALFRED, of Vancouver, B.C. Born at Toronto, Ont., Sept. 19th, 1889; Educ., private & high school; 1904-Sept. 1906, with T.C. Rly. Co., rodman, etc. on reconnaissance and preliminary surveys; Oct. 1906-July 1908, with C. N. Rly. Co. as topographer and leveller on re-location Ottawa to French River, also asst. on exploratory work, Sudbury to Port Arthur; Aug. 1908-May 1909, with Keewatin Lumber Co., dftsman, scaler, etc.; June 1909-Supt. 1910, instr'man, asst. engr. i/c of field parties, Municipality Point Grey, Vancouver, B.C.; Sept. 1910-May 1912, asst. engr. and supt. in full chg. to alter, direct or design of all day labour and constrn. work, etc.; May 1912-Oct. 1913, with Marshall, Plumber and Co., partner and supt. i/c of constrn., grading and diking scheme, Fraser River; Oct. 1913-Dec. 1915, contracting engr., public works; Jan. 1916 to date, contractor, engr., designing and constructing flumes, dams, etc., at present carrying on business under firm of A. A. Plummer Co. Ltd., loggers and contracting engrs.

References: R. F. Hayward, G. A. Walkem, H. E. C. Carry, C. Brakenridge, J. N. Anderson, W. Anderson, C. E. Cooper.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

BROWNE—GEORGE ALLEYNE, of Ottawa, Ont. Born at Deseronto, Ont., 30th April, 1887. Educ., Montreal high school and I.C.S. in civil engr. 1905-09, with the C.P.R., as rodman, topographer, revision, constrn. and mtce.; 1909-10, N.T.C. Ry., as instr'man on constrn.; 1910-13, G.T.P. Ry., as instr'man, acting res. engr. on constrn. and res. engr., on constrn. revision, Mountain div.; 1913-14, res. engr., Pacific Gr. Eastern Ry., 1915, 6 mos., G.N. Ry., Seattle, on bridges, etc.; 3 mos., Pacific Telegraph & Telephone Co., Seattle, on valuation work; 1915-17, on active service, discharged as physically unfit; 1917-20, res. supt., engr. branch, military hospitals, in chg. of constrn. and mtce. of hospitals; April 1920, to date, asst. gen. supt. engineering branch, S.C.R., Ottawa.

References: J. Callaghan, G. H. Cagnat, W. Rathbone, H. S. Johnson, E. L. Miles, C. H. Pozer, F. J. George, C. R. Crysdale.

MOORE—CHARLES MELBOURNE, of Calgary, Alta. Born at Hartington, Ont., 20th Dec. 1895. Educ., B.Sc., (C.E.) Queen's Univ., 1919. 1912-14, rodman instr'man, C.P.R.; 1916, asst. on geological surveys, Canada; 1917, with B.E.F. France; at the present time, inspecting engr., Reclamation Service, Dept. Interior, Calgary, Alta.

References: F. L. C. Bond, J. B. Harvey, G. N. Houston, F. H. Peters, C. W. P. Ramsey, T. S. Scott.

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

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— BY —

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THE CANADIAN SOCIETY OF CIVIL ENGINEERS

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Volume III | MONTREAL, SEPTEMBER 1920 | Number 9

The St. Lawrence Route and Welland Ship Canal

Alex. J. Grant, M.E.I.C., Engineer in charge, Welland Ship Canal.

Before describing the works required for the construction of the Welland Ship Canal, and the work done thereon to date, a brief statement tracing the origin, development and construction of the canals that now form the navigation system connecting the Great Lakes with the Atlantic Ocean via the St. Lawrence Route is, in a measure, essential to a clear and comprehensive understanding of the Ship Canal project. We, and our cousins to the south of us, use our canals, and benefit by them, and until recent years we boasted of them as being unparalleled in the world, but few among us have taken the trouble to investigate the magnitude of the work accomplished in their construction by our forefathers during the past one hundred years. It is interesting from a professional point of view, and also instructive of the political and commercial development of this great country, and the marine transportation on the Great Lakes.

Advance proof of paper to be read at the General Professional Meeting, September 16th.

Canadian Canal Systems

The Canadian canals may be divided into six groups, as follows:—

1. The St. Lawrence River Canals, including the Welland and Sault Ste. Marie Canals.
2. The Ottawa River Canals. The route of the proposed Georgian Bay Canal between Montreal and French River Harbour, on the Georgian Bay, Lake Huron.
3. The Rideau Canal, Ottawa to Kingston.
4. The Trent Canal, from Lake Ontario to the Georgian Bay, Lake Huron via the Trent and Severn Rivers.
5. The Richelieu River Canals, from the St. Lawrence to Lake Champlain.
6. The Red River Canals.

St. Lawrence River Canals

The first of these groups, and the only one dealt with in this paper, is the most important, as it forms a great chain of inland navigation, extending about 2,339 miles from the Straits of Belle Isle Westward to Duluth, at the head of the Great Lakes. It passes through some of the best agricultural and mineral lands in the interior of the continent, and provides them with navigation facilities for internal and external traffic such as are enjoyed by no other inland region of equal size. At the head of the great chain is Lake Superior, about 385 miles long from west to east, and 602 feet above the sea. At its eastern end it narrows in to the St. Mary's River, which carries its surplus waters to Lake Huron through a course of 59 miles, in which are rapids, overcome by the American and Canadian Ship Canals. Lake Huron is about 220 miles long from North to South, and 581 feet above the sea. At its southern end it narrows into a channel 82 miles long, and known as the St. Clair River, St. Clair Lake and Detroit River, through which the surplus waters of the Lake flow into Lake Erie. A ship channel has been dredged through the sand flats of these rivers and lake.

Lake Michigan is the same elevation as Lake Huron, and joins it at its head, but does not form a link in the main chain of inland navigation.

Lake Erie is about 243 miles long, from the western end, at the mouth of the Detroit River, to its eastern end at the head of the Niagara River, and is 572.5 feet above the sea level. The eastern end of the Lake overlaps the western end of Lake Ontario, and at the eastern end of the peninsula thus formed is situated the Niagara River, which crosses the peninsula in a north and south direction, and carries the surplus waters of the Lake on to Lake Ontario. In a distance of thirty-five miles it falls 326 feet. Communication between the Lakes is obtained by the Welland Canal, which crosses the peninsula about fifteen miles West of the Niagara River.

Lake Ontario, the most eastern of the Great Lakes, is about 160 miles long, from Port Dalhousie, the end of the Welland Canal, to Tibbets' Point, and is 246 feet above the sea level. At Tibbet's Point, Lake navigation ends, and river navigation begins.

The waters of the Lake Plateau, about 270,000 square miles in extent, flow out of Lake Ontario at the rate of about 220,000 C.F.S., by the St. Lawrence River, which carries them for 750 miles to the Gulf of the same name. For the first 182 miles of its course, as far as Montreal, it is crossed by spurs of the Laurentian Mountains, which act as dams, and divide the river into a series of long still water reaches, separated by rapids, with a total fall of 221 feet between Lake Ontario and Montreal. The rapids are overcome, in a descending order by the Galops, Morrisburg, Farran's Point, Cornwall, Soulanges and Lachine Canals. Below Montreal the river, with a fall of 25 feet, widens out at intervals into broad expanses of shallow water till it meets the tidal flow about 50 miles below the city, and from there continues broad and deep to the Gulf, a further distance of 500 miles.

History of St. Lawrence Canals

This great and historic river is the natural outlet for the export and import traffic of the Lake region, and provides the only route for a continuous descending channel from the Great Lakes to the Ocean. In all probability the first excavation undertaken for Canal purposes upon the St. Lawrence, was begun in 1700 by the Rev. Dollier de Casson, Superior of the Seminary of St. Sulpice, Montreal, who undertook to cut a channel providing a depth of 18 inches for a combined canal and mill race, but without locks, from Lachine to Montreal, via the Little River St. Pierre, and the small lake of the same name. The work was arrested by the failure of the contractor, Gédéon de Catalogne, in 1701. Various unsuccessful attempts were made to revive the work between 1717 and 1733, but the scheme was finally abandoned on account of its cost. The first Canal and lock on the route opened for traffic was the small canal, and lock 38 feet long, 8¾ feet wide, 9 feet lift, for 2½ foot draught, built at Sault Ste. Marie by the Northwest Fur Company in 1798.

The first lock canals built on the St. Lawrence were the Haldimand Canals, built by the Royal Engineers, for military purposes, 1779-1783, around the lower and upper rapids between Lakes Sts. Louis and Francis. These locks were 40 feet long, 6 feet wide, with 2½ feet of water on the sills. They were enlarged (1800-1804) to 110 feet long, 12 feet wide, with 4 feet depth on the sills.

After the War of 1812, a joint commission of Upper and Lower Canada reported in favor of a canal system with four feet depth of water for the St. Lawrence River, and in 1821 Government commissioners were appointed to build the Lachine Canal, which was completed in 1825. The first canal was 28 feet wide on the bottom, and 4½ feet deep, with locks 100 feet long, and 20 feet wide.

Shortly after the opening of the canal the Royal Engineers, then constructing the Rideau Canal, recommended for the St. Lawrence larger and wider locks and double the depth of water. It was not, however, until 1834 that Upper Canada began the construction of the Cornwall canal, and twenty-three years had elapsed after the opening of the first Lachine Canal before the last of the St. Lawrence Canals for 9 foot depth were completed and opened by Upper and Lower Canada for traffic in 1848, between Montreal and Prescott. The locks of these canals has a length of 200 feet, and a minimum width of 45 feet.

Welland Canal

In 1816 the Parliament of Upper Canada appointed a joint committee of both Houses to report upon inland navigation, and in 1823 a Commission reported in favor of constructing the Welland Canal for the class of vessels then navigating the Lakes.

The first canal, however, was built as a private enterprise, by the Welland Canal Company, formed by the late Honorable William Hamilton Merritt, and incorporated with a capital of £40,000 for that purpose in January, 1824. It completed the canal, via the Twelve Mile Creek, to Port Robinson in November, 1829 (four years after the opening of the Erie Canal), when two vessels, one British and one American, were taken from Lake Ontario to Port Robinson, on the Chippawa River, by forty wooden locks, 110 feet long, 22 feet wide, and 8 feet depth of water. At Port Robinson the schooners descended the Chippawa to the Niagara River, and thence to Lake Erie.

The ridge dividing the Twelve Mile Creek and the Chippawa River involved a cut 70 feet deep and two miles long, in order to feed the Canal from the River. Owing to slides occurring in the cut, due to encountering quick sand strata in the bottom, it became imperative to seek a source of water supply higher than the Chippawa River. The configuration of the country between Port Robinson and Lake Erie, as well as that of the Grand River was found to be so favorable that by building a dam six feet high across the river, water was obtained at a height sufficient to excavate the canal channel through the deep cut above the level of the quick sand strata. The feeder was twenty-seven miles long, and crossed the Chippawa River on a wooden acqueduct four miles above Port Robinson, where connection was made with the river by two locks.

In 1831 the Government of Upper Canada loaned the Company £50,000 for improving the canal, and continuing it from Port Robinson to Port Colborne, on Lake Erie, and in 1833 was opened what may be considered as the present Canal between Port Colborne and Allanburg, but fed from the Grand River.

In 1834 the legislature decided to purchase the canal from the Company, and after the Union of Upper and Lower Canada an Act was passed to enlarge it for nine feet navigation, and to complete the remainder of the St. Lawrence Canals, only one of which had been begun by Upper Canada before the Union. The first work done on the Welland was the enlargement of the Canal between Port Dalhousie and the feeder junction, (one mile south of Welland). The forty wooden locks were, by increasing the lifts, replaced by twenty-seven stone locks, each 150 feet long, 26½ feet wide, and 9 feet depth on the sills. The feeder from the Junction was also enlarged, and the Port Maitland Branch built which afforded an outlet to Lake Erie at Port Maitland. This route was opened for navigation in 1845. The section of the canal between the feeder junction and Port Colborne was then enlarged, and opened for nine feet navigation in 1850.

As the completion of the second canal coincided with the completion of the St. Lawrence Canals in 1848, a boat about 140 feet long, 26 feet beam, and 9 feet draught could then for the first time pass via the St. Lawrence Route from Montreal to Chicago.

In 1853 it was decided to increase the navigable depth to 10 feet, which was done by raising the locks and banks, but it was not until about 1881 that the Canal was fed from Lake Erie.

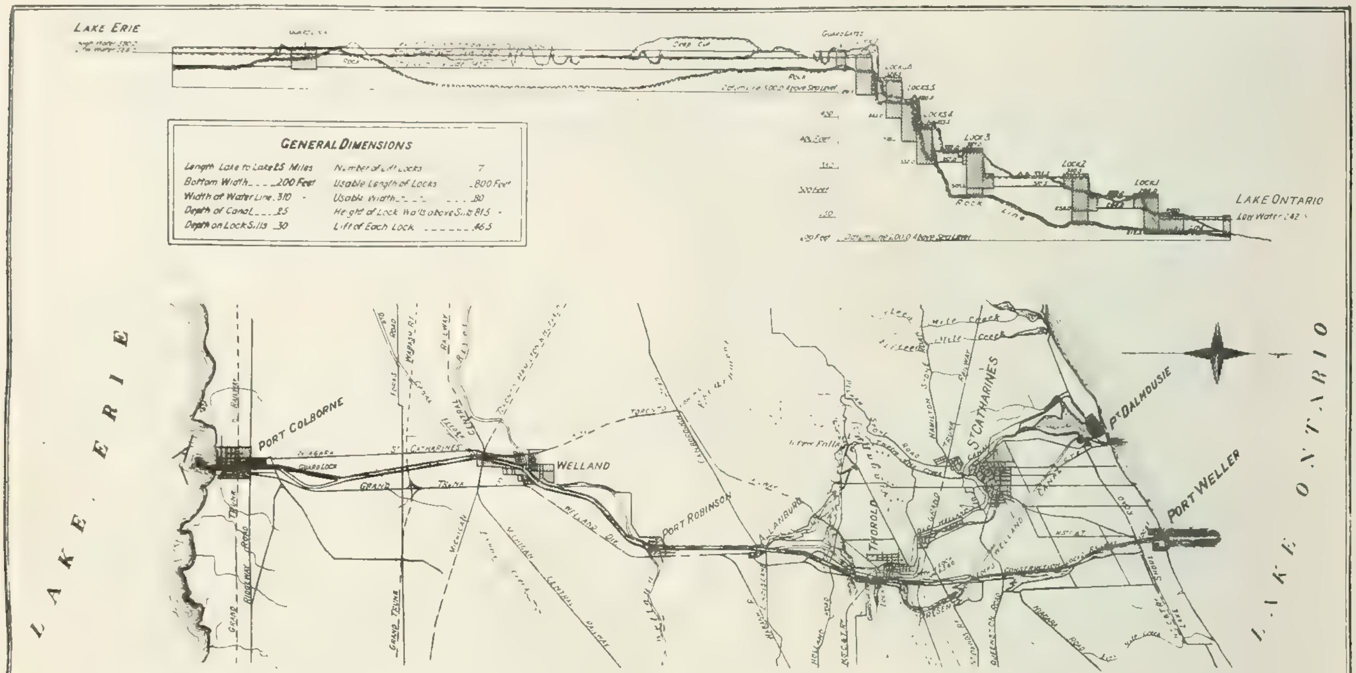
The Second Welland Canal

Twenty-two years later Upper and Lower Canada had completed the 9 foot navigation improvement of the St. Lawrence system, the Dominion of Canada took up the question of inland navigation, and appointed a commission in 1870 who, in their report of February, 1871, recommended a uniform scale of navigation for the St. Lawrence and Welland Canals, with locks 270 feet long, 45 feet wide, and 12 feet depth of water on the mitre sills. The work was proceeded with on these dimensions, but before any locks were built Parliament, in 1875, ordered the canals to be deepened so as to pass vessels drawing fourteen feet of water, but did not change the length or width of the lock chambers. Unfortunately the new Welland Canal was constructed on this plan, and completed to 12 feet depth in 1882, with Lake Erie as the feeder, at a cost of about 14 millions of dollars. The additional two feet cost about two more, so that the change from nine feet to fourteen feet draught cost about 16 millions of dollars. The canal was opened to traffic for fourteen feet navigation in 1887, and the St. Lawrence River Canals in 1901, when the Northwestern Steamship Company, of Chicago, placed a fleet of four steamers in commission between Chicago and Europe. On more than one occasion the boats were loaded slightly over the 14 foot limit.

The short-sighted policy of 1870 left the Welland canal as much or more out of date in 1887 than it was when the improvements were begun in 1872, whereas a moderate increase in the length of the locks alone would have enabled a large part of the Lake fleet even of 1901 to descend to Montreal, instead of being confined to the Upper Lakes, to the manifest disadvantage of the St. Lawrence Canals which, with the present Welland Canal, cost Canada up to the 31st March, 1919, [illegible] on capital construction, and [illegible] for repairs and maintenance. These amounts do not include the original cost and maintenance charges of the Port Colborne Breakwaters, built by the Public Works Department, and the aids to navigation built and maintained by the Marine Department between Port Colborne and Montreal.

These canals, locks and river channels are entirely inadequate for use by the Great Lake steamers of today, and can now be considered as of little more than barge size. The improvement of the St. Lawrence Canals to such dimensions as would carry ships of at least 25 feet draught has been the dream of many, and the special hope of those localities, and those persons deeply interested in enterprises that would be specially benefitted by such a development. During the past quarter of a century two very exhaustive surveys have been made to determine the feasibility and cost of such a waterway, and another is now being carried out.

Concurrently with the opening of traffic for vessels drawing fourteen feet of water via the St. Lawrence, the Departments of Railways & Canals and Public Works began improvements to Port Colborne Harbour, consisting of deepening it to twenty-two feet, constructing a million bushel modern elevator, and building of large breakwaters. The construction of these works, and public agitation for the building of a Canadian deep waterway via the Welland Canal and St. Lawrence River, versus the Georgian Bay Route, finally led to exhaustive surveys being made for a ship canal across the Niagara Peninsula. These surveys were carried out between 1907 and 1912,



THE WELLAND SHIP CANAL

SCALE OF MILES

Surveys for Routes from the Great Lakes to the Atlantic

In 1897 the United States Government appropriated funds to make surveys and examinations of deep waterways betwwen the Great Lakes and the Atlantic. The Board of Engineers appointed for this purpose submitted their report in 1900, covering the estimated cost of a waterway 21 feet deep, with locks 600 feet long and 60 feet wide, and for a waterway 30 feet deep, with locks 740 feet long and 80 feet wide. Among other routes investigated by the board was the St. Lawrence—Champlain Route, which followed the river to the foot of Lake St. Francis, and thence across country to Lake Champlain and the seaboard via the Hudson River.

In 1904 the Public Works Department appointed a Board of Engineers to investigate the feasibility and probable cost of a deep waterway from the Great Lakes to the Seaboard via the French and Ottawa Rivers. The Board reported in 1909 that a twenty-two feet waterway, with locks 600 feet long, 60 feet wide, and 20 feet depth on the sills, would cost about $100,000,000.00.

under the direction of J. L. Weller, M.E.I.C., superintending engineer of the Welland Canal. Several routes were examined, but all were found unsatisfactory except the one via the Ten Mile Creek, on account of the poor material found at the sites of the large structures. When the route of the Ship Canal was finally adopted, and the Government had decided to proceed with its construction, Mr. Weller was transferred from the present canal to the position of engineer in charge of the surveys, design and construction of the new Canal, under W. A. Bowden, M.E.I.C., chief engineer, Department of Railways & Canals, which position he continued to fill until the work was closed down in 1917, owing to the European War.

Welland Ship Canal

The Ship Canal, as finally located, follows the valley of the Ten Mile Creek between its mouth, about three miles east of Port Dalhousie, and Thorold, crossing the present canal below Lock No. 11, where the water level of both is at elevation 382.0. Between Thorold and Allanburg a new cut will be made for the purpose of straightening the alignment of the canal between these points. The Ship Canal will again leave the present one below Lock No. 25, where the water levels of both are at elevation 569.0, the extreme low water level of Lake Erie above sea level. From Allanburg to Port Colborne on Lake Erie, it will follow closely the course of the present canal.

The total length of the canal will be twenty-five miles and for all practical purposes of navigation, it is a straight line throughout. It is 2¾ miles shorter than the present one. The fall of 325½ feet between the Lakes is to be overcome by seven locks of 46½ feet lift each. The direct line of the canal down the face of the escarpment, and the topography of the lower plateau, permitted the adoption of these high lifts, which constitute a peculiar feature in the design of the canal, and has no precedent in actual construction for locks of their size. The few locks required permit a rapid descent into Lake Ontario and diminish the time required for vessels to pass through the canal. The usable dimensions of the locks are 800 feet long, 80 feet wide, with 30 feet depth on the sills. The canal will be made 200 feet wide on the bottom, with 2 to 1 slopes, and for the present will be excavated to a depth of twenty-five feet only. All structures, however, will be built for 30 feet depth, so that the canal, at some future date, can be enlarged by simply dredging out the canal prism and harbour entrances.

The above dimensions on the canal prism give a wet section of about four times the immersed section of a ship of 75 feet beam and 22 feet draught, which may be expected to use the canal on its completion, and when completed to the 30 feet depth the ratio of channel to the immersed section of the largest ship will be about 3½.

At the Ontario end of the canal Port Weller Harbour is being formed by two earth embankments extending one and one-half miles out into the lake, where the depth is 30 feet at extreme low water. The banks are being formed from the materials excavated from the canal prism, and will be protected on their inner and outer slopes with rock. The banks are parallel to one another, and provide a channel 800 feet wide, and 5,000 feet long, which, at the entrance, is narrowed to 400 feet wide by two converging lines of reinforced concrete crib work. From the shore the harbour channel extends inland about one-half mile, gradually narrowing from 800 to 200 feet in width to Lock No. 1, 9,500 feet from the harbour entrance. The Harbour docking is being built of reinforced concrete cribs. The docking on the west side of the harbour is connected with Lock No. 1 by a long entrance pier of reinforced concrete. Above Lock No. 1 the canal follows the bed of the creek to Lock No. 4. Lock No. 2 is situated about one and one-half miles above Lock No. 1, where the rock surface was fortunately found at an elevation slightly below that required for the lock foundations. Lock No. 3 is located just north of the present canal, or about 2½ miles South of Lock No. 2. The rock at this point is about twenty feet lower than required for the foundation of the structure.

As a lockage requires about 70 acre feet, it is essential that there be a large pondage area above each lock, in order to avoid drawing down the levels as little as possible when filling the locks. For this purpose the configuration of the valley east of the canal was fully made use of in creating regulating ponds above the locks. That above Lock No. 1 has an area of 107 acres, No. 2, 200 acres, and that above No. 3, 140 acres. The surplus flow through the canal will be regulated by weirs at the side of the locks.

Locks Nos. 4, 5 and 6 are twin locks in flight, one will be used for up-bound vessels, and the other for down-bound vessels, a double flight being necessary in order to save long delays to vessels passing through these locks. They are situated on the face of the escarpment, and in order to create a regulating basin of 86 acres above Lock No. 6 an earthen dam, with a maximum height of 75 feet, and about 3,300 feet long, extending from the head of Lock No. 6 across the present canal above Lock No. 19 to the high ground East of it will be built, with a concrete core wall of selected material from the canal excavation.

Welland Ship Canal completed portion
Harbour Wall Port Weller.

The head of Lock No. 7 is opposite Peter Street, Thorold, or opposite Lock No. 24 of the present canal, the distance between the foot of the Lock and the head of Lock No. 6 being only about 3,000 feet. It is fed from a small pond of twenty-seven acres formed by flooding the upper end of the Ten Mile Creek Valley lying East of the canal. This pond, however, will have direct communication through the channel of the present canal with the summit level of the Ship Canal above the twin Guard Gates, which are located about a quarter of a mile above Lock No. 7, where the main line of the Niagara, St. Catharines & Toronto Railway crosses the Canal.

Between the Guard Gates and Allanburg a new channel, on a direct line, will be excavated, and the present canal between these points abandoned. From Allanburg to Port Robinson the present canal, known between these points as "the Deep Cut", (maximum depth 80 feet), is being widened on the west side, and deepened for twenty-five feet draught.

Between Port Robinson and Welland it is proposed, instead of straightening and enlarging the present canal, and building a new aqueduct to carry the Ship Canal over the Chippawa at Welland, to raise the level of the river permanently about six feet, to the summit level of the canal, elevation 568.0, by means of a dam across the river at Port Robinson, which would be provided with stop-log sluices for allowing freshet and other surplus waters to flow through the dam back into the river, and out into the Niagara at Chippawa as at present. The river valley would then be used as the canal channel from Port Robinson to Welland, and the present aqueducts dredged out.

From Welland to Ramey's Bend the present canal will be deepened, and widened along its Western bank, and a new cut made across the point that forms the bend for the purpose of straightening the canal opposite the point. From Humberstone, immediately south of Ramey's Bend, to Port Colborne, the Canal will be deepened, and widened on the west side.

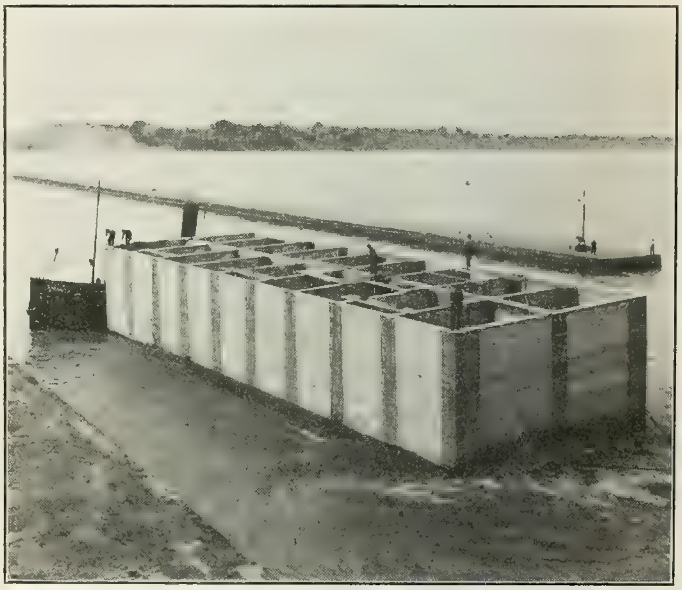
The improvements to Port Colborne Harbour will consist of deepening the inner and outer harbours to the twenty-five foot depth, and the entire removal of the old guard locks and supply weir at the North end of the Harbour. A new guard lock will be built in the new cut north of Humberstone, and a supply weir built across the section of the present canal that will be abandoned, at Ramey's Bend. It is also proposed to build a new western breakwater, extending 2,000 feet further out in the lake than the present one, for better protection to the Harbour during high gales. The new breakwater would consist of a rock bank, built from the rock excavation north of Port Colborne.

There will be thirteen highway bridges, three combined highway and electric railway bridges, one electric railway bridge, and five steam railway bridges across the canal. These bridges will have 80 feet clear spans where they cross the foot or head of locks, and 200 feet clear spans where they cross the canal prism. They will all be bascule bridges, except where local conditions will permit the economical and satisfactory use of the old reliable swing bridge. The electric railway bridge, a swing span carrying the main line of the Niagara, St. Catharines & Toronto Railway over the canal at the Guard Gates has been completed, and the substructures for several of the bascule spans are being built.

For the economical construction of the canal between Lake Ontario and Thorold the Government built and operates a double track standard gauge railway between these points, along the West side of the Canal. It connects with the Grand Trunk Railway at Merritton, and with the Niagara, St. Catharines & Toronto Railway at Thorold and Port Weller, and is equipped with a complete interlocking and block signal system, and a telephone train despatching service.

During the working season of 1915, 1,700,000 cubic yards of excavated material were handled over the railway to the Port Weller Harbour embankments, together with a large quantity of other material that was deposited as back-fill behind the structures. There were also 270,000 tons of crushed stone for concrete, sand, cement, and other miscellaneous freight taken over the railway. As an instance of the volume of traffic taken over the line during the middle of 1915, there were 5,917 loaded and empty trains moved in July, or an average of 228 trains per day. As many as 360 trains have been handled over the line in twenty-four hours.

As the construction of the Canal is only begun, and very few of its structures under construction, the time is not opportune for a highly technical discussion of the problems involved in their design and construction, and that of the machinery for their operation, the plans for the latter being only of a tentative character at present. A brief description of the main features of the more important ones will, therefore, only be alluded to now.



Welland Ship Canal towing Concrete Crib from Port Dalhousie Harbour.

Reinforced Concrete Cribs

The standard cribs are 110 feet long, 38 feet wide, and 34 feet high, divided into 18 compartments by one longitudinal and eight cross walls. The front and rear walls vary from 12 inches thich at the top to eighteen inches thick at the bottom, and the end walls from 15 inches to 21 inches, and the longitudinal and cross walls from 10 inches to 14 inches. Along the face of the cribs a heavy wall, about 7 feet high, is built of reinforced concrete blocks and mass concrete. The blocks are 9 feet long, 9 feet 3 inches wide, and 3 feet high, and are supported at the face by the wall of the crib, and at the rear end by concrete beams built between the cross walls of the crib. Above these blocks the wall is finished to coping level in mass concrete.

A standard crib contains 934 cubic yards of concrete, and 120,000 lbs. of steel rods, three-quarter inch diameter, and weighs approximately 2,000 tons.

Each crib is built to its full height upon a floating pontoon about nine feet high, and so constructed that when the crib is finished the sides and ends can be released and allowed to float away, while the heavily ballasted bottom sinks to the bottom below the crib.

Before the pontoon is released from the crib temporary wooden bottoms are fitted in each compartment, for the purpose of floating the crib into position on removal of the pontoon. When the crib has been sunk, by filling it with water through valves in the temporary bottoms, the latter are released, and recovered for use over again. The crib is then filled with shale and rock from the harbour excavation.

When the crib seats have been dredged out, three rows of stone, broken to macadam size are deposited through a pipe on the lines of the face, back and centre longitudinal walls, for the purpose of providing as nearly as possible a level foundation for the crib to rest upon when sunk in position. This method of building and sinking the cribs has proven satisfactory. There will be forty-six cribs required for the Port Weller Harbour docking, eighteen of them have been built and sunk in place.

Locks

Locks Nos. 1, 2, 3 and 7 are single locks, each $46\frac{1}{2}$ feet lift. Locks Nos. 4, 5 and 6 are twin locks in flight, each $46\frac{1}{2}$ feet lift. The Guard Lock is a single lock, with a variable lift between nothing at extreme low water of Lake Erie, to several feet at high water.

The locks are designed to pass vessels of 800 feet in length, and 80 feet in breadth, with a maximum draught of 30 feet. In general, they will only have one service gate at the head, and one at the foot. In addition to the service gates, Locks Nos. 1 and 4 will be provided at their lower end with unwatering gates, and the guard lock will also have unwatering gates at each end of it.

Welland Ship Canal. West Wall Lock No. 1.

As a guard against accident the gates will be protected by ship fenders placed below the lower gates, and above all gates, where required.

The upper gates are placed on top of the breast walls which correspond in height to that of the sill. These walls will remove the cause of probably nine-tenths of the accidents which occur on the present canal, namely, vessels carrying away the upper gates of the locks by striking them while entering from the lower reach. If a vessel goes ahead too far in the Ship Canal locks, she will strike against the breast wall, and damage herself instead of the gate.

Welland Ship Canal. Lower West Entrance Wall Lock No. 1 in process of backfilling, looking south.

Filling the Locks

To fill and empty the chambers, one culvert 14 feet wide and 15 feet high, with an area of 210 square feet, running lengthwise of the lock, will be built in the base of each wall. Each of these culverts will be controlled by Tainter or Stoney valves at their intake and outlet ends. At the locations of the valves the culverts are divided into two parts by a middle pier, it being considered undesirable to attempt to control the whole culvert with one valve. The side wall culverts open directly into lateral culverts 26 in number. Each of these laterals has an area of 12 square feet, and discharges horizontally into the lock chamber. The floors of the side wall culverts and their laterals are at the same elevation as the top of the lower gate platforms.

Welland Ship Canal, Lock No. 1. Looking towards Breastwall.

The intake and valve chambers controlling the culverts in both walls are located side by side, on the east side of the locks, and immediately in front of the regulating dams at the head of the raceways beside the locks. The water feeding the culverts in the west walls is passed through a syphon culvert under the chamber floor immediately in front of the breast walls. This method of drawing water from the regulating ponds instead of directly from the canal above the locks will tend to prevent the formation of objectionable currents in the upper entrances of the locks. All the culverts discharge directly into the lower entrances of the locks, and as the two streams flowing in opposite directions will meet each other squarely in the centre of the channel, hey will tend to destroy each other, and be forced to pread out, and take a new, and comparatively quiet leparture down the canal. In this manner it is not xpected that vessels waiting below the locks will be eriously inconvenienced by the currents and surges esulting from emptying the locks.

The middle wall of twin locks Nos. 4, 5 and 6 is 60 eet wide at the bottom. In its base are two separate nd independent culverts of 210 square feet area each, with 26 laterals per lock chamber. These culverts are controlled at the upper and lower end of each lock by large valves, in the same manner as the culverts in the side walls of the single and twin locks. This control is necessary in order that the twin lock chambers may be independent of each other.

The culvert area is such that if all the valves be fully opened at once the lock chamber can be filled and emptied in about 8 minutes. At this rate of filling or emptying, the level in the lock chamber would change at an average vertical rate of 5.8 feet per minute. The method of filling and emptying locks through culverts in the side walls has proven very satisfactory in practice, as the vessel is subjected to very little surge in filling the chamber, and none at all when emptying it.

The lower gates will be 81 feet 6 inches high, and the upper ones thirty-five feet high. They will be made of steel of the horizontal girder, double skin type, and will probably be operated with steel cables.

Records kept by the Superintending engineer of the Sault Ste. Marie Canal show that the time required to pass a vessel through the lock 900 feet long, 60 feet wide, 25 feet depth on sills and 29 feet lift is about 28 minutes between Stop Posts above and below the lock. The actual time of filling the chamber is ten to eleven minutes.

The time to pass vessels between the Stop Posts of the Ship Canal Locks will probably be somewhat less than required at the Sault Ste. Marie lock, and the estimated time of passing a loaded freight vessel through the Canal from Lake to Lake is eight hours, as against fifteen to eighteen hours in the present Canal.

Weirs

At Locks 1, 2 and 3 regulating raceways will be built on the east side of the locks, for controlling the service flow of the canal, and emptying the reaches when required. The raceway will consist of a concrete lined channel, whose level will be about midway between the upper and lower levels. The flow through the raceway will be controlled at the upper end by a dam, with a series of large valves in the base of it for emergency use, and the emptying of the upper pool. Normal regulation will be obtained through shallow stop log sluices on the crest of the dam. The dam controlling the lower end of the sluiceway will be a stop log dam, with deep sluices. The controlling weir for Lock No. 6 will be built in a rock channel, excavated in the rock at the east end of the high earth dam that forms the pondage of Lock No. 6. The flow through the weir will then pass down the present canal to No. 3 Pond. The supply weir at Lock No. 7 will be located on the site of Lock 24 of the present canal.

Welland Ship Canal. Lock No. 2, looking south.

Cost

The estimated cost of the Ship Canal in 1912 was $50,000,000.00. The expenditure to the 31st March 1920, including cost of surveys, engineering expenses and right-of-way was $20,270,[illegible]. The quantities of several of the main items involved in the construction of the Canal are as follows:—

Earth excavation	Cu. Yds.	19,500,000 – 40%	completed
Rock excavation	"	6,000,000 – 22%	"
Watertight embankments	"	1,400,000 – 30%	"
Concrete, all kinds	"	2,400,000 – 20%	"
Steel reinforcing	Lbs.	16,500,000 – 5%	"

Welland Ship Canal. Lock No. 1, from Upper Entrance Wall.

Progress of the Work

For the purposes of construction the canal has been divided into nine sections. Section No. 1 is at the Lake Ontario end of the canal, and Section No. 9 at the Lake Erie end. During the Fall of 1913, Sections Nos. 1, 2, 3 and 5 were placed under contract. The first three sections include the Lake Ontario entrance, the seven lift locks, guard gates, eight bridges, and the canal prism between the Lake and Thorold. Section No. 5 embraces the deepening and widening of the "Deep Cut" on the summit level between Allanburg and Port Robinson.

Welland Ship Canal. Lock No. 2, looking south from Concrete Plant.

Welland Ship Canal. Port Weller Harbour, July 29, 1915.

Owing to the European War the work on the canal practically ceased in 1916, and in the Fall of 1917 the contracts were cancelled, and the work entirely closed down. After the Armistice, November, 1918, the Government decided to resume work on a small scale, and arranged with the former contractors, — The Dominion Dredging Company, Section No. 1; Messrs Baldry, Yerburgh & Hutchison, Section No. 2; Messrs Doheny, Quinlan & Robertson, Section No. 3; and the Canadian Dredging Company, Section No. 5, for the resumption of the work, and which has been continued in a more or less intermittent manner, due to labour troubles, and other causes, since January, 1919.

On Section No. 1 the excavation is about 75% completed, and the concrete work 67%. Lock No. 1, including its upper and lower entrance piers, is about 75% built. The concrete built in these structures to date amounts to 178,000 cubic yards.

On Section No. 2 the excavation is about 77% completed, and the concrete work 30%. Lock No. 2, with its upper and lower entrance piers is about 67% built. About 210,000 cubic yards of concrete have been built in these structures to date. At Lock No. 3 only part of the breast wall has been built.

On Section No. 3 about 60% of the excavation has been taken out, and 5% of the concrete built. Locks 4, 5, 6, 7 and the Guard Gates are located on this section, but no part of these structures are built, except short sections of the upper entrance piers of Lock No. 6.

On Section No. 5 about 77% of the excavation has been taken out, and wasted between the present and old canals North of Allanburg.

The engineering work is under the direction of W. A. Bowden, M.E.I.C., chief engineer, Department of Railways & Canals, and Alex. J. Grant, M.E.I.C., engineer in charge, at St. Catharines. W. H. Sullivan is principal assistant, and next in authority to Mr. Grant. F. E. Sterns, formerly of the Panama Canal Staff, is in charge of designs. For carrying out the engineering superintendence and construction of the works a field force has been established on each contract, with a resident engineer in charge, who has under him several assistant engineers, instrumentmen, inspectors, etc. The resident engineers on the different contracts are, E. P. Johnson, Section No. 1; F. C. Jewett, Section No. 2; F. S. Lazier, Section No. 3; and H. W. Bruce, assistant engineer, Section No. 5.

Increase of Trade

In 1901 the total tonnage passing through the Welland Canal was only about 620,000 tons. In 1914 it had increased to 3,860,000 tons, indicating that since the completion of the 14 feet navigation system in 1901 the St. Lawrence route has gradually drawn more heavily year by year upon the Great Lakes—Atlantic Seaboard trade, and will undoubtedly do so to a greater degree when the Ship Canals are completed through to Montreal, as many of the Western States as far West as Idaho and South to Kansas look upon the St. Lawrence as their natural waterway to the sea, and most direct route to Europe, and from the evidence submitted to the International Deep Waterways Commission this summer, the people of fourteen of these States appear determined to leave no stone unturned to obtain in the near future the construction and completion of the St. Lawrence Ship Canals as an international undertaking, in the firm belief that a Ship Canal to the sea via the St. Lawrence has now become an imperative necessity for the proper economic development of their import and export trade.

This western trade is, at present less than 10% of the vast volume of tonnage that annually passes down the Detroit River, and it is only a portion of it that the St. Lawrence Route and Montreal can compete for against the Erie Canal and railway interests, and those of the ports of New York, Baltimore, etc., who have constantly affirmed that the western trade should not be permitted to descend to Lake Ontario if it were possible to avoid it. They have always contended that once on that level it would be likely to find its way down the St. Lawrence to the Seaboard, and have consequently always been antagonistic to any canal scheme for uniting Lakes Erie and Ontario, even by a route through the State of New York.

The Role of the Welland Canal

These views have been confirmed by the increasing traffic through the Welland Canal since 1901, and if this ever-increasing trade is considered to be of so much importance by the shrewd, far-seeing people of New York, and other Atlantic Seaboard States, who are ever alive to the interests of the Erie Canal, and their seaports, there is every reason to believe that it would be equally beneficial to the people of Canada to secure and retain the control of the lion's share of it by the completion of the Ship Canals, that would in all probability place the St. Lawrence Route beyond the reach of successful competition. A long step towards this end would be the completion of the Welland Ship Canal during this decade.

The Design of the Queenston-Chippawa Power Canal

T. H. Hogg, A.M.E.I.C., Assistant Hydraulic Engineer, Hydro-Electric Power Commission

The power canal for the Queenston-Chippawa Development is one of great interest both from the economic as well as from the hydraulic side. A history and detailed account of the design will not be given in this paper but rather a general description of the economics and hydraulics of the canal that is under construction, together with certain details of the methods that were employed in attacking the problems of design.

The canal is divided into four sections, a profile and typical cross-sections of which are shown in Fig. 1. The first of these is the Welland River section 21,000 feet in length, with a bottom slope 0.000119 and side slopes of 2 to 1. This is being excavated by means of dipper dredge and cableway. The earth section which follows the river section is 6,250 feet long with a bottom slope of 0.0001208 and is to be rip-rap lined with finished side slopes of 1.5 to 1. For each of these sections a roughness factor of .035 in Kutter's formula was used. The earth section of the canal was originally designed as a concrete lined section of much smaller cross-sectional area but a study of the economic, constructional and operating conditions indicated the advantages of the larger section with the rip-rap lining would be sufficient to compensate for the cost of the extra excavation. This portion of the canal has a capacity of over 15,000 c.f.s. with uniform flow at the assumed roughness factor of 0.035, and extreme low water in the Niagara River at Chippawa.

At the end of the earth section is located a transition 300 feet long in which the trapezoidal cross-section is changed to the rectangular rock section of 48 feet finished width with concrete sides and bottom. Beyond this are the control works, which are described in the paper by M. V. Sauer, A.M.E.I.C.

The rock section proper is 36,252 feet long and is divided into two parts by the Whirlpool section which has a length, including transition, of 2,450 feet. The rock portion of the canal has the water section with concrete lined sides and bottom with a finished width of 48 feet. The bottom slope is [illegible] and the roughness factor used in Kutter's formula 0.014. This value is conservative in view of the proposed method of placing the concrete lining. With the steel forms that are to be used and the special provisions being made for alignment of the forms, a smooth plane surface will be obtained on the concrete lining.

T. H. HOGG, A.M.E.I.C.
Assistant Hydraulic Engineer, Hydro-Electric Power Commission

For [illegible] feet the concrete lining will be carried up 32 feet above the finished grade of the canal; for the next 11,500 feet the lining will be [illegible] feet high, and for the remainder 30 feet high, except in the Whirlpool Section where it is carried up to elevation [illegible]. For the greater part of the time the water surface will be above the top of this concrete lining but the friction loss will be reduced by the lower velocities that will then exist in spite of the greater roughness of the unlined rock. Numerous hydraulic

Advance proof of paper to be read at the General Professional Meeting, September 17th.

studies have been made to determine the surface slopes in the canal for various discharges and for various water levels in the Niagara River. In cases where the water surface was above the top of the concrete lining a composite roughness factor was used in which the proportions of the wetted perimeter on the lining and on the rock surface were taken into account. Roughness factors as high as 0.019 resulted in some of these instances.

Determination of Depth and Slope

The depth and slope of the rock section were fixed by an economy study and the decision to use a concrete lining throughout its length was also reached in the same way. The method of arriving at the economic section of the canal will be explained later.

An examination of the profile of the canal (Fig. 1) indicates that the rock surface falls far below the grade of the canal about Sta. 333, rising again to grade about Sta. 349. This occurs in the Whirlpool Section, which is located at Bowman's Ravine or the Whirlpool Gully. Here it is necessary to carry the canal partly on fill and to use a trapezoidal cross-section on account of the foundation upon which the canal is carried .A concrete lining is essential on account of the high velocities. The cross-section is shown in Fig. 1, where it will be seen that the bottom width is 10 feet and the side slopes 1½ to 1. The slope of the bottom is the same as that of the rock section, viz., 0.0002113.

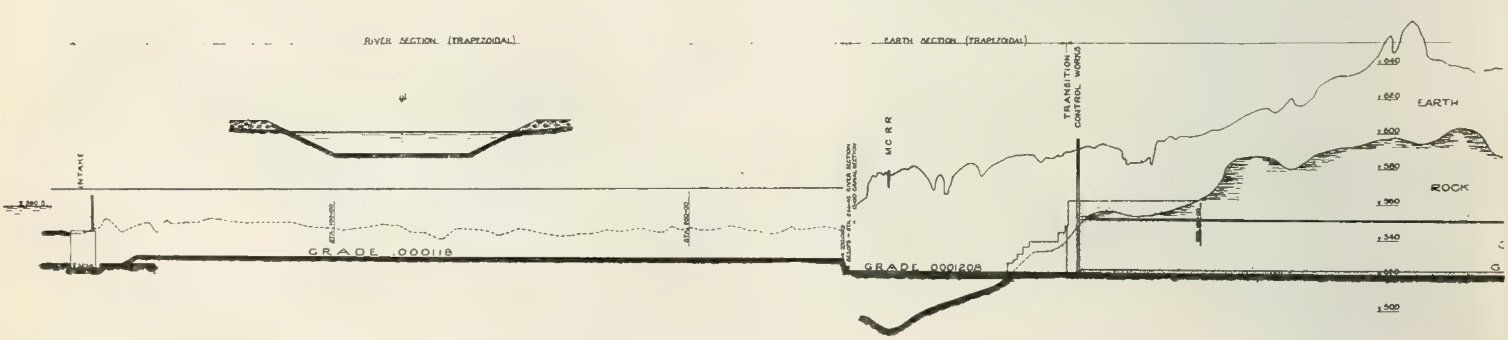
The Whirlpool section of the canal was designed to have the same cross-sectional area at the lowest possible operating water level as that of the rectangular rock section. This minimum water level would be somewhat above elevation 542, which is the elevation of the curtain wall at the screen house. The area of the cross-section below elevation 542 is the same for both and for greater elevations the Whirlpool section has the greater area so that there is no danger of the canal capacity being "choked off" at this point.

In locating the Welland River section the river course was closely followed so as to take advantage of the area of the natural channel. This necessitated leaving in, all the bends that occurred in the unimproved stream. As the deflection of these curves is not great they will not produce any appreciable loss.

The first important change in direction occurs at the beginning of the earth section at Montrose and is followed by a second bend at the Michigan Central Railroad crossing at Montrose. In addition to these there are only five changes of direction in the rock section of the canal, the deflections of which are 51°, 27°, 31°, 33° and 46°. The radius of curvature in every case is 300 feet and this radius is used for the inside and outside of the bend as well as for the centre line. That is, the curves of the two sides and the centre line of the canal are not concentric, resulting in a greater width of canal at the middle of the bend than at either end, the expectation being that the energy losses will be less than in a bend with concentric curves. It is probable that a shorter radius than 300 feet would give even better results, but this minimum was fixed by the size of the electric shovels that are being used for the excavation of canal.

The question of surges of the water surface in the canal, due to changes of load on the plant, is of great importance. This problem has received an amount of study proportionate to its importance, but on account of the limited space of this paper, it will be sufficient to say that the sides of the canal and the floor of the screen house will be built to such an elevation that with the worst combination of conditions the water will always be contained within the sides of the canal.

Observations of river stage at Chippawa have been available since 1902 and show a minimum W. S. elevation of 558.5, which low stage was reached only on two days.



An examination of the past records of Lake Erie stage indicate that as low a stage as 556.0 may be possible at Chippawa. This latter water level is therefore treated as extreme low water and the canal is designed to carry full load at this stage of the river.

While the low water conditions control the size and slopes of the canal, on the other hand the mean water conditions were assumed to be those on which the economic proportions should be based.

Design of Canal Section

Certain limitations were met with at the outset. The Welland River section of the canal had to be maintained as a navigable stream, and as the excavation is in earth this portion of the canal was therefore designed for a low non-scouring velocity. The minimum width of the rock section was fixed by the type of electric shovel used for excavating this portion of the canal and was placed at 48 feet.

The problem thus resolved itself into selecting the best proportions for the trapezoidal earth section and the best depth and slope for the 48 foot rock section. The procedure in the latter case is the one that will be described.

It is, of course, possible to design any number of canals 48 feet wide, but with depth and slope varying so that all will give the same discharge at low water. For a low velocity the wetted cross-section must be deep but its slope may be moderate. For a high velocity the depth of the wetted cross-section will be small but the slope may be so great that the depth of the cut at the down-stream end may be greater and the total cost of excavating greater than for the low velocity design.

The procedure in determining the economic depth was as follows:

First, the design of a number of cross sections for velocities of 3, 4, 5, etc., feet per second, the determination of the required slope of the bed in each case to give the full load discharge with uniform flow, and the determination of the variation in cost of these canals with low water velocity.

Second, the determination of the friction loss in each of these canals with the river stage at its mean value. This friction loss represented so much lost power, which was, of course, small in amount for the lower low water velocities, and greater as the low water velocity increased up to a certain point.

Third, the plotting of the differential curves for items 1 and 2 thus showing the variation in delta cost with low water velocity and the variation in delta power with low water velocity. From these two differential curves a third curve can thus be obtained giving the value of delta-cost by delta-power plotted against low water velocity. Thus there is obtained what will be called an economy curve, showing for any given low water velocity, the rate at which further gains in power may be made at any low water velocity by enlarging the canal slightly and so cutting down velocity and friction loss.

Fourth, the selection of the best low water velocity from this economy curve. This step will now be explained.

The gain in power which results from a slight enlargement of the canal comes as a result of the reduction in friction loss. The additional cost for power house equipment is so small, within the limits in which we are working, that they can be neglected. It is reasonable then to continue the enlargement of the canal until the interest charges on the cost of excavation for the last horse power gained are equal to the average value of the power from the whole plant, including interest, depreciation, operation and maintenance. By stopping short of this point we would be in a position to gain more power at a cost less than the average that we were willing to pay for the power from the whole plant. It is interesting to note that the

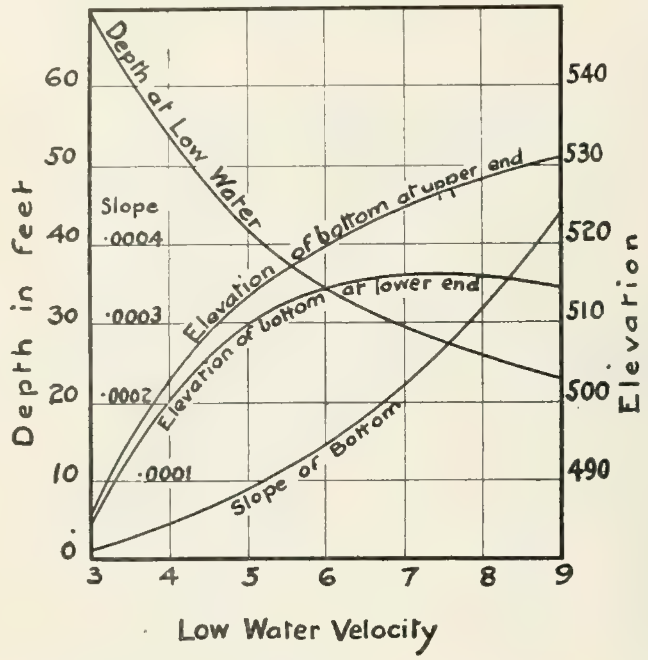


Fig. 3.

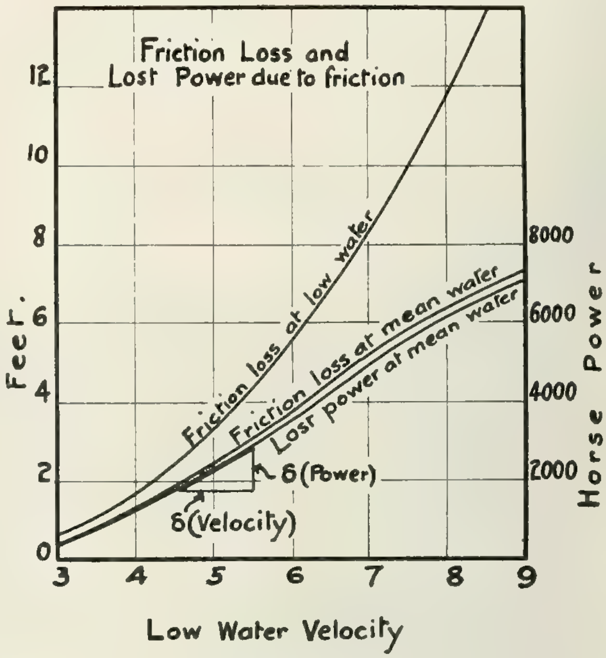


Fig. 4.

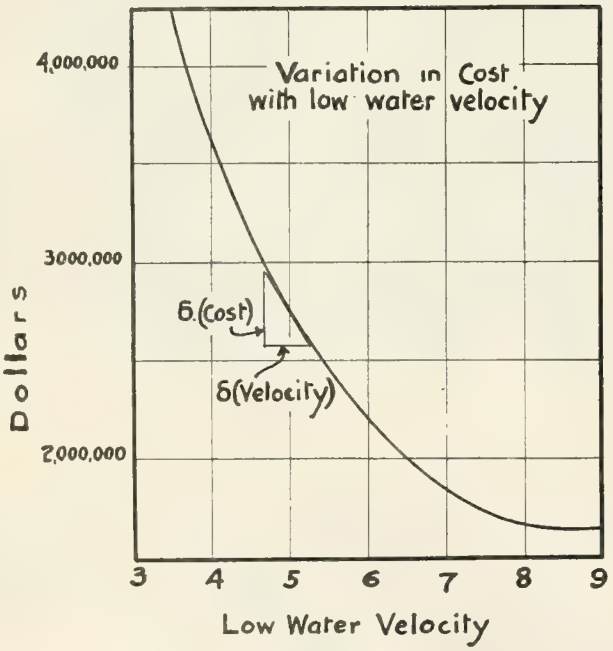


Fig. 5.

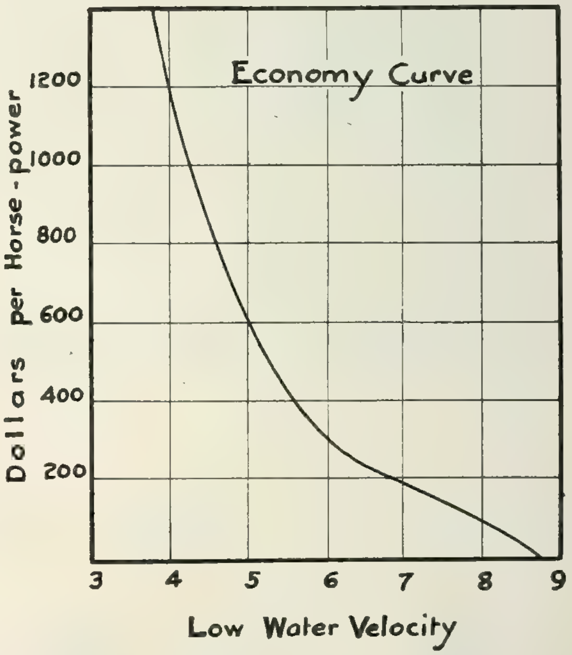


Fig. 6.

H·E·P·C

QUEENSTON CHIPPAWA DEVELOPMENT

CANAL - ROCK SECTION

ECONOMIC STUDIES

economic velocity determined in this way is but slightly greater than the minimum cost at which the canal could be built to get the required discharge at low water. The minimum cost occurs for a velocity somewhat greater than the economic velocity.

The advantage for this method of attack is that it permits an economic size to be adopted for the canal without the inclusion in the estimate of the cost of anything that does not vary with the low water velocity. In this case, the width of the rock cut being fixed, the earth excavation does not vary with the various designs for the rock section and as a matter of fact in computing the cost of rock excavation only that below some assumed horizontal plane at a lower elevation than natural rock surface but above canal grade was considered.

Figures 3 to 6 illustrate a typical economic canal study. The studies from which these figures are taken were for a canal of smaller capacity and greater roughness than the one being built, so that the curves show the method only and do not apply to the present canal.

Figure 3 shows the results obtained in designing for various low water velocities. These designs can be made only when a previous study for the earth section has been completed so that the elevation of water surface at the end of the earth section is known.

Figure 4 shows friction losses and lost power due to friction. The method of obtaining the first derivative of the lost power curve is also indicated.

Only the variation in cost, not total cost, is shown in Figure 5. It is evident that the shape of the curve is the same whether we include the whole cost or only that part which varies with low water velocity. In either case the first derivative will have the same value.

The determination of the form of the economy curve Figure 6 is explained above.

The procedure in the economic design of the earth section of the canal was similar to that for the rock section but somewhat more complicated by reason of the fact that certain changes in the design of the earth section involved changes in the excavation throughout the length of the rock section. The differences in procedure were thus largely a matter of properly taking care of all the variations in cost.

It is the intention at a later date to present a complete detailed description of the methods and analyses used in determining the various hydraulic features of this work. At that time there will be submitted the calculations covering the economics and hydraulic characteristics, so that these may become a permanent record for use on similar work.

Hydraulic Installation of the Queenston-Chippawa Development

M. V. Sauer, M.E.I.C., Hydraulic Engineer of Design, Hydro-Electric Power Commission.

The purpose of this paper is to describe briefly the pertinent features in the Hydraulic Installation of the Queenston Development with a short discussion of the reasons that led to the various designs adopted. On completion of the work and after the plant has had a thorough workout, it is expected that a paper will be presented to *The Institute* covering in fuller detail the complete layout, with a full comparison of the results obtained in operation as against those predicted in the design and determined by the various mathematical analyses employed therein.

The features to be touched on in this paper cover:—

Canal Control Gate,
Ice Chutes,
Screens,
Removable Gates,
Penstocks,
Johnson Valves,
Turbines,
Governor System,
Control Pedestals,
Service Units.

Canal Control Gate

A single motor-operated vertical lift roller gate for the purpose of controlling or entirely shutting off the flow will be installed at the upper end of the canal near Montrose where the earth section of the canal merges into the rock section. The combination of span and head make this gate the largest ever built and particular attention is being paid to the roller design in order to secure bearing loads well within safe, structural and operating limits. The clear width is 48 feet and the height of the gate is 42½ feet.

Volume of Water Delivery

It is of course essential that the canal shall deliver sufficient water to the power plant under the most adverse conditions of water level in the Niagara River. The canal is therefore designed to deliver a quantity of water equal to its rated capacity when the river is at its lowest stage.

The general arrangement of the control gate is shown in Fig. 1. It will be noted that the lift is extended to a point 14 feet above the water level and this has been done in order to permit a patrol tug to pass freely up and down the canal when the gate is in normal position, i.e. wide open.

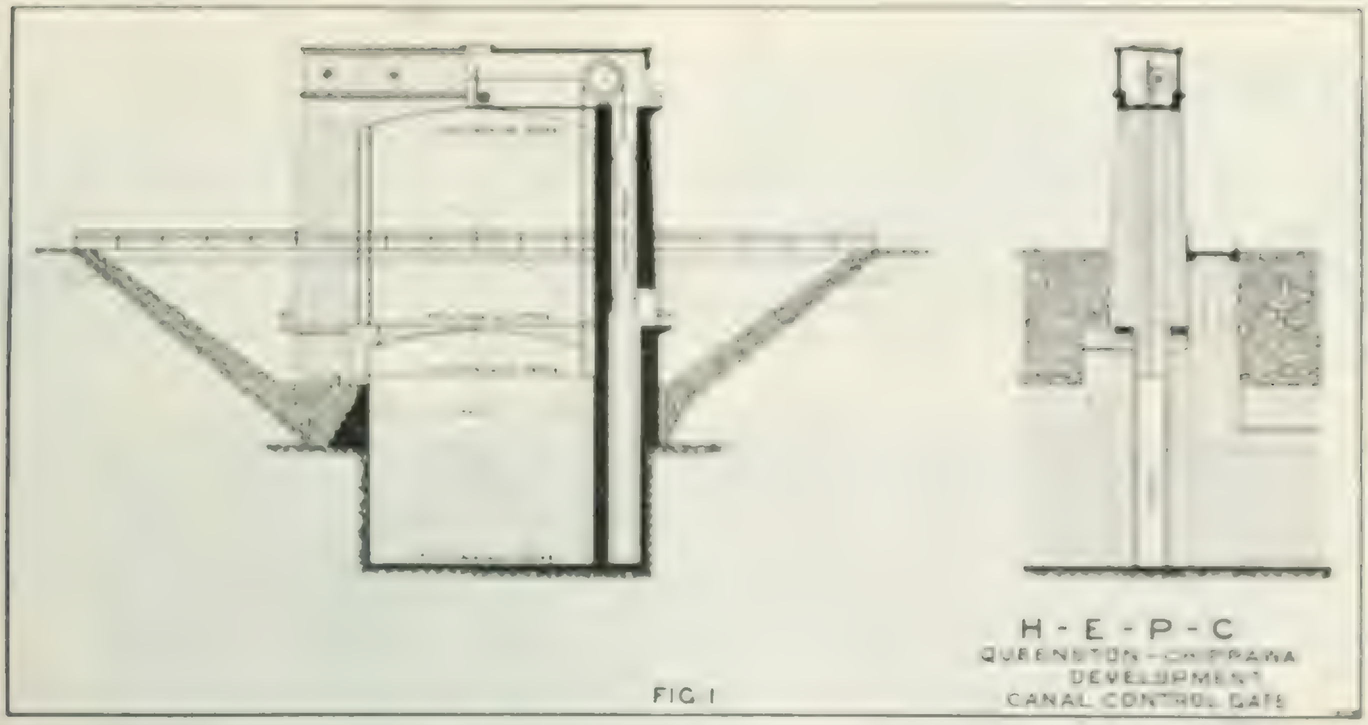
Advance proof of paper to be read at the General Professional Meeting, September 17th.

The gate will be counterweighted and operated by a motor connected through a worm drive to the two main hoisting gears, and the motor will be provided with distant as well as local control so that the gate can be operated from the power house if required.

M. V. SAUER, M.E.I.C.
Hydraulic Engineer of Design, Hydro-Electric Power Commission.

The gate itself will be made up with horizontal trusses spanning the opening and vertical beams to which the skin plate will be rivetted. It is not important that the gate be absolutely watertight when closed although "stanching" bars will be provided to insert between the skin plate and the end guides which will make it practically tight.

A comparative analysis of costs and operating conditions was made on the single gate as against two gates with an intermediate pier, and it was found that the cost of a single gate and superstructure did not exceed the cost of the twin gates, on account of the additional construction required by the intermediate pier and the necessary widening of the canal to keep down the velocity to normal. When the added advantage of having a clear unobstructed waterway was taken into account as well as the simplified operation of a single gate in place of two, the decision was entirely favorable to the single large gate.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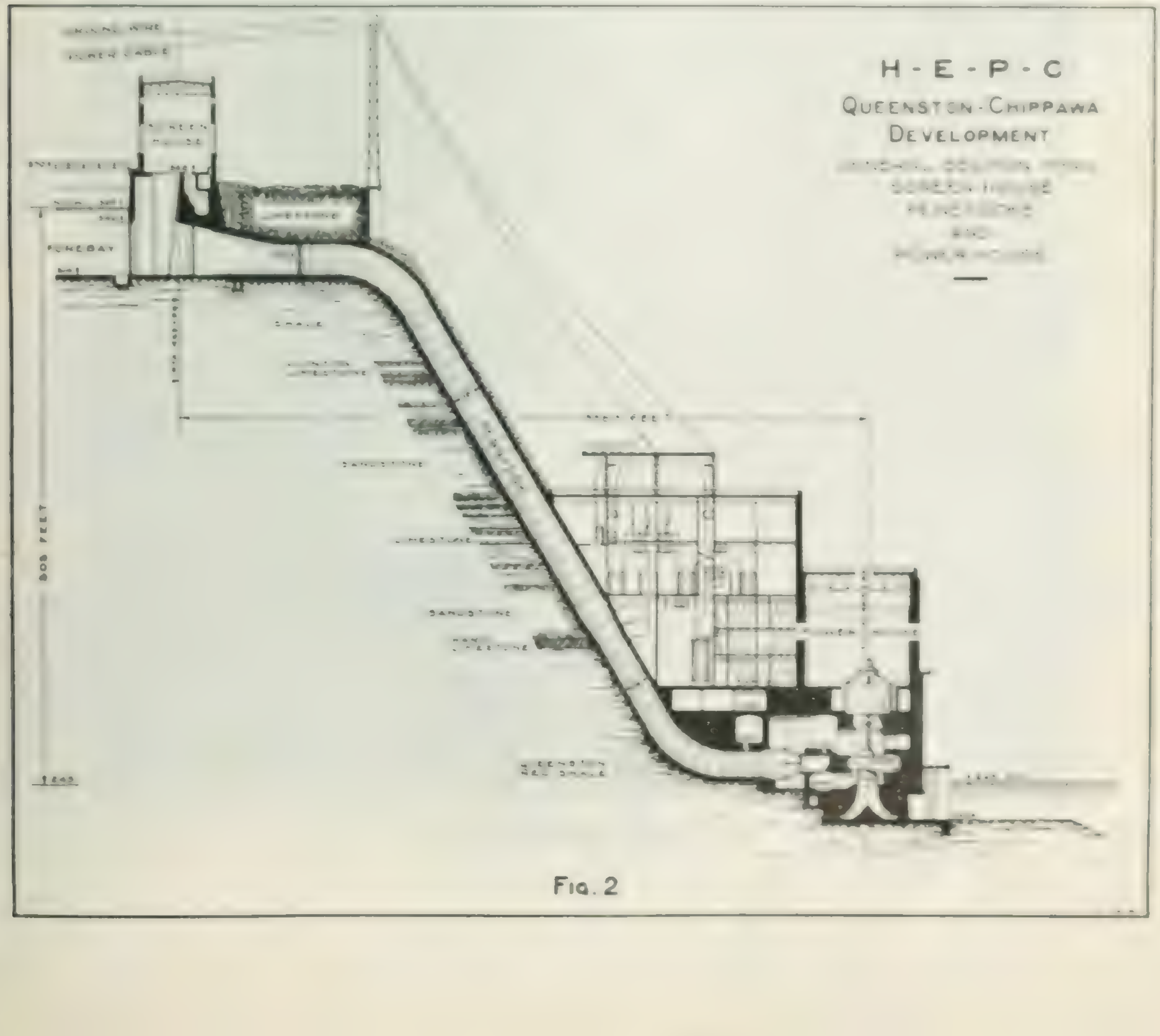
QUEENSTON-CHIPPAWA
DEVELOPMENT
CANAL CONTROL GATE

FIG. 1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DEVELOPMENT
FOREBAY
SHALE
SANDSTONE
LIMESTONE

FIG. 2

Ice Chutes

It is expected that the intake as designed will take in water from the Niagara River, absolutely free from floating ice, but to take care of any ice that may form on the surface of the canal or the Chippawa River channel a small ice chute is being provided at the lower end of the forebay. It consists simply of an opening through the screen house provided with a drop gate which can be lowered below the water surface for a depth of 12 feet. The discharge over the gate is carried through the screen house and down the cliff and under the power house to the lower river in a reinforced concrete pipe 10 feet in diameter.

An elaborate design of ice skimmer has been made up which if found necessary can be installed later on. This consists, in general, of a reinforced concrete horizontal pivoted leaf which can be raised or lowered in accordance with the water stage so that floating ice will be skimmed off the surface to a discharge channel, at the same time allowing the clear water to pass underneath. Provision is now being made in the outer wall of the curve in the canal immediately above the forebay so that this skimmer can be installed in the future if it is found that sufficient capacity is not provided in the smaller ice chute through the screen house.

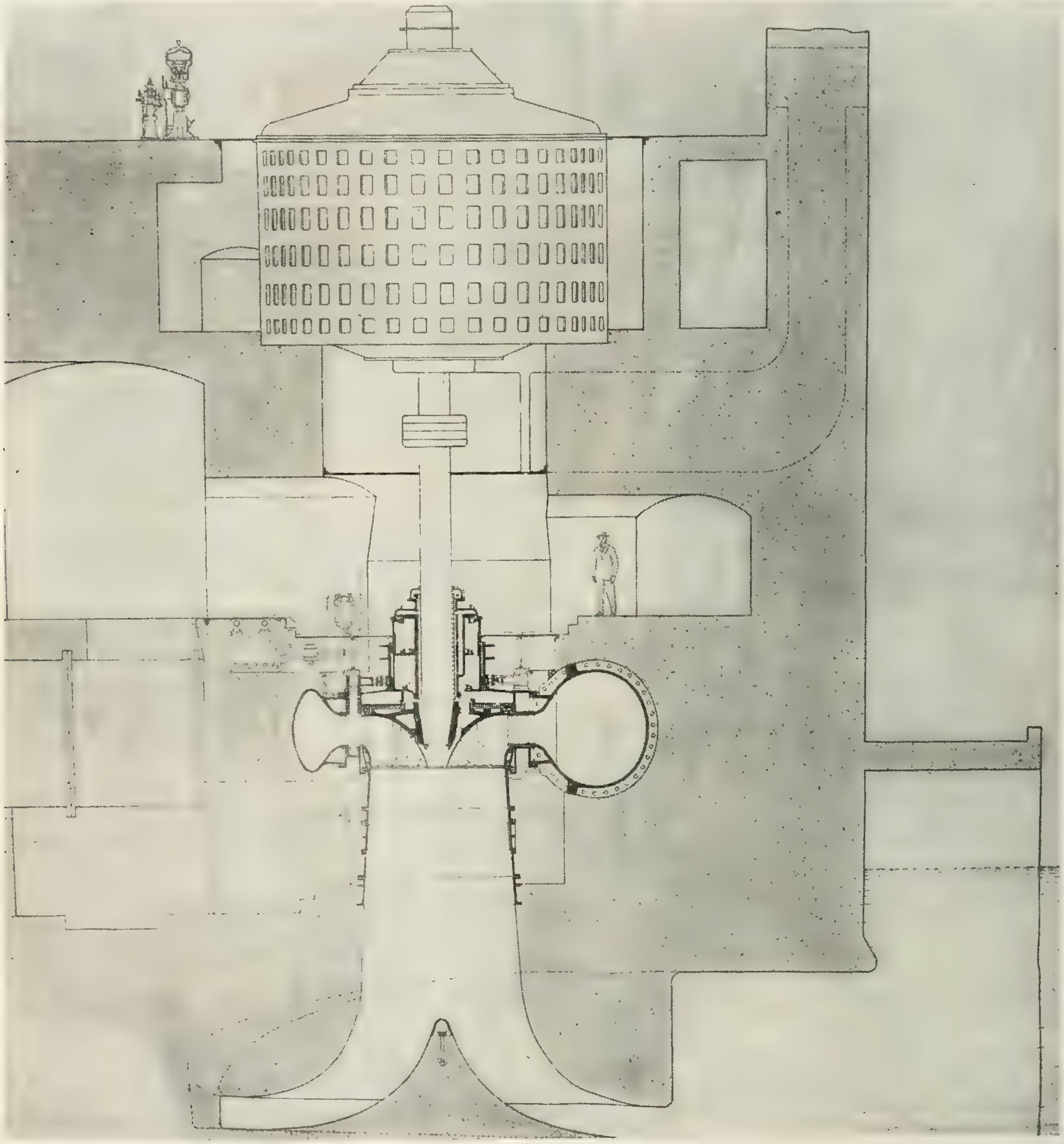

Fig. 3. Section through Power House.

Screens

The only features of the screens worthy of comment are the wide bar spacing of 4½ inches in the clear and the layout of the bars and frames which are so designed that the whole frame with the bars attached is removable thus leaving a completely unobstructed passage when they are removed. There are three bays of screens for each penstock and two frames in each bay. The tops of the screens are eight feet below the normal surface of the water and the maximum velocity of water through the screens is 2.25 feet per second. With these provisions it is not anticipated that anchor ice will cause much trouble.

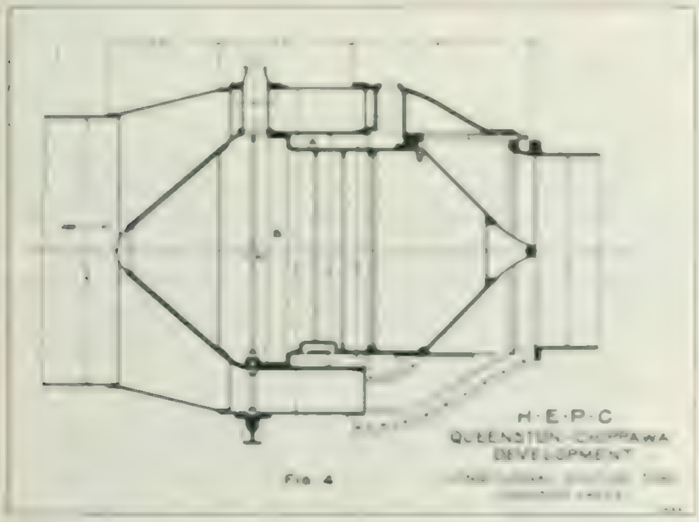

Fig 4

Removable Drop Gates for Penstocks

In view of the fact that a Johnson valve is to be installed at the lower end of each penstock adjacent to the turbine it has been decided to omit permanent gates in the screenhouse at the penstock entrances. To take care of any failure in the valves, removable structural gates made up in sections will be provided which can be lowered into any penstock entrance by means of an electric travelling crane in the screenhouse.

Penstocks

The quantity of water used by each turbine at full load and under normal head is approximately 1800 cu. ft. per sec., and in the design of the penstocks, the diameter was fixed by plotting up various curves showing the value of lost power due to varying velocities and their consequent friction losses as against the carrying charges on the corresponding penstocks. By this means a diameter of approximately 15 feet was found to give the best value, but so great a diameter at the lower end required a plate thickness of over 1½ inches and this was considered beyond the limit for safe field rivetting. On this account the diameter of the upper two-thirds of the pipes was made 16 feet and the bottom third 14 feet which made the construction work feasible and at the same time gave the nearest economical results. The total loss through the screens, penstocks and valves is 1.25 feet using a value of C = 110 in the Hazen & Williams formula. The loss is considerably reduced by the use of butt girth joints with an outside cover plate as against the customary practice of using inside and outside courses.

Johnson Valves

Figure 4 shows a longitudinal section through the Johnson hydraulic operated valves which are located at the lower end of the penstocks. The operation of these valves is very simple, no outside power being required, the valve being opened or closed by means of the penstock pressure. The valve plunger is of the differential type and seats against a ground-in ring in the neck of the body. The annular chamber A and the central chamber B are connected through a control valve and piping either to the penstock pressure or to the atmosphere. Admitting penstock pressure to A and atmosphere to B opens the valve while the reverse operation closes it.

The advantage of a valve of this type is the simplicity of operation. Furthermore, because of its circular section it can be built for any head and thus located at the lower end of a penstock, obviating by this arrangement the necessity of emptying and filling the penstock for each shut down.

FIG. 5

Turbines

Five turbines are at present under contract, which is one half the ultimate installation. They are each of 50,000 H.P. rated capacity of the vertical, spiral case, single runner Francis type and will operate at a speed of 187½ R.P.M. This gives a specific speed of 36. The maximum guaranteed efficiency is 90% although in view of recent practice it is expected that this efficiency will be exceeded. On model runners of homologous design tested at Holyoke 91% was obtained. The inlet diameter of the scroll case is 10 feet and the diameter of the runner is 10′5″ at the inlet. Figures 2 and 3 show the turbine setting and it will be noted that an open space has been left in the power house foundations below the runner so that by removing a section of the draft tube the runner can be taken out from below, thus obviating the necessity of dismantling the generator when a renewal of the runner is necessitated. The runner is designed for a capacity of 61,000 h.p. and is "gated back" to a maximum capacity of 55,000 h.p. The reason for this is that the turbines, which will normally operate at or near full rated load, will also therefore operate at their maximum efficiency. Special taps have been provided in the crown plate and from the annular spaces around the discharge side of the runner to which gauges can be attached and a record kept of the varying pressures at these several points. This will furnish an indication of the wearing away of the runner seal and show when renewals of seal rings are necessary. Connections from these chambers to the scroll case and draft tube will allow readjustment of the downward thrust when required.

The runners and spiral casings are cast steel and a test pressure of 260 lbs. per sq. in. is required in the latter.

Governor System

The centrifugal head, relay valves, and hand control for each governor will be located on the generator floor while the main automatic valve control will be located directly under the governor stand at the level of the turbine regulating cylinders. The advantages of this arrangement are the short piping between the main valve and the regulating cylinders and the separation of the two main parts of the governors, giving freer access for repairs and maintenance. The pressure fluid will be water, probably treated with Bichromate of Potassium, which will prevent rusting of the wearing parts and at the same time give a lubricating value to the water. A central pumping system will be used, with duplicate motor driven multistage centrifugal pumps, either one of which will have sufficient capacity for all the governors. The pressure fluid will be piped to all the governors through accumulator tanks, one located near each governor so as to eliminate any inertia effects through the piping system. The pump motors are automatically controlled by relay switches which are controlled by pressure variation in the system. As a further safeguard for preserving continuous operation in the event of failure of the pumps or motors penstock pressure can be turned into the governor system. When the plant is finally extended to its full capacity a complete duplicate pumping system, similar to the one above described will be installed and interconnected with the present system.

Control Pedestals

A control pedestal as shown in figure 5 will be set up adjacent to each generator, and on this will be mounted the various indicating instruments and control handles shown on the diagram. The principal use for such an arrangement is that the communicating devices between the floor operator and the chief operator in the control room, together with the local control and indication, will be located in such a way that the floor operator can handle the machine while in touch with the chief operator.

A telegraph communication, similar to a ship telegraph and a loud talking telephone, both communicating with the control room will form the principal means of communication. In addition to this a signal lamp mounted at the top of the column over the control pedestal will enable the chief operator to call the floor operator to the unit as required. The air brake and Johnson valve control will also be mounted on this pedestal. The location of this pedestal adjacent to the governor places the control of all the pertinent features of the unit within easy reach of the operator, while at the same time he will be in communication with the control room. The various indicating instruments shown will at the same time be under his observation.

Service Units

For furnishing heat, lights, and power service to the plant two service units, each of 2500 h.p. capacity will be installed. Each of these consists of a vertical turbine running at 500 r.p.m. direct-connected to a generator. The turbines are supplied by a single 5 foot diameter penstock branching into two pipes at the turbines, each branch being provided with a Johnson valve. It is expected that the service plant will be duplicated when the power house is completed to its full capacity.

Electrical Features — Queenston-Chippawa Development

E. T. J. Brandon, A.M.E.I.C., Electrical Engineer Hydro-Electric Power Commission

A — General

A novel feature of the generating room is that the main floor is level with the top of the generator frame. Space between this floor and the floor at the bottom of the generator is utilized for cooling air, power leads and piping. The generating room is approximately 60 ft. wide x 60 ft. high, the units being spaced at 50 ft. centres. The space devoted to transformers and low and high voltage switching is approximately 90 ft. wide x 100 ft. high, the equipment belonging to each generating unit occupying the corresponding 50 feet taken by the generator.

B — Generators

These are 45,000 k.v.a., 12,000 volt, 25 cycle, 187½ r.p.m., vertical shaft generators with thrust bearings and direct connected exciters. The thrust bearings to be used are designed to carry a load of about one million pounds. Five such units have already been contracted for. In the neighborhood of 100,000 cubic feet of air per minute will be required to cool the generators at full load. The air system is completely enclosed so that the cooling medium can be taken from and discharged to the outside air without mixing with the air inside the station. It is interesting to note that the weight of air passing through the generator every 3 hours equals the complete weight of the generator itself.

C — Transformers

In the present installation there will be fifteen 15,000 k.v.a., 25 cycle single phase transformers which will be used for transforming from generator voltage of 12,000 to a nominal voltage of 110,000. Taps are however, provided in high voltage windings to permit operation at 132,000 volts.

D — Switching Equipment

Provision is being made for operation on the "unit" system, that is, the generator, bank of transformers and transmission line will be considered as a unit, and have the same capacity so that in case of emergency a unit may be operated to full capacity without utilizing either the high or low voltage busses. Provision will also be made so that units may be operated in parallel on either the high or low voltage bus, current limiting reactors being installed between generators at 12,000 volts. With 8 units paralleled without current limiting reactors it will be possible to obtain about 2,800,000 k.v.a. in a fault. Such a condition with busses at 24-inch centres would impose mechanical forces tending to separate the busses of the order of one and one-quarter tons per lineal foot. However, oil switches have not been developed as yet which will rupture such large amounts of energy and it is not intended that the units would be operated all tied together without reactors. The two limits of operation are, operating the units entirely separated and with 8 units paralleled as above. The former imposes a possible short circuit k.v.a. of probably 500,000 and 350,000 on the low and high voltage circuits respectively, while the corresponding short circuit k.v.a. for the latter are 2,800,000 and 1,800,000.

EDGAR T. J. BRANDON, A.M.E.I.C.
Electrical Engineer of the Hydro-Electric Power Commission

Synopsis of paper to be read at the General Professional Meeting, September 17th.

The General and Economic Features of the Queenston-Chippawa Development

H. G. Acres, M.E.I.C., Hydraulic Engineer, Hydro-Electric Power Commission

Although the active promotion of the Queenston-Chippawa Power Project commenced in 1914, it was not until 1917 that the grave power shortage, created by the demand for munitions and war materials, reached such proportions that the then existing government authorized the commencement of actual construction. At this time a shortage of skilled and common labor had manifested itself, the cost of labor, plant and construction materials was rising rapidly, and conditions on the whole were such that the undertaking of this project could not have been justified wholly as a commercial venture. On the other hand, the Allied Nations were in the midst of a bitter struggle, which at that time might well have been expected to last for another five years or more. With this possible, it was generally conceded that the resultant exhaustion of man-power would transform the final stages of the struggle into a war of munitions, with a resultant imperative demand for large additional supplies of electric power for their manufacture. It was therefore evident that if 200,000 horse-power could be made available through the agency of the Queenston-Chippawa Development by the year 1921, a factor would be introduced which would have a vital bearing on the success of the Allied Arms. For this reason the construction of the Queenston-Chippawa Development was undertaken primarily as a war measure.

When, however, the crisis of the war passed in July of 1918, and peace came in the following autumn, it became necessary to reconsider the status of the project, and transform it as far as possible from a war scheme designed to meet an urgent and immediate need, to a commercial scheme, embracing as many as might be of the elements of true conservation, and an ultimate maximum of economy in the production of power. Space is not available to cover the steps of this transformation in detail, suffice to say that it resulted in the final development as it stands to-day, with permanent works designed for the installation of plant up to an aggregate of 500,000 horse-power capacity, whenever the necessity arises, as dictated by the public need.

Selecting a Location

From the combined viewpoint of conservation and ultimate economy, the ideal Niagara Development would be one which would utilize the whole of the future available water under the gross head of 327 feet existing between Lake Erie and Lake Ontario. Several schemes, approximating this ideal in varying degree, have been advanced during the last 20 years, and of these the most practicable and promising was one, known as the Jordan-Erie scheme, which involved the intaking of water near Morgan's Point on Lake Erie, the building of an open waterway across the Niagara Peninsula to the brink of the escarpment above Jordan Harbour, thence carrying the water to the power-house at Lake Ontario level through a mile of pipe. Studied from an engineerings tandpoint, this scheme was open to serious objection for three main reasons; first, the unfavorable intake conditions at the Lake Erie end; second, the structural difficulties and un-

H. G. ACRES, M.E.I.C.,
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avoidable head loss in connection with the 24-mile canal; and third, the regulation difficulties attendant upon the control of a mile long water column in the penstock connection between the head of the canal and the power-house, where something over 16 feet of penstock would be necessary for each foot of effective head. The economic effective head for this scheme worked out slightly less than 300 feet, the bulk of the losses being, of course, taken up in the long canal.

The problem was, therefore, to find if possible some feasible location which would obviate the main objections to the Jordan-Erie scheme. During the course of the

Advance proof of paper to be read at the General Professional Meeting, September, 17th.

subsequent investigation, it developed that by far the best intake conditions would be obtained at the mouth of the Welland River at Chippawa, and also that suitable power-house locations were obtainable in the gorge between Foster's Flats and Queenston, which would require only about 18 inches of pondage connection for each foot of effective head, thus reducing the regulation problem to one of minor importance. Fig. 1 illustrates the comparative layout and location of these two schemes.

Pressure Canal versus Open Canal

Having tentatively solved the intake and regulation problems, it remained to determine whether or not it was feasible to construct a suitable waterway between the Chippawa intake and the power-house location above Queenston. An exhaustive series of surveys and core-drill borings established the fact that it would be entirely feasible to connect these two points by either the open canal or the pressure tunnel type of waterway, and the next problem was to determine which of these two types of waterway would be the more suitable from the combined viewpoint of pure hydraulics, structural difficulties and hazards, and comparative cost.

In the matter of comparative cost, carefully compiled estimates indicated that throughout the full range of assumed carrying capacities, the open canal had a decided advantage over the pressure tunnel.

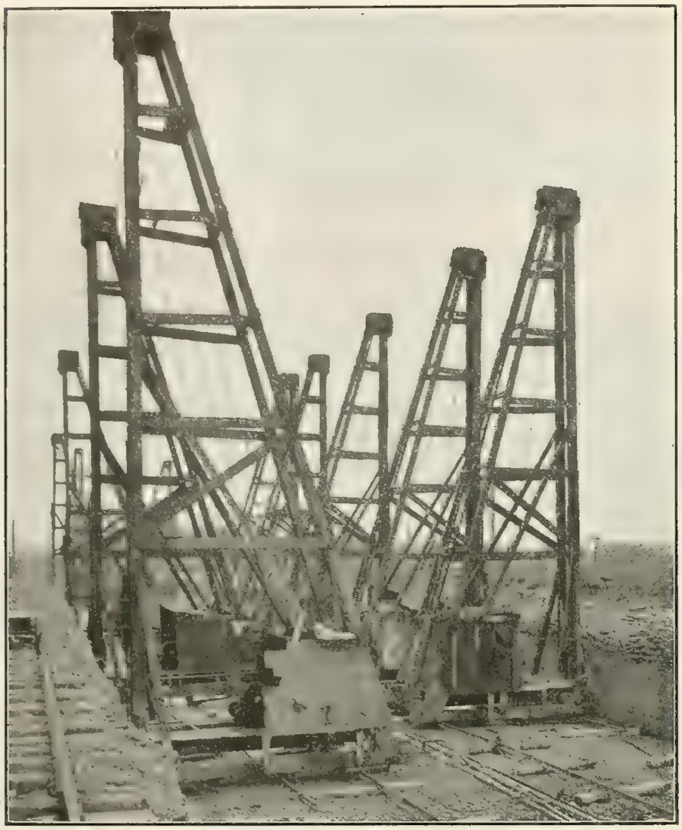
Pressure Tunnel Disadvantages

In the matter of structural difficulties and hazards the following main points were given consideration in the case of the pressure tunnel:—

(a) The necessity of driving the headings at an acute angle through the various limestone, shale and sand-stone formations, involving the certainty of a heavy overbreak and expensive timbering and lining.

(b) The unfavorable conditions as regards the disposal of excavated material.

Fig 1



Battery of Marine Drills Sta. 391 + 44, June 1st, 1920

(c) The unknown water hazard and the impossibility of predicting the cost of unwatering within reasonable limits of accuracy.

(d) The difficulty and hazard attending the driving of, and maintaining a pressure tunnel of unprecedentedly large diameter in the clay formation of the Whirlpool Ravine.

(e) The difficulty in connection with the construction of a distributing chamber in the shale and sand-stone at Queenston.

As against the above, the difficulties and hazards in the case of the open canal were limited to two main points; first, the removal of the earth overburden in the canal prism, and second, the permanent holding of the slopes subsequent to such removal. While it may never be possible to establish finally the comparative importance of the above points on the basis of actual construction, the fact remains that the work already accomplished on the open canal has demonstrated beyond doubt that the overburden can be removed with no more difficulty than was anticipated and that the means originally devised will hold the banks safely within the limits of the predetermined slopes.

Hydraulic Comparison

In the matter of purely hydraulic comparisons, the first point to consider is that both types of waterway of necessity would have the same point of intake at Chippawa and the same point of discharge at Queenston, so that they are exactly on a par as regards the utilization of available gross head, neither having any primary advantage over the other in this regard.

Since 1902 the water level at Chippawa has been observed and recorded twice daily, and Fig. 2 shows the mean daily elevations for the ensuing period compiled in the form of a duration curve. The following facts are deducible from this curve.

(a) The mean level for the entire period is about elevation 560.8.

(b) A level of elevation 559.5 or higher is obtained for nearly 99% of the entire period.

(c) A level of elevation 561 or higher is obtained for a little more than one-third of the above period.

(d) That it is reasonable to assume that the effective operating range of levels lies between elevations 559.5 and 561.

As to the possibility of the carrying capacity of either type of waterway being seriously affected by a permanent lowering of the natural levels of the Chippawa-Grass Island pool, due to present and future diversions of water therefrom, it is essential to consider two facts; first, that any diversion for power purposes from the pool itself will be largely compensated for by the intercepting effect of the diversion works, and second, that the level of the pool can be controlled independently to compensate for any diversion whatever, whether from the pool itself, from the upper reaches of the river, or from Lake Erie direct.

Travelling Derrick in Canal at Sta. 451 + 5, May 6th. 1920

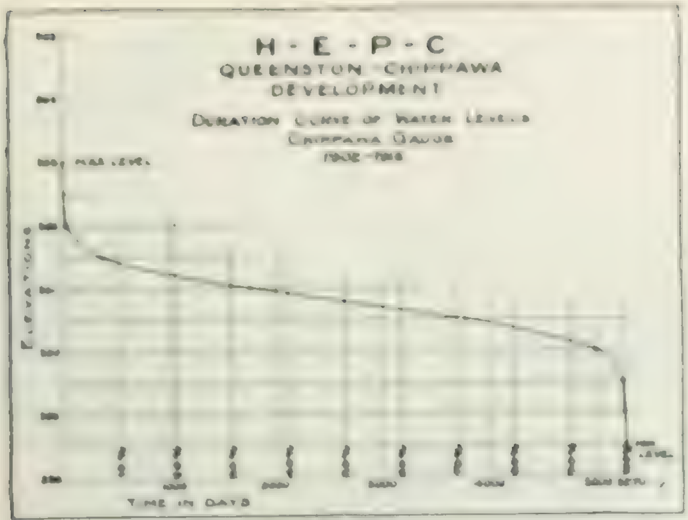


Fig. 2

In Fig. 3 an effort has been made to show in graphic form a comparison of the head losses chargeable to each type of waterway under discussion. In making this comparison, a possible extreme low elevation of 558 has been assumed for head-water, and the open canal losses calculated on this basis for a carrying capacity of 15,000 sec. ft. On the basis of this loss a tunnel was designed of the requisite diameter for the same capacity of 15,000 sec. ft.

These curves have been computed for the extreme range of possible operating levels, elevations 558 minimum and 561 maximum. The shape of these two pairs of curves illustrates clearly the basic difference between the two types of waterway. Under the assumed conditions the tunnel and canal curves for the head-water elevation 558 and 15,000 sec. ft. discharge have a common point of origin. As the discharge drops off, however, it is seen that the canal delivers any fixed discharge to the forebay at a consistently higher elevation than in the case of the tunnel. This is simply due to the inherent characteristics of the two types of waterway. In the case of the pressure tunnel, the discharge area is necessarily constant and any gain in head is due to decreased friction only. In the case of the canal the reduction in velocity not only reduces the friction losses, but the retardation of flow increases the effective discharge area of the canal section. By reason of this extra factor, the open canal has an advantage over the tunnel ranging as high as 5 feet of head loss. When the high discharges involved in the problem are considered, it is evident that this difference in head loss is a very important factor.

The curves shown on Fig. 4 have been plotted on a different basis, but with the same factors involved. In Fig. 3 head-water level and carrying capacity have been assumed constant and forebay level the variable. In Fig. 4 head-water and forebay level are the constants and carrying capacity expressed in horse-power is the variable. In this latter curve forebay level is assumed constant at the fixed minimum elevation for peak load capacity and from this common point the comparative carrying capacities of the two types of waterway have been calculated for specified levels of head-water in the Chippawa-Grass Island Pool.

Here again the two curves have a common point of origin at the point of extreme minimum capacity, but from this point on the canal characteristically pulls away as the head-water level rises, until at the maximum operating level of elevation 561 the canal has an advantage over the tunnel of 20,000 horse-power in carrying capacity. This gain is due to the fact that the tunnel can only realize the gain of a trifling increase in gross head, and a resultant trifling increase in pressure gradient, as the level of head-water rises, whereas the canal gains a material increase in natural gradient and effective discharge section. This increase in carrying capacity is therefore gained by the canal without any reduction of operating head at the forebay, whereas the tunnel can gain the extra capacity only at the expense of a reduced operating head.

Conclusions Favour Open Canal

The conclusions which may justifiably be drawn from the above discussion are; first, that starting from the common basis of equal loss and carrying capacity at extreme minimum head-water level, the open canal will deliver the required quantity of water to the forebay with a materially less loss of head than the pressure tunnel, for any head-water level above the assumed absolute minimum; second, that starting from the common basis of a fixed minimum forebay level, the canal will deliver a constantly increasing quantity of power in proportion as the level of head-water rises above the assumed extreme minimum level, which the pressure tunnel cannot do to any appreciable extent by reason of its inherent hydraulic characteristics, and finally, that the open canal is the only agency, under the above conditions, which can make automatically available the large quantities of excess power resulting from any temporary or permanent increase in the level of the Chippawa-Grass Island Pool, above the extreme minimum level which has been used as a basis of comparison.

The above were the primary reasons which led to the final choice of the open canal for the connecting waterway between Queenston and Chippawa. This canal as now being constructed, consists of 4½ miles of the improved

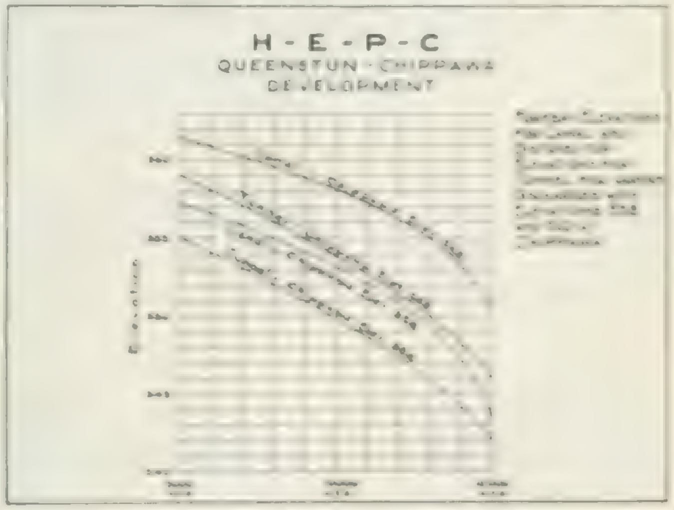


Fig. 3

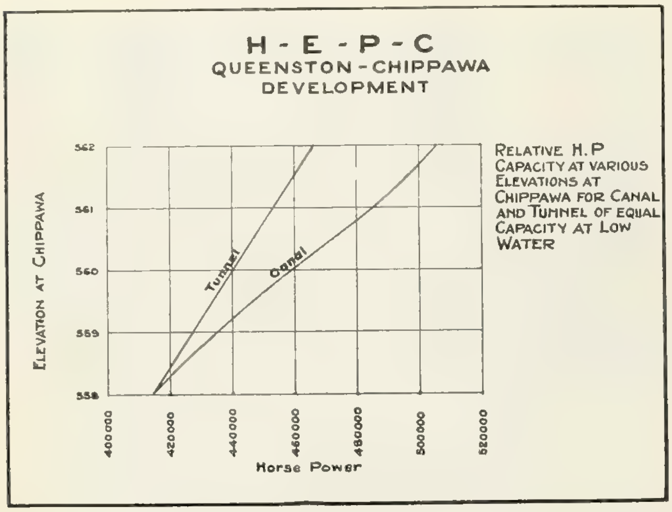


Fig. 4

natural channel of the Welland River and 8½ miles of dry excavated section from a point on the Welland River near Montrose to the forebay site above Queenston. Besides being only about half the length of the alternative Jordan-Erie Canal, the average operating head for equal quantities of water carried is about six feet greater at Queenston than it would have been at Jordan Harbour, despite the fact that the elevation at the point of intake is about 9 feet lower, and the elevation at the point of discharge about 2 feet higher, than would have been the case with the Jordan project.

Another distinct advantage of the open canal is the fact that it can effectively and inexpensively take advantage of any water which might now or in the future be available from the Welland Canal system. This open waterway would furthermore furnish the only means, in connection with the upper reaches of the Welland River, of reclaiming the unused 9 ft. of head in the Niagara River above Chippawa. This would involve a very heavy expenditure, but the value of power will not always be judged by present standards and the time may well come when this extra power may be considered worth reclaiming at a capital cost per horse-power ten times greater than is considered justifiable at the present time. These are more or less remote contingencies, but the fact remains that the choice of the open type of waterway, and the layout of the rest of the scheme will enable effective advantage to be taken of these conditions whenever the public need may become sufficiently acute. When this happens the extreme limit of conservation will have been realized in the matter of utilizing the gross difference in level between Lake Erie and Lake Ontario, and the anticipatory provision made in the present design will have justified itself.

Public Benefit from the Power Project

In considering this phase of the problem, it should be realized that under co-operative municipal ownership, a block of power delivered to the out-going lines at Niagara is not valued by what it can profitably be sold for at so many dollars per horse-power per annum, but by what it means to the individual citizen as an agency for increasing his comforts, conveniences and general standard of living and for facilitating increased commodity production. Such conditions tend toward the building up of the greatest asset any country can possess, an increasingly prosperous and contented population. The influence of Niagara Power on the wealth and prosperity of the community at large will therefore be measured more effectively by the maximum amount of power which can ultimately be produced and utilized, rather than by considering the power itself as the ultimate commodity which is to be produced as cheaply as possible in limited quantities and sold at a corresponding profit. In other words the secondary profit derived from a widely diversified use of power throughout the community must take precedence over any primary profit derived from its direct sale as a commodity, if the true interests of conservation are given proper weight.

It is not within the scope of this article to cover any details of design, construction methods and installation, but as regards the canal, the most vital feature of the plant design, original methods of attack were devised, with the assistance of R. D. Johnson, which involved an interesting application of the graphic calculus. Th s in turn led to a similar application of the graphic calculus to the penstock design and a practically rational method was devised for determining the economic diameter.

Capacity of Units

The decision to fix capacity of the units at 50,000 rated horse-power was governed by three primary considerations; first, the rapidly increasing demand for power necessitated the development of power in blocks of a magnitude not hitherto conceived; second, by reason of the economy in first cost which results from making the capacity of the individual unit a maximum for any given head; and third, because the lineal power-house space in the gorge was limited, having regard to tail-water levels and the possibility of further extensions.

Shovel No. 1, Canal Excavation Looking S. at Curve Sta. 443, Feb. 5th, 1920

As the design now stands each unit comprises about 10 per cent of the ultimate installed capacity, and the power house will contain something over 1800 horse-power of effective capacity per foot of length, a figure which has not hitherto been approached, as far as is known.

Summary of Construction Methods

In conclusion it might be of interest to make some reference to construction methods and to summarize briefly the reasons which lead to the adoption of the type of construction plant which is now operating on the work.

A careful study of construction methods in connection with the excavation of earth and rock in the canal was plant required. The operation of electric and steam driven excavating machinery was witnessed and studied in various parts of Canada and the United States and a large amount of information with reference to output, operating cost, working conditions, etc. was obtained and carefully analyzed.

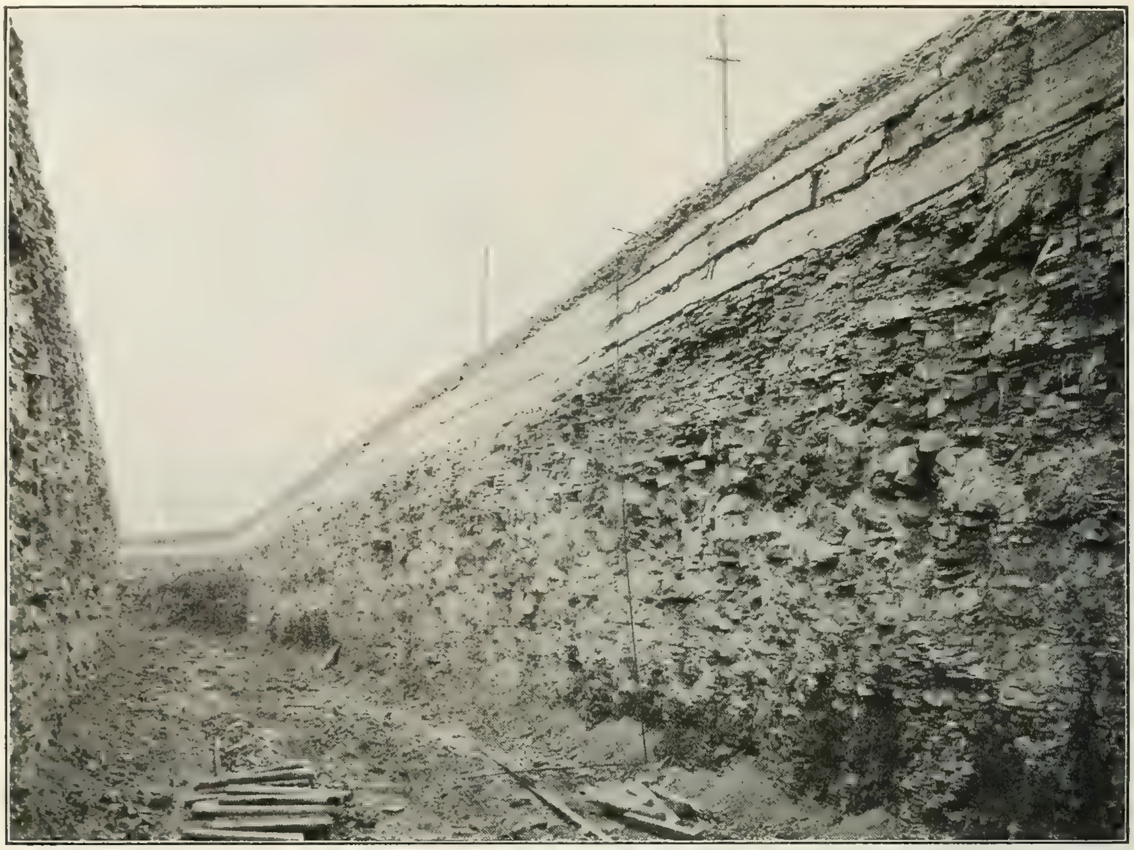
The most important decision arrived at in connection with the purchase of this plant was that with reference to the use of the largest type of shovel that could be obtained. These shovels are removing the full depth of overburden while working from solid rock bottom, a face averaging 40 feet in height, with a maximum of 80 feet. It was furthermore necessary to use these shovels in the rock cut, where they are lifting and loading into cars up

No. 2 Shovel opposite Sta. 267 + 57, looking south. May 5th, 1920

necessary by reason of certain existing conditions which would have a vital influence upon excavation cost. These conditions were first, the availability of cheap electric power for operating construction plant; second, the large quantities of earth and rock to be removed, which made it possible to consider the use of excavating machinery of the heaviest type and largest capacity obtainable; and third, the unusually good facilities available for the disposal of spoil, within short hauling distance, along the crest of the Niagara escarpment.

Having the above conditions in mind, the Commission's engineers spent several months in collecting and studying data in connection with the type of construction to 70 feet above shovel grade. The rock cut, being only 48 feet wide would not permit the carrying of loading tracks down to a sufficiently low elevation to reach the loading range of an ordinary railroad shovel and it is certain that excavation by plant or drag-line would have very materially increased the cost and seriously delayed the date of completion of the rock work.

In the earth work it was demonstrated beyond any doubt that on the bulk of the work railroad shovels would have been useless on account of the soft bottom and on some sections of the work it is doubtful if the overburden could have been removed by any possible means other than by these large shovels working from rock.



Rock Walls before Scaling South to Sta. 443, June 1st, 1920

The economy of this construction plant is rather plainly indicated by the fact that in 1917, when work commenced with railroad type shovels, direct labor cost comprised 29% of the total unit cost of excavation. To-day, with labor costing 250% more than in 1917, the labor cost per yard of excavation has only increased 4% over the 1917 figure of 29%. This would appear to indicate that the saving of man power resulting from the use of the large excavating units has practically off-set the 250% increase in labor expenditure. In the month just past (July) 500,000 cubic yards of earth and rock were removed and finally disposed of in 26 working days, with a total working force of 2,000 men, not more than half of whom were engaged in the direct excavating operations. These two facts alone would indicate that the type of construction plant on the Queenston-Chippawa Work has fully justified the decision which led to its adaptation, and that the results being achieved would not otherwise have been possible.

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JOHN MURPHY
G. GORDON GALE
J. B. CHALLIES
P. GILLESPIE
W. A. McLEAN
A. H. HARKNESS
E. R. GRAY
GEO. HOGARTH
H. B. R. CRAIG
A. C. D. BLANCHARD

REPRESENTATIVES OF BRANCHES
REX. P. JOHNSON, Niagara Peninsula Branch
M. E. BRIAN, Border Cities Branch
R. K. PALMER, Hamilton Branch
R. L. DOBBIN, Peterborough Branch
H. G. ACRES, Toronto Branch
A. B. LAMBE, Ottawa Branch
Lt.-Col. A. MACPHAIL, Kingston Branch
F. M. PERRY, Sault Ste. Marie Branch

REPRESENTATIVES OF NON-RESIDENT MEMBERS
J. A. BELL
H. A. BRAZIER
G. H. BRYSON
S. B. CLEMENT
Major W. H. MAGWOOD
F. D. REID

Sec.-Treas., A. B. LAMBE, Ottawa, Ont.

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOL. III. September 1920 No. 9

Dates of Professional Meetings

The Seventh General Professional Meeting will be held in Niagara Falls, September 16th, 17th, and 18th, and the Eighth General Professional Meeting will be held in Halifax, October 13th, 14th and 15th.

The Annual and Annual General Professional Meeting will be held in Toronto on February 1st, 2nd and 3rd, 1921.

Banff Meeting a Great Success

As the time between the holding of the Western Professional Meeting at Banff and that of going to press did not permit of including a complete account of the meeting held under the auspices of the Calgary Branch of *The Institute,* the following night-letter signed by Arthur L. Ford, M.E.I.C., Secretary-Treasurer of the Calgary Branch will give an idea of the splendid success of the meeting.

Banff, August 18, 1920.

Camp opened Friday night, the fourteenth, for the convenience of members wishing to take advantage of the weed-end at Banff, and by Saturday noon there were seventy-six registered in attendance.

Sunday was a beautiful day spent by delegates in sightseeing trips and bathing in sulphur springs. Business programme opened Morning by R. S. Stronach, A.M.E.I.C., Superintendent of Parks and preliminary speeches by representatives from all across Canada indicated that meeting organized to bring all engineers together was considered as fulfilling the great requirements of present time to bring about co-operation between all branches of professional men. The important feature of this morning was a paper on "Concrete in Alkali Soils" by A. S. Dawson, M.E.I.C., which resulted in the following resolution.

"That fifteen thousand dollars per annum for three years be secured for investigation purposes by specialists engaged to devote entire time to work."

"That existing committee be authorized by Council to make definite application for necessary funds from all interested bodies."

"That work be carried on under jurisdiction of existing committee who will act in advisory capacity."

"That Council be asked to ratify this manner of dealing with the problem."

Monday afternoon was spent in seeing more of scenic beauty of Banff with result that all came back Tuesday morning very much refreshed to carry through morning's business programme. In the afternoon delegates were entertained at Alpine Club by C. H. Mitchell, M.E.I.C., Vice-President of *The Institute.* In the evening delegates viewed special moving pictures of Banff and Jasper Parks and later enjoyed an informal dance arranged by ladies reception committee. On Wednesday a most excellent paper was read by R. P. Blakey on "Architectural Engineering," and later two hours of keen and interesting discussion developed on subject of legislation for engineers. This discussion developed a fine feeling of co-operation and unanimity of opinion extending from Pacific to Atlantic coast. Attitude of parent Institute and complicated position in Ontario were very ably set forth by Vice-President Mitchell and J. B. Challies, M.E.I.C. In the afternoon a unique entertainment was provided by delegates witnessing first demonstration by Air Board of

Canada of ability to perform aerial reconnaissance and survey in mountain regions; new feature of inviting not only Institute members, but also all other scientific professional men and bringing them together under canvas proved an unqualified success and brought forth most flattering comments from delegates. Total registration was one hundred and fifty including large number of ladies whose presence contributed very largely to success of camp. Everybody enthusiastic, repetition next year.

ARTHUR L. FORD, M.E.I.C.

Provisional Programme for the General Profession Meeting of the Engineering Institute of Canada, Halifax, N.S.

Wednesday, Thursday, and Friday, Oct. 13th, 14th, 15th.

Headquarters of the convention will be at the Nova Scotia Technical College, Spring Garden Road, Halifax, N.S., and all business sessions and reading of papers will take place there.

Wednesday, October 13th, Opening Session 10 A.M.

Addresses of welcome by the Lieutenant Governor and Mayor.

Business Session.

Paper, Professor F. H. Sexton, M.E.I.C. on "Secondary Technical Education."

Luncheon.

Afternoon Session.

Trip to the Halifax Ship Yards.

Evening Session, 8 P.M.

Papers, by F. H. Williams, A.M.E.I.C., Moncton, on "Electric Welding of Iron and Steel," illustrated by lantern slides.

A paper by J. W. Roland, M.E.I.C., on "Road work in Nova Scotia."

Thursday, October 14th, Morning Session, 10 A.M.

A paper by D. W. Robb, M.E.I.C., on "The Development of the Steam Engine in the Maritime Provinces."

A paper by H. S. Johnston, A.M.E.I.C., on "The Development of the Sheet Harbour Water Power."

Afternoon Session, 2.30 P.M.

This time has been allotted to the Nova Scotia Association of Professional Engineers for their first business meeting, including the election of permanent officers to replace those appointed provisionally by the Act.

Evening Session.

Dinner, arrangements for which will be announced later.

Friday, October 15th, Morning Session, 10 A.M.

Papers by the New Brunswick Branch.

Luncheon.

Afternoon Session.

Visit to the new Automatic Exchange of the Maritime Telegraph & Telephone Company, Limited.

On account of the present difficulties of hotel accommodation, members are requested to advise the Halifax Branch at the earliest possible date of their desire for accommodation, and where possible state the date on which they propose to arrive.

Report of Remuneration Committee

To the President and Council of
The Engineering Institute of Canada.

Since the "Committee on Remuneration" was appointed last April for the purpose of reporting to you on the question of a proper scale of remuneration for engineers, two meetings of the Committee have been held at the headquarters of the E.I.C. in Montreal. On account of the nature of the work carried on by the members of the engineering profession, and also on account of the spring and summer being the busy season for the profession, the attendance at these meetings was small. However, a certain amount of work has also been done by correspondence and considerable progress has been made.

A very great deal of work along the lines being undertaken by this Committee has been done during recent years by committees appointed by other engineering organizations and by Branches of *The Institute.* Your Committee has examined many of the reports prepared by these bodies, and has concluded that it would be an unnecessary duplication of work to prepare a salary or fees schedule. Of the many reports prepared that of the "Engineering Council" on "Classification and Remuneration of Engineers" dated December 15th, 1919, seems to your Committee most nearly to meet the needs. This report is concise, it avoids multiplicity and duplication of details, the classifications are distinct enough to be easily followed, and the rate of remuneration seems to be fair.

There are some classes in the profession which are not included in the report, but the proper remuneration for such classes would be easily established by comparing the importance and responsibility of the work with that of the class with corresponding work in the report.

Your Committee has asked the Executive Committees of the several Branches of the E.I.C. throughout the Dominion to act as Committees to review the report of the Engineering Council, and to make such suggestions as may occur to them in regard thereto. As soon as the reports have been received from these Committees your Committee will take these into consideration for a final report.

This Committee has not attempted to do any work towards preparing a schedule of fees for consulting engineers. Should the Council so desire we shall be pleased to report thereon.

A. H. HARKNESS, M.E.I.C.
Chairman, Remuneration Committee.

Seventh General Professional Meeting

Conducted by the Ontario Provincial Division under the auspices of the Niagara Peninsula Branch

The Clifton, Niagara Falls, Ontario,
September 16th, 17th and 18th, 1920.

OFFICIAL PROGRAMME

Thursday, September 16th.

9.00 A.M Registration at the Clifton.

12.30 Noon Luncheon at the Clifton (Tickets obtained when registering, $1.50). H. B. R. Craig, M.E.I.C., Chairman of the Ontario Provincial Division, Chairman.

Address of Welcome by H. P. Stephens, Esq., Mayor of the City of Niagara Falls, Ontario.

H. B. R. CRAIG, M.E.I.C.
Councillor, Chairman Ontario Provincial Division,
District Engineer Dept. Public Works, Windsor, Ont.

Reply by R. A. Ross, Esq., President of *The Institute.*

Illustrated Talk "The St. Lawrence Route and the Welland Ship Canal," by Alexander J. Grant, M.E.I.C., Engineer-in-Charge, Welland Ship Canal.

2.30 P.M. Inspection of the Welland Ship Canal by invitation of the Department of Railways and Canals. An excursion has been arranged to inspect the canal construction with special attention to Lock 1 and Port Weller Harbor. Cars will leave the top of Clifton Hill at 2.45 p.m.

7.00 P.M. Dinner at the Clifton, A. C. D. Blanchard, M.E.I.C., Chairman. (Tickets obtained when registering, $2.00).

Dinner will be followed immediately by an entertainment provided by the Niagara Peninsula Branch.

10.00 P.M. Adjournment to the hotel balcony to witness the illumination of the Canadian Falls.

W. P. NEAR, M.E.I.C.
Chairman Niagara Peninsula Branch, City Engineer,
St. Catharines, Ont.

Friday, September 17th.

9.00 A.M. Continuation of professional papers.

R. A. Ross, President of *The Institute*, Chairman.

"Design of the Queenston-Chippawa Power Canal," by T. H. Hogg, A.M.E.I.C., Assistant Hydraulic Engineer of the Hydro-Electric Power Commission.

"Hydraulic Installation of the Queenston-Chippawa Power Development," by M. V. Sauer, M.E.I.C., Hydraulic Engineer of Design.

N. R. GIBSON, A.M.E.I.C.
Vice-Chairman Niagara Peninsula Branch, Hydraulic Engineer The Niagara Falls Power Company, Niagara Falls, N.Y.

"Electrical Features of the Queenston-Chippawa Power Development," by E. T. J. Brandon, A.M.E.I.C., Electrical Engineer of the Hydro-Electric Power Commission.

"General and Economic Features of the Queenston-Chippawa Power Development," by H. G. Acres, M.E.I.C., Hydraulic Engineer of the Hydro-Electric Power Commission.

Motion Pictures.

A. C. D. BLANCHARD, M.E.I.C.
Councillor, Convenor Programme Committee, Chief Field Engineer, Hydro-Electric Power Commission.

1.00 P.M. Luncheon at the Administration Building, Queen Victoria Park. W. [illegible], M.E.I.C., Chairman. This luncheon is given by the Department of Highways, Province of Ontario, to members, ladies and guests in attendance.

Official photograph. (Immediately after the luncheon.)

2.30 P.M. Inspection of Queenston-Chippawa Power Development by invitation of the Hydro-Electric Power Commission. An itinerary has been arranged to inspect the Canal, Forebay and Power House now under construction. Cars leave the administration building immediately after the taking of the official photograph.

R. P. JOHNSON, A.M.E.I.C.
Secretary-Treasurer, Niagara Peninsula Branch, Office Engineer, Hydro-Electric Power Commission.

7.00 P.M. Banquet at the Clifton. Tickets obtained when registering, $4.00. W. P. Near, M.E.I.C., Chairman of the Niagara Peninsula Branch, Chairman.

Toasts.

9.00 P.M. Dancing in the ball-room, at which those present at the dinner will be guests of the Niagara Peninsula Branch.

Saturday, September 18th.

9.00 A.M. Professional session continued. Lt.-Col. R. W. Leonard, M.E.I.C., Past President of *The Institute*, Chairman.

"Demonstration of the Gibson Method of Measuring the Flow of Water in Closed Conduits for Determining the Efficiency of Hydraulic Turbines," by N. R. Gibson, A.M.E.I.C.

Alex J. GRANT, M.E.I.C.
Member Executive Niagara Peninsula Branch,
Engineer in Charge Welland Ship Canal.

"Activities of the Division," Conducted by officers of the Ontario Provincial Division.

10.30 A.M. Arrangements have been made for visiting, during the morning, the following Power Plants:

(a) Ontario Power Company.
(b) Toronto and Niagara Power Company.
(c) Niagara Falls' Power Company (American Side).

W. H. SULLIVAN, M.E.I.C.
Member Executive Niagara Peninsula Branch,
Assistant Engineer in Charge Welland Ship Canal

At the last mentioned plant visitors will see the three new 37,500 H.P. units installed in 1919, and now in successful operation. These are the largest hydro-electric units in the world.

1.00 P.M. Luncheon at the Administration Building, Queen Victoria Park Commission. This luncheon is given by the Park Commission to members, ladies and guests.

Visiting members may avail themselves of the privileges of the courses of the Niagara Falls' Golf and Country Club at Lewiston and the St. Catharines' Golf Club at St. Catharines. Green tickets may be obtained from the Committee.

A trip to the peach orchards.

Scenic attractions available for visitors are listed elsewhere.

F. S. LAZIER, M.E.I.C.
Member Executive Niagara Peninsula Branch,
Resident Engineer Sections 3 and 4, Welland Ship Canal.

Baseball—Spectacular baseball competition has been arranged to take place in Queen Victoria Park, starting at 10.30 a.m., with entries from several Branches.

Registration for Saturday's excursions should be made with the Committee Friday evening or as early as possible Saturday morning.

Notes

Members are requested to register promptly.

The time given in this programme is DAYLIGHT SAVING TIME.

Points of Scenic and Historical Interest

Reached via International Railway,
Northbound cars from Upper Bridge

Brock's Monument and Queenston Heights
The Niagara Glen.
The Whirlpool and Spanish Aerocar
The Whirlpool Rapids.

Reached via International Railway
Southbound cars from Upper Bridge

Chippawa Village and the Welland River
Clifton Aeroplane Flights
Dufferin Islands and the Cascades
The Falls of Niagara
Under the Falls—Table Rock
Queen Victoria Niagara Falls' Park

Special Notes

Ladies accompanying members are invited to participate in every proceeding of the professional meeting, including, particularly, excursions and functions arranged by the Branch.

Any changes from this programme will be announced at the meeting.

H. L. BUCKE, M.E.I.C.
Convenor Entertainment Committee, Division Sup't Railway Const'n., and Maintenance, Queenston-Chippawa Power Development

Officers

The Engineering Institute of Canada

R. A. ROSS - - - - - - - - President.
FRASER S. KEITH - - - - - - - Secretary

Ontario Provincial Division

H. B. R. CRAIG - - - - - - Chairman.
A. B. LAMBE - - - - - - Secretary

Niagara Peninsula Branch

W. P. NEAR - - - - - - Chairman.
N. R. GIBSON - - - - - Vice Chairman
REX JOHNSON - - - - - Secretary.
H. L. BUCKE - - - - - -
W. H. SULLIVAN - - - - - Executive
F. S. LAZIER - - - - - - Committee.
A. J. GRANT - - - - - -

F. W. CLARK, A.M.E.I.C.
Chairman Professional Meeting Committee
Division Engineer, Hydro-Electric Power Commission

Councillors of the Institute representing the Niagara Peninsula Branch

LT.-COL. R. W. LEONARD - - Past President
A.C.D. BLANCHARD - - - Councillor.

Professional Meeting Committee

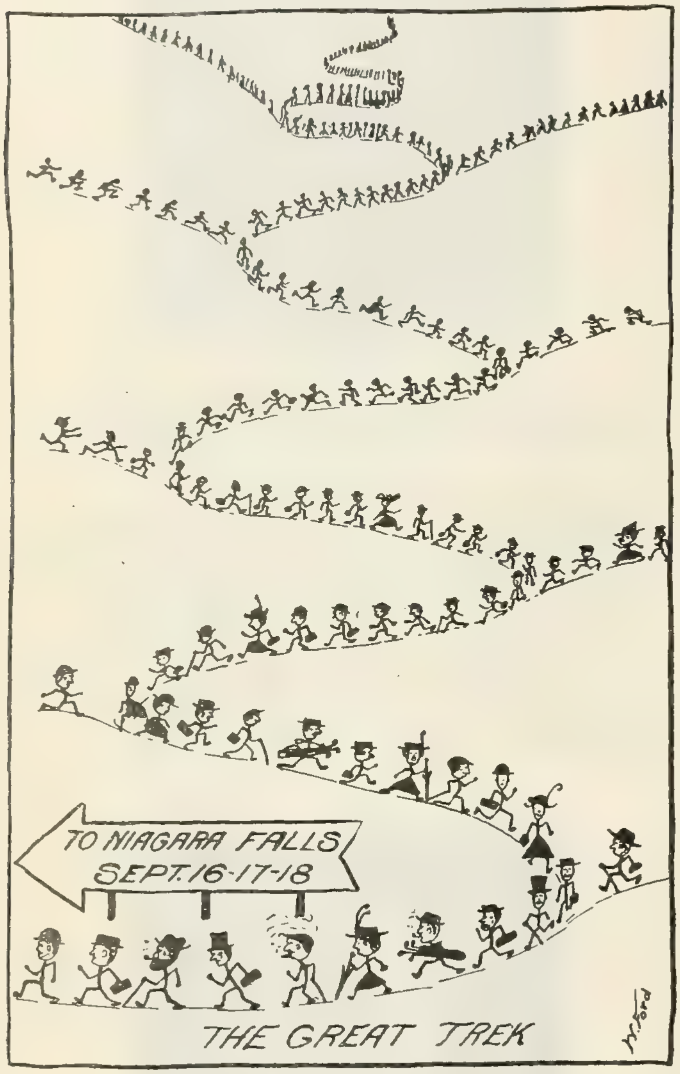
F. W. CLARK - - - - - Chairman.
S. R. FROST - - - - - Secretary

D. T. BLACK, A.M.E.I.C.
Convenor Publicity Committee
City Engineer, Niagara Falls, Ont.

Convenors of Sub-Committees

H. L. Bucke - - - - - - -	Entertainment
A. C. D. Blanchard - - -	Programme.
R. T. Gent - - - - - - -	Finance.
W. P. Near - - - - - - -	Publicity.

The attention of members is directed to the professional papers and to the advertising section in the September *Journal of the Engineering Institute*, which is published as a special Niagara Peninsula Branch Number.



Moncton Branch

For some time members of *The Institute*, resident at Moncton, have felt that the establishment of a Branch there, would stimulate further interest in the profession and enable engineers in that vicinity to keep in closer touch with the activities of their fellow members throughout Canada and to promote greater fraternity than is possible where no organization exists. After considerable discussion and several meetings it was decided to forward an application to Council for the establishment of a Branch. The application is as follows:—

"We the undersigned, Corporate Members of *The Engineering Institute of Canada,* resident within twenty-five miles of Moncton, respectfully request that the Council grant permission to establish "The Moncton Branch of *The Engeering Institute of Canada.*"

J. G. Dryden	F. B. Tapley
F. B. Fripp	H. J. Crudge
J. D. McBeath	J. Edington
E. G. Evans	W. B. Mackenzie
W. A. Duff	M. J. Murphy
R. H. Emmerson	S. B. Wass
Fred. H. Williams	W. R. Devenish

This application was presented at the Meeting of Council, June 22nd, and heartily approved together with the assurance of Council that every possible assistance would be given the Branch in connection with its establishment.

It has been arranged, in view of the consent of Council, to call an organization meeting to be held at Moncton on Monday, October 11th, thus ensuring the Branch's establishment before the General Professional Meeting, at Halifax, October 13th, 14th and 15th. It is expected that a large gathering of engineers will be present, as during recent months engineering activities in and about Moncton had been unusually great. The Secretary of *The Institute* will be present at this meeting and will give an address on Institute affairs.

Advertising in the Journal

Quality advertising rather than quantity has been the foremost thought in the minds of the Board of Management since the inauguration of *The Journal*. It is the earnest desire to keep the advertising pages of *The Journal* on a high plane and with that in view the greatest care is exercised in supervising advertising matter so that if possible no statement may appear which could be considered in any way to be misleading, although not from intent, possibly due to inadvertence on the part of the copy writer. Further, only reputable firms are considered so that members can be referred with confidence to the advertisers in *The Journal* as reliable firms with whom they can safely deal.

The advertising pages contain much valuable information and members are urged to consult this source of information freely and when dealing with or communicating with advertisers refer to *The Journal* as the source.

In the present issue a special section is being devoted to the Niagara Peninsula and to firms which supplied material and equipment to the great engineering undertakings, around which will centre the technical features of the General Professional Meeting at Niagara Falls in September. In addition a number of our regular advertisers who have special positions also supplied material and equipment although their advertisements do not appear in that section.

The engineer as a purchasing power is just beginning to be appreciated. More and more will it be realized in the future that the technical man is a deciding factor where engineering materials and equipment are required.

ELECTIONS AND TRANSFERS

At the meeting of Council on August 24th, the following elections and transfers were effected:—

Members

George Leonard Freeman, of Mattawa, Ont. (B.S. in C.E., Maine Univ.), Mgr. of Engr'g., Kipawa Co.; George Paxton Napier, of Victoria, B.C., Asst. Public Works Engr., Prov. of B.C.

Associate Members

Charles Wesley Burroughs, of Montreal, Que. (B.Sc., Queen's Univ.), Consltg. Engr.; Albert Grainger Cornell, of Winnipeg, Man., Asst. Engr. Reclamation Br., P.W.D. of Manitoba; Joseph Dumont, of Quebec, Que., Engr. Quebec Prov. Govt. (Highways); Charles Allen Fox, of Montreal, Que. (B.Sc. McGill Univ.), Sales mgr. and engr. for H. H. Robertson Co.; Charles Frederick Gray, of Winnipeg, Man., consl. engr. and Mayor of Winnipeg; Frederick Brackenridge Hazel, of Winnipeg, Man. (B.Sc. St. Andrews, Scot.), Draftsman for Manitoba Drainage Commn. Winnipeg; Sydney Arthur Hustwitt, of Toronto, Ont. (B.A.Sc. Univ. of Toronto), Res. Engr. Toronto Harbour Commission.; James Patrick Hynes, of Toronto, Ont., arch. for Hynes, Feldman & Watson, of Toronto and Montreal; Ernest Ian Walter Jardine, of Winnipeg, Man.; William Johnston, of Winnipeg, Man. Chief Engr. & Supt. of Steam Power with Winnipeg Elec. Ry. Co.; Frank White Smith Kennedy, of St. Catharines, Instr'man with Hydro-Elec. Power Commission on Chippawa Development Scheme.; Cecil George John Luck, of Montreal, Que., Asst. Instructural Dept., G.T.R.; Harold Riviere Lynn (Major) of Edmonton, Alta., Res. Engr. on Kleanza Greek, Usk., B.C.; Louis Henry Marrotte, of Montreal, Que. (B.Sc., McGill Univ.), Supt. of operation, Mont. Public Service Corp.; Gerald Marryat, of Montreal, Que.; James Sims Mitchell, of Paris, Ont. (B.A.Sc. Univ. of Toronto), Asst. Engr., Dept. of Public Highways, Ontario,; Harold Robinson McClelland, of Montreal, Que., vice-pres. N. E. McClelland & Co., Ltd., naval architects; Peter John McCuaig, of Winnipeg, Man. (B.A.Sc. Univ. of Toronto) with Winnipeg Elec. Ry.; Ned Franklin Nutter, of St. John, N.B. (B.C. Worcester Polytechnic Inst.) with Western Union Telegraph Co.; Alexander Vivian Polson, of Winnipeg, Man. (B.A. Univ. of Manitoba) Asst. Maintenance Engr., Winnipeg Electric Ry. Co.; James Quail, of Winnipeg, Man. (Diploma S.P.S., Toronto), Mgr. Can. Bridge Co. Ltd., Winnipeg; George Jabez Rayner, of Victoria, B.C., Engr., Canadian Puget Sound Lumber Co., Victoria; Brent Trevelyan Rodd, of Dundee, Man. Municipal Engr., Municipality of Springfield; Gerald Steele Roxburgh, of Winnipeg, Man. (B.Sc. Univ. of Toronto), Engr., Featherstonhaugh & Co., Winnipeg; Grant Simmons Sherman, of Shelburne, N.S., Res. Engr. on highway bridge, Annapolis to Granville, N.S. Highway Board; Stanley Shupe, of Oshawa, Ont. (B.A.Sc., Univ. of Toronto), Engr. Board of Works, Oshawa Ont.; David Smith, of Dauphin, Man., Asst. Dist. Engr., Good Roads Dept., Manitoba; Evan Roy Stewart, of Calgary, Alta. (B.A.Sc., Univ. of Toronto), Asst. Hydraulic Engr., Dept. of Interior, Calgary; John Bernard Wass, of Montreal, Que., Chief Draftsman, Valuation Dept., C.P.R., Montreal; George Hart Waring, of St. John, N.B., Gen'l. Mgr., Union Foundry & Machine Works, Ltd., West St. John, N.B.; Stanley Gregson Webb, of St. John, N.B., Mgr. and owner, The Webb Elec. Co., St. John, N.B.; Thomas Ted Wilson, of Dauphin, Man., Dist. Engr., Good Roads Board, Manitoba.

Juniors

Blair Edmundston Bayne, of Moncton, N.B.; Frank Carl Christie, of Yorkton, Sask. (B.A.Sc. Univ. of Toronto); Orville Mervyn Falls, of Toronto, Ont. (B.A.Sc. Univ. of Toronto) Designer and Draftsman for Baker & Wynne-Roberts, Toronto; Melvin Alan Montgomery, of Prince Rupert, B.C., Engr. with G.T.P. Rly.; Ernest E. Smith, of Sault Ste. Marie, Ont. (B.A.Sc. Univ. of Toronto), Engr. Algoma Steel Corpn.; Aubrey Arnold Turnbull, of Digby, N.S.

Associates

Arthur Macnamara, of Winnipeg, Man. Chief Inspector, Manitoba Bureau of Labor; Arthur Stuart Perrin, of Hamilton, Ont., Mgr. Can. Gen. Elec. Co., Hamilton.

Transferred from the Class of Associate Member to that of Member.

Edward Harrison Harrison (Capt.) of Lingfield, Surrey, Eng., Engr. with R. B. Matthews; Murray Calder Hendry, of Morrisburg, Ont. (B.A.Sc. Toronto Univ.), Engr., Hydro-Elec. Pr. Commission of Ont.; Olivier Odilon Lefebvre, of Montreal, Que. (B.A.Sc., Polytech. Univ.), Chief Engr. for Quebec Streams Commission; James McGregor, of Glasgow, Scot., Chief Engr. and Officer i/c of Harbour survey party, Gold Coast Colony, W.A.; John Hamilton Rychman, of Chicago, Ill., Designing Engr., Bureau of Engr's. P.W. Dept., Chicago, Ill.

Transferred from the Class of Junior to that of Associate Member.

Frank Eugene Victor Dowd, of Montreal, Que., Asst. Supt. of Sewer Dept., Montreal; George Macleod, of Vancouver, B.C., Instrumentman for Vancouver Harbour Commission; Sydney Clarence Mifflen, of East Wabana, Nfld. (B.Sc., C.E., McGill Univ.), Asst. Res. Engr. for Dom. Iron & Steel Co., Wabana Mines, Nfld.; John Earle Pringle, of Hamilton, Ont. (B.A.Sc. Univ. of Toronto), Asst. Engr., Kipawa Pulp & Paper Co.; Clarence Victor Putnam, of Ottawa, Ont. (B.Sc., Queen's Univ.), Asst. Chief, Organization Branch, Civil Service Commission, Ottawa.

Transferred from the Class of Student to that of Associate Member.

Edwin Victor Deverall, Capt., M.C., of Toronto, Ont. (B.A.Sc., Univ. of Toronto), Structural Engr. with Dom. Bridge Co., Toronto; Neil John Maclean, of Penticton, B.C., Res. Engr. on constrn., Kettle Valley Railway; Ivor Francis Rees Roche, of Westmount, Que. (B.Sc., McGill Univ.), Asst. Engr. Lignite Board of Canada; James Archibald Tom, of Guelph, Ont. (B.A.Sc., Toronto Univ.), Asst. Engr. to City of Guelph, Ont.; Hubert Gray Welsford, of Winnipeg, Man.

Transferred from the Class of Student to that of Junior.

Joseph Matthew Conroy, of Ottawa, Ont. (B.Sc., McGill Univ.), Test Dept., Can. Genl'. Electric, Peterboro, Ont.; L. Ludger Delorme, of St. Leonard, Port Maurice, Que., Civil and Chem. Engr. with J. J. Joubert & Co. Ltd.; Edward Walter Francis, of Westmount, Que.; Oswald Slemens Luney, of Niagara Falls, Ont. (B.Sc., Queen's Univ.).

EMPLOYMENT BUREAU

To make this department more valuable it is proposed that in future advertisements of situations vacant should state salary, and give details of requirements.

Hydraulic Designer

Hydraulic designer wanted. Salary $200.00 to $400.00 per month depending on ability and experience. Box 109.

Ass't Civil Engineer for British Honduras

Asst. Civil Eng'r. wanted for Public Works Dept. of British Honduras. Candidate should be a properly qualified engr. with a general knowledge of roads, bridges, buildings and with some drawing office experience. Preferably unmarried and between the ages of twenty-eight and thirty-five. The duties will necessitate his travelling on horse back and in boats along the coast and on rivers. Transport expense will be paid and a subsistence allowance of three dollars a night while travelling. No quarters are provided. Free transportation from Canada. Salary $2,430 (American) per annum. Further information may be obtained from Sir Geo. E. Foster, Minister of Trade and Commerce, Ottawa, Ont. Box 146.

Mechanical Draughtsman

Mechanical draughtsman required for pulp and paper company in Province of Quebec. $225 per month. Box 148.

Instrumentman

Instrumentman familiar with laying out and supervising town work. Salary from $150 to $175 per month. Box 149.

Four Railway Draughtsmen

Wanted, four railway draughtsmen at $175.00 per month, temporary employment. Box 150.

Draughtsman

Draughtsman required for city engineering department. Salary $130 per month. Box 151.

Three Young Engineers

Three young engineers required for temporary work on bridge inspection. Salary $125 per month and expenses. Box 152.

Draughtsman

Draughtsman for work on steam and electric hoists, location, Province of Quebec, rate $150 per month. Box 153.

Surveyor

Surveyor to take charge of small party on water storage work on the Sturgeon River. Salary $150.00 per month. Box 154.

Civil Engineer

Recent graduate civil engineer for consulting engineer's office in Ontario. Initial salary $150 per month. Give full details of experience with references. Box 155.

Civil Engineer

Graduate civil engineer, must be an O.L.S., for consulting engineer's office in Ontario. Initial salary $250 per month. Give full details of experience, with references. Box 156.

Designing Engineer

Fully qualified designing engineer preferably with selling ability for construction work in Malay States. Applicant should be experienced in construction of concrete buildings, and must be Canadian or British. Commencing salary $800. (Strait Settlement), equal about $400.00 American per month. Engagement will be made on a regular contract basis with furloughs and all travelling expenses paid. Box 157.

Structural Draughtsman

Structural draughtsman of superior ability capable of doing individual work; permanent work of good opportunity for the right man. Salary to start $173.00 to $200.00 per month. Box 158.

Civil Engineer for Dam Construction

Civil Engineer as assistant for construction work on dam in the Province of Quebec; salary $150.00 per month. Box 159.

Members Exchange

We have a request from one of our members for copies of the May "Journal", 1920. Any member not wishing to hold this number will confer a favour by mailing his copy to the Secretary.

PERSONALS

I. Blake Allan, S.E.I.C., has recently been appointed jr. assistant to the road engineer of Hamilton, Ontario.

•

E. L. Holmgreen, Jr.E.I.C., has taken a position with the Manitoba Power Commission, Winnipeg, Man.

•

H. A. Elgee, M.E.I.C., has recently returned to London, England, after an absence of eight months in Africa and India.

•

G. F. Layne, Jr.E.I.C., has been appointed assistant mechanical engineer with Price Brothers and Company, Ltd., at their plant in Kenogami, Que.

•

D. G. Anglin, A.M.E.I.C., has recently accepted the appointment of assistant engineer with the Anglin-Norcross Company, Ltd., contracting engineers, of Victoria St., Montreal.

•

William Ford, A.M.E.I.C., has left the valuation department of the Grand Trunk Railway to take a position in the construction department of the Northern Electric Company, Shearer Street, Montreal.

•

Harry F. Barnes, A.M.E.I.C., has now left the Chinese Government Engineering College, Tangshan, North China and has accepted a position with the Department of Public Works, Shanghai, China.

•

A. J. Lawrence, A.M.E.I.C., of Outremont, has since June 1st been visiting Chicago and other points for the Northern Electric Company, Montreal, in connection with the new Machine Switching Telephone System.

•

Capt. W. A. Ervine Grim, M.E.I.C., has been for some time with the United Sugar Companies of Los Mochis, Sin., Mexico, a new company formed recently. Some $2,000,000 are to be expended within the next two years on plant, railways and irrigation. Captain Grim is in charge of construction of both broad-gage and 60cm lines, and expects to start work on surveys for the irrigation canals shortly.

Re Baseball Challenge

Editor, *Journal*:—

I note with a great deal of pleasure in the August issue of *The Journal* the so-called challenge of the Niagara Peninsula Branch of *The Institute* to a game of "Indoor-Outdoor" baseball to be played at the time of the professional meeting at Niagara Falls, probably on Saturday morning, September 18th.

As the suggestion originated with some of our Toronto members, we regard Mr. Clark's letter as an acceptance of *our* challenge.

I have asked Mr. H. L. Seymour to act as Captain of the Toronto Branch team and have requested him to make all arrangements. Yours very truly,

R. O. Wynne Roberts, M.E.I.C.
40 Jarvis Street, Toronto, Ont.

BRANCH NEWS

Halifax Branch

F. R. Faulkner, M.E.I.C., Secretary-Treasurer.

At a meeting of the Executive of the Halifax Branch a Committee on Policy was appointed to assist the central Committee in its work. It was moved by W. P. Morrison, A.M.E.I.C., seconded by J. L. Allan, M.E.I.C., that H. W. L. Doane, A.M.E.I.C., L. H. Wheaton, A.M.E.I.C., and Ira P. Macnab, M.E.I.C., be appointed. This was duly carried.

St. John Branch

Harry F. Bennett, A.M.E.I.C., Secretary-Treasurer.

C. O. Foss, M.E.I.C.
Member Executive St. John Branch.

Charles Orrin Foss, M.E.I.C., was recently appointed a member of the New Brunswick Electric Power Commission and subsequently chosen chief engineer of that Commission.

Mr. Foss was born in Wentworth, New Hampshire, on March 20th, 1850. He was educated at Dartmouth College and was engaged in general engineering work at Concord, N.H., with Charles C. Lund, C.E., under the firm name of Lund and Foss. In 1880 he was made chief engineer of the Texas Trunk Railway with headquarters at Dallas, Texas. Soon afterwards Mr. Foss contracted malaria and was forced to leave Texas and return to Concord, where, upon the death of Mr. Lund, he became associated with F. A. Merrill under the firm name of Foss and Merrill, civil engineers.

In 1881 Mr. Foss became chief engineer of the Des Moines, Oscola and Southern Railway with headquarters at Oscola, Iowa. In 1883 he was made chief engineer of the Nova Scotia Central Railway, which, after many financial interruptions, was completed from Middleton, N.S. to Lunenburg, N.S. in 1889. In 1902 this road was acquired by McKenzie and Mann and became a branch of the Halifax and Southwestern. Mr. Foss remained with this line in various capacities till 1904 when he joined the staff of the National Transcontinental Railway in New Brunswick. In 1905 he was made assistant district engineer in District "A", and, with the exception of a few months in 1907 when he was temporary district engineer at Kenora, Ont., he remained with this line till as district engineer he turned over his district completed and ready for operation on the last day of Dec. 1913.

During 1914 and until May 1917, Mr. Foss took his first vacation in 35 years and attended to various private affairs in which he had become interested. In May 1917 he became a director and chief engineer of the St. John and Quebec Railway, which title he still holds. In June 1918, he was appointed a member and afterwards Chairman of a Commission to gather data regarding possible water powers in New Brunswick, the other members being B. M. Hill, M.E.I.C. and K. H. Smith, A.M.E.I.C. This commission made a very thorough report to the New Brunswick Government this year. In July 1920 Mr. Foss received his present appointment.

Mr. Foss is a member of the Executive of the St. John Branch, Engineering Institute of Canada and of the Council of the Association of Professional Engineers of the Province of New Brunswick.

*

Chas. S. Bennett, Jr.E.I.C., recently severed his connection with the Dominion Public Works Department at St. John, N.B. to join the Fraser, Brace and Company, Limited, of New York.

*

Henry F. Morrisey, Jr.E.I.C., has been appointed resident engineer, Marine Department at St. John, N.B., in place of Gordon S. MacDonald, A.M.E.I.C., who resigned recently.

*

At the July meeting of the Municipal Council of St. John, N.B., a report and sketch plans were submitted by a Committee of the St. John Branch of the *Engineering Institute of Canada* dealing with the proposed construction of a Court House and Municipal Building in the Centre of the City. The Council decided to have detailed plans prepared for a Civic Centre, with the idea of proceeding with the first Section, or Court House, as soon as practicable.

Montreal Branch

J. L. Busfield, A.M.E.I.C., Secretary-Treasurer.

At a recent meeting of the Executive Committee the following appointments were made:—

A. C. Tagge, M.E.I.C., Vice-Chairman, Industrial Section.

Alex. Wilson, A.M.E.I.C., Vice-Chairman, Electrical Section.

F. A. Combe, M.E.I.C., Vice-Chairman, Mechanical Section.

J. H. Valiquette, A.M.E.I.C., Vice-Chairman, Civil Section.

The Papers and Meetings Committee is actively preparing the programme for next season's meetings and a number of very interesting papers have been promised. One of the first to be presented will be, in all probability, by a prominent consulting engineer of New York with a continent-wide reputation.

*

W. S. Lockhart, A.M.E.I.C. has been appointed a superintendent in the electrical branch of the town department of the Riordon Company, Limited, Kipawa, Ont.

Kingston Branch

W. P. Wilgar, M.E.I.C., Secretary-Treasurer.

A Committee on Policy to assist the central Committee has been appointed by the Kingston Branch. The personnel of the Committee will be; the Chairman of the Branch, Alexander Macphail, M.E.I.C.; and the Secretary, W. P. Wilgar, M.E.I.C.

Peterborough Branch

R. L. Dobbin, M.E.I.C., Secretary-Treasurer.

At a meeting of the Executive Committee of the Peterborough Branch, the following members were appointed a Committee on Policy. Jas. Mackintosh, A.M.E.I.C., Chairman; B. L. Barnes, A.M.E.I.C. and A. P. Millar, A.M.E.I.C.

Border Cities Branch

J. E. Porter, A.M.E.I.C., Secretary-Treasurer

On July 22nd, the Border Cities' Branch gave a dinner at the Windsor Club in honor of the Members of *The Engineering Institute* from other Branches, who were attending The St. Lawrence Tidewater Convention being held in Detroit.

The guests of the evening were Messrs. C. R. Coutlee, M.E.I.C., J. B. Challies, M.E.I.C., A. B. Lambe, A.M.E.I.C., and A. J. Matheson, M.E.I.C. of Ottawa, and Col. H. J. Lamb, M.E.I.C. of Toronto.

Following the last touches of an appetizing meal, Mr. Craig called upon Mr. Coutlee to give the members a short address and Mr. Coutlee did,—tracing the Canal System and the St. Lawrence River to the Atantic, pointing out the natural obstacles and the vast amount of work that had already been done, which should be credited to the Canadian Government, also pointing out the fact that the present Canal System is not used to capacity, illustrating his point with his famous canal story Toot-Toot.

Mr. Mattheson also gave the members a short address.

A. B. Lambe, A.M.E.I.C., in addressing the members, called attention to the plans for the September Professional Meeting at Niagara Falls, urging the fullest possible attendance. Mr. Lambe also pointed out the recent recognition of engineers in Ontario Provincial Government appointments and commissions, showing the growing tendency of the public to recognize the engineer as a business man as well as a technical man.

Col. H. J. Lamb, M.E.I.C., a former well known resident of the Border Cities, emphasized the necessity and the advantage of the get together meetings and that too little stress was being placed on good fellowship amongst the engineers.

Mr. Challies then outlined the work being done by the Advisory Conference Committee towards Legislation, pointing out the many obstacles that had to be overcome in finding a common footing for a workable and satisfactory professional act in Ontario. Mr. Challies also emphasized the advisability of encouraging all members to take part in the discussions at branch meetings rather than leave it to a few leaders.

This suggestion was immediately put into effect by Mr. Craig calling upon several members of the branch. Messrs. Keith, Henderson, Anderson and Kirkpatrick, lately resident within the branch, responded in good form and well within the spirit of the meeting.

No further remarks were possible from other members due to Messrs Brian, Thorne and Stevens, the old celebrities, taking the floor. The meeting closed wth imany expressions of appreciation from all sides of the table.

The intention was a get-together become-acquainted meeting. Mr. Coutlee started the ball arolling by his happy faculty of presenting his facts and illustrating them in his humorous manner.

This spirit prevailed throughout the meeting and the Border Cities Branch hopes that the opportunity for such an enjoyable and entertaining evening will soon occur again.

Sault Ste. Marie Branch

Geo. H. Kohl, A.M.E.I.C., Secretary-Treasurer

Early in January 1920 foundation work was begun on a large structural steel mill which is being added to the Algoma Steel Corporation's Plant. Great credit must be given to the management for the initiative shown in the establishment of this much-needed branch of the Canadian Steel Industry.

The new mill, the first of its kind in Canada, will be electrically operated throughout. It will be 1,750 feet long, made up of the following units: 2 Pit Furnace, 40-inch Blooming Mill, 3 Re-heating Furnaces, 35-inch Roughing Mill, and 28-inch Finishing Mill. The estimated cost is $7,000,000. The annual production will be in the vicinity of 550,000 tons of rails and structural steel. This amount, of course, is not in addition to the present output. The new mill will largely supplant those now in use. The existing Blast Furnaces and Open Hearths will furnish sufficient material for the increased production. When beginning operations, 24-inch structural shapes will be the largest size rolled, although provision is made for an ultimate size of [illegible] sections. The latest rolling-mill practice has been followed throughout in the design, and every means has been taken to reduce manual labor to the minimum, and to provide safe working conditions for employees.

For reasons not made known by the management, foundation work was temporarily suspended on July 1st. At that date, [illegible] of the total [illegible] cubic yards of concrete was in place. The following percentages give the above date and these stages of construction:

Pit Furnace Foundations	[illegible]	completed
40-inch Mill & Motor Foundations	[illegible]	"
Reheating Furnace Foundations	[illegible]	"
35-inch Roughing Foundations	[illegible]	"
28-inch Finishing Mill Foundations	[illegible]	"

The [illegible] Company of Montreal and New York placed all foundations.

(Submitted by [illegible], A.M.E.I.C.)

Saskatchewan Branch

J. N. de Stein, M.E.I.C., Secretary-Treasurer

4th Summer Meeting, Saskatchewan Branch.

Canadian Section of the American Waterworks Association

At a recent meeting of the Canadian Section of the American Water Work Association, the following executive was elected.

Chairman: Alex. Milne, A.M.E.I.C., St. Catharines.
Vice-Chairman: F. H. Pitcher, M.E.I.C., Montreal.
Sec.-Treas.: H. G. Hunter, M.E.I.C., Montreal.
Trustees: R. L. Dobbin, M.E.I.C., Peterborough.
Arthur Surveyer, M.E.I.C., Montreal.
W. C. Harris, Toronto.

Preliminary Notice

of Applications for Admission and for Transfer

20th August, 1920

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in September, 1920.

FRASER S. KEITH, Secretary.

*The professional requirement are as follows:—

Every candidate for election as MEMBER must be at least thirty years of age, and must have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. The term of twelve years may, at the discretion of the Council, be reduced to ten years in the case of a candidate who has graduated in an engineering course. In every case the candidate must have had responsible charge of work for at least five years, and this not merely as a skilled workman, but as an engineer qualified to design and direct engineering works.

Every candidate for election as an ASSOCIATE MEMBER must be at least twenty-five years of age, and must have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineers' office, or a term of instruction in some school of engineering recognized by the Council. In every case the candidate must have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, shall be required to pass an examination before a Board of Examiners appointed by the Council, on the theory and practice of engineering, and especially in one of the following branches at his option Railway, Municipal, Hydraulic, Mechanical, Mining, or Electrical Engineering.

This examination may be waived at the discretion of the Council if the candidate has held a position of professional responsibility for five years or more years.

Every candidate for election as JUNIOR shall be at least twenty-one years of age, and must have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the Council, if the candidate is a graduate of some school of engineering recognized by the Council. He shall not remain in the class of Junior after he has attained the age of thirty-five years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects Geography, History (that of Canada in particular), Arithmetic, Geometry Euclid (Books I.-IV. and VI.), Trigonometry, Algebra up to and including quadratic equations

Every candidate for election as ASSOCIATE shall be one who by his pursuits scientific acquirements, or practical experience is qualified to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ADDISON—GEORGE DICKSON, of Vancouver, B.C. Born at Brierly Hill, Eng., 12th Feb. 1879. Educ. King Edward Grammar School, Stourbridge, Eng. and apprentice to R. Blackadder, Dundee; 1895-99 asst. engr. on mtc. Caledonian Rly.; 1899-04, draftsman, James Bay Rly.; 1905-09 with C.N.Rly., as draftsman to div. engr.and ch. draftsman to dist. engr.; 1910-16, draftsman ,C.N.R.Rly.;1916-19, ch. asst. draftsman C.Nor.Rly., Toronto; 1919-20 ch. draftsman, C.National Rly.; Okanagan Br.; at the present time, ch. draftsman, Vancouver Harbour Comm'rs.

References: W. G. Swan, A. F. Stewart, H. T. Hazen, S. H. Sykes, D. A. Graham, C. J. Fox, G. P. Stirrett.

BELCHER—JOHN TRESILIAN, of Cameron Falls, Ont. Born at Toronto, 13th Nov. 1890. Educ. B.A.Sc. Univ. of Toronto, 1914. Summers 1911-12 on mtce. work, C.P.R.; summer 1913, gen. survey work, O.L.S.; summer 1914, draftsman, D.P.W. on Georgian Bay Canal and St. Lawrence river development; 1914, 6 mos. rodman, H.E.P.C.; 1916 draftsman H.E.P.C.; 1916-18, on active service; 1919 to date with H.E.P.C. as draftsman and office asst.

References: T. H. Hogg, J. N. Shanly, G. F. Hanning, J. A. G. White, A. Drowley, T. M. McCarthy, S. J. Chapleau.

BERTRAM—H. GRAHAM, of Dundas, Ont. Born at Dundas, 9th May, 1886. Educ. B.Sc., Queen's 1910. 3½ yrs. apprenticeship, John Bertram & Sons Co.; summer 1909, special apprentice, C.P.R. shops, Winnipeg; 1910-12 general engineering" Cartago, Costa Rica; 1912-13, asst. engr. Mexico, N.W.Rly., Juarez, Mexico; 1913 to date, with John Bertram Sons & Co., and since 1918 ch. engr.

References: A. Bertram, J. B. Stirling, D. S. Ellis, C. R. Murdoch, W. Chipman, W. L. Malcolm, E. S. Malloch, P. A. Laing.

BUCHANAN—FRANK MONTGOMERY, of Montreal. Born at Blenheim, Ont., 12th August, 1893. Educ. B.A.Sc., Univ. of Toronto, 1915. land surveying engr's office, Kitchener; engr. in ch. of Wagner County highway comm'n.; plant and work engr. Dom. Tar. & Chem. Co., Sydney; asst. mgr. same Co. in Can. head office; at the present time mgr. of Road Dept. same firm, Montreal.

References: P. Gillespie, E. A. James, R. J. McClelland, L. Brown, E. D. Gray.

CLIFFORD—ARTHUR LePOER TRENCH, of Hamilton, Ont. Born at Delhi, India, 24th Aug. 1887. Educ. 1905-1909, engr. dept. Univ. Coll.,London,Eng.1909-10, articled pupil, burough surveyor, Southal dist. Council, London, W., Eng.; 1911-12 draftsman, Hamilton Br. Works; 1912, checker, Canada Foundry Co., Toronto; 1913-16 draftsman, Hamilton Br. Works., 1916-19 on active service; 1919 to date, checker in drafting dept., Hamilton Bridge Works, Co.

References: R. K. Palmer, C. H. Marrs, J. A. McFarlane, G. Colhoun, E. H. Darling.

CREIGHTON—CHARLES PEARSE, of Cedars, Que. Born at New Westminster, B.C.. 1st Aug. 1892. Educ. B.Sc., (E.E.) McGill Univ. 1920. 1910-11, (2 yrs.) with B.C. Elec. Rly. in operating, Constrn. and engr. dept. and later in ch. of a mtc. gang; 1915-19 on active service, June-Aug. 1920, asst. to supt. of Cedars plant, M.L.H. & P.Co.; at the present time with McDougall & Pease, consulting engrs.

References: L. A. Herdt, C. V. Christie, E. Brown, C. C. Worsfold, R. M. Wilson, G. K. McDougall.

DAVIS—CHARLES HOULTON, of Moose Jaw, Sask., Born at Gloucester, England, March 28th, 1888; Educ. Private Tution, Eng. pupil with Messrs. Summers & Scott., Engr's Gloucester, Eng. for three years; 1907-08 Draftsman Benson & Houlton Co., Calgary, Alta.; 1908-10 Rodman & Draftsman C.P.R.; 1910-15 Instrt'mn. with the C.P.R. Maintenance of Way, Western Lines 1916-1919 on active service in France; Sept. 1919 to March 1920 Eng. in charge of construction dam for C.P.R. at Moose Jaw, at the present time Asst. to the Division Engineer, C.P.R. at Moose Jaw.

References: J. R. C. Macredie, J. L. R. Parsons, W. T. Daniel, C. S. Moss, J. C. Macnabb, W. H. Greene.

FERGUSON—JOHN WILBUR, of Brampton, Ont. Born at Brampton, Ont. March 22nd, 1887; Educ. B.A.Sc. Toronto University, 1911; In charge Elec. installation during vacation, with Dominion Bridge Toronto & Lachine for 4 yrs. as draftsman and inspec.; at present time Draftsman and designer of Struct. steel. Can. Allis Chalmers, Co. Toronto, for one year.

References: J. L. Brower, C. R. Young, G. C. Parker, M. B. Watson, L. R. Wilson, D. C. Tennant.

GIBSON—LEONARD, of Montreal West; Born at Scarborough, Eng., May 29th, 1886. Educ. Tideswell Grammar School; 1904-10 with H. W. Smith, M.I.C.E., Borough Engineer, 3 years as article pupil and 4 years Asst. Eng.; 1910 to date with the G.T.Ry. in various capacities and at the present time Asst. Eng. of valuation.

References: F. L. C. Bond, A. S. Going, R. Armour, H. B. Stuart, J. A. Burnet, V. I. Smart, P. De La Cour, J. W. H. Ford.

GREER—JOHN, of Montreal, Born at Belfast, Ireland, 5th Feb. 1885. Educ. B.A. and Bach. of Engr. Royal Univ. of Ireland, 1910. Before taking Univ. course, 3½ yrs. drafting office and workshops, J. Mackie & Sons, Belfast; 1911, 2nd asst. to chief engr., Belfast & County Down Rly.; 1911-12, land surveyor and valuer, Irish Land Comm'n. Dublin; 1913-14, transitman and res. eng. C.N.R., Vancouver Is.; 1915-19, on active service; 1919 to date with the G.T.R., and since Jan. 1920, asst. engr. on valuation of bridge substructures, at the present time asst. engr. Portland div.

References: W. Walker, R. Armour, F. L. C. Bond, M. S. Blaiklock, W. McNab, A. S. Going, G. M. Stewart, H. B. Stuart, E. G. Carty.

MATHER—WILLIAM ALLAN, of Moose Jaw, Sask. Born at Oshawa, Ont., Sept 12th 1885. Educ B.Sc. McGill Univ. 1908; since graduation with C. P. R. holding such positions as Res. Eng. Supt. and since 1918 Gen. Supt. Moose Jaw, Sask.

References: J. G. Sullivan, W. A. James, Frank Lee, J. R. C. Macredie, J. C. Holden.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

BRETT—JOHN FRANCIS, of Montreal. Born at Grandson, Switzerland, 16th Oct., 1891; Educ. 2 yrs. Tech. Coll., Geneva. 1910-13 rodman, etc. on geodetic and Geological surveying (pt. time); 1913-14, instr'man and draftsman on rly. and br. constrn.; 1915-19, on active service; 1919, 5 mos. instr'man on locating work, C.P.R. Aug. 1919 to date, asst. engr. D.P.W., Montreal.

References: C. L. Hervey, LeR. Wilson, C. W. P. Ramsey, C. T. DeLamere, L. W. Klinger, G. R. MacLeod.

CHAPMAN—EDWARD WILLARD GORDON, of Truro, N.S. Born at Dartmouth, N.S., 17th Sept., 1890. Educ. S. B. (C.E.), N.S. Tech. Coll., 1914. 1912-13, draftsman and instr'man, C.N.O. Rly.; 1914-16, instr'man on mtce. of way, C.N.R., Halifax to St. John; 1916-19, on active service; 1919 to present instr'man, C.N.R., Truro, N.S.

References: R. H. Smith, W. A. Duff, C. W. Archibald, J. W. Roland, I. P. MacNab, G. S. Stairs, F. G. McPherson, K. E. Whitman.

FLITTON—RALPH CYRIL, of Peterboro, Ont. Born at Cambridge, England, 15th, Sept. 1887. Educ. B.Sc. McGill Univ. 1914, 1907-10, and during summer vacations in city engrs. dept. on drafting instrument work and asst. on constrn.; 1914-15, with F. A. Devereux, office and field work; 1915-16, C. H. Topp & Co. in field and office, on waterworks and mining surveys, Vancouver Is.; 1916-19, with Br. Munitions Co., Verdun, Que. as tool designer, asst. to supt. in blending and proofing dept., and in chg. of proofs, and asst. to supt. forging dept.; 1919, 3 mos. sales engr., Williams Mfg. Co.; 1919 to date, with Wm. Hamilton Co., Peterboro, as asst. to supt. and engineer.

References: F. A. Devereux, J. D. Hathaway, G. R. Kendall, C. H. Rust, P. P. Westbye.

HARCOURT—HARRY EDMOND, of Trenton, Ont. Born at Toronto, Ont., 8th Jan. 1889. Educ. Grad. S.P.C. 1918, 1909, mine surveying and est. air consumption, Cobalt Mining Camp, Cobalt Hyd. Power Co.; 1911-14, Dept. of Works, City of Toronto, res. engr.; 1914-16, Sec. Treas., J. H. Tromanhauser Co. Ltd., engrs. and contractors; 1916-19, estimating and consulting work on chemical products, Canadian Stewart Co.; 1919 to date, Mgr. Benedict Proctor Mfg. Co., Trenton, Ont.

References: J. L. Weller, E. R. Gray, W. R. Worthington, G. G. Powell, H. E. T. Haultain.

JONES—WILLIAM HENRY, of Winnipeg, Man. Born at Cardiff, Wales, 7th Nov., 1887. Educ. B.C.S., Univ. of Man. 1914; qualified in aeronautics, Oxford, Eng. 1904, 4 mos. clerk J. Woodman, Arch. Winnipeg; 1904-09, Rodman, instr'man C.P.R.; 1910. asst. city engr., Medicine Hat; 1911-12, insp. masonry and asst. engr., C.P.R., Coquittam terminals; 1913, engr. partner, Boyne & Hobbs, Winnipeg; 1914, Munic. engr., Rockwood Munic. and Good Roads Board, Winnipeg; 1914-19, on active service, R.A.F.; 1919-20., mgr., Community Lumber Yards Ltd.; May 1920 to date, engr. and Mgr., Can. Insulation Co. Ltd., Winnipeg and West Selkirk.

References: J. A. Hesketh, E. E. Brydone-Jack, L. M. Jones, G. A. Bayne, F. Lee, E. P. Fetherstonhaugh, A. McGillivray, B. Ripley.

SAUNDERS—WALTER LAIDLAW, of Consul, Sask. Born at Goderich, Ont., 29th April, 1889. Educ. 2½ yrs. S. P. S., 1910-12; 1907-10 with T. C. Rly, as rodman, instr'man, etc.: (pt. time); summers, 1911-12, asst. engr. on mtce., G.T.R., Toronto: 1912-13, instr'man, T. C. Rly.; 1913-15 Lake Erie & N. Rly., as instr'man and res. engr. on constrn.; 1915-19, on active service; 1919 to date, instr'man on constern., C. P. R. at Consul, Sask.

References: J. A. Hesketh, W. A. James, E. G. Hewson, E. W. Reed-Lewis, J. G. Jack, J. V. Dillabough, D. Hillman.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

BROWNE—GEORGE ALLEYNE, of Ottawa, Ont. Born at Deseronto, Ont., 30th April 1887. Educ. Montreal High School and I.C.S. in civil engr. 1905-09, with C.P.R., as rodman, topographer, revision, constrn. and mtce; 1909-10, N.T.C. Ry., as instr'man on constrn.; 1910-13, G.T.P. Ry., as instr'man, acting res. engr. on constrn. and res. engr., on constrn. revision, Mountain div.; 1913-14, res. engr., Pacific Gr., Eastern Ry., 1915, 6 mos., G.N.Ry., Seattle, on bridges, etc.; 3 mos. Pacific Telegraph & Telephone Co., Seattle, on valuation work; 1915-17, on active service, discharged as physically unfit; 1917-20, res. supt. engr. branch, military hospitals, in chg. of constrn. and mtce. of hospitals; April 1920, to date, asst. gen. supt. engineering branch, S.C.R. Ottawa.

References: J. Callaghan, G. H. Cagnat, W. R. V. Smith, H. S. Johnston, E. L. Miles, C. H. Pozer, F. J. George, C. R. Crysdale.

HEURTLEY—ERNEST SYDNEY, of Oxford, Eng. Born at Parton, Oxford, England, 31st October 1877. Educ. McGill Univ., Montreal. 15 yrs. with East. Exten. Telegraph Co., as cable electrician at their stations and on board their ships. (Invented an apparatus in connection with submarine cables now in use by all transatlantic cable cos. and of immense value during war); since May 1918, partner, Clarke, Forde & Taylor, consl. civil & elec. engrs. (spec. submarine cables).

McCAGHEY—NORMAL F., of Kenogami, Que. Born at Quebec, Que., May 30th 1890. Educ. 3 yrs. C.E. McGill Univ. Summer 1908, M.P. & J. T. Davis, Quebec Bridge, Summers 1909-11, Asst. to the Eng. for Contractors, 1911-14, Instrt'mn on construction N.T.C. Ry.; 1914-19 on active service 1919; to date on the Eng. staff of Price Bros. & Co. Asst. to Res. Eng. draftsman and instrument work, designs, etc.

References: John S. Bates, S. E. Oliver, C. A. Buchanan, Art. Dick, C. N. Shanly, H. M. Lamb, John Farmer, F. L. Darrell.

MEIKLE—ANGUS URQUHART, (Major, M.C.) of Ottawa. Born at Lachute, Que., 17th Sept., 1887. Educ. B.Sc., Queens Univ. 1912; D.L.S. 1907, prospecting; 1908-09, on triangulation survey; 1910, on geological survey; 1911, instr'man, Shawinigan Water & Power Co.; 1912-14 on D.L.S.; 1915-19, on active service; at the present time with the S.C.R., Ottawa.

References: A. Macphail, W. P. Wilgar, W. L. Malcolm, L. W. Gill, D. S. Ellis, C. R. Avery, F. S. Lazier.

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Reminiscences

Pioneer Life in the West

H. J. Cambie, M.E.I.C.

In connection with my Professional Record, it might be of interest to some members of the E.I.C. to give a few reminiscences of events which have occurred during a long, busy life.

I was born in the County Tipperary, Ireland, in 1836, and brought up on the banks of the River Shannon (Lough Dearg) and, terrible as is the unsettled state of that country at present, with the almost daily murders which are taking place, the same sort of things were common during my childhood, and were just as brutal, differing only in frequency.

Irish Life in the Thirties

My father's house consisted of an old castle, supposed to have been built about 800 years ago, to which had been added, in later years, a lean-to of a more modern type, which made it a comfortable residence. A courtyard in front of the house was enclosed with high walls, and during part of my boyhood, if any visitor came after dark, he had to ring a bell outside the courtyard gate and give an account of himself to someone at an inaccessible window, and if satisfactory he was admitted to the courtyard and to the hall door. But I do not remember a case when the visitor was not admitted.

The walls of the "old castle" part of the building gave evidence of the unsettled state of the country many centuries before our time, for my father had occasion to make repairs to certain rooms during my lifetime and in doing so, to pull out pieces of the walls. At one of these places he found the skeletons of two girls and on two other occasions, the skeletons of men. These were rather gruesome finds, but were not supposed to point to murders, for the tradition was that the Anglo-Saxons who overran that country, with King John's followers and their descendants, were at enmity with the original inhabitants, the Celts, for several centuries and if they buried their dead in grave yards, they would be desecrated, consequently they sometimes built their bodies up in the walls of their dwellings.

Arrival in Canada

In 1852 I came with my parents to Canada, sailing from Liverpool to Philadelphia in the "City of Manchester," the first ship of the Inman Line — now known as the American Line, and took eighteen days on the passage, landing on May [illegible].

The next day we travelled by rail to Perth-Amboy, and thence to New York by boat. On that evening and the next, the lower end of Broadway and the Battery were lit by arc lights on high poles. The carbons were just such as are in use today, but the electricity for each was furnished by a large number of cell batteries. They were found to be unreliable and very expensive and were abandoned in two or three days. I saw the lights myself, but only knew of the batteries by hearsay. Of course they did not come into actual use for nearly thirty years later, when the dynamo had been invented.

The Hudson River Railway had not been built, so we came by steamer to Albany and thence by rail to Buffalo, which was a hard night journey, as Pullman sleepers did not come into use for fifteen years or more afterwards. Next day we took a small ferry boat from Buffalo to Chippawa, about two miles above Niagara Falls, and from there to Queenston we travelled by a railway which was, I believe, the only one then operating in the Province of Upper Canada (Ontario) and is worth describing.

The line was on very much the same location as that occupied by the electric railway of late years. We were carried in an old fashioned English type of coach, with two or three compartments, each of which had seats for six or eight persons. It ran on wooden rails, reinforced with iron straps, and was drawn by one horse, driven by a man sitting on the front of the car, and we jogged along quietly. This seems a primitive sort of railway, but was a great convenience. The Northern Railway from Toronto to Collingwood was then under construction, as also the Great Western Railway from Windsor to Niagara Falls, but neither of them was completed for traffic for a couple of years afterwards, and the Grand Trunk did not even get a charter till the following year, 1853.

From Queenston we crossed the lake to Toronto on a side wheel steamer, called the "Chief Justice" with a long protruding snout, which was intended to pass under ice, lift it, break it up and throw it clear of the paddle wheels.

The Saxby Tide

My experiences for the next twenty years were just like those of any other engineer employed continuously on explorations surveys and construction. One incident, however, may be worth mentioning which seems to have dropped out of memory now. I refer to "*The Saxby Tide*" of October 1869.

Some three or four years previous to that time, Mr. Saxby, an Astronomer at Greenwich, while compiling the Nautical Almanac, became aware of the fact that on a certain day in October, 1869, the Earth, the Sun, the Moon and the planet Mars, would be all in a line, which would undoubtedly cause an extraordinary tidal wave.

As contractor's agent, I was at that time, October 1869, ballasting the western part of the Windsor and Annapolis Railway, preparatory to handing it over to the Company for operation. As the tides in the Bay of Fundy have, at ordinary times a great range, amounting at springs to about 50 ft. and we expected them to be, then, quite out of the common, we made such preparations as were possible, but the tide exceeded our utmost expectations. Large areas had been reclaimed from the sea by the French, and the dykes had been extended, as well as strengthened, by the English, after it had passed into their hands, and had held good for over 100 years, so it was hard to believe they were not safe. But when the Saxby Tide came in, it had a "bore" of such size and force that the dykes offered no resistance, and miles of them were swept away in a moment and the "bore" rushed on, wiping out fences, railway tracks, etc. and killing cattle which were pasturing on the after-grass. On the Annapolis end of the railway, the damage was not very great, but on the other end of the line, near Wolfville, and especially on the Grande Pré (the scene of Longfellow's poem of "Evangeline") the devastation was appalling.

Early Exploration in the Canadian West

Coming to the mountains of British Columbia in 1874, I had a few experiences out of the common.

In 1875 I was instructed, by Mr. Marcus Smith (my Chief) to make an exploration and survey for a line to Bute Inlet, by way of the Homathco River, passing through the country of the Chilcotin Indians. About ten years previously Mr. Waddington had obtained from the Provincial Government, a concession to build a trail by another branch of this river, from Bute Inlet to the Cariboo gold mines, and during the year 1863, built about thirty miles inland from tide water, at which point his men came in contact with the Indians of the Interior.

So far they had been assisted by the Coast Indians with their canoes, who lived on fish to a great extent, were lazy and had no ideas of morality, but the Indians of the Interior, who lived on meat, acquired by hunting in the woods, and on the mountains were a much braver race and jealous of their wives and families — and Waddington's men offended them deeply.

They ceased work in the Autumn of 1863, and when they returned to work in the Spring of 1864, the Indians descended on their camp at night, dropped the tent on them while sleeping and stabbed sixteen men to death, while tangled under the canvas. A company of volunteers was sent out, well armed, to punish them but needless to say, clerks from offices in Victoria could not overtake Indians on the mountainside.

I am not, however, writing an account of the Waddington Massacre, except insofar as my personal experiences are concerned. An armed survey party passed through, accompanied by a magistrate, in 1872, by another branch of the Homathco, but saw little or nothing of the Indians. I went through their country in 1875, approaching it from the interior where the country was open and sufficiently free from timber to enable us to ride on horseback.

Mr. W. T. Jennings and I went with survey parties, together, to a point near Tatla Lake and parted there, he going North East towards Fort George, while I turned South West towards Bute Inlet.

Experiences with Indians

Before making an actual survey, I went for a four or five days ride into the Pass, accompanied by Mr. M. Eberts, my assistant, and a couple of packers, a Frenchman and a Mexican. We took with us some blankets, clothes and tobacco as presents for the Indians if we should meet any. On our second day out from the main party, we found a band of thirty or forty Indians camped on a sandbar between a lake and a swamp and putting up (smoking) fish for the next Winter. We offered them presents which they scorned, ordered us to turn back, and one man got up on a stump, gesticulated wildly and made a most impassioned speech. So we packed up our presents and proceeded on our way for another couple of days ride.

On our return, about three days after, we passed over a mountain spur about two miles away from the Indian Camp, and could see them on the sandbar, men, women and children, at their various occupations. When we reached there, however, every soul had disappeared, even the horses and dogs — and though often there afterwards, I never discovered where they had gone.

Our pack horses were running loose and I called to the packers to lead them by the halters, which they did, as the Indians were evidently very hostile and might stampede them. So we passed on quietly and had gone, say a couple of miles further, and were in a narrow defile between two hills and riding in single file, when I heard a noise behind and on looking back saw a dozen or more Indians coming full gallop on horseback, with very scant clothing but each one armed with a Hudson Bay Company's musket, having a barrel over three feet long and a knife or some other weapon in a belt—when they came close they opened out into two columns, one passing at each side of us, and when the last man came even with me (one on either side and about 6 feet away) they stopped dead, throwing their horses on their haunches. No one spoke—we kept on our even way, a fast walk, and soon left them behind. I confess that, knowing these men to be of the same families who had murdered Waddington's party ten years before, it gave me a cold chill down my spine, but I kept outwardly calm, knowing that any sign of weakness would be very bad.

When we had travelled another mile or two, our friends repeated the operation, and when they pulled up next me, one of the Indians opened a conversation in "Chinook" and said they would accept the presents offered them five or six days before. This I absolutely refused to consent to, and stuck to it, notwithstanding sundry threats, but on the advise of a priest who came to visit them a few days later, consented to hand them over.

The priest, Father Maréchal, had only been visiting them for a few months and had already acquired a considerable influence and helped me in every way. This party of Indians left us for some hours, but when we were camping for the night, rode up again, asked for supper and were refused. We did not however pitch our tents, but laid them on the ground and slept on top of them, with one rifle between Mr. Eberts and me, and one axe between the two packers, and insisted on the Indians keeping at a distance.

They followed us to our main camp next day and we afterwards became good friends, after I had an interview with their Chief, and assured him they, and especially their women, should be treated with every respect.

We were greatly amused at these women, who had not been allowed to visit the settlements, and when they came round our camp on Sundays, refused at first to look in a mirror, but after a week or so consented, and then all of them removed the large bone nose rings which they wore — though they had seen them in each others noses all their lives.

A number of the men came to my camp one Sunday, shortly after, and told me they had come from Mr. Jennings' camp, thirty miles away, to ask me if I believed in Hell, as it had been described to them by the priest and illustrated by Mr. Jennings. On being pressed for an accurate description it appeared, Mr. Jennings had burnt something in a soup plate, which I afterwards found to be brandy, and as it was in a brilliant sun, they could not see the flame, though its burning power was good. I backed up Jennings' description, and gave them a similar exhibition to their very great satisfaction.

I referred just now to a conversation in "Chinook," which was a jargon said to have been devised by some Hudson Bay Company voyageurs, and which all travellers in this country used, when I first came to British Columbia. It consisted of about 200 (?) words, mostly French, a few English, a few Spanish and some Indian words. It was most useful, for I have had, in one party, men who spoke only French, others only English, others Spanish (Mexican packers) and Indians of two different tribes. That is, five languages in a party of twenty or twenty-five, and our "official" language was Chinook.

During the years 1876-1878 explorations and surveys were made continuously under my charge through all the Passes in the Cascade Mountains, from the Pacific Coast towards the Yellow Head Pass, and the route from Burrard Inlet, via the Fraser and Thompson Rivers, was selected as the most favourable.

Exploring the Peace River District

But in 1879, the Minister of Railways, Sir Charles Tupper, and the Chief Engineer, Sir Sandford Fleming, determined to put off construction for a year, for various reasons, and in the meantime make as complete an exploration of the Peace River country as was possible in one season, examining it from various points of view — as to the obstacles in the way of railway construction, as to its suitability for settlement and agricultural pursuits, and as to its mineral possibilities from a geological standpoint, before actually letting contracts for the work of construction on another route, and so fixing the location, irrevocably.

In carrying out this idea, I had the honour of leading into that country, a party of most distinguished men: Rev. D. M. Gordon, who was till lately Principal of

Queen's University at Kingston, the late Dr. G. M. Dawson, assistant director of the Geological Survey with Mr. McConnell, his assistant, who was afterwards director of the Geological Survey, also Mr. H. A. F. Macleod, who with myself, was to report more particularly on the engineering features of the ground we traversed.

We came from Ottawa to San Francisco by rail, thence to Victoria by boat. There I chartered the "Princess Louise," a steamer belonging to the Hudson's Bay Company, which took us to Port Simpson, the natural outlet for a line from the Skeena River Valley, and one of the finest harbours on the Pacific Coast of Canada. Thence we proceeded across the country, by canoes on rivers and lakes, and on foot over mountain trails, etc. to Fort Macleod, on Crooked River, a small tributary of the Peace.

At Fort Macleod we patched up an abandoned boat of the Hudson's Bay Company, caulked the seams with leaves, etc. and drifted down the Crooked River, the Parsnip and the Peace to Rocky Mountain portage—about one hundred and fifty miles—one man baling all the time. At the other end of the portage (opposite Hudson Hope) we made a raft and drifted on it nearly one hundred and fifty miles further, to Fort Dunvegan, where we scattered.

The slopes of the valley facing the South, are generally devoid of timber, but largely covered with bushes bearing berries, which at the time of our passing were just ripe, and bears of all varieties had gathered there to feed on them. In drifting on a boat of raft, we made no noise and had an opportunity to see them at close range. I remember being struck with admiration at seeing a large grizzly, lying on her back and playing with two cubs, as I have seen an acrobat at a circus, tossing a child about.

From Fort Dunvegan, we scattered — Mr. Macleod and I hired the few horses, (six), which the Hudson's Bay Company had, to carry our provisions, and travelled South about fifty miles to, approximately, the place now known as Grande Prairie, all the way through excellent land. There we parted, he going West and I going East.

I crossed Smoke River and its branches to Sturgeon Lake where there was a band of Cree Indians, and then to Lesser Slave Lake, passing through a country, all of which was fit for cultivation and settlement if the climate should not prove too rigorous.

From Lesser Slave Lake we returned to Dunvegan by the regular Hudson's Bay trail, crossing the Peace at what is now known as the town of Peace River — but there was not even a single inhabitant there at that time.

We reached Lesser Slave Lake on a July evening, and in front of the Fort, at the head of the Lake, there is a large flat, flooded at times, on which grew coarse grass — on this were several mowing machines at work, also horse rakes, and men stacking the hay, as well as some milch cows grazing, and all this, seen in the light of the setting sun, seemed to me, after some months in the wilds, to be one of the most peaceful and beautiful scenes I had ever witnessed.

The country from Peace River Crossing to Dunvegan was over a plateau of indefinite extent, at an elevation of several hundred feet above the Peace River, and all of it fit for settlement.

All the way from Lesser Slave Lake to Dunvegan, a distance of perhaps one hundred and twenty miles, we did not meet a human being at that time, nor in all that country, except about three Indian families and those Crees at Sturgeon Lake.

All the members of our party assembled again at Dunvegan, early in September and made a joint report, which was wired to Ottawa from Battleford, the nearest telegraph station. And we then each took up our journey for home, breaking up the best informed, most congenial and happiest party, with which it was ever my good fortune to be associated.

One of the Pioneers

Before leaving the subject of my Peace River trip, it might not be amiss to mention my meeting there with an Irishman, who assisted me for a few days while making my way southward from Hudson's Hope on the Peace, across a couple of spurs of the Rockies to Pine River.

He was an intelligent and educated man and, sitting round our camp fire at night, we had reminiscent chats, when he told me that he had been adopted and brought up by a maiden aunt in Ireland. But when grown up to man's estate, he decided that he was not adapted for an old maiden lady's pet, and so came to British Columbia with the rush to the Cariboo Gold Mines, about 1860.

He mined in many of the camps, doing fairly well, but acquired bad habits — and despite good resolutions, returned to them again and again, and was going down hill. So he decided to retire to the wilds and live by hunting and trapping, far from temptations.

When I met him he had a nice little shack about the size of a ship's cabin and, having some tools, he had made it comfortable, clean and neat. He had a good supply of provisions, ammunition traps, etc. also a net with which he was catching white fish in a nearby lake and drying them as feed for his dogs, during the coming Winter.

Once a year he went out to the banks of the Peace River to meet a trader, sell his furs and lay in supplies for another year, and he suggested to me that he was now living an abstemious life, like a gentleman, and without temptation.

In my official report of this trip I commenced with an itinerary and mentioned his surname only (Mr. Axxxx) as one who had assisted me, and then went on to describe the country.

Some three years afterwards I had a letter from a newspaper editor, who had read the report, and had come to this country in the Cariboo days, with a young Irishman of that same name, whose aunt was now old, in bad health and anxious to be reconciled to a long lost nephew, if he could be found.

I had his receipt for money, with his signature, still in my note book, tore the page out, sent it to his friend the editor, and he turned out to be the very man wanted.

Through the kindness of some of the Hudson's Bay Company officials, we found him, after a two years' search. He went back to Ireland, was with the aunt for some time before her death, and she left him a competency.

My newspaper friend told me, many years after, that while in Ireland, he again fell into bad habits and had come back to British Columbia and gone once more to Peace River, to lead the life of a hermit, free from temptation.

I have mentioned him as a type, with several of whom I came in contact, at odd times in the mountains, who could not trust themselves to live among their fellows.

In 1917, after a lapse of just thirty-eight years, it was my privilege to visit this country again, and to travel by railway in a sleeping car from Edmonton to Peace River and shortly afterwards to travel by motor from there to Dunvegan. In all this motor trip from Peace River Crossing to Dunvegan and on to Spirit River (formerly known as Ghost Creek) there were good country roads, for we made ninety miles in about seven hours, and all the way was through, or in sight of, wheat fields — and the houses were sufficiently close to each other to support schools at reasonable distances.

This was a wonderful transformation in thirty-eight years, and on this latter trip, I was permitted to descend the Peace River some three hundred miles farther North, on Lord Rhondda's boat, the "D. A. Thomas" to Fort Vermillion, and found the country for all that distance, as fertile as that round Dunvegan, and saw splendid grain crops raised at the experimental farm at Vermillion.

I returned to British Columbia by the Pine River Pass, with a pack train of about thirty animals. We had been delayed by various causes and only reached its summit October 1st 1879. There we were caught by a fall of snow, which ended the feed for our poor animals, with still two hundred miles to go, except for one night on a prairie covered with lupins, which stood above the snow.

On reaching the Nechaco River, we obtained a boat and taking most of our baggage, descended it and the Fraser River, for over one hundred miles with ice forming along the shores, and ran all the rapids without a pilot, except the Fort George Canyon, till we reached civilization at Quesnel Mouth.

Building the Canadian Pacific Railway

In the end of 1879 the Government at Ottawa decided to adopt, as the route for the Canadian Pacific Railway, a line through the Yellow Head Pass and via the Thompson and Fraser Rivers to Port Moody on Burrard Inlet, and at once called for tenders for the construction of that portion, extending from Emory's Bar, five miles west of Yale (the head of river navigation) to Savonas Ferry, at the outlet of Kamloops Lake (the beginning of inland navigation) a distance of one hundred and twenty-eight miles.

This was devided into four contracts, and I, having been identified with the canyons of the Fraser, which had been pronounced by some prominent engineers as impracticable for a railway, was given charge of Contract 60, which embraced those canyons.

The work was allotted to the lowest tenders, which were all by Canadians, but before construction was actually commenced, they were severally bought out by Andrew Onderdonk, a young man from the United States only about thirty years of age, a clever engineer, of excellent organizing ability, who had splendid financial backing.

We, the engineering staff, came from Ottawa to British Columbia via the Union and Central Pacific Railway and by boat to Victoria, which was the only available route at that time.

As soon as snow had gone, at the end of April, we proceeded to Yale to locate the line and lay out the work.

Up to that time, we had been given as our standard, a maximum of four degree curves and one per cent grades, except in one or two special cases, where we might be allowed to consider something sharper and report on them.

We had located about two miles, with the above as a standard, when I received a telegram from the chief engineer to "locate the cheapest possible line, with workable curves and grades."

I stopped the survey at once and with Mr. T. H. White, my principal assistant (who is now chief engineer of the Canadian National Railway in British Columbia) spent a day examining the ground at sundry critical points, and adopted eight degree curves as our maximum, with one per cent grades. The conformation of the ground was such that steepening of grades could not reduce the work much, but sharpening of curves could do wonders in avoiding tunnels and other expensive works, and we considered eight degree curves the sharpest we were then justified in adopting for a transcontinental line.

In order to reduce the amount of excavation we in many places built the line along the face of bluffs where there was good foundation for walls, but no building stone available till it should come by train, so trestles were built with steps cut in the rock for the posts. We built many such, with the outer post thirty or more feet in height and the inner one very short, or perhaps without a post at all, but the end of the cap resting directly on the rock.

There was a special design made for each bent of every trestle and, though some of them were not replaced for ten or twelve years afterwards, not one of them ever failed or caused an accident.

Labour Difficulties

One of Mr. Onderdonk's greatest difficulties was the shortage of labour. Employment agents in San Francisco sent up men who had never done a day's work before, and we often saw broken-down bar-keepers, or men of that class, in cuttings, with fashionable but shabby clothes and perhaps patent leather shoes. So early in 1882 he had two ship-loads of Chinese coolies sent over to the work, one thousand in each ship, and coming as they did in sailing vessels in Winter, they had to be kept below decks the greater part of the time with the hatches on. On reaching the railway, they looked well and in good condition but after a few days work many developed scurvy, the result no doubt of bad ventilation on board ship, and I am confident five per cent of them, or more, died. As soon as a man was taken ill his comrades would not touch him, or wait on him, consequently very few recovered. His friends would not even bury his body ; that had to be done by white men.

Contract 60 was completed early in 1884, and my work for the Government came to an end. I at once, however, entered the service of the Canadian Pacific Railway Company and took charge of construction from Savona, eastward.

I had then been ten years in the service of the Government, in British Columbia, on the explorations and surveys for the selection of a route, and on construction, and had the pleasantest relations with my Chiefs, Hon. Alexander Mackenzie, Minister of Railways till 1878, who loved to be talked to, and so saved the trouble of studying reports, my dear old Chief, and life long friend Sir Sandford Fleming, and later my dear friend Sir Collingwood Schreiber.

The track from the West was connected with that from the East at Craigellachie, three hundred and fifty miles from Vancouver, on November 7th, 1885, but it was not opened for traffic till July 1886.

At the driving of the last spike, by Sir Donald A. Smith, there were present, as the British Columbia contingent, Marcus Smith, representing the Dominion Government; M. J. Haney, representing Onderdonk, and Major Rogers and myself, representing the Company's work Eastward through British Columbia.

Extension of the Canadian Pacific to Coal Harbour

Early in 1886, the Railway Company decided to extend the line from Port Moody, the Government terminus, along the shores of Burrard Inlet to Coal Harbor, where the City of Vancouver was afterwards laid out and built, and this extension came under my charge, as engineer of the Pacific Division, which was most gratifying to my personal vanity, for the following reason.

In 1877 while I was in charge of a survey of the line from Yellow Head Pass to Burrard Inlet, the chief engineer, Sir Sandford Fleming, applied to the Admiralty for reports on the various terminal ports in British Columbia, which it was possible to reach with a railway line, and more particularly on Burrard Inlet. These reports were to be by some of the naval officers who had charted the Coast, many years before, and were then, most of them, on the retired list with the rank of admiral. The naval officer (admiral) then in command at Esquimalt was also asked to report on these harbours. He consulted with people on Vancouver Island who were personally interested in, and partisans of other routes, and by their advice he made a trip to Yale and the Fraser Canyons, and reported that he had inspected that line and could state from personal knowledge, that it was impracticable for a railway. Also that he had been advised to the same effect by prominent engineers and that it was therefore useless to report on Burrard Inlet as a terminal harbour for that line, so he passed it over without a report.

It was, therefore, must gratifying to me, whose opinion as to this harbour and route had been treated slightingly by so prominent a person as the admiral on the station, that I should have charge of the extension of the line to this place and the building of the first wharves and terminals.

I continued as engineer of the Pacific Division of the C. P. R. from 1886 to 1903, and superintended the replacement of the wooden bridges by steel and masonry — and most of the trestles by fills with walls where necessary, and have finally retired from the service in 1920, having been over sixty-seven and a half years at work, and having had the happiest and most interesting life which was possible, and for which I am duly thankful.

As most of those under whom I served on the Canadian Pacific Railway are still in charge of the destinies of that Company, it would hardly be fitting in me to refer to them or say how highly I appreciate them.

The Development of the Steam Engine in the Maritime Provinces of Canada

D. W. Robb, M.E.I.C.

Although Nova Scotia, New Brunswick and Prince Edward Island, the Maritime Provinces of Canada, are more widely known for the extent and importance of their fisheries, lumbering, mining and some departments of agriculture, particularly apples, potatoes, etc. than for mechanical and engineering achievement, it is interesting to find that in the early development of steam engines for steamers, locomotives, and later in connection with electrical apparatus, a department of engineering which has contributed more towards the rapid progress of the world during the nineteenth century than any other; the little provinces by the sea were among the first on this side of the Atlantic.

When we remember that the first practical steam engines were built by Watt from 1775 to 1800 and that we are only now celebrating the centenary of Stephenson who started the steam locomotive on its triumphant career, it may surprise many of us to find that as early as the years 1844-48 and 1854, John Waring and John Smith, pioneer engineers of St. John, N.B., designed and built marine engines for steamers running on the

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Advance proof of paper to be read before the Eighth General Professional Meeting at Halifax, October 14, 1920.

St. John River. Stationary engines were built by Fleming & Humbert at St. John, N.B. as early as [illegible] and locomotives were built by Mr. Fleming before [illegible]. One of Mr. Fleming's locomotives hauled a train for the late King Edward, then Prince of Wales, when he visited Canada in 1860.

It may be interesting to give a few particulars in regard to the steamers and engines referred to above. I am indebted to Captain R. Retallick of St. John, who has sent me, through Geo. H. Waring, grandson of John Waring one of the pioneer engine builders referred to above, the following particulars:

The steamer "Reindeer," for service on the St. John River, was built in 1844. Her engines were compound, the high pressure cylinder being horizontal with Stephenson link motion and the low pressure cylinder oscillating. Captain Retallick states that this was the first compound engine that was run successfully, (probably he means for marine service), but it must have been among the first compound engines built for any purpose. This engine was designed by Tippitts and Waring—built by John Smith at St. John, N.B., and must have been of good design and construction as it was transferred to the steamer "Antelope," also a river boat, in 1861 and later installed in the steamer "Admiral," which was broken up in the year 1915, so that this engine passed the scriptural "three score and ten".

The steamer "John Waring" was built in 1848 at Woodstock, N.B. by Mr. McConnel. The engines were built by John Waring and had two high pressure cylinders. The boat was a side wheeler as the water is very shallow at Woodstock. The "John Waring" was launched under steam and came direct from Woodstock to Indiantown, just above the reversing falls at St. John, about 140 miles. She was considered very fast.

The next steamer, Captain Retallick states, was the "Anna Agusta" built at Fredericton. The engine was a horizontal low pressure, or single cylinder engine, placed on one side of the boat with the boiler on the opposite side and was built by Fleming and Humbert of St. John. She was a side wheeler also.

One of the earliest steamers was the "St. John" built at East St. John. She was a side wheeler. The engine was built by John Smith. Captain Retallick says it, (the reciprocating part of the engine), looked like a saw mill gate or sash moving up and down. This boat was launched under steam and managed to paddle around into St. John Harbour under her own power, but the hull was so full aft, that she would not steer. Later, after a new stern was added, making her about 24 feet longer, she worked satisfactorily.

George Fleming of Dysart, Scotland, who served his apprenticeship at Dunfermline, grandfather of the present owners of the Phoenix Foundry and Locomotive Works, established at St. John in 1835, and built quite large marine engines for service on the St. John River, Bay of Fundy, and later for the Prince Edward Island service—two of these boats, the "Rothesay" and "David Weston" for river service were famed all over Canada for their speed. The old records of the Company show that Mr. Fleming supplied an engine to Brazilian [illegible] in [illegible], price [illegible] pounds, and in 1840 an engine and mill [illegible] for [illegible] pounds and an engine for George Younger, price [illegible] pounds. The Flemings are said to have built the first steam fog whistle used in any part of the world, which was designed by a St. John man, and was placed on Partridge Island, St. John Harbor.

In the early sixties and seventies, a number of well known engineering concerns in the Maritime Provinces built stationary steam engines for the many large saw mills in New Brunswick and Nova Scotia, as well as for factories, mines and various other purposes. Among the most prominent of these may be mentioned, Geo. Fleming & Sons, John Smith, Harris & Allen, and Allen Brothers of St. John. The Pictou Foundry, established by Mr. Davies, Sr., in [illegible], who came from the old country as Master Mechanic of the General Mining Association.—J. Matheson, formerly located at Chatham, N.B., and later at New Glasgow, and his son W. G. Matheson. The Truro Foundry and Machine Company. The Burrell Johnson Iron Works of Yarmouth, N.S. which built tug boats and small steamers, marine engines of considerable size, Waterworks engines, etc. The Montgomery Iron Works at Halifax and Moir Symonds. The Montgomery company built a few locomotives which were used on the Intercolonial Railway.

From [illegible] to [illegible] the use of electric power for lighting, tramways and other purposes began to develop extensively in the United States and to some extent in Canada. Among the first to foresee and take advantage of the increasing demand for improved high speed engines suitable for driving electric dynamos direct from the engine shaft, was the Robb Engineering Company of Amherst, N.S. This concern, working in collaboration with the General Electric Company, Westinghouse Company and other manufacturers of electrical apparatus, succeeded in producing combined steam engines and electric machines in compact form, adapted to the various services for which electricity was required. The first of these engines was designed and built by the Robb Engineering Company at Amherst, N.S. in 1890-91 under the direction of E. J. Armstrong, who was a pupil of the late Professor John E. Sweet of Syracuse, New York, one of the best known designers and builders of high speed engines and a great educationist in mechanical engineering.

Mr. Armstrong was able, during the few months he spent at Amherst, through his thorough knowledge of the inter-changeable system used in building high speed engines and his natural ability as a draftsman and shop instructor, to organize a department of the Robb works so that they were able to build, with Maritime Province boys, engines for electric service which were equal to the best produced in the United States or elsewhere. He also enabled this Canadian shop to develop its own steam engineering and drafting departments in which engines were designed and supplied for electric work, not only throughout Canada, but, being among the first in this field, was able to furnish engines of this type to Great Britain, Spain, Australia, India, South America, British Guiana and several of the West India

Islands. The exceptional compliment was paid to these works of receiving an order for a compound electric engine for use and educational purposes in the Manchester Technical School at Manchester, England.

The steam turbine has to a considerable extent, supplanted the reciprocating steam engine for large electric units where steam furnishes the motive power. Oil and gas engines are making considerable headway for the smaller units and to some extent for marine use.

The tremendous development of water powers in Canada has also restricted the use of steam engines for electric production, but as yet the marine field is to a very large extent held by the steam engine. In passing it will no doubt be of interest to mention that the triple expansion engines to be installed in Nova Scotia's two largest ships, 8100 tons each, were built at Amherst. One of these ships the " Canadian Mariner " was launched from the Halifax Shipyards on the 4th of September and the other is well advanced in construction.

There is no doubt that steam engines will continue to be built and used for ship propulsion for some time to come, or until the rapid changes constantly taking place in engineering construction bring forth something better or more efficient and economical.

Concrete in Alkali Soils and Waters

A. S. Dawson, M.E.I.C., Chief Engineer,
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The action of alkali soils and alkali waters on concrete is not a recent development, and is one of extreme importance, not only to engineers and chemists, but to all governments, corporations, and individuals, whose money is being used in the construction of works in districts where certain conditions exist.

The question was studied some fifty years ago by members of an International Association of Testing Materials, on the coasts of France and Algiers. It has been discussed in the United States for some fifteen years by the American Society of Testing Materials, the American Society of Civil Engineers, the Bureau of Standards, and the United States Reclamation Service, as well as by some universities and engineers specializing in concrete work.

In Western Canada the subject is of still more recent birth, and has had the attention of many interested parties since about 1913.

The general effect of these investigations has not been to condemn concrete as a structural material, but in some measure to confine it to its proper field, and to prevent its mis-use. Concrete has been found so generally serviceable and beset with so few disadvantages, that its use has been generally recommended without any reservations.

Actual results have, however, proven conclusively that concrete has its limitations as a structural material, where certain ground and water conditions are known to exist.

In 1918, the subject received considerable attention at a Professional Meeting of the Western Branches of *The Engineering Institute of Canada,* at Saskatoon; and the writer then presented a paper on behalf of a Committee appointed by the Calgary Branch of *The Institute.* This paper is also written on behalf of that Committee.

Read at the Western Professional Meeting, Banff, August 16th, 1920.

Causes of Disintegration of Concrete

The general usual causes of the disintegration of concrete may be summarized as follows:—

(1) Bad workmanship.
(2) Poor and unsuitable materials; and badly graded and proportioned mixtures, including the amount of water used.
(3) Alternate wetting and drying out, and alternate freezing and thawing out.
(4) Destruction and removal of the protecting outer skin from various causes.
(5) The presence of an excess of alkali salts.

It is unnecessary to mention the effects of frost before setting, the erosion of the outer skin by excessive velocities and other mechanical agencies, which to a great extent can be provided against during construction and subsequently, by various well known methods.

This paper deals primarily with the effects on concrete of alkali soils and alkali waters.

Origin of Alkali Salts

First, a brief summary of the origin of alkali salts will be of interest to members who may have forgotten some of their earlier knowledge of chemistry.

The "Alkalis" as they are called, are carried into the soil with the other elements which form its inorganic bulk by the pulverization of rocks and minerals; by the decomposition of inorganic sediment held in solution by water; by glacial action; seepage from rivers and numerous other sources.

Alkali in the popular sense is a term used to designate the soluble salts that have accumulated in the arid and semi-arid regions. In the humid districts these salts are leached out of the soil, and removed through natural drainage channels.

Oxygen acts on potash, soda, lime, and magnesia and forms what are known as the "alkali bases".

Oxygen unites with potassium and forms potash.

Oxygen unites with sodium and forms soda.

Oxygen unites with calcium and forms lime.

Oxygen unites with magnesium and forms magnesia.

But—

Oxygen unites with silica and forms silicic acid.

Oxygen unites with carbon and forms carbonic acid.

Oxygen unites with phosphorus and forms phosphoric acid.

Oxygen unites with sulphur and forms sulphuric acid.

These acids, called metallic and mineral acids, have a great affinity for the alkali bases forming "salts"; and this is where the whole trouble with alkali soils begins.

These mineral or metallic acids attack the alkaline bases with the following results.

Silicic acid forms silicate of potash, soda, lime, and magnesia.

Sulphuric acid forms sulphate of potash, soda, lime, and magnesia.

Carbonic acid forms carbonate of potash, soda, lime, and magnesia.

Phosphoric acid forms phosphate of potash, soda, lime, and magnesia.

The salts usually present in greatest amounts in the soils and waters in the middle West, are the sulphates, carbonates, and chlorides of sodium, magnesium, and in a small degree the calciums.

It is the carbonate of soda, or what is commonly called sal-soda which forms what is generally termed "Black Alkali", and the sulphate of soda commonly called "Glauber Salt" which constitutes what is termed "White Alkali". Numerous other salts are of course formed by combining the alkali bases and the mineral acids, but these are not so important in this connection.

When water is brought into the question, the distribution of these salts is largely aided by the fact that the alkalis are extremely soluble in water. When these solutions are brought to the surface evaporation takes place, and an accumulation of alkali salts become evident.

Importance of Sulphates and Chlorides

Chemists have as yet been unable to agree on the determination of the exact reactions which are the cause of the disintegration of concrete; but investigation has shown that the sulphates and chlorides appear to be by far the most active salts found—and it is generally now admitted that magnesium sulphate, magnesium chloride and sodium sulphate are the most active salts found in alkali soils and waters.

The magnesium sulphate acts on the calcium hydrate of the cement, forming calcium sulphate, and the latter combines with the alumina of the cement, forming calcium sulpho-aluminate, whose crystallization gives rise to swelling and cracking in the material, and a corresponding destruction of all cohesion. Similarly, sodium sulphate combines with the calcium hydroxide of the cement, forming soluble sodium hydroxide. This also brings up the question of the difference in the susceptibility of various cements to these destructive agencies.

Action of Ground Water

It has been determined by several chemists that the action of the ground water seems to be a chemical change—converting the lime of the cement into a sulphate and carbonate, accompanied by the removal of silicic acid, alumina and lime, and usually destroying the cohesiveness of the concrete.

The formation of sulphates of lime and aluminates of lime, results in an immense increase of volume, and a corresponding total destruction of all cohesion.

To offset this, the magnesium hydrate may have a tendency to fill the pores of the concrete, and in this and other ways, may gradually become more impervious,—thus checking somewhat the disintegrating effects.

A working theory generally now accepted, is as follows:—

The chemical reaction of alkali that is destructive to cement work is a double decomposition between the various alkali salts and calcium hydroxide, the latter being an unavoidable constituent and probably the binding constituent of all set cement, whether the cement is classed as "Portland", "Natural," or "Slag". This reaction removes a greater or less amount of the calcium hydroxide, the amount depending upon the salts present, the concentration of the solution, the rate of percolation and imperviousness of the cement, and the solubility of the reaction products; and deposits in its place, in most cases, a molecularly equivalent amount of other compounds, which have good cementing properties, but occupy more space than the calcium hydroxide. This increase of space occupied disrupts the cement, causing it to bulge, crack, and crumble.

Analysis of Alkali Action

The following conclusions are now generally accepted.

I. The disintegration of cement by alkali salts is principally due to reactions between these salts and the calcium hydroxide necessarily present in set cement.

As a result of these reactions, relatively insoluble new compounds are formed in the body of the cement structures.

It has been shown that these new compounds have greater weight and require greater space than the calcium hydroxide replaced.

In order to obtain the necessary space the new compounds force apart the particles of the cement, thus weakening or breaking the binding material.

1. The compounds resulting from these reactions with the various destructive salts are as follows:

a. With sodium sulphate the resulting compounds are sodium hydroxide, which is soluble and therefore is removed by leaching, and gypsum, which is relatively insoluble and therefore accumulates in place of the calcium hydroxide.

b. With magnesium sulphate the resulting compounds are magnesium hydroxide and gypsum, both of which are insoluble and accumulate in place of the calcium hydroxide.

c. With sodium carbonate the soluble sodium hydroxide and the insoluble calcium carbonate are formed. In this case there is little increase in the space required, but the silicates and aluminates are also attacked and dissolved. This solvent action is especially marked upon the silica. This loss of silica must weaken the cement; but there is little, if any, crumbling due to expansion.

2. The additional material, requiring increased space, consists in part of dry matter and in part of combined water, which is taken up by the cement during its exposure to the alkali solutions.

a. This increase in dry matter is brought about by the formation of the sulphates, magnesium hydroxide, and carbonates, as shown by the reaction given in paragraph 1, a, b, and c.

b. Part of this increased amount of combined water is due to the fact that the new compounds, gypsum, magnesium hydroxide, etc., require more water for crystallization than did the calcium hydroxide which they replaced. This further assists in the disruption of the cement.

c. A part of this increased amount of combined water is due merely to the continued action of water upon the incompletely hydrated cement. This amount should serve to set free more calcium hydroxide, and thus to a certain extent repair the damage due to loss of binding material and to expansion.

II. A certain weakening, not a disruption of the cement, is due to the loss of a portion of the binding material, crystallized calcium hydroxide, which is merely dissolved and removed in solution.

III. In order for destructive action to become marked, the alkali solutions must percolate through the cement work, or at least must penetrate beyond the surface.

IV. When the action is strictly confined to the surface, as when briquettes of neat cement are immersed in a still solution, the tensile strength may be increased. In such cases the expansive action closes up the pores, making the surface more nearly impervious and preventing the alkali from penetrating further.

V. When cracks are started by the expansive action, due to alkali salts; wetting and drying, or freezing and thawing, will hasten the destruction of the cement, by extending the cracks already started.

Preventive Measures

VI. Any measures that hinder the penetration of the alkali solutions into the interior of the cement will delay the destructive action. For this purpose both soap and aluminum sulphate have been tried, and have been found to afford some protection. The soap, however, in itself had a slightly injurious effect on the tensile strength of the cement.

The efficiency of these and of other water-proofings is being further studied, and results may be expected later.

The mixing of cement in weak solutions of sulphuric acid, di-sodium phosphate, magnesium fluoride, and oxalic acid has been shown by laboratory tests to increase the alkali-resisting qualities of concrete. The effects of most of the alkalis have also been shown to be less pronounced on neat cement briquettes than on sand cement briquettes, and in fact somewhat proportional to the amount of sand used.

Conditions Found in Practice

In practice, the worst conditions are generally found on types of structures whose design has necessitated their being backfilled on one side, and subjected to ground water from the same direction — and at or below the original ground surface. These conditions seem to be aggravated where the structures are subjected to dry and wet surroundings — exposed to sun and shade during the winter months, — and where alkali salts are most in evidence, and the ground wet. The facts that the deterioration starts on the surface extending inwards, and that the water being carried by the structures has analytically been shown not to be responsible for the trouble, would indicate that the deterioration was primarilly caused by the ground water and its effects on the concrete. These effects vary in a degree from the surface spalling off in what results in a pile of loose gravel below— to a condition where the mass becomes of a slimy consistency, like so much lime mortar, and mud. As a rule samples in what might be termed an intermediate stage get harder if permitted to dry out in the air — when they become coated with white powdery salts.

Either the disintegration is due to soluble compounds which are leached out of the concrete leaving it inert, or it is due to the disruption caused by the crystallization of the salts in the pores, or by chemical action of the substances in solution with the constituents of the concrete.

Any conditions which will tend to carry the salts from the soil, to the concrete, will hasten the disintegration action and lessen the percent of alkali necessary to cause destruction.

A volume could be written on the chemical phases of this subject, and it would all be interesting; but as previously stated, this paper deals primarily with the experimental work done to date by a Committee of the Calgary Branch of *The Institute*.

Experimental Work by the Concrete Committee

In October 1918, 270 concrete blocks and 180 cylinders were made at Calgary, under close supervision.

These blocks were moulded in wooden gang moulds, 10″ x 10″ x 30″ long, and the cylinders in steel moulds, 8 inches in diameter and 16 inches long. Two hundred and sixteen blocks were made, using Western Cement, and 54 from Owen Sound Cement. All were carefully marked for identification purposes.

All materials used were analyzed physically and chemically.

The gravel was from what is known locally as the Carseland Pit, a well graded, bank-run material. The water was from a City of Calgary main. Samples of soil and ground water were procured from each hole in which a specimen was placed.

The blocks were made in three series.

(A) Screened, sized and washed. The sand was supposed to grade uniformly from fine to coarse — not to exceed 40% by weight passing a No. 50 screen, and not more than 30% by weight passing a No. 100 screen, and the voids were not to exceed 35%.

The gravel was supposed to be uniformly graded in sizes from ¼" to 2" in diameter, and the voids not to exceed 40%.

(B) Bank run material, washed.
Bank run material unwashed.
Each series of blocks were made in two mixes.
First, 1 — 2 — 4.
Second, 1 — 1½ — 3.
Of each mix, three blocks were plain.
Three were treated with two coats of soap and alum.
¾ lb. of castile soap, per gallon of water, heated to 180 deg. F.

2 oz. of alum to one gallon of water, heated to 100 deg. F.

1 coat of hot alum solution.

1 coat of hot soap solution.

1 coat of hot alum solution, after 24 hrs., all well brushed in.

Three were treated with water gas tar and coal gas tar as follows:—

First coat, refined water gas tar of thin consistency.

Second coat, same, and immediately after the first.

Third coat, refined coal gas tar, applied hot, after coats one and two, were well soaked in.

Fourth coat, same as third, after third coat set.

The blocks were taken from the moulds in 48 hours and cured for 28 days, after which they were placed in the ground 22 inches, with 8 inches exposed, at the following points:

(1) On top of a high hill in Calgary, where no alkali conditions were likely to exist, and where there would be no ground water in contact with them.

(2) Near a sewer, in a low lying plot of ground, in Burns-land, Calgary, generally wet, and where alkali conditions had given evidence of being bad.

(3) At Strathmore, in a low lying plot, once a slough, where alkali conditions seemed bad, and where they would probably be wet most of the time.

(4) Near Brooks, in a low lying place, where the alkali conditions were apparently very bad, and where they would be wet most of the time from seepage water from an irrigation ditch.

The cylinders which were all made of Western Cement, were buried at the foregoing points, and 62 were placed in the Calgary City Hall Laboratory.

Conclusions to Date

1st. Laboratory test cylinders are all relatively lower in strength than field tests because of the difficulty of maintaining a uniform degree of moisture.

2nd. The blocks and cylinders located in the Calgary district show no disintegration as yet because of the fact that the ground conditions were relatively much dryer than normal.

3rd. The blocks at Cassils show a much greater disintegration than those at other locations because of the greater concentration of soil solutions. Those at Strathmore show the next greatest degree of disintegration, because of less concentration of soil solutions and possible drying out at certain seasons.

4th. In a concrete of high density, where absorption of the alkali ground water appears to be mainly at the surface of the concrete, the action appears to be relatively slow and is largely in the nature of surface action, gradually extending to the interior.

In a concrete of low density and relatively high porosity the action is more rapid as it appears to take place simultaneously throughout the structure.

The more porous concrete is subject to the action of other disintegrating forces of a physical nature, such as frost action and the crystallization of salts in the pore space.

A dense concrete mixture, through some property not determined, such as low percentage of pore space or the character of this pore space, results in a greater resistance to the action of the alkali ground water. Apparently this is true in either mixture 1-1½-3 or 1-2-4. Chemical action takes place over relatively small distances, direct contact of the reacting elements being necessary. The more porous concrete allows this more intimate contact throughout the structure; and consequently more rapid action takes place.

5th. The presence of alkali soil solutions does not retard the setting of the cement.

6th. The action is undoubtedly more rapid in weaker mixtures and mixtures of low density.

7th. No apparent difference in results was found in blocks and cylinders made of Eastern and Western cements.

Continuation of Experiments

The investigations are being continued on several lines that may give further information.

Blocks after approximately twenty months curing in the Calgary district on which no alkali action has as yet become apparent, have been transferred to the Cassils location, and action of alkalis will be noted.

New blocks and cylinders are being prepared from gunite, and these after curing will be placed in the Cassils location and action noted.

Some tests are being made on waterproofing compounds at the present time.

The important practical phase of this matter is to have further investigation work carried on by competent chemists and engineers, working in close co-operation with one another; and in the meantime for all those concerned, to make use of the existing data, and take all possible precautions and remedial measures to prevent further deterioration to the existing works. In this connection the following points should be noted.

Desirable Features for Concrete in Alkali Soils

(1) Efforts should be made to get the densest possible mixture, and in this connection the smallest quantity of water consistent to good work should be used; in other words: a quaking mixture should be made of a workable mix i.e. to a consistency that will permit of the concrete flowing around the reinforcement with thorough puddling, and not so as to cause the finer particles to be carried to the top in suspension and the heavier ones to settle. About one gallon of water to each cubic foot of concrete in place is a fair average for a good mix.

(2) The best possible materials procurable should be used — and the best graded mixtures. All bank run material or river gravel should be screened out and remixed in proper proportions — based on proper tests made as to voids.

(3) It is desirable that all material should be washed, and it is almost essential that the sand should be washed; and in this connection it would be folly to assume that sands can be properly selected and passed on, without proper tests having been made on them.

(4) More care should be exercised in making field joints, using ½″ of 1 to 2 grout on the junctions between the old and new work.

(5) Where chutes are used, they should be on easy slopes and kept down to the shortest possible length.

(6) The time of mixing is an important factor, and it is now generally conceded that the best results are obtained from machine mixing for a period of about 1½ to 2 minutes continuous revolving of the mixing drum.

(7) Backfilling with sand and gravel with the coarser material next to walls and plenty of weep holes are all extremely desirable, and particularly on such types of structures as have been previously mentioned, and are more easily subjected to alkali conditions.

(8) Closer supervision of all work done, by men who really *know* the concrete business is essential.

(9) Proper seasoning and protection from the elements, and not too early removal of the forms. It is important to remember that the methods and operations adopted in mixing concrete, are just as important factors affecting its density, strength and permanence, as are the qualities of the materials used.

(10) The use of gunite and gun driven asphalt at normal temperature or heated are being tried out, and are both likely to prove effective methods — not only of damp-proofing and waterproofing, but of preventing the ill effects of alkali salts on concrete structures.

Extract from 'LIME AND CEMENTS', *second edition by Earnest A. Dancaster B.Sc., A.I.C., London Eng., 1920.*

Super-Cement

"A variety of Portland cement was introduced by Mr. J. F. Goddard in 1915 under the name of SUPER-CEMENT. This cement is manufactured from Portland cement clinker by grinding in with it treated gypsum instead of the ordinary gypsum used for regulating the setting time. Super-cement was originally intended to be a waterproof Portland cement, that is to say, an ordinary Portland cement to which material was added in order to render it waterproof, thus obviating the disadvantage of having to entrust the mixing of the waterproofing compounds to possibly careless or ignorant workmen. It was soon found, however, that the cement prepared in this manner not only produced a waterproof mortar, but the latter was also much stronger than ordinary Portland cement mortar, thus differing from the usual waterproofing materials, which tend to weaken the cement with which they are used. The increase in strength is specially marked in the case of cement and sand mortar, and the difference increases with time. This cement requires more water to produce a paste of 'normal' consistency than does ordinary Portland cement, and the mortar is both denser and harder. It is too soon to say definitely in what manner this addition of the treated gypsum acts upon the cement, but it certainly is neither a mere water repellent nor a pore filler. The main effect appears to be to bring about a more complete hydration of the cement particles. A number of tests with this cement have been carried out by the author, and also by others, and it has been found that the same clinker invariably yields a stronger cement when ground with the treated gypsum than it does when ground in the ordinary way.

The following tensile and crushing results were obtained by Messrs. David Kirkaldy & Son. Both the Portland cement and the Super-cement were made from the clinker, but the former was ground with ordinary gypsum and the later with the treated material.

Summary of Tests

Tensile Strength

Ordinary Cement

Neat cement. Gauged with 23% water.		3 parts standard sand, 1 part cement. Gauged with 9% water.	
Age 7 days	660 lbs.	Age 7 days	371 lbs.
" 28 "	843 "	" 28 "	425 "
" 90 "	806 "	" 90 "	453 "
" 6 mos.	872 "	" 6 mos.	845 "

Super-Cement

Age 7 days	746 lbs.	Age 7 days	408 lbs.
" 28 "	865 "	" 28 "	471 "
" 90 "	899 "	" 90 "	501 "
" 6 mos.	894 "	" 6 mos.	511 "

Crushing Strength

Ordinary cement. 1 : 3.			*Super-Cement. 1 : 3.*		
Age	7 days	[illegible] lbs.	Age	7 days	[illegible] lbs.
"	28 "	4470 "	"	28 "	[illegible] "
"	90 "	[illegible] "	"	90 "	[illegible] "
"	6 mos.	[illegible] "	"	6 mos.	[illegible] "

The tensile tests given below were carried out for the Author:

Tensile Strength

Ordinary Portland Cement

Neat cement. Gauged with [illegible]% water.			*3 parts standard sand, 1 part cement. Gauged with 10% water.*		
Age	7 days	592 lbs.	Age	7 days	263 lbs.
"	28 "	[illegible] "	"	28 "	314 "
"	90 "	[illegible] "	"	90 "	[illegible] "

Super-Cement

Age	7 days	703 lbs.	Age	7 days	398 lbs.
"	28 "	[illegible] "	"	28 "	[illegible] "
"	90 "	814 "	"	90 "	[illegible] "

This cement may truly be described as a waterproof cement. It is found that a slab one inch thick, made of a mortar composed of 1 part by weight of Super cement to one part of washed sand, will keep back water under a pressure of over 300 lbs., per square inch. The cement is also petrol proof, a similar slab having been found to keep back petrol under a pressure of 50 lbs., per square inch for 67 days. At the end of this period the test was stopped and the slab broken, when it was found that no penetration had taken place. Advantage has already been taken of this property, a number of storage tanks for petrol having been built with Super cement reinforced concrete at various aerodromes. It is probable that when this material becomes more widely known it will be not only universally used where ever waterproof cement work is required, but also in ordinary work where a high quality of reinforced concrete is desired."

It is not the purpose of this paper to attempt to discourage in any way the rapidly growing use of cement in its manifold forms of application, but rather with the belief that "Forewarned is Forearmed" by calling attention to the dangers which exist, and the necessity of taking all possible steps to avert trouble and financial loss.

The whole question serves as an illustration of the inter-relation of chemistry and engineering which exists on many of the Public Works being carried on at the present date.

Discussion on Western Concrete Conditions

Following the reading of his Paper on Concrete in Alkali Soil by [illegible] Dawson, M.E.I.C., at the Western Professional Meeting at [illegible]

By [illegible], M.E.I.C.

I was in Saskatoon when this question was discussed and I had the more or less honour on that occasion of giving our experiences in Manitoba. At that time I learned for the first time of the extent to which the work had been carried on in Alberta by the Calgary branch and I congratulated them then, and I wish to congratulate the Committee again on the work they have done, and especially Mr. Dawson on the very clear way he has put this subject to us. It is clear to me at least, but perhaps it is not so clear to those who are not familiar with, or do not realize the seriousness of the subject. I do not want to go into the matter in too much detail. There is some difficulty in deciding just how this subject can be tackled. People who are not interested in the subject do not seem to realize the seriousness of the matter and it is a very difficult thing to obtain their interest and co-operation. In Manitoba we cannot come before you with a description of any field experiments. We have not done any as yet, but unfortunately we have practical demonstrations which were carried on in spite of ourselves, which are exceedingly serious. Since the meeting in Saskatoon, we have had an experience on the new aqueduct and as this is a kind of a family gathering I think I am perfectly safe in speaking freely on it. I was appointed as a member of a Commission to look into the question about a year ago. Some of this structure has only been in the ground three years. A great deal of this aqueduct has been drained but this four miles was not under-drained. The particular section is eight feet pressure pipe, about eight inches thick in the barrel and was constructed in place. Some of the other parts are lock joint pipe construction. This pipe had been built by the use of metal forms, which as you know, necessitate the use of a bolt to tie the outside and the inside forms together. When the forms are removed, the bolt has to be taken out, which leaves a hole through the barrel; this is grouted up and the repair made. The first evidence was in one of these bolt holes. W. G. Chace, M.E.I.C., the chief engineer, noticed this condition and a repair was made, the surface of the pipe being plastered over and this is where the first action came. We inspected this area and found this action had gone on under the patch. I mentioned this for the reason that one of the members of the Committee went over it and made the assertion that the damage was solely on account of the patch. We went over the line and in some places there was no action whatever and other places it was very slight. About a year after, I mention the fact it was a year because it took a year before any action could be obtained from one of the Commissioners of the district, who were vitally concerned in the structure, on which they had spent so much money, a meeting of our Commission was held. At this meeting there were five members of the Commission and four of us were absolutely at one in our opinion it was a serious matter. One of the

Committee took absolutely the opposite ground and made a most wonderful display of demonstrating his position. He assured the Commissioners that when concrete was put into place, the action of the air had a certain oxidizing and put an armour around the surface, which was absolutely impregnable and assured them he knew it was all right and they need not worry at all. He told them the expenditure we four recommended was absolutely ridiculous and he said that the question of alarming them was a perfectly insane thing on our part. A member of our Commission, told the water Committee, that he had not the faith in this armour that this other gentleman had, and explained that doctors would assure patients that as long as they kept breathing they would keep alive, but a great many people died notwithstanding. He said, "That is our position in this matter", and he said, "This action is going on whether you believe it or not." Now in our municipal work in Winnipeg, there was a report presented by the Inspector of Sewers, and he has reported an enormous amount of alkali action in the city sewers. There are forty-four and a half miles of our sewers in Winnipeg just about ready to collapse. That is a frightful condition. I speak from personal knowledge of these things, a rather unpleasant knowledge I may say. I have been down in many of these structures and it really is a most disturbing condition. You can go along these large trunk sewers, put your hand right into the surface and go right through to the clay on the outside. When you consider the fact, that you cannot drain these structures and there is no way of getting at them, the problem is a very serious and a very difficult one. When this report was presented to the council, one of the aldermen, who was a former mayor of the City, got up and remarked, "This report we have received from our Superintendent of Sewers makes me tired. There is too much of this scientific investigation going on altogether." That is a serious thing to say. I have a letter on my file from an official of our province, I am getting personal here but I think I should, I have a letter on my file in my office, in which he does us the honour to say that our whole investigation is done with one object and that only, and that is to defend bad work. There is no such thing as alkali action, the whole thing is bad work, and we are trying to cover it up. You can see our difficulty.

The Committee of *The Institute* has been in operation for some little time. I think this is the first year it has been called a Committee of the Western provinces acting as an Institute Committee. Heretofore we have had our various provincial Committees. I am a member of our own, Mr. Dawson of Alberta and Prof. MacKenzie of Saskatchewan. Now we feel that this matter has got to be tackled on a thoroughly organized basis and we wish to present a statement of our attitude on the matter in the form of a resolution which we will put before the meeting and which will be open for discussion. We want to have the thing in shape so that we can transmit it to the council. This is the form in which we have expressed our feelings in the matter.

"That fifteen thousand dollars per annum for three years be secured for investigation purposes by specialists engaged to devote their entire time to work."

"That the existing committee be authorized by Council to make definite application for necessary funds from all interested bodies."

"That work be carried on under jurisdiction of existing committee who will act in advisory capacity."

"That Council be asked to ratify this manner of dealing with the problem."

I would therefore move this resolution. We have put it in this form so that it might be passed and that we might get the authority or at least the endorsement of this meeting. The resolution can then be transmitted to the council at *The Engineering Institute in Montreal.* (Applause.)

Prof. C. J. MacKenzie, A.M.E.I.C.: I take great pleasure in formally seconding that motion.

The Chairman: You have all heard the resolution. I do not think I need go into the details. The substance is that the sum of $15,000.00 be secured from the various parties interested in this work, that is, $15,000.00 per annum for a certain period, three years, this amount to cover cost of organized investigation.

All in favour of that resolution.

(The resolution was put to the meeting and declared carried unanimously.)

Some Notes on The History of Investigating Alkaki Action on Concrete

Discussion of Mr. Dawson's Paper on Action of Alkali on Concrete.

Professor C. J. Mackenzie, A.M.E.I.C.

I do not propose to enter into a detailed discussion of the paper we have just heard at this late hour, for as your chairman has suggested, a thorough analysis would take more time than we have available.

First, let me congratulate Mr. Dawson on his very interesting paper, which shows that he and his associates have done a large amount of investigation work and are well aware of the importance of the Alkali Problem. Mr. Dawson has told us that this problem has been recognized for the past fifteen years, and we know that the similar one of Sea Water Action dates back to a much earlier period, but on account of the fact that alkali action is restricted to the Western areas of Canada and United States, it has remained a comparatively local problem to the engineering profession, with the consequence that considerable confusion of ideas and misunderstanding has existed.

In the past there have been many men, reputable engineers and others, who contended that there was no such thing as Alkali Action on Concrete, and, due to the complexity of conditions for a long time we were not able to submit positive proof to the contrary. For instance, one structure would be found standing up under alkali conditions, while another would be materially disintegrated. Again on the same structure one portion would be affected while the remainder would be unaffected. Naturally this led to the contention that the disintegration was due to either bad workmanship, bad material, or both. But we may now say that the first phase of the investigation has been passed and I do not think that anybody who will go into the results of experiments available today, can deny that even a good, well made concrete will be affected by Alkali Ground Waters of certain concentrations.

In the past there were numerous engineers who made concrete of excellent quality which afterwards was badly disintegrated on exposure to alkali conditions. These engineers knew well that the concrete was of a high grade, but when asked by those who doubted the action, for the exact qualities of the concrete, were unable to submit strength tests, etc.

Our Saskatchewan Committee on Alkali started some investigation work over a year ago with the object of clearing up the above points if possible. Accordingly we mixed concrete blocks under rigid laboratory control in the shape of cubes of 12″ sides. These we exposed to actual field conditions in Saskatoon, and I have photos here today taken after one year's exposure, showing that in this short time concrete of far better than ordinary 1–2–4 concrete is being gradually disintegrated by alkali waters whose concentration is about 1%.

The other question of the doubters which needed answering was, "How do you explain the fact that a portion of your structure shows signs of disintegration while contiguous portions are unaffected?"

The answer to this is now available as follows. Disintegration is caused when the concentration of the alkali solution reaches a certain strength, and it has been clearly proved that the concentration in the ground varies, for some reason not yet determined, as much as 100% in only a few feet. We found that in the same trench one series of blocks was decidedly affected while only 25 feet away another series of equal and similar quality showed no effect whatever. Chemical analysis of the ground water at these two points showed that in the former the concentrations were 20 to 100% greater than in the latter. This clearly answers the above question. I should like to state here that Mr. G. M. Williams of the Bureau of Standards, Washington, who has done more work on this problem than any other investigator in America, pointed out the above conclusion previous to our own inspection.

Now that we have passed the first phase in this problem when we can say with assurance that even the best concrete if exposed to alkali action of sufficient concentration will be eventually disintegrated, we must look forward to the next phase which for a successful end must be participated in by both chemist and engineer, and I believe that it will be a major problem for both. The chemist will be asked to discover the exact reactions that take place and to provide, if possible, a remedy. The engineer must adapt all findings of the chemist to practice, investigate thoroughly the relative part played by grading of aggregate, consistency, mix, permeability, etc., and further, providing the chemist can find no remedy (and this is by no means guaranteed), the engineer must still carry on and evolve standards of practice for concrete work in alkali soils.

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Dates of Professional Meetings

The Eighth General Professional Meeting will be held in Halifax, October 13th, 14th and 15th.

The Annual and Annual General Professional Meeting will be held in Toronto on February 1st, 2nd and 3rd, 1921.

Remuneration of Engineers

The report of the Committee on Remuneration of Engineers of *The Institute*, presented to Council at the August meeting and published in the September Journal, shows a decided leaning towards the recommendation to adopt the report of the Committee on Classification and Compensation of Engineers of Engineering Council, issued under date of December 15th, 1919. Inasmuch as this report has not yet been published by *The Institute* and for the benefit of the members who have not yet seen a copy of it the many points of the report covering classification and compensation are reproduced. It will be seen that eight grades are recommended.

Professional Service

Grade 1.—Chief Engineer

Duties.—To act in chief administrative charge of a technical organization, or of a main division thereof; to determine the general policies of the organization under the limitations imposed by law, regulation, or other fixed requirement; to have final responsibility for the preparation or reports, cost estimates, designs, and specifications and for the construction, maintenance, or operation of engineering works or projects; to have full charge of the collection and presentation of data for and the conduct of valuation proceedings; to conduct or direct the most comprehensive lines of engineering research.

Qualifications.—Training and experience of a character to give substantial evidence of engineering knowledge and ability or of executive capacity of highest order along lines of work similar to those involved in the position to be occupied and of at least twelve years' duration, of which at least four years shall have been spent in duties of Engineer, or their equivalent, and at least five years in responsible charge of important work or projects. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing or, in absence of such degree, at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

Grade 2.—Engineer

Duties.—Under general administrative direction and within the limits of the general policies of the organization, to have responsible charge of and to initiate and determine policies for a major subdivision of an organization; to prepare for final executive action reports, cost estimates, designs, specifications, and valuation studies and data; to have immediate charge of the construction, maintenance, or operation of engineering works or projects of major importance; to conduct or direct major lines of engineering research; or to furnish for executive action expert or critical advice on engineering works, projects or policies.

Qualifications.—Active professional practice or executive charge of work for at least eight years, of a character to demonstrate a high degree of initiative and of ability in the administration, design, or construction of engineering work or projects of major importance, of which at least three years shall have been spent in duties of Senior Assistant Engineer, or their equivalent, and at least three years in responsible charge of work. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing or, in absence of such degree, at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

Grade 3.—Senior Assistant Engineer

Duties.—Under general administrative and technical direction, to be in responsible charge of an independent division of an engineering [illegible] engineering [illegible] studies and computations necessary for the preparation of [illegible] estimates, designs, specifications, [illegible] to have immediate charge of the construction, [illegible] engineering works or projects, or to conduct [illegible] engineering research.

Qualifications.—Active professional practice or responsible charge of work for at least five years, of which at least three years shall have been spent in duties of Assistant Engineer, or their equivalent, with at least one year in responsible charge of work. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing or, in absence of such degree, at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

Grade 4.—Assistant Engineer

Duties.—Under specific administrative and technical direction, to be responsible for the conduct of the work of a minor subdivision of an organization; to collect and compile data for specific items of engineering studies; to take immediate charge of field survey parties and of the design and construction of minor engineering work; to lay out and develop work from specifications and to supervise the work of a drafting or computing force; or to conduct specific tests or investigations of apparatus, material, or processes.

Qualifications.—Experience for at least two years in duties of Junior Assistant Engineer or their equivalent. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing or, in absence of such degree, at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

Grade 5.—Junior Assistant Engineer

Duties.—Under immediate supervision, to perform work involving the use of surveying, measuring, and drafting instruments; to take charge of parties on survey or construction work; to design details from sketches or specifications; to compute and compile data for reports or records; to inspect or investigate minor details of engineering work, or to perform routine tests of apparatus, material, or processes.

Qualifications.—No experience required other than that involved in securing a professional degree upon the completion of a standard course of engineering instruction in an educational institution of recognized standing, but in absence of such degree, a high school education, or its equivalent is required and at least four years' experience in the use of surveying, measuring or drafting instruments, or the computation and compilation of engineering data, together with evidence of a knowledge of the fundamentals of engineering science sufficient, with further experience, to qualify for the higher professional grades. The completion of each full year of such standard course of engineering instruction shall be considered as the equivalent of one year of experience.

Sub-Professional Service

Grade 6.—Senior Aid, Office

Duties.—[illegible]

Qualifications.—Experience for at least five years in [illegible] ing, drafting, and computing, of which at least three years shall have been spent in the duties of [illegible]. Education equivalent to graduation from high school. The completion of each full year of a standard course of engineering instruction in an educational institution of recognized standing shall be considered as the equivalent of the experience otherwise required, with the provision, however, that at least one year shall have been spent in the duties of [illegible].

Grade 6.—Senior Aid, Field

Duties.—To direct work of field party on surveys or construction; to keep survey notes and engineering records; to supervise construction or repair work; to direct the work of computing surveys and estimates; to direct the work of making minor engineering computations.

Qualifications.—Experience for at least five years in the use and care of surveying instruments, of which at least three years shall have been spent in the duties of [illegible]. Education equivalent to graduation from high school. The completion of each full year of a standard course of engineering instruction in an educational institution of recognized standing shall be considered as the equivalent of the experience otherwise required, with the provision, however, that at least one year shall have been spent in the duties of [illegible].

Grade 7.—Aid, Office

Duties.—To prepare [illegible] drawings where design is furnished; to plot n[illegible] and prepare maps; to design simple [illegible]; to make computations and compile data for reports and records; to check plans, surveys, and other engineering data.

Qualifications.—Experience for at least two years in [illegible], drafting, and computing. Education equivalent to graduation from high school and familiarity with the use of the slide rule, and of logarithmic and other simple mathematical tables. The completion of each full year of a standard course of engineering instruction in an educational institution of recognized standing shall be considered as the equivalent of the experience otherwise required.

Grade 7.—Aid, Field

Duties.—To use surveying instruments and to adjust and care for same; to compute surveys and estimates; to make minor engineering computations; to inspect [illegible] construction or repair work.

Qualifications.—Experience for at least two years in the duties of [illegible]. Education equivalent to graduation from high school and familiarity with the construction, operation, and care of surveying instruments. The completion of each full year of a standard course of engineering instruction in an educational institution of recognized standing shall be considered as the equivalent of the experience otherwise required.

Grade 8.—Junior Aid, Office

Duties.—To trace and letter maps and plans; to make simple tracings from sketches and data; to make minor calculations.

Qualifications.—Education equivalent to graduation from high school.

Grade 8.—Junior Aid, Field

Duties.—To run tape or leveling rod; to perform other miscellaneous subordinate duties in survey party in field or office, as directed.

Qualifications.—Education equivalent to graduation from high school.

Experience Equivalents for Post-Graduate Work

The completion of each full year of post-graduate work in the specific subject of study or investigation appropriate to a particular service or branch of service shall be considered the equivalent of one and one-half years of general experience, but such substitution shall not thus be made for more than four years of such experience or be considered as reducing the requirements in any grade of the number of years engaged in the conduct or direction of responsible work.

An examination of the schedule shows that the minimum experience requirements for the various grades may be briefly summarized as follows:

Service	Grade	Experience in Years With Degree in Engineering	Experience in Years Without Degree in Engineering
Sub-professional	8—Junior Aid	0	0
	7—Aid	0	2
	6—Senior Aid	0	5
Professional	5—Junior Assistant Engineer	0	4
	4—Assistant Engineer	2	6
	3—Senior Assistant Engineer	5	9
	2—Engineer	8	12
	1—Chief Engineer	12	16

Some Title Equivalents in Common Use

The following table illustrates the practicability of adapting the proposed classification to any particular grade or branch of the engineering service and in such a way as to clearly retain a description of the relative rank.

Professional Service

1.—Chief Engineer

Chief Engineer	Deputy Chief Engineer
State Engineer	Deputy State Engineer
City Engineer	Deputy City Engineer
Chief Engineer of Maintenance of Way	Director, etc.

2.—Engineer

Electrical Engineer	Division Engineer
Mechanical Engineer	District Engineer
Mining Engineer	Sewer Engineer
Chemical Engineer	Topographical Engineer
Bridge Engineer	Landscape Engineer
Sanitary Engineer	Hydraulic Engineer
Tunnel Engineer	Geodetic Engineer
Maintenance of Way Engineer	Structural Engineer
Signal Engineer	Valuation Engineer
Highway Engineer	Designing Engineer, etc.

3.—Senior Assistant Engineer

Senior Assistant Electrical Engineer
Senior Assistant Mechanical Engineer
Senior Assistant Mining Engineer
Senior Assistant Chemical Engineer
Senior Assistant Bridge Engineer, etc.

4.—Assistant Engineer

Similar to Senior Assistant Engineer

5.—Junior Assistant Engineer

Engineer Inspector, etc.

Sub-Professional Service

6.—Senior Aid

Office:		Field:	
	Chief Draftsman		Chief Instrumentman
	Chief Computer		Chief Inspector

7.—Aid

Office:		Field:	
	Draftsman		Instrumentman
	Computer		Inspector

8.—Junior Aid

Office:		Field:	
	Junior Draftsman		Rodman
	Tracer		Tapeman

Schedule of Salaries Suggested for Discussion

Grade	Total Years Experience Required to Qualify With Professional Degree	Without Professional Degree	Salary Range Minimum	Salary Range Maximum
8—Junior Aid	....	0	1,080	$1,560
7—Aid	....	2	1,680	2,400
6—Senior Aid	....	5	2,520	3,240
5—Junior Assistant Engineer	0	4	1,620	2,580
4—Assistant Engineer	2	6	2,700	4,140
3—Senior Assistant Engineer	5	9	4,320	5,760
2—Engineer	8	12	5,940	No limit
1—Chief Engineer	12	16	8,100	No limit

Applying the average proposed salary to the present incumbents of these positions as reported in the State and Municipal services, it will be found that there would be a resulting increase in annual compensation totaling about $5,500,000 as compared with a total increase of $2,500,000 recommended by the service heads, against which should, however, be charged the economy growing out of the increased efficiency brought about by a restoration of morale.

The Committee is not prepared at this time to recommend the adoption of any definite schedule of compensation, and it is not at all clear as to the wisdom of fixing even a minimum limit on the highest grades of service or of keeping the maximum of one grade below the minimum of the grade above, all of which questions are now receiving its

[illegible]

[illegible]

In order to secure information as to the situation at present date the Secretary of *The Institute* communicated with Mr. Alfred D. Flinn, Secretary of Engineering Council, as to the present status of the report and as to whether changes were proposed. To this communication Mr. Flinn replied:

September 10th, 1920.

Dear Mr. Keith:—

In connection with the work of Council's Committee on Classification and Compensation of Engineers you will probably be interested to learn that the replies so far received to circular letters sent to Engineering and Technical Societies, Civil Service Commissions, Mayors, Governors, and Engineering Heads of Government Bureaus, have been favorable. These letters requested the endorsement in the case of engineering societies, and the adoption in the case of government bureaus, of the proposed classification as standard and asked for an expression of views regarding the compensation schedules suggested.

Committees of the National Societies are considering the question of endorsing the proposed classification, which has already been formally endorsed by several local societies. Government Bureaus and Civil Service Commissions have been greatly interested in the work and in a number of cases have recommended the adoption of the classification.

This note is sent you with the idea that you may wish to publish this information in connection with the December 1919 report of Council's committee, of which, I believe, you have a copy.

Cordially yours,

(Signed) Alfred A. Flinn.
Secretary.

The Council of *The Institute* has requested the Committee to prepare a schedule of fees for consulting engineers.

Niagara Falls Branch—Esto Perpetua

Members of *The Institute* to the number of nearly three hundred are richer by many happy memories through having had the privilege of attending the seventh Professional Meeting of *The Institute* held at Niagara Falls, September 16th, 17th and 18th. The report of the meeting, which appears elsewhere in *The Journal*, shows a nicely balanced programme, carefully arranged, and carried out with splendid attention to detail. These features combined with an ideal setting and splendid weather conditions, made this one of the most satisfactory good fellowship gatherings that *The Institute* has yet held. Congratulations in the superlative degree are due to all who had a part in contributing to the success of this meeting and particularly the officers and members of the Niagara Peninsula Branch, whose courage in planning, executive ability in arranging, and whose energy and enthusiasm in carrying out the many numerous details, reflect the greatest credit, the results achieved being a tribute to their genius. Everyone who attended was loud in his praises of the men of the Niagara Peninsula Branch, and words fail to express the real gratitude due them from *The Engineering Institute of Canada*. If all the members of *The Institute* could be inspired to the same zealous pitch that directed those responsible for the Niagara Meeting, there is no reasonable ambition which *The Institute* might strive to reach that could not easily be accomplished.

For the first time in the history of *The Institute* ladies were particularly invited to participate in all the functions on the programme, and their presence there in such large numbers added to the cheerfulness of the gathering and established a precedent which will, no doubt, be continued.

As far as the records go, this, too, was the first time that engineers included on their programme sports of any kind, and now that, as President Ross stated, we are starting to be human, a programme of sports may yet be a regular feature of our meetings.

To those who experienced their first attendance at a professional meeting of *The Institute*, the gathering was more or less of a revelation, resulting in many a resolve to attend all similar gatherings.

The formal votes of thanks passed to various men and organizations whose kindness and courtesy meant much to the success of the convention, do not fully express the deep sense of gratitude which members of *The Institute* feel.

These votes of thanks were, to:—

The Premier and Cabinet of the Government of Ontario, and particularly to the Hon. F. C. Biggs, Minister of Public Works and Highways of Ontario, for his personal attendance and his kindness in attending the convention and giving an address outlining the policy of the Department of Highways and for so kindly entertaining the Members of *The Institute* and their guests at Luncheon at the [illegible] on Friday, September 17th.

The Chairman of the Hydro-Electric Power Commission and many of the staff in supplying transportation facilities for inspecting the Queenston-Chippawa Power

Development so ably described by Engineers Acres, Hogg, Sauer and Brandon in their addresses and in their papers published in *The Journal* of *The Institute*, and for supplying automobiles which throughout the convention were constantly at the disposal of ladies and guests, and for their courtesy in arranging a visit to the peach orchards.

The Hon. J. D. Reid, Minister of Railways and Canals of the Federal Government for transportation to the Welland Ship Canal, and for facilities of inspecting the Welland Ship Canal under the personal supervision of Mr. Alex. J. Grant, M.E.I.C., Engineer-in-charge.

The Queen Victoria Park Commission, Mr. P. W. Ellis, Chairman, Mr. John H. Jackson, M.E.I.C. Superintendent, for giving the splendid luncheon on Saturday.

The Collegiate Institute of St. Catharines for supplying the lantern used at the Professional Meeting.

The St. Catharines' Golf Club for extending the courtesies of their club.

The various Power Companies for the privilege of visiting their plant and arranging trips thereto, including the Niagara Falls Power Company, Niagara Falls, N.Y., The Toronto Power Company, and the Ontario Power Company.

The Members of *The Institute* whose hard work and constant attention to detail resulted in such a successful gathering including the officers of the Ontario Provincial Division and particularly the Officers and Members of the Niagara Peninsula Branch whose time and energy have been so freely given.

The management of the Clifton Hotel, for courtesies extended.

All others who did so much to add to the comfort and enjoyment of the convention and contributed towards making it one of the most successful yet held.

Seventh General Professional Meeting

Niagara Falls, Ontario, September 16-17-18.

One of the most successful General Professional Meetings ever held by *The Engineering Institute of Canada* has just been concluded under the auspices of the Ontario Provincial Division at Niagara Falls, Ontario.

The meeting was favoured in many respects. Within a few miles of Niagara Falls are the two largest engineering works at present under construction on this continent, if not in the world. The inspection of these undertakings formed an important part of the programme of the meeting, particularly as the inspection had been provided for by the reading of papers on various features of both the Welland Ship Canal and the Chippawa-Queenston Power Development at the formal sessions. The preparation and arrangements for the meeting made by the Executive of the Niagara Peninsula Branch were most thorough, and the success of the meeting is due very largely to the unsparing work of the Niagara Branch Members. An important factor was the weather, bringing sunshine every day to the Convention and adding very considerably to the enjoyment of those present.

Opening of Technical Session

The proceedings of the Professional Meeting were opened at 11.30 on Thursday September the 18th in the Convention Hall of the Clifton. H. B. R. Craig, M.E.I.C., Chairman of the Ontario Provincial Division Niagara Falls, presiding, when an address of welcome was given by H. P. Stephens Esq., Mayor of the City of Niagara Falls, Ontario. Mr. Stephens spoke of the appropriateness of Niagara Falls as a place of convention for *The Engineering Institute*, and paid tribute to the greatness of the contribution of the engineers to the progress of humanity. He spoke also of the success which has been demonstrated here of practical engineering in the development of the great natural resources, the great difficulties which have been successfully overcome, and the great benefit, not only to this district, but to other portions of the Province.

R. A. Ross, M.E.I.C., President of *The Engineering Institute* responded on behalf of *The Institute*, and in a brief but happy speech told of the great development, especially in electrical engineering in recent years. In a reminiscent vein he spoke of the construction of a dynamo forty years ago, which lighted two arc lights;—sometimes the arc lights burned, sometimes the dynamo.

The paper of the day was that of Alex J. Grant, M.E.I.C. Engineer in charge of the Welland Ship Canal; Mr. Grant's paper is printed in full on page 425 of the September *Journal*. Following the reading of Mr. Grant's address, the Chairman expressed the indebtedness of the meeting for this most interesting talk on the Welland Ship Canal.

Informal Luncheon at the Clifton

The professional meeting was followed by an informal luncheon at the Clifton when several announcements were made by W. P. Near, M.E.I.C., chairman of the Niagara Peninsula Branch. The programme for the afternoon's excursion to the Welland Canal and an invitation from Mrs. W. B. Burgoyne to the Flower Show at St. Catharines was read.

Inspection of Welland Ship Canal

In the afternoon the convention adjourned to an inspection of the Welland Ship Canal in electric cars provided by the courtesy of the Minister of Railways and Canals. The first part of the journey was through the upper table-land between Niagara Falls and Thorold, and passing several of the immense plants which have sprung up in the neighbourhood of Niagara Falls in the past few years due to the cheap power obtainable. Leaving the cars at the crossing of the Welland Ship Canal the party proceeded on foot to inspect the progress on the upper locks. One of the unique features of the Welland Ship Canal is the remarkable flight of three twin locks climbing the escarpment.

These locks compare in size with the gigantic locks of the Panama Canal and in some respects involve engineering problems of much greater magnitude.

The work on this section on the Welland Ship Canal is at present practically at a standstill, partly on account of labour troubles and partly on account of the shortage of cement, but the scale of the undertaking is quite evident from the work which has already been accomplished.

The electric cars having been shunted to the double track construction railway of the Welland Ship Canal, the party embarked for the second stage of the inspection tour. An excellent feature of this part of the programme was the provision of guides familiar with the construction features of the Canal in each car. Points of interest were announced by megaphone, and in this way the inspection, through naturally brief, was entirely satisfactory, and illustrated once more the thoughtfulness of the Niagara Branch in attention to the details which mean so much.

The cars were drawn to Port Weller and a thorough inspection of the lower locks was made by the party on foot. The immense size of these locks is not apparent at first glance, but every member of the party had the scale of the locks brought home after climbing to the top of the lock walls, descending to the mooring tunnel with final exit by ladder.

Dinner and Entertainment

Following the inspection of lock No. 1 the party returned by the electric line to the Falls. At one place on the return journey the cars were held up on the siding and a number of the more enterprising members of the party made a scientific investigation of the windfalls in the adjoining apple orchard; this orchard by the way, being part of the estate of a past President of *The Institute*.

The first day of the convention was brought to a most enjoyable close by a dinner at the Clifton, A. C. D. Blanchard, M.E.I.C., Chairman, followed by an excellent entertainment provided by the Niagara Peninsula Branch. The good fellowship and spirit of the whole meeting was strongly in evidence and the various songs called for by the entertainer were given with great heartiness including that which was announced as the new national anthem of Canada. At 10 o'clock the gathering adjourned to the hotel balcony to view the illumination of the Canadian Falls; a sight, the beauty of which will remain one of the chief memories of a remarkable meeting.

Continuation of Professional Session

On the morning of Friday, September the 17th the Professional session was continued, R. A. Ross, M.E.I.C., President of *The Institute* in the chair.

The first paper to be read was that of T. H. Hogg, A.M.E.I.C., Assistant Hydraulic Engineer of the Hydro Electric Power Commission on "The Design of the Queenston-Chippawa Power Canal." This paper is printed in the September number of *The Journal* on page 433, but in the course of his remarks and the discussion which followed, Mr. Hogg added some very interesting details. On account of the danger from ice jams, the power house at Queenston will have no opening to admit water lower than 50 ft. to prevent any possible flooding, such as that caused by the great ice-jams of 1909.

Following Mr. Hogg's paper, M. V. Sauer, M.E.I.C., Hydraulic Engineer in Design of the Hydro Electric Power Commission read his instructive paper on "Hydraulic Installation of the Queenston-Chippawa Power Development." This was followed by "Electrical Features of the Queenston-Chippawa Power Development," by E. T. J. Brandon, A.M.E.I.C., Electrical Engineer of the Hydro Electric Power Commission and "General and Economic Features of the Queenston-Chippawa Power Development" by H. G. Acres, M.E.I.C., Hydraulic Engineer of the Hydro Electric Power Commission. These papers have been printed in the September number of *The Journal* on the following pages:—440, 446, and 454. Mr. Brandon enlarged considerably on the synopsis of his paper published last month and gave an account of the new power house as it will be when completed.

Following the reading of the four papers, all illustrated by lantern slides, a short discussion followed, and after a vote of thanks had been passed, the meeting adjourned to the Refectory of the Parks Commission in Queen's Park, where the convention were the guests of the Department of Highways of the Province of Ontario for luncheon.

Lunch at the Refectory

Deputy Minister, W. A. McLean, M.E.I.C., in a brief address introduced the Hon. F. C. Biggs, Minister of Highways in the Province of Ontario. Mr. Biggs eulogized the Park Commissioners and Supt. J. H. Jackson for the great work they are doing at this frontier, and hoped soon to see the river boulevard extending from Lake Erie to Ontario. He stated that in his department he has 30 graduate engineers, and by a recent act of the Ontario Legislature all county road superintendents in future must be graduate engineers; each engineer has from 50 to 100 miles to supervise. Much preliminary work has been done this year on the provincial road systems, but by 1921 the Government expects to be ready to go ahead in earnest.

The Ontario Government has a policy somewhat different from that in vogue in some parts of the United States and Canada. The policy in Ontario is to assume responsibility as soon as roads are taken over, put them in decent condition as soon as possible, and gradually convert the 2000 miles into permanent highway, beginning with the heavy traffic sections.

The province pays 60% of the cost of these roads under the Provincial County system and 40% of the county roads. These two classes of roads are in the hands of the county councils and are 9,000 miles in extent. Were it not for the good work done by the counties, the roads of the Province would to-day be in a worse condition than they are at present; the rural people should receive credit for what they have done in the past, for they keep up their roads with no help from the province.

Mr. Biggs stated that during the war motor traffic greatly increased and people were too busy winning the war to give much attention to roads. This year the great problem had been to get material, and many contracts have been cancelled owing to inability to get cement. Labour is very expensive but this would not be serious if it were efficient. He expressed the hope that the time will soon come when everyone will have to give 100% efficiency.

Inspection of Queenston-Chippawa Development

Immediately after the luncheon, the official photograph of the meeting was taken in front of the Refectory, following which the party were taken on four electric cars to view the Chippawa-Queenston Power Canal.

As on the previous day guides provided with megaphones were on each car to announce features of interest, and this feature was appreciated fully as much on this inspection tour as on that of the previous day. Proceeding for a short distance on the Niagara St. Catharines and Ontario line the cars were transferred to the double track construction line of the Hydro Electric Power Commission where they were taken in tow by one of the powerful electric locomotives used on construction work. Passing along the banks of the Canal, an excellent view was had of several channellers at work in the bottom of the canal, facing the rock for final excavation. It was explained that in the rock section the canal was being excavated 10 ft. at first, and then shot to grade, the work on the last 30 ft. being done by the large Bucyrus electric shovels, the largest in the world. Two of these shovels were seen at work by the party, and proved of very great interest. Each machine weighs 400 tons; has a capacity of 8 yards with an 80 ft. hoom, and can load cars 65 ft. above grade.

After the work of the shovels had been inspected at close quarters, the party was taken along the bank of the canal, passing the great crushing plant to the forebay, where the drilling at present in progress was inspected. At the forebay drillers are at work preparing to blast off the overhanging face of rock above the power house site, and it was of interest to note that drills both of the standardized piston drill type, and also of the more modern hammer-drill were at work.

An excellent view was had of the excavation at present under way for the power house, and a vivid impression was carried away by every member of the party of the immensity of this undertaking; one that has great possibilities for the people of Ontario.

Banquet

A banquet was held at the Clifton after the return from inspecting the Queenston-Chippawa Development, W. P. Near, M.E.I.C., Chairman of the Niagara Peninsula Branch presiding. After the toast to the King, proposed by the Chairman, W. F. Tye, M.E.I.C., past President of *The Institute* proposed to the health of the Province of Ontario. In his speech Mr. Tye referred to the engineering undertakings which had been inspected by those present during the past two days. He mentioned the remarkable fact that the whole of the work on the Chippawa-Queenston Power Development is being done by engineers, and while expressing a doubt as to the possible future value of the equipment, stated that this was the most complete he had ever seen.

In coupling the toast of the Province of Ontario with the name of Hon. F. C. Biggs, Mr. Tye spoke of the enormous importance of cheap transportation, and referred to Mr. Biggs as the one man who could do more to reduce this cost than any other in the Province.

In replying to the toast of the Province of Ontario, Mr. Biggs made a brief reference to the policy of the present Ontario Government, and after a sketch of the remarkable possibilities of the Province and the suitability

Seventh General Professional Meeting,

of Niagara Falls for an engineering convention, took up the question of transportation particularly comparing haulage by motor truck with transport by train, he was of the opinion that up to 100 miles the former method had the advantage both in convenience and cheapness.

In proposing the toast of "Sister Societies", Professor Peter Gillespie, M.E.I.C., made reference to the common aims of the Professional Engineering Societies in the United States, and *The Engineering Institute of Canada* and made a strong plea for international co-operation. In a witty speech of reply, F. S. Carman, President-elect of the American Society of Mechanical Engineers, dwelt on the importance of co-operation, and the value of the human side in engineering service.

The final toast of the evening was that of "*The Engineering Institute of Canada*", proposed by C. H. Rust, M.E.I.C., Past President of *The Institute*. In proposing the toast, Mr. Rust mentioned that this was his first opportunity of attending a gathering of *The Institute*, on account of his absence in the West for several years. He congratulated *The Institute* and the Niagara Peninsula Branch on the splendid programme provided, and mentioned his gratification at the fact that every member of the staff working on the Hydro Development is a Canadian, and a graduate of a Canadian University. R. A. Ross, M.E.I.C., President of *The Institute* replied to the toast, the key-note of his speech being that the engineer of the present day is too unselfish. A beaver, emblem of *The Institute*, builds his dam for his own family. The engineer builds work for other people. Using witty illustrations, Mr. Ross pointed out the necessity of self advertisement, and advised the engineers to be more assertive. Mr. Ross congratulated the gentlemen responsible for the evening's entertainment, and the Niagara Branch in general, one of the youngest Branches of *The Institute*, but one of the best. Mr. Ross gave it as his conviction that *The Engineering Institute of Canada* is now alive from stem to stern, and a good deal busier than it was a few years ago; it is a good Society because it is busy.

Following the toast to *The Engineering Institute*, the meeting adjourned, to continue a most enjoyable evening by dancing. The arrangements made for the dance were admirable, and the bachelors from other Branches were well looked after by the Niagara Peninsula Executive. The programme of the dance was varied by the music of the bagpipes, which inspired two members present to dance the highland fling, meeting with approval upon all sides.

Saturday Morning Professional Meeting

On the morning of Saturday, September 18th, the Professional Session was continued at 9 o'clock with A. C. D. Blanchard, M.E.I.C., in the chair, when a very interesting demonstration of the Gibson Method of Measuring the Flow Water in Closed Conduits for Determining the Efficiency of Hydraulic Turbines, was given by Norman R. Gibson, A.M.E.I.C. This method has been developed quite recently by Mr. Gibson, and has been acclaimed as an outstanding achievement in connection with the measurement of water flow. An exhaustive test has been made recently at Cornell University, comparing the Gibson Method with the usual volumetric method of measurement, and while the result of this test has not been officially announced, it is understood that the Gibson Method is found to be the most accurate of any devised to date. Mr. Gibson demonstrated by means of a small model of the apparatus used, and his address was followed with much interest by those present.

Inspecting Power Houses and Peach Orchards

The reading of Mr. Gibson's paper concluded the Professional Session, the remainder of the morning being spent in various trips arranged by The Niagara Peninsula Branch. Those interested in peach orchards, and this included a large number of the ladies present, were given the opportunity to inspect one of the large orchards near Queenstown. Trips had also been arranged to inspect the plants of The Ontario Power Company, Toronto & Niagara Power Company and Niagara Falls Power Company, (New York). Of these three power plants, the last mentioned proved the best drawing card on account of the three 35,000 kilowatt, units installed at present the largest operating hydro-electric units in the

Niagara Falls, Ontario, September 16-17-18 world. A party of fifty-five was taken to the American side of Niagara Falls in motor cars to the plant of The Niagara Falls Power Company, where a thorough inspection was made under the guidance of officials kindly provided by the Company; these gentlemen were most obliging in supplying information.

Luncheon at the Refectory

The convention later assembled at The Refectory in Queen's Park for luncheon as the guests of The Park Commissioners.

In a brief speech, introducing P. W. Ellis, Chairman of the Park Commission, J. S. Jackson, A.M.E.I.C., made a brief reference to the public spirit of the members of the Commission, stating that these gentlemen gave their services for nothing, and that starting with a small loan from the Ontario Government thirty-five years ago, the Commission had gradually taken hold of the entire frontier from Lake Ontario to Lake Erie, and had been successful in raising the annual revenue from $25,000 per annum to over $250,000. per annum.

Mr. Ellis, after welcoming *The Engineering Institute of Canada* as the guests of The Park Commission, made a brief reference to the days when he was President of The Canadian Manufacturers Association, and attended a banquet at the University of Toronto. At this time the University did not include The School of Practical Science, and, noting that in the majority of cases the speeches were of the soothing order, he asked if they realized that the students were to go out to develop the resources of the world, and that their surroundings in the University should not be too luxurious, at the same time making a strong plea that S.P.S. be made a part of the University. Next day, Mr. Ellis was gratified to receive a letter from the Chancellor of the University, and not very long thereafter the School of Practical Science became the Engineering Faculty of the University of Toronto.

Mr. Ellis then passed to the work of The Park Commission. He stated that it was the purpose of the Commission to receive American tourists with open arms, and to return them to their native land—without money, but with more than a dollar's worth for every dollar they had spent. He alluded to the great historical interest of the Niagara frontier, hallowed ground from Niagara-on-the Lake to Fort Erie. Mr. Ellis also drew a vivid picture of the scenic beauties of the Niagara district, with particular reference to the Niagara Falls, and Niagara Glen, and in concluding the description of the Niagara district, Mr. Ellis alluded to the enormous industrial wealth, due directly to the power from the Niagara Falls. Mr. Ellis gave a brief history of the achievements of the Park Commission. The Commission has at present control of the whole frontier along the Niagara River, and while the principal achievements have been in connection with the park and boulevard, plans are under way for a very great extension of the work. The right-of-way of the railway from Queenston to Niagara Falls has been acquired by the Commission, and it is planned to extend the boulevard, first to Queenston, finally to Niagara-on-the-Lake, with chalets at Niagara Glen, Queenston and Niagara-on-the-Lake. Bungalows for summer residents are to be built, and it is planned to improve the facilities at the Glen by providing an elevator, ponies, guides, etc. The work of the Commission is also to be enlarged above the Falls. The boulevard will be extended to Fort Erie, where another chalet will be built; it is planned to name the chalets after battles in the late war, whose names are sacred in Canada. Bathing facilities will be improved at Dufferin Island, and two real gondolas will be provided. The Refectory will be enlarged, and in many other ways the work of the Commission greatly entended.

In concluding his speech, Mr. Ellis stated his conviction that the beauty of the Niagara Falls district is one of its greatest assets, and that the policy of the Commission was to preserve this beauty to the greatest extent possible. The plans outlined, might seem visionary, but it was the intention of the Commission to have the programme completed in three years and paid for in forty years.

The Great Baseball Game

After a vote of thanks, moved by C. H. Rust, M.E.I.C., the members adjourned to witness an interesting baseball game when an all star Toronto team were able to pull off a decisive win over an International team composed of members of *The Institute* from Niagara Falls, with two experts from St. Catharines and one from Philadelphia.

To describe the game accurately would take more space than *The Journal* would permit. It seemed to be the consensus of opinion that the Toronto team were just a little bit better than the International.

Spectacular plays were pulled off by "Chuck" Macdonald who put up a stellar game, playing second base for the Toronto team. In fact the whole Toronto team were right on their toes all the time.

The last out was made on a sensational play with Niagara Falls et al. at bat. A high line drive was just reached by the pitcher of the Toronto team and knocked up into the air, to be caught by Johnston, the short stop, who made a quick dive for it.

Special mention should be made of some of the players on the International team. Bond, playing third base, had never been in a baseball game before, but handled himself like an old timer and learned immediately the art of talking back to the umpire. The final score was 9—3, favour Toronto.

The players were as follows:—

International	Toronto
Frost, 1b.	Caldwell, c.
Clark, c. (Capt)	Seymour, p. (Capt.)
Near, ss.	McIntyre, 1b.
Lowry, rf.	Macdonald, 2b.
Bond, 3b.	Johnston, ss.
Donnelly, cf.	Stevens, 3b.
Sherron, 2b.	Grant Jack, lf.
Swift, p.	Jack, cf.
Johnson, lf.	Amos, rf.

Umpire

Fred Berger, Campbellford, Ont. who was umpire, as far as can be learned escaped without serious injury.

Registration

The registration is one of the largest, if not the largest, ever recorded at a summer professional meeting. The list does not include the ladies, who were in attendance in large numbers took part in every function, and whose presence added greatly to the success of the meeting.

Seventh General Professional Meeting, — Niagara Falls, Ont., Sept. 16, 17, 18, 1920

REGISTRATION

Amos, W. L., Toronto.
Anderson, A. A., Ottawa.
Anderson, Lt.-Col. Wm. P., (Paris).
Avery, C. W., Dalhousie.
Bell, Norman, Toronto.
Barber, Frank, Toronto.
Bannon, H. S., St. Catharines.
Bastin, J., Thorold.
Bartle, E. E., Niagara Falls.
Baynes, Geo. F., Kitchener.
Bell, J. A., St. Thomas.
Bell, F. A., St. Thomas.
Beaubien, D. [illegible], Montreal.
Biggar, Hon. F. C., Toronto.
Black, A. Fennell, Toronto.
Black, D. T., Niagara Falls.
Black, S. W., Toronto.
Blanchard, A. C. D., Niagara Falls.
[illegible], H., Niagara Falls.
Bond, James W., Niagara Falls.
Bowden, G. E., Ottawa.
Bowie, C. A., Welland.
Bradley, N. S., Hamilton.
[illegible], A. G., St. Catharines.
Brennan, J. T. J., Niagara Falls.
Brien, M. E., Windsor.
Brodie, London, Ont.
Brown, E. L., Toronto.
Burke, H. E., Niagara Falls.
Burke, Wm. A., Toronto.
Bushnell, B. E., Niagara Falls.
Burnett, F. A., Campbellford.
Burpe, H. R., Toronto.
Butler, A. W., St. Catharines.
Butler, M. J., Oakville.
Byrne, G. H., Niagara Falls.
Carter, A. F., Campbellford.
Caldwell, H. J., Toronto.
Campbell, L. H., Toronto.
Carman, E. S., Cleveland.
Carmichael, R. M., Toronto.
Chace, W. G., Toronto.
Challies, J. B., Ottawa.
Chester, D. J., Hamilton.
Chipman, Willis, Toronto.
Chisholm, E. G., Hamilton.
Clark, F. W., Niagara Falls.
Clark, H. S., St. Catharines.
Clement, S. B., North Bay.
Cockburn, J. Roy, Toronto.
Connolly, E. M., Toronto.
[illegible], L. E., Niagara Falls.
Cooke, A. S., St. Catharines.
Craig, H. [illegible], Windsor.
Cousins, L. A., Montreal.
Crosby, W. H., Twin Falls.
Cummings, H. L., St. Catharines.
Dallyn, F. A., Toronto.
Darling, E. H., Hamilton.
Dayton, A. E., Toronto.
Dobbin, R. L., Peterborough.
[illegible], A. C., Toronto.
Donnelly, C. H., Niagara Falls.
Dunn, C. E., Niagara Falls.
Elliot, W. N., Hamilton.
Ellis, D. S., Kingston.
Ely, S. B., Pittsburgh.
Ewart, H. E., Ottawa.
[illegible], Toronto.
Fellows, R. C., Niagara Falls.
Fenwick, Dr. C. P., Niagara Falls.
Ferguson, F. A., Ottawa.
Ferguson, M. V., Galt.
[illegible], Toronto.
Fleming, D. H., Owen Sound.
Foley, Ed. P., Thorold.
Ford, W. B., Hamilton.
Foster, Howard, St. Catharines.
Frost, S. R., Niagara Falls.
Gaby, A. V., Ottawa.
Gale, Gordon, Ottawa.
Gest, R. T., Niagara Falls.
[illegible], A. E., Montreal.
Gillespie, Peter, Toronto.
Gillespie, J. L., Niagara Falls.
Gibson, N. R., Niagara Falls.
Gibson, R. W., Newcastle.
Gillies, W. J., St. Catharines.
Gore, Wm., Toronto.
Gould, Harry G., Niagara Falls.
Grant, J. F., Niagara Falls.
Grant, Mrs. J., St. Catharines.
Gray, E. R., Hamilton.
Grieve, J., Montreal.
Griffith, Geo. E., Niagara Falls.
Grimwood, R., St. Catharines.
[illegible], R. H., Ottawa.
Hamilton, C. W., Toronto.
Harcourt, R. H., St. Catharines.
Harkness, A. H., Toronto.
Harrington, E. P., Ottawa.
Harland, W., Toronto.
Harmer, R., Toronto.
Hart, H. C., Hamilton.
Hartford, Ernest, New York.
Hayes, C. L., Montreal.
Hayes, F. E., Toronto.
Hebert, H. F., Toronto.
Henderson, C. E., Windsor.
Henderson, John, Ottawa.
Hensley, E. G., Toronto.
Hogg, T. H., Toronto.
Holley, O., Toronto.
Hollingworth, W., Hamilton.
Holsbergen, J. S., Niagara Falls.
Hough, J. H., Port Colborne.
Huntley, A. D., Niagara Falls.
Hughson, Thos., Niagara Falls.
Hutchinson, W. H., London, Eng.
Jack, F., Guelph.
Jacobs, A. W., Welland.
Jackson, J. H., Niagara Falls.
Jackson, Walter, Niagara Falls.
Jennings, A. F., Toronto.
Jewell, F. C., St. Catharines.
Johnson, A. E., Montreal.
Johnson, E. F., St. Catharines.
Johnson, Ben P., Niagara Falls.
Johnston, A. E., Montreal.
Johnston, G. W. F., Ottawa.
Johnston, S. H., Toronto.
Johnston, S. W., Niagara Falls.
Jones, Harry A., Montreal.
Jost, E. B., Ottawa.
Kaelin, F., Montreal.
Keefer, C. H., St. Catharines.
Keefer, T. C., Ottawa.
Keith, Fraser S., Montreal.
Kenmore, W. H., Providence, R.I.
Kennedy, A. L., Niagara Falls.
Kennedy, F. W., St. Catharines.
Kester, F. H., Niagara Falls.
Killaly, A. L., Peterborough.
Knight, L. A., Toronto.
Lambe, A. B., Ottawa.
Lambe, H. J., Toronto.
Lawson, B. F., St. Catharines.
Lazier, F. S., Thorold.
[illegible], F. H., Niagara Falls.
[illegible], J. A., Toronto.
Lowry, G. H., Niagara Falls.
Macallum, A. F., Ottawa.
MacDonald, C. E., Toronto.
MacDonald, W. H., Welland.
MacIntyre, W. B., Toronto.
Macintosh, J. A. S., Peterborough.
MacKenzie, E., Cayuga.
Magee, F. A., Hamilton.
Maywood, W. H., Cornwall.
Malcolm, A. L., Campbellford.
Mallock, Norman, Niagara Falls.
Marshall, W. E., Toronto.
Marr, Norman, Ottawa.
McAll, H. W., Toronto.
McAndrew, J. B., St. Catharines.
McCallum, R. J., Kingston.
McComb, J., St. Catharines.
McCarthy, Geo. A., Chatham.
McDougall, C. H., Niagara Falls.
McElroy, James, Toronto.
[illegible], J. C., Walkerville.
[illegible], A. K., Niagara Falls.
McLachlan, W. C., St. Catharines.
McLaren, A. A., Niagara Falls.
McLean, W. E., St. Catharines.
McLean, W. B., Toronto.
McLean, W. M., Toronto.
[illegible], Malcolm, Niagara Falls.
Miller, Hugh, Montreal.
Miller, W. C., St. Thomas.
Milne, Jas., St. Catharines.
Millar, W. G., Hamilton.
Mills, James A., Niagara Falls.
Mott, R., Montreal.
Mott, W. L., Berne, Switzerland.
Moore, J. L., St. Catharines.
Murray, J. W., Hamilton.
Murray, A. F., Ottawa.
Moody, D. A., St. Catharines.
Nash, W. P., St. Catharines.
Nevitt, E., [illegible].
Newman, J. L., Windsor.
Norman, F., Montreal.
Norton, R. R., Montreal.
Oakes, J. E., Toronto.
Oliver, J. M., Cayuga.
Orr, E. P., Hamilton.
Paxton, F. W., Hamilton.
Parker, G. Cameron, Toronto.
Parker, R. H., Peterborough.
Pelton, G. H., Toronto.
Pearson, L. C., Hamilton.
Pearson, R. M., Toronto.
Powell, J. W., Toronto.
Reid, E. B., Ottawa.
Robins, Michael W., Peterborough.
Robertson, R. F., Niagara Falls.
Robertson, F., Toronto.
Robinson, A. W., Montreal.
Rose, H. W., St. Catharines.
Ross, R. A., Montreal.
Russell, J. E., Toronto.
Russell, W. H., Toronto.
Rust, C. H., Toronto.
Smart, M. V., Toronto.
Saunders, J. E., Peterborough.
Sears, John, New York.
Sellar, H., St. Catharines.
[illegible], H. L., Toronto.
Shaw, C. H., Hamilton.
Shaw, W. J., Jr., St. Thomas.
Shepherd, G., Niagara Falls.
[illegible], Geo. A., Philadelphia.
[illegible], G. L., Montreal.
Smith, C. E., Peterborough.
Smith, R. T., Port Weller.
Stevenson, W. E., London, Ont.
Stevens, F. E., St. Catharines.
Stevens, Alfred A., Windsor.
Stevenson, Robt. E., Toronto.
Stone, E. A., Toronto.
Stuart, F. E., Toronto.
Sullivan, W. H., St. Catharines.
Swan, R. W., Montreal.
Swift, C. Jas., St. Catharines.
Taylor, O. M., Niagara Falls.
[illegible], Geo. E., Toronto.
Trail, E. L., Toronto.
Trye, W. F., Montreal.
Vaughan, H. K., Montreal.
Vogan, G. H., Toronto.
Vollmer, G. F., St. Catharines.
Walker, J. L., Hamilton.
Weir, C. W., Thorold.
[illegible], H. R., Toronto.
Wight, E. L., New York.
Wilson, E. E., Toronto.
Wilson, C. M., Toronto.
Wise, O. S., St. Catharines.
Wood, Dr. F. W., Niagara Falls.
Wood, H. M., Niagara Falls.
Wynne-Roberts, R. O., Toronto.
Young, C. R., Toronto.
Young, W. E., Toronto.

EMPLOYMENT BUREAU

To make this department more valuable it is proposed that in future advertisements of situations vacant should state salary, and give details of requirements.

Situations Wanted

Graduate Civil Engineer

Graduate Civil Engineer, A.M.E.I.C., with 10 years experience on construction, maintenance, superintendence and contracting on railway and building work and 5 years on hydraulic work, desires position with operating department of a Pulp Industry. Salary $300.00 per month. Full particulars of experience and references furnished. Apply box 40-P.

Civil Engineer

Civil Engineer, A.M.E.I.C., and Quebec Land Surveyor, with several years' experience, on railroad, hydraulic, municipal and surveying work, for personal reasons, wishing a change, seeks employment. Single. Box 41-P.

Mechanical Engineer

English engineer visiting Canada wishes to settle in the Dominion and wishes to get into touch with a large organization requiring services of experienced mechanical engineer; was chief engineer of large plant at Nottingham, England, with sole charge of engines, boilers, pumps, etc., also charge of building extensions, etc., 30 years continuous experience. Box 42–P.

Situations Vacant

Structural Engineer

Structural engineer wanted by a structural steel co. in Ontario; technical man with considerable experience in detailing, designing and estimating on structural steel; to take charge of designing and oversee small drawing room; must be fast, accurate and reliable; salary $275.00 to $300.00 per month. Box 161.

Engineer for Construction Work in India

Young Canadian Engineer about thirty years of age, unmarried, required for engineering position in India; work necessitates knowledge of concrete construction. Salary in neighbourhood of $5000 per annum. Box 162.

Geometry, Freehand Drawing and Lettering Assistant

Assistant for department of descriptive geometry freehand drawing and lettering for large Canadian University; salary $125.00 to $150.00 per month. Box 163.

Junior Engineer for Pulp and Paper Company

Junior engineer with at least one year's experience to look after water records and do general office work, draughting, etc., for large pulp and paper company in Ontario. Salary $150.00 per month. Box 164.

Draftsmen for Hydro Electric Work

Two field draftsmen wanted immediately for hydro electric work, in Ontario; salary $150.00 per month. Box 165.

Member's Exchange

Transactions Inst. C.E. For Sale

Set transactions Inst. C.E. 1881 to date 12 vols. for sale, are bound, should be worth $100.00 to any member acquiring eng library. Box 3-A.

Transactions

Books—Transactions A.M.I.E.E. 1904-1918 *Journal* of The Institute of Electrical Engineers, England, 1893-1913. Box No. 5-A.

Journals Wanted

We have an enquiry from one of our members who is very anxious to have a complete set of *The Journal* for Nos. 1, 2, 3 and 4 of Volume 1. Any member who has these journals and does not require them for binding purposes could rest assured that they would be appreciated if sent in. Box 6-A.

For Sale

Transit light mountain Keuffel and Esser, suitable for railway construction, first class condition, $175.00; also Dump Level, good condition, $65.00, or sell both together for $225.00. Box 7-A.

Dumpy Level For Sale

12" Dumpy level by Baker & Company, High Holborn, London. This level is in good condition; has exceptionally good lenses and a comparatively new tripod. Although well worth $100.00 may be had for $60.00. Box 8-A.

OBITUARIES

Thomas Matthew Schenk, A.M.E.I.C.

Mr. Schenk died in Halifax on Friday the 3rd of September, 1920, after an illness of five weeks of typhoid fever, leaving a widow and two children.

He was the only son of Capt. E. G. Schenk, for many years Commander of the Commercial Cable Company's Repair Ship "MacKay-Bennett". Capt. Schenk's elder brother, A. O. Schenk, M. Inst. C.E., is now, and has been for many years, chief engineer of the Swansea Harbour Board, Wales.

Mr. Schenk was admitted to *The Institute* as a Student April 17th, 1909, Junior, January 13th, 1913, and as an Associate Member June 27th, 1916. At the time of his untimely death — he was only thirty two years of age — he had been on the staff of C. E. W. Dodwell, M.E.I.C., district engineer, Public Works Department of Canada, at Halifax, N.S., for eleven and a half years; first as draughtsman and junior, and for the past seven or eight years as assistant engineer.

His was an exceptionally fine character, clean-living and scrupulously honourable, absolutely trustworthy, conscientious, loyal and efficient, and his death is a severe loss, not only to the Halifax Staff of the Public Works Department, but to the Department, as a whole.

Major R. Douglas Galbraith, M.C., S.E.I.C.

Major R. Douglas Galbraith, M.C., S.E.I.C., a widely-known Canadian soldier, and prominent in University of Toronto graduate life, died at the Toronto General Hospital on Saturday, Sept. 11, following a long illness. He entered the hospital last May to secure relief from the abdominal ailment from which he was suffering, but after a series of operations failed to recover. He was twenty-seven years old, and was a son of the late Dean John Galbraith, who was long the head of the Faculty of Applied Science of the University of Toronto. Major Galbraith was a graduate of the University, and after the war planned to follow his profession as a civil engineer. He is survived by one brother, Lieut. John Galbraith, M.C., A.M.E.I.C., of Seattle, and a sister, Mrs. F. S. Jamieson, 150 Albany avenue. Sir Frederick Stupart, Director of the Observatory, is an uncle. The funeral takes place to-morrow afternoon.

Major Galbraith began his military career in the Mississauga Horse, and commanded the North York Company of the 127th Battalion, York Rangers, during the last year of the war. He joined the York county unit, which became a battalion of railway troops, in 1917 as an engineer officer. His first service was in the Somme in 1916, as an officer of the 6th Machine Gun Company.

He won his Military Cross in March, 1918, at Villers Brettoneaux.

Major Galbraith seemed to bear a charmed life all through the war, although he suffered many bereavements. His father died during the first year of the war. On his return to Canada he picked up a paper in Halifax, where he read the first news of the death of his mother, who had died while he was at sea on the way home. A romance in his life was tragically ended by the German bombing of the Canadian hospital at Doullens, where the brave young woman to whom he was engaged to be married was serving as a nurse. She was instantly killed while on duty with her patients.

Edward Ashley Wilmot, M.E.I.C.

Edward Ashley Wilmot, M.E.I.C., died in Victoria, B.C., Sept. 4, 1920, in his 75th year. The late Mr. Wilmot was for upwards of twenty years in the employ of the Provincial Government as a civil engineer, and for fourteen years he held the important position of Provincial Inspector of Dykes. From 1892 until 1899, he was city engineer of Victoria, and since 1899 he had been engineer in charge of the construction and of the maintenance and management of dykes for the Provincial Government, and in that connection made a highly creditable and commendable record.

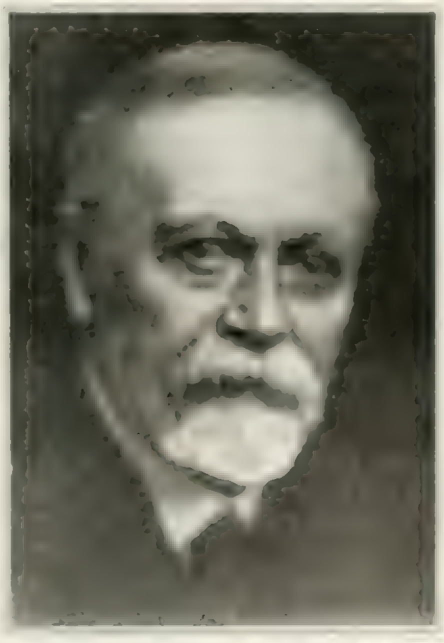
The late Mr. Wilmot was widely recognized as an able and successful representative of the profession. He did military service during the period of the Fenian raid of 1866, and received a Fenian Raid medal awarded by the Dominion Government to survivors. He was educated first at Sunbury Grammar School, and afterwards at the University of New Brunswick. His father, Hon. Robert Duncan Wilmot, represented Sunbury County in the Senate from the time of Confederation until 1880, and in 1885 was appointed Lieutenant-Governor of New Brunswick.

The deceased, who was born in St. John, N.B., on November 4th, 1845, is survived by a widow and four sons, Hugh Humphry, of Victoria, Ashley Neal, of Vancouver, Robert Percy, of Victoria and [illegible], of Bradford, Ont.

Dr. William Hodgson Ellis, M.E.I.C.

Dr. William Hodgson Ellis, M.E.I.C., former Dean of the Faculty of Applied Science of the University of Toronto, died at Lake Joseph, Muskoka, on August [illegible].

Born at Bakewell, Derbyshire, England, son of a physician of note and a grandson of the Rev. Wm. Ellis, the famed missionary to Madagascar, he came to Canada when young and attended the University of Toronto, receiving the degree of B.A. in 1867 and M.A. in 1868. Pursuing his medical studies at the same time, he went to England and in 1871 obtained the diploma of Licentiate of the Royal College of Physicians, with the distinction of F.S.C., F.I.C. and F.R.S.C. He was appointed to the chair of chemistry in Trinity Medical School, and became lecturer of chemistry in Toronto S.P.S. In 1887 Dr. Ellis resigned his connection with Trinity for the professorship of applied chemistry in the S.P.S., becoming dean in 1914. The Dominion Government made him public analyst for Toronto; in 1895 the University of Toronto elected him a senator.



Dr. William Hodgson Ellis, M.E.I.C.

Dr. Ellis had early joined the University Corps of the Queen's Own, and served as a [illegible] with the regiment in the Fenian Raid of 1866. He participated in the battle of Ridgeway.

Beside his widow, two sons, Major (Dr.) Arthur Ellis, C.A.M.C., who had a distinguished career in France, and Capt. Harold Ellis, C.E.F., secretary to the Minister of Militia and Mrs. Crooks, wife of Alex. D. Crooks, a Toronto barrister, survive.

PERSONALS

B. A. Johnston, Jr.E.I.C., is now with The Good Roads Department of the Province of Manitoba.

*

Briton O. Smith, A.M.E.I.C., has recently joined the staff of the De Laval Steam Turbine, Trenton, N.Y.

*

Chas. Errington, S.E.I.C., is at present in the Dominion Civil Service, Water Power Board, at Calgary, Alta.

*

W. C. MacDonald, A.M.E.I.C., is at present with The Bedford Construction Co., Royal Bank Chambers, Halifax, N.S.

*

A. W. G. Clark, Jr.E.I.C., has recently been appointed general manager of the Edmonton Cement Co., Ltd., Edmonton, Alta.

*

W. G. MacNaughton, A.M.E.I.C., has been recently appointed manager of the Spruce Falls Company, Ltd., Kapuskasing, Ont.

*

W. G. Calbert, A.M.E.I.C., has been appointed engineer in charge for the Mead Pulp & Paper Company of Port William, Ont.

*

V. J. Melsted, A.M.E.I.C., is leaving Winnipeg for a long holiday in British Columbia and will be resident for some time at Salmon Arm, B.C.

*

Donald Ross-Ross, Jr.E.I.C., has accepted a position with the planning department of the Canadian Rubber Company, Papineau Square, Montreal.

*

I. Matheson Fraser, Jr.E.I.C., has left McGill University, and is now employed as draughtsman with the Dominion Engineering Works, Lachine, Que.

*

R. Norman Coke, Jr.E.I.C., has recently accepted a position with the traffic engineer for the Western Division of the Bell Telephone Company, Toronto, Ontario.

*

A. E. MacGregor, Jr.E.I.C., has recently left Ottawa and is now with the Engineering Branch of the Department of Soldiers Civil Re-Establishment, Toronto.

*

W. E. Joyce, A.M.E.I.C., has accepted a position as resident engineer for Rondout Creek Bridge, Kingston, N.Y., taking charge of this work for the Kingston Shipbuilding Corporation.

*

Capt. L. Kirk Greene, S.E.I.C., has accepted a position with the Wolseley Motor Co., (Commercial Branch) Birmingham, England, and left on the 18th inst. to assume his new duties.

J. E. Openshaw, A.M.E.I.C., has recently returned from a visit to England where he was successful in securing a number of agencies for engineering supplies. It is his intention to open an office in Montreal in the near future.

*

Major W. T. Wilson, A.M.E.I.C., who has been residing at Ottawa since his return from overseas, sailed for England early in September en route to Mesopotamia where he has accepted a position with the Imperial Government.

*

Edmund Grummitt, A.M.E.I.C., formerly instructor in mechanical and architectural drawing for the Department of Soldier's Civil Re-establishment, is now employed as a draughtsman with the Welland Ship Canal, St. Catharines, Ont.

*

Professor L. M. Arkley, M.Sc., M.E.I.C., who has for a number of years occupied the Chair of Assistant Professor of Mechanical Engineering, University of Toronto, has accepted the position of Professor of Mechanical Engineering in charge of that department at Queen's University.

*

R. Lawrence Weldon, Jr.E.I.C., M.Sc., has recently left the engineering department of The Laurentide Company Limited of Grand'Mère, Que., to join the Fort Frances Pulp and Paper Company Ltd., of Fort Frances, Ont., as resident engineer, in charge of engineering and construction work.

*

A. D. Creer, M.E.I.C., has formed a partnership with A. R. MacKenzie, (Assoc. M. Inst. C.E.,) in the practice of civil engineering and valuation and has opened an office at 517 Metropolitan Building, Vancouver, B.C. It is intended to specialize in water power development, water supply, sewerage, railway construction, irrigation, and land development and valuation.

*

Capt. C. B. R. Macdonald, A.M.E.I.C., returned to England from Canada about the middle of September. Capt. Macdonald has spent the last year, on his return from overseas, gaining further Canadian engineering experience and returns to England to accept a position with a contracting firm of which his uncle, Lt.-Col. A. C. Macdonald, D.S.O., M.E.I.C., is head.

*

H. L. Swan, A.M.E.I.C., has recently gone into practice with A. P. Augustine, A.M.E.I.C., in Pencticton, B.C., as Civil Engineers, Architects and land Surveyors.

Mr. Augustine and Mr. Swan have both been recently registered as "Professional Civil Engineers" under the British Columbia act. They have also been recently elected members of the American Concrete Institute.

*

Col. F. M. Gaudet, M.E.I.C., has recently been appointed head of the Public Safety Department of the City of Montreal, this appointment including the control of the Police and Fire Services.

Colonel Gaudet has had a distinguished career as an engineer and administrator. He was responsible for the recruiting of the famous 22nd Battalion, and was

Commanding Officer of this Battalion overseas. Colonel Gaudet is one of the five members of the administrative commission for the City of Montreal, and this appointment is evidence of the value placed on his service in this connection.

•

Chas. Evan Fowler, M.E.I.C., delivered a lecture recently to the Detroit Engineering Society on "Harbours and Harbour Bridges", with particular reference to the proposed Detroit-Windsor bridge. Mr. Fowler's lecture was illustrated with lantern slides, showing harbours all over the world, together with views showing long span bridges. At the recent Great Lakes-St. Lawrence Tidewater Congress held in Detroit, Mr. Fowler was one of the leading speakers. In addition to being a member of *The Institute*, Mr. Fowler is a member of The American Society of Civil Engineers. His experience extends over thirty years in the design and construction of bridges and harbours, both on this continent and abroad. He is an author of ten publications on engineering design and construction.

•

Hugh B. Walkem, M.E.I.C., has retired from the service of the Canadian Pacific Railway, with which he has been connected for forty years, and is now resident at Haney, B.C.

Mr. Walkem was born in Montreal in 1858 and has been with the C.P.R. since 1882. He first served under A. J. Hill as a rodman, was later on location and construction in connection with the Thompson Section, B.C., also on the Shuswap Section, B.C., under Major Rogers, later Mr. Walkem joined the staff of H. A. Cambie and rose to asst. engineer on the extension of the Canadian Pacific Railway, from Port Moody to Vancouver. Mr. Walkem was placed in charge of the Direction of the Terminal Works of the Canadian Pacific Railway at Vancouver and later rose to take charge of permanent way, locating and construction of branch lines, etc., in the Western District.

•

F. W. Cowie, M.E.I.C., chief engineer of the Port of Montreal, has recently completed the first part of the work in connection with electrifying The Montreal Harbour Terminal Railway, having a total trackage of 58 miles. The system being installed is the 2400 volt, D.C. system, which has proved so satisfactory on many lines in the United States, and, nearer home, on the electrified lines of the Canadian National Railways in Montreal. The overhead system has been installed with catenary suspension, wooden poles being used where development is not yet complete, and steel poles where permanent conditions exist. The system has been divided off into half mile sections, with a view to anchoring each section indepedently. It is intended to have electric locomotives of a type similar to those in use on the Canadian National Line through Mount Royal Tunnel, weighing 83 tons each. The power house will be erected centrally and will eventually have a capacity of 3,000 kilowatts.

BRANCH NEWS

Ontario Provincial Division

A. B. Lambe, A.M.E.I.C., Secretary.

Following Mr. [illegible]'s demonstration at the General Professional Meeting, Niagara Falls, a meeting of the Ontario Provincial Division was held. A. B. Lambe, A.M.E.I.C., Secretary of the Division gave a brief survey of the work of the Division in regard to organization, legisation and remuneration.

Two of the Ontario Branches have prepared schedules—Toronto and Niagara Peninsula, and the latter has been to a large extent adopted by the Hydro Electric Power Commission. Council, however, takes the stand that as the salary question is nation-wide, the schedule should be discussed by a general committee of the Institute.

The schedule favoured by the committee appointed by Council is that recently published by Engineering Council (printed on page [illegible] of this issue), which is considered concise, simple and fair. With regard to consulting engineers' fees Mr. Lambe stated that the committee is still working on the question and would present its report at the annual meeting 1921. The legislation problem in Ontario is being considered by a committee having two members from the Engineering Institute of Canada, and two each from other technical organizations. The Toronto Branch is doing good work by keeping in touch with the Ontario Government as to the appointment of engineers for all engineering positions.

Fraser S. Keith, Secretary of *The Institute*, stated that the Branches will be given an opportunity to make recommendations before the final report of the Committee on Remuneration is presented, also that the report of the Committee on Policy will be presented at the October meeting of Council.

Toronto Branch

H. A. Goldman, A.M.E.I.C., Secretary-Treasurer.

Syllabus of Subjects for Winter Session 1920-1921

Oct., 1920, 7 Opening Meeting.—Business and Chairman's Address.
14 Open Night.—Discussion on Questions of Policy.
21 C. D. Dean, A.M.E.I.C.—General Oil Refining Practice (Moving Pictures) Mining Bldg. University.
28 Open Night.—Discussion on Committee's Report on Fees and on Remuneration Committee's Interim Report.

Nov., 1920, 4 F. M. Dawson, A.M.E.I.C.—Cement and [illegible] (Illustrated).
11 Public Meeting in Physics Building, jointly with the Canadian Deep Waterways and Power Association. Addresses on "St. Lawrence Deep Water Route".

18 Open Night.—Discussion on Committee's Report on Zoning. H. L. Seymour, AM.E.I.C.

25 L. W. Wynne Roberts, A.M.E.I.C.—Mesopotamia, (illustrated).

Dec., 1920, 2 Open Night.—Discussion on Committee's Report on Ethics. T. D. Mylrea, A.M.E.I.C.

9 B. F. Haanel, M.E.I.C.—Peat Fuel.

16 J. T. Burt-Gerrans.—Electro-Chemistry and the Engineer (illustrated).

Jan., 1921, 6 Open Night.—Discussion on Committee's Report on Engineers and Sociology. T. L. Crossley, A.M.E.I.C.

13 F. A. W. Taylor.—Super-heaters and economisers, (illustrated).

20 W. Gore, M.E.I.C.—Reservoirs (illustrated).

Feb., 1921, 1, 2 & 3.—Annual Convention of *The Engineering Institute of Canada* in Toronto.

10 Arthur Hewitt.—Toronto Gas Works (illustrated).

17 Murray A. Stewart, A.M.E.I.C.—City Street Paving.

24 R. B. Young, A.M.E.I.C.—The New Theory of Concrete Mixtures; a practical method of proportioning based thereon. T.V.McCarthy,A.M.E.I.C.—Experience with this method on a large power development.

Mar., 1921, 3 Open Night.

10 A. T. Clark & T. M. Jones, A.M.E.I.C.—Design of Centrifugal Pumps (illustrated).

17 T. H. Hogg, A.M.E.I.C.—Description of Hydraulic Power Plant of Hydro-Electric Power Commission.

24 J. Morrow Oxley.—Some Points in the Economics of Building Design (illustrated).

31 C. Nelson Gain.—Pulp and Paper Works (illustrated).

April, 1921, 7 Open Night.

14 W. E. Douglas, A.M.E.I.C.—Engineers and Contractors.

21 F. A. Gaby.—Hydro Radial Railways.

28 Frank H. Keefer.—K.C., M.P.,—St. Lawrence River Deep Waterway and Power Development.

May, 1921, 5 Open Meeting.—Reports. Election and installation of Officers for ensuing year. (Nominations for Chairman, Deputy Chairman, Secretary and three Committeemen to be sent to Mr. Goldman on or before March 17th, 1921).

Note: Watch announcements in press each week.

List of Subjects in Reserve

L. M. Arkley, M.E.I.C.	Purchase and burning of coal on B.T.U. basis.
H. G. Acres, M.E.I.C.	Additional information re Chippawa Power Scheme.
W. R. Worthington, A.M.E.I.C.	Sewerage Works.
P. W. Ellis,	Engineering Features of Queen Victoria Park Developments. (Illustrated).
N. R. Gibson, A.M.E.I.C.	Measurement of velocity of Water Flow in Closed Conduits. (Illustrated).
George A. Sherron,	Modern Concrete Road Construction and Machinery. (Illustrated).
J. C. Krumm, A.M.E.I.C.	Railway Location.
R. R. Knight, M.E.I.C.	Steel Forging and Heat Treating Furnaces.
T. T. Black, A.M.E.I.C.	Forms for Concrete Work.

Internal Combustion Engines.
Foundations.
Mechanical Transportation.
Mechanical Excavators.
Alignment Charts.
Shrinkage or Expansion in Earth works.
Essential Specifications and Conditions.
Rights and Wrongs of Public Ownership.
Economics in Engineering.

Niagara Peninsula Branch

Rex. P. Johnson, A.M.E.I.C., Secretary-Treasurer.

The members of the Branch feel as if they were out of a job. The Professional Meeting has gone off with a bang exceeding our best expectations, and everybody in the Branch feels great satisfaction at the success of the gathering which was conceived almost a year ago and given official sanction by the Branch members last December.

Committee meetings of exasperating frequency and extending to late hours are already forgotten as a thing of the past and only the still late convivial evenings of the meeting have a place in our memories, at least most of us remember them very distinctly.

We wish to thank those firms whose interest in the meeting prompted some very acceptable gifts of inspiration and F. H. Hopkins & Co., The Lyman Tube and Supply Co., The Canada Cement Co. and the Dominion Dredging Co. are to be numbered among the good fellows. Drummond McCall presented the committee with a cheque which was applied to entertainment along the same lines.

It is in order here to call attention to a very important feature of the committee work which was not in evidence at the time of the meeting. This is the fine work done by the Finance sub-committee headed by R. T. Gent, M.E.I.C.

The Committee were very much pleased at the large contribution and especially by the many older and prominent engineers who took the time to come long distances and it is with some pride that we feel that we made the meeting interesting and enjoyable for them as well as for the younger members.

The captain of the winning baseball team promised to write a story about the Saturday afternoon game and we are referred to another page for this account. Mr. Wynne-Roberts should feel gratification at the result even if the origin of the challenge did require explanation in the September *Journal*.

The impromptu parade headed by Mr. Grant during the dance intermission and done to the strains of the pipes was much appreciated and H. L. [illegible] had his own way about the pipes.

A financial statement will be published in the November *Journal* for the information of members.

Winnipeg Branch

Geo. L. Guy, M.E.I.C., Secretary-Treasurer.

A special meeting of the Winnipeg Branch of *The Engineering Institute of Canada* was held in the Engineering Building, September 9th, 1920. W. M. Scott, M.E.I.C., in the Chair and 61 Members present.

The meeting was called to receive and consider the report of the Special Salary Committee, and to make arrangements for the trip of inspection to the Manitoba Rolling Mills at Selkirk.

It was moved by W. P. Brereton, M.E.I.C., seconded by D. A. Ross, M.E.I.C. and carried:—

That the date of the inspection trip to the Manitoba Rolling Mills be left to H. A. Mackay for any time after the 14th inst., preferably on Wednesday.

Mr. Brereton conveyed the invitation from Mr. Martin, President of the Manitoba Gypsum Company, to the Members of the Branch, to pay a visit to his plant. It was moved by D. A. Ross, M.E.I.C., seconded by J. G. LeGrand, A.M.E.I.C., and carried:

That the time of the visit to the Gypsum plant be left to the Executive to decide the date, such date to be within the current month.

At the request of the Chairman, H. A. Mackay, A.M.E.I.C., assumed the chair, as he was convenor of the Special Salary Committee. Mr. Mackay stated that eleven meetings of the Special Committee had been held, and a great deal of thought and energy had been put on its, as well as many hours of discussion.

The report was then read by the Secretary.

It was moved by W. P. Brereton, M.E.I.C., seconded by J. M. Leamy,, M.E.I.C. that the report had adopted by the Branch as presented.

An amendment was moved by A. J. S. Taunton, A.M.E.I.C., seconded by W. M. Scott, M.E.I.C. and carried:—

That the words "that recommended" be struck out in the last line of the clause dealing with organization on page 3, and that there be substituted therefor "one approved."

Mr. Brereton then altered his original motion to comply with the amendment, which was carried unanimously.

It was moved by A. W. Smith, A.M.E.I.C., and seconded by E. Brydone-Jack, M.E.I.C., that copies of the report be sent to the Council of *The Institute* and to all Branch Secretaries for their consideration, and that each Branch take similar action in preparing and submitting a similar report.

It was moved by E. Brydone-Jack, M.E.I.C., seconded by Geo. [illegible], A.M.E.I.C., and unanimously carried.

That a hearty vote of thanks be tendered to the Members of the Salary Committee for their successful efforts in the preparation of the Salary Report during the past summer.

It was moved by A. W. Smith, A.M.E.I.C., seconded by W. P. Brereton, M.E.I.C., that a special committee consisting of the Nomination Committee and Executive of the Branch, be appointed to nominate the Remuneration Committee, the latter to consist of five Members and to report back to the ordinary general meeting on September 16 next. Carried.

D. A. Ross, M.E.I.C., then gave notice of motion that at the regular meeting on October 7th, he would move that Paragraph 13 of the by-laws covering Standing Committees be amended by adding thereto Clause G—remuneration committee. Clause [illegible]: The Remuneration Committee shall be responsible for taking all reasonable steps to assist the members in obtaining salaries in accordance with the schedules adopted from time to time by the Branch, and for recommending such revision of said schedule as may seem advisable.

On Mr. Scott pointing out that notice of motion could only be given at a regular meeting it was agreed to have this notice of motion presented at the next regular meeting, being September 16th.

The meeting adjourned at 10 p.m.

Edmonton Branch

C. C. Sutherland, A.M.E.I.C., Secretary-Treasurer.

At a general meeting held in August, and after a scrutiny of ballots, the following Gentlemen were declared elected to the executive of the Edmonton Branch, and will take office at the first general meeting held in October.

Chairman —	D. S. Carter, A.M.E.I.C.,
Vice-Chairman —	A. W. Haddow, A.M.E.I.C.,
Sec.-Treas. —	C. C. Sutherland, A.M.E.I.C.,
Councillors:	J. Robertson, A.M.E.I.C.,
	Wm. H. Hunt, A.M.E.I.C.,
	[illegible], A.M.E.I.C.,
Ex Officio	[illegible], M.E.I.C.,
	R. J. Gibb, M.E.I.C.

Mr. Sutherland has already taken office as Secretary and all communications should be addressed to him at City Engineer's Department, Civic Block, Edmonton.

New Brunswick News

First General Meeting of The Association of Professional Engineers of the Province of New Brunswick.

The first General Meeting of the Association of Professional Engineers of the Province of New Brunswick was held on September 10th, in the Board of Trade rooms in St. John. The attendance was representative of all sections of the Province and every branch of engineering. Those present were:—Harry F. Bennett, A. R. Crookshank, C. O. Foss, F. G. Goodspeed, J. A. Grant, A. Gray, G. G. Hare, G. N. Hatfield, W. J. Johnston, C. C. Kirby, G. S. Macdonald, H. F. Morissey, G. G. Murdoch, E. J. Owens, A. G. Tapley, E. A. Thomas, F. P. Vaughan, J. A. W. Waring, S. R. Weston and B. Wilson of St. John, G. W. Arnold of Sussex, D. F. Maxwell of St. Stephen, C. B. Brown, Jr., F. O. Condon, C. H. F. Donkin, W. A. Duff, J. A. Ellis, E. G. Evans, F. B. Fripp, J. D. McBeath, G. C. Torens, and S. B. Wass of Moncton, K. S. Pickard of Sackville, M. W. Black, B. M. Hill and John Stephens of Fredericton, N. A. MacKenzie and G. Stead of Chatham, R. J. Sandover Sly of Campbellton.

The provisional president, C. C. Kirby, M.E.I.C., occupied the chair. The minutes of the organization meeting held in September 1919 were read and adopted. The reports of the provisional council and the secretary-treasurer dealing with the progress of the Legislation and the passing of the Act as well as the financial standing of the Association were read and adopted. The registrar reported that 92 engineers had been registered.

The By-Laws which had been prepared and distributed by the provisional council were taken up and thoroughly discussed. The By-Laws as amended were adopted and ordered printed.

The election of Officers resulted as follows:—

President: C. C. Kirby, M.E.I.C., divisional engineer, C.P.R., St. John, N.B.

Vice-President: C. B. Brown, M.E.I.C., chief engineer, C.N.R. Moncton.

Councillors:

St. John District,	J. A. Grant, A.M.E.I.C., of the J. A. Grant and Co. Ltd., general contractors, St. John, N.B. (1922)
	F. P. Vaughan, M. E. I. C., manager of The Vaughan Electric Co., Ltd., St. John, N.B. (1921)
Moncton District,	S. B. Wass, A.M.E.I.C., dist. engineer, C. N. R., Moncton, N.B. (1923)
	J. Edington, M.E.I.C., city engineer, Moncton, N.B. (1921)
Fredericton District,	B. M. Hill, M.E.I.C., provincial highway engineer, Fredericton, N.B. (1923)
Chatham District,	Geoffrey Stead, A. M. E. I. C., dist. engineer, Public Works, Canada, Chatham, N.B. (1922)

Auditors: J. A. W. Waring, A.M.E.I.C., asst. engineer, C.P.R., St. John, N.B.

F. G. Goodspeed, M.E.I.C., dist. engineer, Public Works, Canada, St. John, N.B.

Nomination Committees for 1921, St. John District, (Counties of St. John, King's, Queen's and Charlotte)

G. G. Murdoch, M.E.I.C. and G. G. Hare, M.E.I.C. Moncton District, (Counties of Albert, Kent and Westmorland) J. D. McBeath, M.E.I.C., and E. G. Evans, M.E.I.C.

Fredericton District, (Counties of York, Sunbury, Carleton, Victoria, and Madawaska) H. M. Armstrong, and M. W. Black, A.M.E.I.C.

Chatham District, (Counties of Restigouche, Gloucester, and Northumberland) R. J. Sandover Sly, A.M.E.I.C. and G. E. Martin, A.M.E.I.C.

The President thanked the Association for their expression of confidence in him as it showed him that the members were pleased with the work of the provisional council and that work had not been light during the organization period. He compared the progress in New Brunswick with that of the other provinces and asked for the support and co-operation of every member.

A vote of thanks was extended to the provisional officers for their services in preparing the Act and putting it through the Legislature.

A vote of thanks was extended to the editor of the Canadian Engineer for the 350 copies of the Act which he had presented to the Association.

At the close of the business session the members adjourned to the supper room at Bond's restaurant where members of the St. John Branch E.I.C. joined with the members of the Association for supper.

After the delightful repast the Chairman, G. G. Murdoch, M.E.I.C., proposed the toast to the King and then welcomed all visiting members to the city and congratulated all on the very enthusiastic and business-like meeting which had consummated the Association of Professional Engineers in New Brunswick. He felt that men of such high standing in the profession could not come together as they had today without widespread results for the betterment of the Profession. He expressed the pleasure the St. John Branch had in being able to join with the outside men in furthering the cause of the Professional Engineer.

C. C. Kirby, M.E.I.C. in proposing the toast to the Engineering Profession dwelt on the standing of the profession in the community and the country at large, on the gradual development which is taking place over the American continent in making the public realize the importance of thoroughly trained engineers. He took up the several phases of the report of the "Engineering Council" on classification and remuneration and urged the necessity for co-operation to bring about better social and financial conditions for the profession.

D. F. Maxwell, M.E.I.C., replied to the toast and congratulated the Association on its choice of president. He drew attention to the great responsibilities of engineers in the expenditure of large sums of money, and yet he did not understand why engineers did not sit in the parliaments of the country where their advice would be valuable in determining the economic use of the people's money. He eulogized the profession as a whole on the magnificent part it had played during the late war.

Geoffrey Stead, A.M.E.I.C., in moving a vote of thanks to Mr. Kirby for his thoughtful address, compared the salaries of young and inexperienced railroad men to engineering graduates with ten years experience who were getting smaller salaries.

C. O. Foss, M.E.I.C., in seconding the vote of thanks became reminiscent of the [illegible] years he had spent in the profession and the uphill work of the engineers in convincing the public of its need for scientific men to safeguard life and property. He felt however that the recent advances made would soon bear fruit and that the engineers would receive the appreciation they rightfully deserved.

The Chairman in tendering the vote of thanks expressed the feelings of everyone present that the address illustrated to all the necessity for united action in order to obtain results. Mr. Kirby's address was thoroughly appreciated.

After the singing of the National Anthem the members proceeded to the St. John Exhibition.

Western Professional Meeting, Banff, August 14, 1920

Key, Banff Meeting Photograph

(1) Maj. W. G. Swan, (2) A. S. Fraser, (3) A. W. McLean, (4) W. R. Warren, (5) J. H. Stewart, (6) [illegible], (7) H. R. Miles, (8) G. H. Whyte, (9) Hugh Peters, (10) F. A. Jameson, (11) Edmund Wright, (12) [illegible] C. H. Mitchell, (13) J. A. McLeod, (14) R. W. E. Loucks, (15) Maj. Wheeler, (16) C. M. Arnold, (17) G. H. [illegible], (18) [illegible], (19) [illegible], (20) H. S. Carpenter, (21) Prof. C. J. McKenzie, (22) A. R. Greig, (23) [illegible] ... [illegible] (56) G. W. Craig, (57) F. H. Peters, [illegible] ... [illegible] (107) Mrs. Loucks, (108) Mrs. J. A. McLeod, [illegible] ... [illegible] (113) Mrs. A. C. Eddy, (114) Mrs. W. G. Swan, (115) Mrs. A. S. Fraser, (116) Mrs. Edmund Wright.

Preliminary Notice

of Applications for Admission and for Transfer

20th September, 1920

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in October, 1920.

FRASER S. KEITH, Secretary.

*The professional requirement are as follows:—

Every candidate for election as MEMBER must be at least thirty years of age, and must have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. The term of twelve years may, at the discretion of the Council, be reduced to ten years in the case of a candidate who has graduated in an engineering course. In every case the candidate must have had responsible charge of work for at least five years, and this not merely as a skilled workman, but as an engineer qualified to design and direct engineering works.

Every candidate for election as an ASSOCIATE MEMBER must be at least twenty-five years of age, and must have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineers' office, or a term of instruction in some school of engineering recognized by the Council. In every case the candidate must have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, shall be required to pass an examination before a Board of Examiners appointed by the Council, on the theory and practice of engineering, and especially in one of the following branches at his option Railway, Municipal, Hydraulic, Mechanical, Mining, or Electrical Engineering.

This examination may be waived at the discretion of the Council if the candidate has held a position of professional responsibility for five years or more years.

Every candidate for election as JUNIOR shall be at least twenty-one years of age, and must have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the Council, if the candidate is a graduate of some school of engineering recognized by the Council. He shall not remain in the class of Junior after he has attained the age of thirty-five years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects Geography, History (that of Canada in particular), Arithmetic, Geometry Euclid (Books I.-IV. and VI.), Trigonometry, Algebra up to and including quadratic equations.

Every candidate for election as ASSOCIATE shall be one who by his pursuits scientific acquirements, or practical experience is qualified to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

AUGER—ALBERT, of Prince Rupert, B.C. Born at St. Boniface, Man., Feb. 14th, 1889; Educ., B. A. 1908, B. C. E. 1913, Univ. of Manitoba; 1908, rodman, G.T.R. & N.T.C. Rlys.; 1909 (summer), concrete & piling inspector, N.T.C.; 1912 (summer) instr'man same company; 1913-15, dftsman, bridge engr's office, G.T.P.; 1915-19, constrn. engr. for Tremblay McDiarmid Company on constrn. new Winnipeg aqueduct; 1919 to date, with G.T.P., dftsman and designer, June 1920 appointed asst. engr.

References: J. G. Legrand, G. C. Dunn, J. A. Heaman, W. S. Fetherstonhaugh, E. E. Brydone-Jack, W. G. Chace, W. H. Tobey.

BEACOCK—VICTOR ALONZO, of Toronto, Ont. Born at Oro, Ont., Sept. 8th, 1892. Educ., B.A.Sc. Toronto, 1915; April to July 1915 and July 1919 to date with H.E.P.C. of Ontario, Municipal Dept., personally in charge of street lighting installation, Windsor, Ont. and at present assisting on the Niagara system, principally in connection with distribution systems.

References: F. A. Gaby, T. H. Hogg, M. V. Sauer, L. G. McNeice, H. G. Acres, W. Harland.

BRIGHT—DAVID MUSSEN, of Winnipeg, Man. Born at Portadown, Ireland, June 28th, 1875; Educ., Matric. Queen's College, Belfast; 1893-97, 5 yrs. ap'ticeship Belfast Foundry & Engr'g. Works; 1897-99, asst. supt. with same firm; 1900-04, asst. mech. engr. Chinese Imperial Rlys. on steel bridge constn.; 1904-11, mgr. Foundry & Engr'g. Works, Portadown, Ireland. Designed and supt'd. erection of many large power plants; 1912-13, res. mech. engr. for Middle West Boving Co. of Canada, supt'ing erection of Hydraulic & Diesel engines; 1913-14, designing and supt'ing. engr. for Canadian British Engr'g. Co. Winnipeg on municipal power plants; 1914-19, served overseas in Can. Engrs., later Lieut. Workshops Officer Mech. Transport, C.A.S.C. Later Imperial Forces as Experimental & Workshops Officer, Rank Staff Capt. in charge of design & layouts of workshops and on tests for Light Railways and Aerial Ropeway etc.; At present Mech. Engr. to Manitoba Power Commission.

References: A. McGillivray, M.A.Lyons, J. Rocchetti, J. M. Leamy, T. H. Kirby.

CAMPBELL—GEORGE WILFRED, of Winnipeg, Man. Born at Portage la Prairie, Man., Aug. 26th, 1889; 1906-13, rodman, topog'r. leveler, field dftsman, transitman, C.P.R. location, Alta. and Sask.; 1915-18, overseas, 8th Battn. Observer in Battalion Scouts; 1918 to date asst. to dist. engr. in charge of location and constrn. Reclamation Dept., Manitoba Govt.

References: J. A. Hesketh, H. A. Bowman, T. C. MacNabb, C. R. Crysdale, D. A. Livingston, A. H. Corbett, R. W. McKinnon.

EASTWOOD—THOMAS, of Winnipeg, Man. Born at Lancashire, England, June 12th, 1879; Educ., Diploma, I.C.S., Steam and Electric, 1910; Erecting engr. on outside install'ns of Canadian Westinghouse Co. since May 1915; At present foreman in charge of service dept. shop of above company.

References: F. H. Farmer, A. W. Lamont, G. L. Guy, E. V. Caton, J. Rocchetti.

FRASER—DANIEL MACFARLANE, of Toronto, Ont. Born at Edinburgh, Scotland, April 15th, 1879; Educ., Heriot Watt College, Edinburgh, Science & Arts Exam. London City and Guilds; 1895, learning gen'l. machine work A. Seggie & Sons, Edinburgh; 1896-98 asst. in test room, electric lighting dept. Edinburgh Corporation; 1898-1906, gen'l. electrical engr'g. work, with T. Stothert McLaren, Edinburgh, Mayor & Coulson, Glasgow, and Drake & Gorham, Manchester; 1906-10, with Drake & Gorham, supt'ing outside erection; 1910 (June-Aug.) Montreal Light Heat & Power Co.; (Aug.-Dec.) shift engr. British Canadian Power Co. Cobalt, Ont.; 1911-12, with R. H. Forsyth, Toronto, supt'ing & estimating on electrical work; 1912 to date, estimating engineer, Can. Gen'l. Electric Co., Toronto, Ont., ("Fellow" (A.I.E.E.)

References: G. R. Langley, F. S. Keith, L. deW. Magie, C. E. Sisson, P. L. Allison, V. S. Foster, W. P. Dobson, P. E. Hart.

FREEMAN—JAMES ROY, of Moncton, N.B. Born at Brighton, Ont., April 14th, 1888; Educ., B.A.Sc. Univ. of Toronto, 1912; 1910-11 (summers), rodman, C.N.R.; 1912-13, dftsman D.B.Co. Lachine, Que.; 1917-19, Gunner, C.E.F.; 1913 to date, dftsman, Bridge Dept. C.N.R. Moncton, N.B.

References: P. Gillespie, C. R. Young, D. C. Tennant, C. B. Brown, W. A. Duff.

HORTON—ROWLAND OSBORNE CHARLES, of Winnipeg, Man. Born at Coventry, England, April 11th, 1895; Educ., 1905-11, Royal Masonic School, Bushey, England, Univ. of Cambridge Junior Cert. 1910, Senior Cert. 1911; 1911-14 and May 1919 to date, with Dom. Bridge Co. Winnipeg, 3 yrs. structural detailer, 1 yr. clerk to shop supt.; At present structural detailer (1914-19, overseas. Mentioned in despatches May 1918.)

References: G. E. Bell, E. V. Caton, H. M. White, A. J. Dostert, H. L. Bunting.

KING—PERRY, of Niagara Falls South, Ont. Born at Niagara Falls South, Ont., March 24th, 1894; Educ., Stamford High School.; At present taking Civil Engr'g. Course I.C.S.; 1915-16, rodman with H.E.P.C. and Can. Niagara Power Co.; 1917-19, with R.F.C. as mechanic in Canada and Texas: 1919 (Jan.-Oct.) and April 1920 to date, H.E.P.C. (Niagara Developments Lands Surveys.

References: S. W. Johnston, W. S. Orr, N. Malloch, F. W. Clark, A. C. D. Blanchard, J. C. Gardner.

FOR TRANSFER FROM THE CLASS OF ASSOCIATE MEMBER TO THAT OF MEMBER

KAELIN—FREDERICK THOMAS, of Montreal, Que. Born at Schwyz, Switzerland, July 30th, 1874; Educ. Federal Technical University, Zurich, Switzerland; 1902-04, dfting. office Shawinigan Water & Power Co.; 1905-07, asst. engr. to Wallace Johnson, Consulting Engineer in New York and Niagara Falls; 1907-20, with the Shawinigan Water & Power Co. in charge of design of 100,000 volt power house, electrical & mechanical equipment etc.; 1919 to date chief engr. Shawinigan Water & Power Co.

References: R. S. Kelsch, G. K. McDougall, R. M. Wilson, C. E. Fraser, D. W. Ross, Jr.

THORNTON—KENNETH B. of Montreal, Que. Born at Montreal, Que., June 26th, 1873; Educ., 1891-93, Elect. & Mech. Engr'g. Technical College, London, England; 1893-05, with Royal Electric Co., and Montreal Light Heat & Power Co.; 1905-11, with J. G. White & Co., New York, N.Y., 05-06, res. engr. and mgr. Nassau Light & Power Co., Roslyn, L.I., '06, asst. mgr. operating dept., New York; '08 & '09, res. engr. and acting mgr. Portland Electric Co., Portland Me., '10, advising engr. with Canadian Light Heat & Power Co., Montreal; 1911-20, with the Canadian Light & Power Co. as chief engr. and operating manager, and Montreal Public Service Corporation as chief engr. and general manager in full charge of operating organizations of both companies. Also consulting engineer, Montreal Tramways Company.

References: R. A. Ross, L. A. Herdt, A. Surveyor, J. C. Smith, R. M. Wilson, R. S. Kelsch, J. M. Robertson, F. B. Brown.

FOR TRANSFER FROM THE CLASS OF JUNIOR TO HIGHER GRADE

BOULTON—C. ALBERT, of Sherbrooke, Que. Born at Ayr, Ont., Jan. 3rd, 1893; Educ., B.Sc. Queen's, 1917; 1914-18, Can. Engrs., surveying and dfting; 1918-19, res. engr. on municipal and highway work with Murphy & Underwood, Saskatoon; 1920 (Feb. to May), asst. engr. on mill constrn. with E.G.M. Cape Co. Ltd. Sherbrooke, Que.; May 1920 to date, engr. on constrn. of houses, with above firm.

References: J. B. Stirling, J. W. Harkom, J. E. Underwood, A. A. Murphy, G. Hemmerick, K. P. Johnston.

LAYNE—GEOFFREY FRANCIS, of Kenogami, Que. Born at Barbados, B.W.I., Feb. 21st, 1892; Educ., B.Sc. (honors) McGill 1914; 1908-09, surveying Dept. of Public Works, Barbados; 1909-10, ap'tice to D. M. Simpson Co. Ltd. Engrs & Shipwrights, Barbados. 1911 (summer), asst. Instr'man on constrn. of Shawinigan Water & Power Co.; 1912 (summer), dftsman C.P.R. motive power dept.; 1914 (May to Aug.), special ap'tice, C.P.R. Angus Shops; 1914-19, overseas, Lieut. R.F.A. instructional duty (Gunnery) Later 287 Seige Bty. R.G.A., B.E.F.; 1919-20, (6 mos.), dftsman, Can. Ingersoll Rand Co. Ltd., Sherbrooke, Que.; 1920 (May to Aug.), dftsman Laurentide Paper Co. Ltd.; At present Mech. Engr'g. Asst. in Technical Dept. Price Bros. & Co. Ltd., Kenogami, Que.

References: H. O. Keay, C. M. M. McKergow, A. R. Roberts, S. R. Turner, H. M. Mackay.

MILNE—A. H., of Montreal, Que. Born at Montreal, July 19th, 1890; Educ., Civil Engineer, McGill, 1917; 1911 & 13 (summers), inspecting engr. town of Montreal West; 1912 (summer), inspecting engr. town of Westmount; 1912-13, asst. to res. engr. at Donnacona, Que. on Hydro Electric Developments; 1914-17, (part time, 2 yrs. in all), estimator and engineer for Reid, MacGregor & Reid; 1917-18, dftsman. Dom. Bridge Co.; 1918-19, Lieut. Can. Engrs.; 1919-20, with T. Pringle & Sons, Montreal, as res. engr. on mill constrn. and latterly as structural engineer.

References: H. M. Mackay, G. R. Heckle, A. Peden, Jr., F. B. Brown, R. de L. French, J. S. Costigan.

SLINN—WILLIAM HARMON, of Sherbrooke, Que. Born at Regina, Sask., Sept. 23rd, 1891; Educ., B.Sc. Queen's, 1916; 1911-12, rodman, instr'man, C.N.R.; 1913-14, (summers) gen'l. office & field work, leveler on location, Morrisburg & Ottawa Electric Ry.; 1916-18, asst. to C.R.C.E. M.D. No. 3, in charge of maintenance & constrn.; 1919, lecturer, Civil Engr'g. Queen's University; 1919 (May to Dec.), asst. City Eng., Kingston, Ont.; 1920 (Jan. to Feb.), Research Lab., Delora Smelting Co., (Queen's); Feb. 1920 to date, asst. engr. on constrn., Cape Constrn. Co., Sherbrooke, Que.

References: A. Macphail, W. P. Wilgar, J. B. Harvey, J. B. Stirling, G. Hemmerick, G. C. Wright.

FOR TRANSFER FROM THE CLASS OF STUDENT TO HIGHER GRADE

ALLAN—EDWARD BLAKE, of Hamilton, Ont. Born at Truro, N.S., July 12th, 1887; Educ., B.A.Sc. Toronto, 1916; 2 yrs. engr'g. course, Dalhousie University; 1907 (Apr. to Dec.), with McKenzie & Mann. as force timekeeper, Garneau to Quebec Rly.; 1909 & 1912, summers, rodman Nipissing Central Rly.; 1913 (June to Aug.) asst. to town engr. Yorkton, Sask.; 1914 (May to Oct.), instr'man, dftsman gen'l. asst., drainage scheme, Cobalt Lake Mining Co.; 3½ yrs. with Imperial Heavy Artillery; 1919-20, engr. of Logging Division, Laurentide Co., Grand Mere, Que., July 1920 to date, asst. to road engr., Hamilton, Ont.

References: J. L. Allan, H. T. Crosbie, E. R. Gray, O. L. Flanagan, C. R. Young, P. Gillespie, E. E. Brydone Jack, J. R. Cockburn.

ELDERKIN—KARL OSLER, of New Glasgow, N.S. Born at Weymouth, N.S., Oct. 27th, 1895; Educ., B.Sc. (Mech.) McGill 1920; 1916-17, Nova Scotia Steel & Coal Co., New Glasgow, N.S.; 1917 (Feb. to June), designing jigs & tools for shells; 1917-19, asst. to efficiency engr. R.A.F. Canada; 1919 (May to Sept.), wireless operator Drexel Institute, Philadelphia; 1920 (June), inspecting, truck dept., Eastern Car Co. New Glasgow; July 1920 to date, dftsman, Nova Scotia Steel & Coal Co., New Glasgow, N.S.

References: C. M. M. McKergow, A. R. Roberts, W. G. Matheson, E. Brown, D. Lewis.

GREENE—LESLIE KIRK, of Montreal, Que. Born at Montreal, Que., Dec. 31st, 1892; Educ., 1911-14, R.M.C. Kingston, Grad. with honours. B.Sc. McGill, 1920; 4 years active service. Asst. sanitary engr. in military camps England. Selected for British Mission in U.S.A. final rank Captain. At present employed by the Wolseley Motor Co. Birmingham, England.

References: H. M. Mackay, G. H. Duggan, F. B. Brown, H. M. Lamb, E. Brown.

GUY—RICHARD W., of Ottawa, Ont. Born at Ottawa, April 29th, 1894; Educ., B.Sc. McGill, 1915; 4 yrs. overseas Can. Engrs. Signal Coy., telephone and telegraph operation and maintenance; 1914 (4 mos.), building constrn. working for self, drafting plans, specifications, superintending constrn.; 1919, one year with British America Nickel Corpn., constrn. of refinery install'n. in charge shift operation copper dept., etc.; At present chief examiner of electric and gas standards, Electric Standard Lab. Dept. Trade & Commerce, Ottawa.

References: A. A. Dion, J. E. Brown, O. Higman, J. Murphy, H. A. Dupre.

McINTOSH—ERNEST DONALD, of Carleton Place, Ont. Born at Pakenham, Ont., June 25th, 1892; Educ., B.Sc. (C.E.) McGill 1919; 1909-12, rodman, instr'man N.T.C. Ry.; Summer 1913, topographer with North Railway Location party; Summer 1914 inspector in charge Highway Bridge Constn. Lanark County; 1915-18, overseas with C.E.F. as gunner and Lieut.; 1920 (Jan.-Aug.) engr. in charge field party G.T.R. valuation; Aug. 1920 to date, asst. engr. Consulting Engineering Dept. G.T.Ry.

References: M. C. MacFarlane, H. M. MacKay, E. Brown, N. Campbell, C. A. Buchanan, A. A. Sunstrum.

MILOT—CAMILLE, of Quebec, Que. Born at Yamachiche, Que., June 8th, 1892; Educ., Civil Engineer, Laval, 1919. B.A.Sc.; Summers 1917 & 18, with Quebec Streams Comm.; Summer 1919, in charge of part of a surveying party on St. Maurice River, for Quebec Streams Comm.; At present employed at the Dept. of Public Works & Labour, Bridge Division, Quebec.

References: C.C. Leluau, O. O. Lefebvre, I.E. Vallée, E.S.T. Lavigne, H. Massue, J. M. H. Cimon, J. Barcelo.

ROWAN—JOHN CUTHBERT, of Winnipeg, Man. Born at Winnipeg, Man., Sept. 22nd, 1895; Educ., Boarding school and Technical High; 1912-14, dfting Dom. Bridge Co., Winnipeg; 1914-19, overseas, in charge signal service, 12th Bty., 3rd Brigade, C.F.R.; At present dfting, detailing, estimating, with Dom. Bridge Co., Winnipeg.

References: H. M. White, V.F.W. Forneret, H. G. Welsford, A. J. Dostert, G. E. Bell, C. S. L. Hertzberg, J. A. Hesketh.

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

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THE ENGINEERING INSTITUTE OF CANADA

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THE CANADIAN SOCIETY OF CIVIL ENGINEERS

ENTERED AT THE POST OFFICE, MONTREAL, AS SECOND CLASS MATTER

VOLUME III MONTREAL, NOVEMBER 1920 NUMBER 11

Secondary Technical Education

A discussion of present and proposed methods of training in industry; vocational training, what it has accomplished in Great Britain and America, and the part to be played by engineers.

Read at the Eighth General Professional Meeting, Halifax, N.S., October 14, 1920

Professor F. H. Sexton, D.Sc., LL.D.

Educated and trained engineers may have a preconceived idea that little may be gained by consideration of secondary technical education. But with this notion, they have not a proper conception of the significance and importance of this phase of education which is one of the most effective instruments for human good and improvement. If general education is defined as preparation for life, technical education may be defined as preparation for making a living. Such short and simple definitions may be open to most serious objections when closely analyzed, but they do possess the advantage of brevity and differentiate the aims and purposes of these two divisions of education so that the limitations of that portion dealt with in this paper will be recognized.

Professional Training

We are well acquainted with the training for the professions, especially that of the engineer. For generations the best thought of educationists has been given to this problem, because the fundamental ambition of society in education has been to train leaders. Courses have been carefully planned, pruned, cut, adjusted, and re-adjusted so that a boy could cram enough knowledge and acquire such specific habits of working and thinking in the space of four years after he had completed his high school curriculum, that he would after a few years of experience develop into a competent lawyer, physician, clergyman, or engineer. High school and collegiate school courses have been modified to suit the underlying motive for carrying the youth into and through the university to his degree. With the evolution of industry and society, the college requirements have been modified to some degree, but not to any alarming extent in recent years. No doubt, engineering courses need some considerable adjustment to modern demands and needs, but these come slowly because of the tendency of universities to be ultra-conservative and to perpetuate jealously certain ideas and methods. On the whole, college training is eminently satisfactory, and is still producing the desired results in good measure.

As engineers are fully cognizant of the particulars of higher college training, the less explored and exploited field of secondary technical education will now be explored. This includes organized effort on the part of public or other authority, acting outside the sphere of regular professional training in college courses, to fit people for occupational fitness. It includes technical high schools, trade schools, industrial art schools, continuation and part-time schools, correspondence schools, mechanics' institutes, corporation schools, vestibule schools and up-grading schools in industry, commercial colleges, university extension courses, home economy training centres, women's institutes, and a host of other institutions and classes. The underlying motive of attempting to fit people for useful vocations is the point of differentiation by which industrial and technical education is classified. The institutions and organizations mentioned are of a secondary nature because they are supplementary to the common or primary schools in the public school system and do not attempt work of a university grade.

Engineers have been deeply concerned in training for their own profession, and rightly so. In this respect they have been following the policy of the general public which for centuries has been mainly concerned with the education of leaders. Private munificence has erected thousands of magnificent university buildings that rival and surpass the palaces and castles of old. Millions upon millions of dollars have been donated to endowments in order that the experts of the world might be assembled and maintained to impart their knowledge to ambitious youths. Huge sums have been subscribed and bequeathed to scholarships in order that special talent that appeared among the poor and lowly might be developed for leadership. The principal concern has been to train *leaders* in human endeavor. The public school curriculum has been modified to meet the college entrance requirements and all education has been more or less subordinated to the one end. It was thought necessary that everyone should learn to read, write, and become proficient in the elements of arithmetic, history, and geography, but the common faith was anchored in the belief that if a few leaders were trained all would be well.

The Importance of Leadership

Leadership is assuredly the most important factor in the success of industrial enterprise, commercial undertaking, social effort, or any human organization, but it is only a factor. Any leader must have a trained and orderly collection of individuals co-operating with and subject to his will if the desired results are to be attained. In earlier pioneer days every person was more independent and self-sufficient than at present. With the introduction of the factory system, the manufacture of power, the growth of cities, the development and transportation and engineering, we have grown more and more dependent one on another. Every person has become highly specialized and renders service to the whole community in exchange for a living for himself. He no longer builds his own house and barn, raises his own food, and makes his own clothes. He works with others to make a product or render a service of which he does not observe the distribution or see the direct result. The radical changes in industry have produced profound changes in society of which we are only half aware. We follow the crowd breathlessly and know that we are on our way, but we do not stop either to consider our relations to the rest of the mob or to exert ourselves to make the procession more orderly and effective. We are so interdependent that each should be much more carefully prepared to render his fullest service to all and to develop his utmost power. Our leaders must prove their fitness to guide the way, and the rank and file must be shown exactly how to perform their functions. Our training for leadership is fairly satisfactory, but we have sadly neglected to provide adequate facilities for those who perform the humbler tasks in life.

The Need for Vocational Training

Never has there been such an insistent and widespread need of education in endless variety for all the people who do not hold directive and administrative positions. Class consciousness of the men and women who worked for wages was growing apace before the war. During the great struggle they came to a full realization of their position in the social and industrial structures and this fact was emphasized and over-emphasized by their own leaders and people in the highest authority. Then came the serious and vociferious crescendo on the importance of labor and the diminuendo on capital and management. We are now in the midst of a turmoil of re-adjustment of relations and understanding, and general conditions must be stabilized before further progress can be made.

The establishment of co-operative good-will between capital, labor, and management is our immediate task. Suspicion, ill-will, misunderstanding, and even hatred are rampant. The only solution for this muddle is education, and the great field of secondary technical education must be exploited quickly and to the limit. Our primary education needs some refurbishing and improvement in efficiency and financial support, but is sound in the main. Technical education both for better work and better citizenship is demanding our best attention and action.

Engineers as they develop come more and more to handle men. In the early part of their career they may be mainly concerned with materials, stresses, machinery, and instruments, but as they rise higher they surround themselves with a staff of men through whom they have to work to accomplish their plans. Their immediate subordinates are men who have had special training in universities or in the college of hard knocks. Each has his special aptitudes and powers, and in a good organization each is fitted into his best sphere of action and authority. Below the staff, however, are the masses of mechanics and laborers by whose immediate efforts the carefully planned work is carried out. Every engineer knows the difference in results accomplished by a sullen, slacking, incompetent gang, and a loyal, energetic, skilful crew. How can we expect the proper and satisfactory effort on the part of the rank and file of labor when it has not had half a chance to be trained for its work? We cannot,—and for this reason engineers should be deeply concerned in the problem of secondary technical education.

Vocational Training a Successor to the Apprenticeship System

Not many years ago the apprenticeship system was widespread and provided a method of training for skilled workers that met the needs of that stage of industrial development. It was wasteful of time and effort on the part of the indentured apprentice, but it did turn out competent workmen. With the extreme specialization of work, however, trades were divided into many different occupations, until men's vocations were limited to the routine production of special machines. Emphasis was placed on production until the chief consideration was the equipment and output of a plant and the human workers were almost forgotten. The apprenticeship system faded away almost altogether and no one had any time to teach anybody else anything. The craftsmen from the apprenticeship system were used up as foremen and now they are fast disappearing. These steps have left industry in a parlous state, and the chief instrument for re-establishing satisfactory conditions seems to be technical education.

It may be said that this sounds well, and that the statement regarding conditions and needs is accepted; but how can such training be carried out—what must be done? I would say bluntly that every worker should be trained for his job and for proper living when he is off of his job. He must be educated so that he may develop himself to the utmost as a productive wage-earner and as an independent, self-respecting, and community-respecting citizen.

The Industrial High School

In spite of all kinds of educational advantages offered all over the world, most boys enter gainful occupations between the ages of fourteen and sixteen. This is largely due to the sudden maturing of youth during adolescence and the desire to play a man's part in the world. This condition will persist. It is wise and necessary that our high schools and academies should be broadened, and that technical courses preparing ambitious boys for skilled trades and vocations should be provided. This will give the boy with special aptitudes for industrial and commercial work an equal opportunity with those of scholastic tendencies who are forging ahead to college to fit themselves for the professions. A comparatively large number of gifted boys who now leave at the end of the common school course, because there seems to be nothing more of value and interest, will flock into vocational courses when they are provided. In some communities where such schools were established, the high school attendance practically doubled. The purpose of the ordinary high school is to teach, but the vocational high school must teach and train similtaneously. The latter type usually gives as many hours of instruction in general and cultural subjects as the other, and adds shop work and laboratory. The change from mental to physical work prevents fatigue, and the boy in the technical school secures his general knowledge with occupational training in addition.

Such industrial high school courses as I have mentioned are of interest to the engineer because the youths trained there will have the power to develop rapidly to positions as foremen, superintendents, and staff assistants. However, we may be sure that no matter how many schools like this are provided which require full-time attendance, the great mass of boys will leave school at the age of fourteen or fifteen and enter business or industry. This will not be from economic necessity in most cases, but because of that restless spirit which is characteristic of adolescence and which prompts a boy to act as a man. The tragedy will lie in the fact that some few years later the men will find a wall stretched across their paths of promotion and then will bitterly rue the day when they flung educational opportunity away.

Day Classes in Working Hours

The great human need now confronting us is the proper preparation of the huge number of youthful workers from fourteen to eighteen years of age for efficient production and responsible citizenship. This is the field of secondary technical education. The effort to exploit this field should be made by industry and public educational authorities working hand in hand. Great strides are being made in the United States in this direction; nearly half of the States have passed legislation requiring boys and girls between fourteen and sixteen or fourteen and eighteen to attend continuation classes if they are at work. They are usually compelled to attend special schools in the daytime for four to eight hours a week and are paid for it by their employers just as if they were engaged in productive work. The instruction is adapted to their vocations, but they are all given vital courses in English and civics. This will have a tremendous effect in raising the standard of intelligence of the workers and in making them keen, well-informed, independent citizens. Ontario has also passed such legislation and the other Provinces will quickly follow her lead.

This is of general interest to engineers because they must have well-trained and intelligent workers to carry out their plans effectively, but their chief concern should be about the education in which they should participate to train their workers for greater and better production. Most engineers are more prone to give orders and directions to men under them than to try to impart the training and knowledge that would do away with so many detailed instructions. Most of them seem to enter the teaching profession, but they should be engaged in some form of education which concerns their workers.

Failure of Scientific Management with the Human Element

Scientific management was hailed as a panacea which would give the highest production and completely satisfied workers. The trouble was that it lacked humanity. It tried to standardize human action in the same manner as we standardize products and methods of production. It was systematic rather than scientific, and it took for granted that men were actuated by the one motive of securing the greatest financial reward. Adam Smith and John Stuart Mill based their laws of political economy on the same basis, and we now find that their tenets do not exactly fit modern conditions. We were amazed at workmen protesting against the use of the stop watch and scientific management methods, and requesting a return to wages on an hour basis, even when it meant smaller pay envelopes. Human beings cannot successfully be regarded and treated as machines. Labour recently has demanded the right of self-determination, whatever it means by this term, and refuses to have itself regarded as a commod ty. All the new plans for industrial democracy and representation of labour in management are due to the pressure and demands of labour and have not been free gifts from employers and corporations.

Present Status of Organized Labor

Through fighting organizations, labour has placed itself in a more advantageous position than it ever possessed before, nor is the end yet in sight. Wages have advanced to unheard of levels, so that contracts have become speculations and corporation profits often assume the form of a mirage. Labour is in danger sometimes of pushing its demands to the extent of practically confiscating productive industry. The laboring classes often come to the point where they depend more on their organization to secure satisfactory wages than upon their own skill ability, or productive capacity. High wages have promoted system, efficiency, and labour-saving machinery to an unprecedented degree. Very often employers and managers have resorted to these helps rather than to new methods of increasing the power and knowledge of the individual workers. There is no resource of more value than the undeveloped powers of human beings. Very little attention has been paid to this in the immediate past, but the late war showed us the wonderful results that may be achieved by adequately training men and women for their specialized work.

What Great Britain Accomplished in Vocational Training

When Great Britain entered the struggle against the Central Empires, there arose immediately an enormous demand for special operatives to manufacture munitions. The machine-tool processes called for a fineness of operation and an accuracy of measurement that was most uncommon in the work of the ordinary machinist. There was only one way to get the desired number of workers and that was to train them. Millions of men were drawn into the army and it was necessary to draft women to a large extent into the factories. Their power to perform the refined tasks of production was almost unknown. Special sections of the shops and special machines in the factories were set aside under skilled instructors for training purposes. Part of the efforts of the corporations were strictly educational. The training was carried out under wholly practical conditions and from the very start the production of the worker was commercial. All the work was on regular parts which went into the output of the factory.

The success of the training efforts was amazing. In a few days or weeks, green employees were making fuse-caps, shells, cannon, and all the machines of war which require so much accuracy and fineness. Women showed surprising capacity for intricate and exact machine-tool work, inspecting, and assembling, and in many respects were more satisfactory workers than men. The results were so gratifying that training schools were established in all kinds of factories, shipyards, arsenals, and all manner of productive enterprises. Industry itself became a more intensive and more comprehensive educational agent in technical training than public authority ever had been.

Corporation schools were also developed for older employees to fit them for occupations requiring more knowledge and skill and for positions of greater responsibility. The organizations for training green workers were called "vestibule schools" and those for older workers "upgrading schools." The Ministry of Munitions collected and disseminated the information concerning the various efforts in industrial training.

Results in the United States

When the United States entered the war the same acute need of a huge number of new skilled operatives presented itself. The United States Council of National Defense organized a Section on Industrial Training and the British authorities immediately gave it the benefit of their experience. When the Vice-President of Production of the greatest munitions plant in America was shown the illustrations of British women making a highly specialized product, he said, "Your plan is good, but it wouldn't work here." An hour later, however, he was convinced that it should be given a trial and soon the company was spending money at the rate of $500,000 per year in training work alone.

The Curtiss Aeroplane Co. was informed that there was no part of an aeroplane or its engine which the women in Great Britain were not making successfully and it immediately organized one of the most successful training plans for its workers in the United States in which it finally expended money at the rate of $470,000 per year. All kinds of industries in the United States followed suit. Perhaps one of the most outstanding examples was that of the Emergency Fleet Corporation in training shipyard workers.

Before the war American shipbuilding had become absolutely decadent. The ship construction programme in the war called for hundreds of thousands of riveters, ship-fitters, chippers, caulkers, oxyacetylene and electric welders and workers in dozens of other specialized occupations. The Corporation organized an Education and Training Section which was immediately given the task of training men to increase the number of workers in 61 shipyards from 50,000 to half a million.

Details of the splendid accomplishment cannot be given in this paper, but the magnitude of the work can be appreciated from the mere statement that 1100 instructors were educated who in turn actually trained 80,000 men for shipyard work. The time and cost to train men for their work was found to be surprisingly short and small. For example, riveters were developed from green men in 21 yards in 28 days, at an average cost for instruction of about $25.00. The average length of training period in 21 yards for 20 different occupations was 19 days. Such startling results as these make employers see the great possibilities of industrial training for all their workers. Many corporations since the war have maintained their training departments, and many other companies have established some form of definite vocational instruction. The Goodyear Rubber Co. has organized and developed a university at Akron, Ohio, which now has about 5000 students, the majority of whom are employees of this concern. Examples could be multiplied by scores, but no great good would be accomplished in further repetition.

Training Returned Soldiers

The retraining of disabled returned soldiers was another great development of secondary technical education due to war conditions. Thousands of men with shattered nerves and crippled bodies returned from overseas and could not resume their former occupations. In other wars such men have been turned adrift with more or less inadequate pensions and have been left to make their own readjustments and complete their own re-establishment in civil life. It is stated that most of the British pensioners of the Crimean war died in the workhouses. In the present struggle, however, secondary technical education was employed as an instrument to place these disabled veterans back on their feet as independent productive citizens.

Canada has achieved a proud record in this great work. Special trade schools were organized by the government to train men for a large variety of occupations where technical knowledge was necessary as well as trade skill. To prepare men for other vocations, they were given short intensive apprenticeships in industry. In the special schools, the training was carried out under practical commercial conditions, while the related science, drawing, mathematics, and theoretical knowledge was imparted at the same time. The men and their dependents were supported during training. After a period of six to eight months the men had acquired enough skill and knowledge to engage in their new occupations at a living wage, and continue in a vocation where their physical disability was little or no handicap. In Nova Scotia we have found about 4000 men who were either physically disabled by war so that they could not efficiently take up their old occupations or who enlisted under 18 years of age and hence had no occupation. These men have been trained for over 250 worthy, gainful vocations. Of those who have satisfactorily completed the courses, over 80% are now working away in industry and commerce as useful, self-respecting citizens. The results achieved in this direction have been most striking and we can rest assured that there is only a handful of seriously disabled men from the war for whom some proper niche cannot be found in the busy world where he can continue to work as a normal member of the community.

Necessity for Instruction

The evident lesson from the successful applications of secondary technical education to the benefit of the individual and society is bluntly that every man should be trained for his job. Engineers are constantly employing men who are supposedly qualified to perform specific duties and the results are only too commonly disappointing. Engineers and the concerns for which they plan and execute are prone to hire the few competent men away from each other and to discharge constantly the incompetent ones. This produces high labour turnover, exorbitant labour costs, discontent, disloyalty, and a train of attendant ills. The workers themselves are not to be blamed in too great a measure for being incompetent, because there is now no one to teach them the proper way to do their work. The school system offers little to prepare boys or men for their occupations and industry is concerned mainly with production.

A Task for Engineers

It seems, therefore, as if engineers would have to assist in the task of making men fit for their jobs while they are working. The laborer will have to be shown carefully how to shovel dirt, drill a hole, perform a factory operation and whatever else he [illegible] out for while he is earning wages. It does not take long, and often it does not cost as much as it does to discharge him and take on another worker. He must not be shown simply to perform a narrow line of routine duties with the single idea that he is to be made a more efficient machine so that his greater production may result in a reward that is shared in some proportion by his employer and himself. He should be trained so that he may work more effectively and derive more human satisfaction from work well done. Every man should know more about his work than his daily duties demand. Industry must render some of the educational service that characterized it in the days of indentured apprenticeship. Engineers as trained and educated directors of work will have to assist in providing opportunities for definite formal training in industry. If they want competent men they will have to help make them.

There is no factor in constructive or productive work today which is capable of more improvement than the labour factor; no part of the organization so susceptible of advancement as the mass of human beings at the bottom of the scale who perform the actual work. The avenues for promotion to the ambitious and able man must be opened, and some of the knowledge and skill necessary for promotion must be given him on the job in the form of industrial training. The schools do not give it, and probably never will render the whole of this service. It seems proper that industry shall be held responsible for giving the worker operative skill while the schools impart the general and technical knowledge necessary for the development of the worker's intelligence and for his understanding of the duties of citizenship. But there is the world's work crying out to be done today and the engineer must have men to do it. In this emergency he cannot wait for the leisurely development of the public school system. In addition to his tasks of tearing the treasured minerals from the protecting bosom of the earth, choking the rushing river into submission to his will, guiding the lightning flash to light his way and directing the forces of nature to the service of man, he must also assume part of the burden of bringing the minds of all those who work with him to greater wisdom and better understanding.

The Legal Phases of Irrigation Development in Alberta

A history of irrigation law in general, developments in Alberta, how an irrigation district is formed, procedure under present laws.

Read at the Western Professional Meeting, Banff, B.C., August 1920.

H. B. Muckleston, M.E.I.C.

The history of human development, and especially that phase of development which we term civilization, is very clear in teaching that it is not good for mankind to grow up in a country where nature is too generous.

Where man has been forced to work hard for his living he has usually developed; where sustenance comes too easily he has seldom advanced and too often has even retrograded. Ancient history is full of illustrations of this phenomenon, but it is unnecessary to go further afield for illustration than the Spanish-American republics. Mexico—Guatemala on the one hand and Chile or the Argentine on the other, shew this tendency in the fullest degree. Both were colonized by the same people at about the same time, yet the lapse of only a few generations has produced something near barbarism in the one case and a relatively high civilization in the other.

Among the features which distinguish barbarism from civilization the most prominent is the existence of what we call law, in reality merely "the rules of the game". In a state of absolute barbarism every man is sufficient unto himself. He gets his own food, makes his own weapons and clothes, builds his own shelter, is his own doctor, priest, and ruler, and when he dies manages to get along without any undertaker.

Civilization connotes initiative, enterprise, community spirit, co-operation and team play, and its first necessity is a code of the rules under which the team works, otherwise the game cannot go on.

It is significant that if we examine the earliest beginnings of civilization of which we have record, we find invariably an obstinate bias in favour of countries where irrigation was a necessity of existence. (According to Sir William Willcocks the garden of Eden was an irrigated farm) and hence it is not surprising that the oldest legal document which has come down to us, the law of Hammurabi, King of Assyria and a contemporary of Abraham, is a code regulating the use and distribution of water.

The Common Law

Such a law has always been a necessity in a civilized state as witness "the shot gun policy" of not very remote days in the West, but the requirements are not the same in all climates, and accordingly we find a very wide variation in the terms and doctrines of the law as applied under different conditions. The law changes as the conditions change but the law is conservative and the process is slow. English common law differs from the Roman law in that it is not reduced to a code, but is the slow outgrowth of judicial decisions rendered during many centuries. Most of Canada and the United States was first colonized by Englishmen, and these colonists brought with them the English common law as they knew it. In so far as this law governed the use of water it did so under the doctrine of Riparian Rights.

By this doctrine a riparian owner was entitled to have a stream flow by his property undimished in quantity and unchanged in quality or to be compensated for any change. He did not own the water but he did have a measure of right in it.

The growth of modern civilization has subjected this doctrine to a severe strain, and naturally has resulted in a slow modification of the fundamental idea, and it is not surprising to learn that one of the earliest of these modifications is found on the east coast of England, where a form of meadow irrigation has been practised since Roman times. In Eastern Canada and the humid states, the doctrine of riparian rights still holds more or less unaltered from its original form, but in the Western states it has been much modified by statute and court decisions till at present in some of the arid states the law relating to the use of water is in a disconnected, fragmentary and unsatisfactory condition.

Federal Legislation

In Western Canada we are more fortunate. Irrigation development here was of much later date than South of the line and we had the experience of the arid states to guide us and point out the legal troubles which we might expect. We were then able to forestall these difficulties by legislation along proper lines.

Irrigation in the territory which is now comprised in the province of Alberta and Saskatchewan began early in the history of its settlement by the construction of numerous private systems on the streams heading in the foot hills and in the mountains. These schemes were small and scattered. Settlement was sparse and little or no legal trouble was experienced. However, the shadows of coming law suits were in sight, and as a result of much study of the subject in all its phases, legislation was decided on and the "North-West Irrigation Act, 1894" was the result. In 1898 this was repealed and the "North-West Irrigation Act, 1898" substituted. This Act has been the basis on which all subsequent development of irrigation in the Northwest Territories and afterwards in Alberta and Saskatchewan has taken place.

Irrigation Act 1898

Following the usual formal clauses and the necessary interpretation paragraphs this statute enacts that "The property in and the right to the use of all water........ ....shall be deemed to be vested in the Crown" unless some prior right was established. The Act thus completely extinguishes the common law doctrine of riparian rights and forestalls all possible litigation over water rights.

The Act then provides a mode of acquiring a right to use water from any surface supply, provides for publication of notice of application and for construction of the necessary works, gives to irrigation canals the right of eminent domain, and specifies the incidental powers of the applicant. It then provides for a license to use the water for the specified purpose and no other, and for cancellation for non-user under certain conditions. Sufficiently drastic penalties for infraction are provided to deter the wilful from violating any of its provisions.

In general the main provisions of the Act are:—

1. All surface waters belong to the Crown.
2. The right to divert and use must be acquired in a stipulated manner.
3. The water when diverted for irrigation purposes is pertinent to the land, and neither can be transferred without the other.
4. License depends on beneficial use, and water hogging is made impossible.
5. Licenses take priority according to date of application, and each higher licensee is entitled to full supply before any lower licensee may divert any.
6. Provision for settlement of disputes as to quantity as between licensees.
7. Provision for forfeiture in case of non-user.

The Act divides the various uses for which water may be diverted into five classes: domestic, municipal, industrial, irrigation and other purposes. Rights of whatever class have precedence according to date of filing application, but, subject to this provision, they take precedence in the order named. In case all water from any source is appropriated the law provides that applicants requiring water for a higher purpose may have rights for a lower purpose extinguished on paying just compensation to the holder thereof.

As no statute is automatic and machinery must be provided for its administration, the Act, therefore, empowers the Government to make the necessary regulations to ensure that its provisions will be carried out. It also vests in the responsible Minister of the Crown the power to survey the sources of supply and the lands on which the water may be used.

Acting under the provisions of the Act the Department of the Interior has carried out hydrometric surveys on all the important streams, springs, and other surface sources in Alberta and Saskatchewan and now has records extending back for variable periods. Under this Act also the Department of the Interior has fixed the duty of water, carried out extensive surveys to determine where the available water can best be used, surveyed reservoir sites and done the preliminary engineering work for a number of projects, some of which are now either in actual operation or in various stages of construction or organization.

Provincial Legislation

Apart from a small host of minor private schemes, the first developments undertaken were under corporate control. Of these the C.P.R. projects are easily in first rank by reason of size and in point of time. There were some disappointments and failures but on the whole the development of irrigation was steady, and about 1915 the time had arrived when the settlers themselves were ready to undertake large projects on a co-operative basis. Before this could be done further legislation was required of a kind which lay within the Provincial sphere of action.

Prior to 1905, when the Provinces of Alberta and Saskatchewan were carved out of what had been the Northwest Territories, such legislation was a function of the federal authorities, and the Irrigation Act as originally passed provided for the organization of irrigation districts, but on the creation of the Provinces these powers passed to the Provincial legislatures.

The first Irrigation District Act for Alberta was passed in 1915, and subsequently amended from time to time. In 1920 the subject was reopened, the Act of 1915 was repealed and a new Act substituted which is now the law of the Province.

Irrigation District Act, 1920

In framing legislation of this kind the subject must be viewed from many angles. The object of such Acts is to facilitate the formation of associations or societies through which the settler can better his condition. It should also make extremely difficult or even prevent the opposite. Good legislation makes progress easy, rapid and sure, bad legislation invites certain and lingering disaster. Regulation is quite as essential to success as facilitation.

The existing Irrigation District Act is the result of very careful consideration of similar legislation in the various arid states of the Union and is an attempt to avoid the pitfalls which their operation has revealed and to stick to the well beaten trails which experience shews have led to success. It probably is not perfect. Legislation in a new country seldom is, and time will probably reveal defects which can be corrected, but it is an attempt to start these districts on the road with the right foot foremost, and to provide a competent guide, philosopher and friend for the journey.

The Act is very complete and if any contingency has not been foreseen and provided against it is not for want of study and care in framing.

The Act is divided into seven parts as follows:—

I. General provisions; formation of districts, their organization, regulation and financing; construction of works or other means of supply of water; striking and collection of rates and assessments;

II. Elections;

III. Provision for making, revision, appeals from and confirmation of the assessment roll;

IV. Provides legal machinery for the enforcing and recovering of rates and assessments, and distress and sale of lands in default;

V. Change of content of district and procedure in the event of dissolution of a district;

VI. Gives power of eminent domain and provides for arbitration;

VII. Execution against the district.

Finally the usual powers are vested in a responsible Minister to make regulations for carrying out the provisions of the Act.

Irrigation Council

The Act creates a body known as the "Irrigation Council", consisting of not more than three members, in whose hands is placed the operation of the Act. This Council is given very wide powers of control over the affairs of the districts which may be exercised at its discretion. Thus, it may forbid any act or course of conduct proposed to be done or entered into by any district; it has absolute control of all borrowed money, contracts and assessments, and it may engage expert advice and assistance in any matter at the expense of the district.

Probably the easiest way to illustrate the working of the Act is to trace some imaginary district through the various steps it must take up to the time it is actually in working order, and then perhaps to follow its trail a little further along the road while it is shaking down to a smooth running machine performing the service for which it was intended.

Most of the large areas suitable and properly situated for irrigation have been or will be surveyed by the Department of the Interior, and the irrigable and non-irrigable lands have been or will be more or less completely determined.

Petition for District

The available supplies of water have also been carefully measured and recorded, so we may assume, in the case of our imaginary district, that most of the preliminary engineering work has already been done, and that our district has in its possession enough information on which to base a decision to go ahead under the Irrigation District Act. The first step is to circulate a petition addressed to the Minister of Public Works praying that the proposed district may be erected. This petition must set out by parcels not larger than a quarter section the lands which the proposed district will include. When any quarter section is subdivided between different owners, each such parcel must be shown. The petition must be signed by persons who are of legal age and collectively own at least half the proposed district. The word "owner" is defined as the registered owner having a freehold estate in possession in land. The petition is forwarded to the Minister accompanied by a sufficient sum to defray preliminary expenses, and sufficient evidence to prove the project feasible, including the report of a competent engineer. As previously stated the federal government have already satisfied themselves as to the feasibility and the Commissioners' report is probably accepted as satisfactory.

If, on examination the Minister is satisfied, he causes a notice to be published in the Alberta Gazette to the effect that petition has been received and gives the proposed district a name. Similar notice is also published for three weeks in a local newspaper. Two weeks is then allowed for kicks, and if none are received directions are immediately issued to take a vote of those interested as to whether further steps are to be taken. At the election the franchise belongs first to the purchaser (if any), second, if there be no purchaser, to the owner or occupant ("occupant" is defined as any person occupying land exempt from taxation). It will be noticed that while the petition must be signed by the *owner*, at the election a purchaser has the vote before the owner. At the same time a board of trustees consisting of three members is elected.

Formation of District

Should the vote prove that two-thirds of those voting favour the formation of the district the Minister by order in Council forms the area into an irrigation district and declares the name of the trustees. The Act provides that the issue of this order shall be conclusive evidence that every requirement of the law has been observed and forbids any Court to question the validity of any of the proceedings up to this point.

The publication of the order *ipso facto* makes the board a body corporate with all the corporate powers necessary for its business.

Within thirty days the board must meet and organize for business by electing one of its members as Chairman and by appointing a Secretary, and a Treasurer or a Secretary-treasurer, and an Engineer who must be a corporate member of the E. I. C. or some other body requiring similar qualifications for membership.

District Assessment Roll

The next step is the preparation of the assessment roll of the district. The Act requires that this be done by the Secretary with the assistance of the Engineer, and details exactly what data this roll shall contain and the form in which it is to be set out. As soon as this roll is completed the Secretary sends to each owner or occupant a notice setting out his land, the irrigable area and the non-irrigable area and a statement of the last date on which complaints will be received, which must be not less than twenty days from the date of mailing the notice. At a previously notified time and place the Board sits as a Court of Revision to hear complaints and act upon them. The roll is then amended as directed by the Court, and in default of appeal, becomes the revised assessment roll of the district, valid and binding upon all parties concerned. Any complainant has right of appeal to a judge of the district court who shall hear and decide such appeals and whose decision is final. As finally amended by the judge the roll becomes the revised assessment roll and can only be altered by the board by by-law for cause, and subject again to appeal to the judge.

While this is going on, the Board may take the necessary steps under the Irrigation Act to acquire a water right and get the necessary authority to construct its works, or it may instead, or in addition, and with approval of the Council, enter into a contract with some other party, corporation or district, which already possesses such right or authority. If thought advisable this step may be postponed until after the debenture by-law is voted on.

As soon as the assessment roll is finally completed, the board is required to submit to the Council an estimate of the cost of the proposed work, preliminary expenses, annual charge for maintenance and operation, cost if any of any contract as above mentioned, and the annual interest charge on the debentures. Should this meet the approval of the Council the board is directed to prepare and submit to the electors a by-law to raise by loan the necessary amounts.

Should there be a two-thirds vote in favour of the by-law the Minister may consent to the proposed loan by an order in writing. This order is filed with the executive Council of the Province and becomes conclusive evidence that everything has been properly done, and beyond question the legality of the debentures.

The form, life, interest and terms of repayment must be approved by the Provincial Treasurer and the debentures when issued are a charge or lien upon all land, whether irrigable or not, within the district, including buildings and improvements, except land exempt from taxation by the Province, and upon all property of the board and all rates levied by the board, but has no priority over previous encumbrances.

The debentures are constituted legal investments for trust funds under "The Trustee Act".

The next step is the issue and sale of the debentures and we will assume that this difficult task has been safely accomplished. The Act provides that the proceeds shall be deposited in some chartered bank to the credit of a special account in the name of a special trustee appointed by the Lieut.-Governor in Council, and only paid out on requisition by the Board with the approval of the Irrigation Council.

Meanwhile the Engineer will have been busy extending the preliminary surveys and making additional ones, and, if this has not already been done, securing a water right, and we will assume that the district is now in a position when it can go ahead with the construction work. Except in a small undertaking this work of construction will probably be done by contract, so the next step is the advertising and the receipt of bids. Under the provisions of the Act the Council probably will require that the bids be placed before it, perhaps accompanied by a recommendation from the Board. If it approves of the bidder and his prices, the contract will be let and the work will start. Estimates will be rendered in the usual way and requisitions made on the Lieut.-Governor in Council for the necessary funds, by the Board and with the approval of the Council.

Raising Funds for Current Expenses

About this time some interest may be due and owing, so the Board proceeds to raise the money with which to pay it.

The Act directs that not later than the 1st of February in each year, the Board shall make an estimate of the amount required during the coming year in order to:—

1. Pay the instalments of principal and interest on outstanding indebtedness; and

2. Pay running expenses including salaries, wages, upkeep, maintenance and operation; and

3. The estimated costs of collection, if any.

These estimates must be submitted to the Council and if approved by it, and payments of the amounts are not to be otherwise provided for, the Board is directed to strike an irrigation rate, which must be equal upon all irrigable land within the district as shown on the revised assessment roll. This rate, although calculated on the basis of the irrigable areas, constitutes a lien or charge upon all land in any parcel up to one quarter section, in which there is any irrigable land, and takes priority over everything except first mortgages and claims of the Crown.

From this rate and the assessment roll, a collectors' roll is made up, and a notice is delivered or sent by mail to each person whose name appears thereon. The Treasurer or some person specially appointed for the purpose by the Board is constituted collector.

In all probability some rate payers will be delinquent from some cause or other and, therefore, provision is made for forcible recovery of unpaid rates. Should they be unpaid after a fixed date, the board must add to them by way of penalty five per cent which is legally made part of the rate and collectible in the same way, and is compounded from year to year.

The rate payer is given 30 days in which to pay up from the date of mailing the notice and if he fails the rate may be levied by distress upon:—

(a) All goods and chattels within the district, the property of the owner or occupant or the purchaser or any person occupying the land in question; or

(b) The interest of any person benefitted in any goods or chattels found on the land and in any goods or chattels to possession of which he is entitled by contract or performance of any condition; or

(c) Any goods or chattels on the land title to which is claimed in any of the following ways:—

1. By execution against any person benefitted, or
2. By purchase, gift, transfer or assignment from any person benefitted, in any manner; or
3. By the wife, husband, daughter, son, daughter-in-law, son-in-law of any person benefitted or by any relative in any degree who lives on the land as member of the family; or
4. By virtue of any instrument made for defeating distress.

These are much wider powers than a municipality has for tax collection and it should be more difficult to evade payment of irrigation rates than taxes. However, should the payment of the rates be evaded and no chattels or goods be available for distraint, the Act provides for judicial seizure and sale of the lands concerned in the same way and under similar provisions, as to procedure, as municipalities follow in case of delinquent taxes.

These are the powers given to the board to be exercised on delinquent ratepayers, and by way of ensuring that they are exercised without fear, favour or affection, the Act provides a penalty up to $1000.00 for failure in duty in this respect.

Changes in a District

The Act provides a method of changing the content of an irrigation district either by inclusion or exclusion. In brief the process is much the same in its working as the initial steps in organization. First, a petition addressed to the Board signed by owners of at least half the land affected. Second, action by the Board, after hearing complaints, (if any) either by way of concurrence or the contrary. Third, consent of the Minister of the Interior and the Minister of Public Works for the Province. Fourth, financial adjustment if any be required. Fifth, an order by the Minister of Public Works effecting the change.

Should the change be by exclusion and there be any outstanding debentures against the land affected the prior consent of all the debenture holders is necessary.

A district can be dissolved by a very similar process after petition and vote of the electors, but no district may be dissolved if there are any outstanding debenture debts and dissolution requires a 3-5 vote only instead of 2-3 required for formation.

The Act gives the Board very wide powers of expropriation of land. These are the same as if the irrigation system were a public work within the meaning of the "Public Works Act", and are exercised in just the same way.

Should any Board neglect payment of its due debts, the Act provides a process whereby writs of execution against the district may be enforced.

Finally, as the Board is human and may wilfully or through error do the wrong thing, or do things in the wrong way, or may be guilty of malfeasance in office, the Act gives the Lieut.-Governor in Council power at any time and from time to time to appoint an Official Trustee, who may be the Irrigation Council, to take over the assets, functions, powers and duties of the Board, and to continue in office during pleasure.

As all acts of the Board must be reported to the Irrigation Council for its approval before becoming effective, the additional proviso should make it well nigh impossible for a district to get itself into any very serious trouble.

Water Users' Districts

The above Act provides a simple and, it is hoped, effective machinery for the creation and functioning of irrigation districts. However, there is an inherent desire in most humans to paddle their own canoe when they can, and sometimes when they can't, and the probability is that in all districts, especially the larger ones, there will be a certain amount of dissatisfaction with the way things are run, with the cost of distributing the water, and the manner in which it is distributed. There will be complaints of discrimination and a feeling that a small area could do these things better if given its share of water in bulk. (This is quite as true in the case of corporate projects, probably more so.) Accordingly another act entitled "The Water Users Districts Act" was passed which provides for the organization of such areas into water users districts.

The processes of organization are essentially the same as for irrigation districts and need not be repeated. These organizations are essentially operating and not constructing agencies, and their sole purpose and function is to act as retailers of water purchased from the irrigation district or company as wholesaler.

The above is an outline description of the legal machinery now in existence in Alberta under which all future development will probably go on. The days of development by corporation are probably gone for good, and the only other way open is by direct Government construction and operation. The experience of the Federal Government of the United States in this particular has not been such as to warrant any optimistic ideas on these lines in this country, and if we are to have progress in development in Alberta it will probably be along mutual co-operative lines with perhaps something of Government aid in certain highly complicated or very extensive schemes, when the construction and operation of the whole as one district is impracticable.

The surest way to help others is to train them to help themselves, see that they don't cut themselves with unfamiliar tools and keep a fatherly eye on their progress.

As the true value of most technical papers lies in the discussion much more than in the matter, the author hopes that his remarks will be freely discussed and criticised to the end that the most good may come of it. The paper is more an attempt to marshal the legal facts than to discuss, explain, condemn or favour the actual legislation. Whether this be good or bad, advanced or retrograde he leaves to the discussion to bring out.

Electric Welding

History and survey of electric welding methods, concluding with research work by the writer.

Read at the Eighth General Professional Meeting, Halifax, October 13th, 1920.

Fred H. Williams, A.M.E.I.C.

Electric Welding is one of the most useful of recent developments in the fabricating of iron, steel and other metals. It made great strides during the late war, when the necessity of rapid fabricating of materials, the repairing of broken parts and the building up of the worn surfaces of machinery of all kinds, were of such great importance.

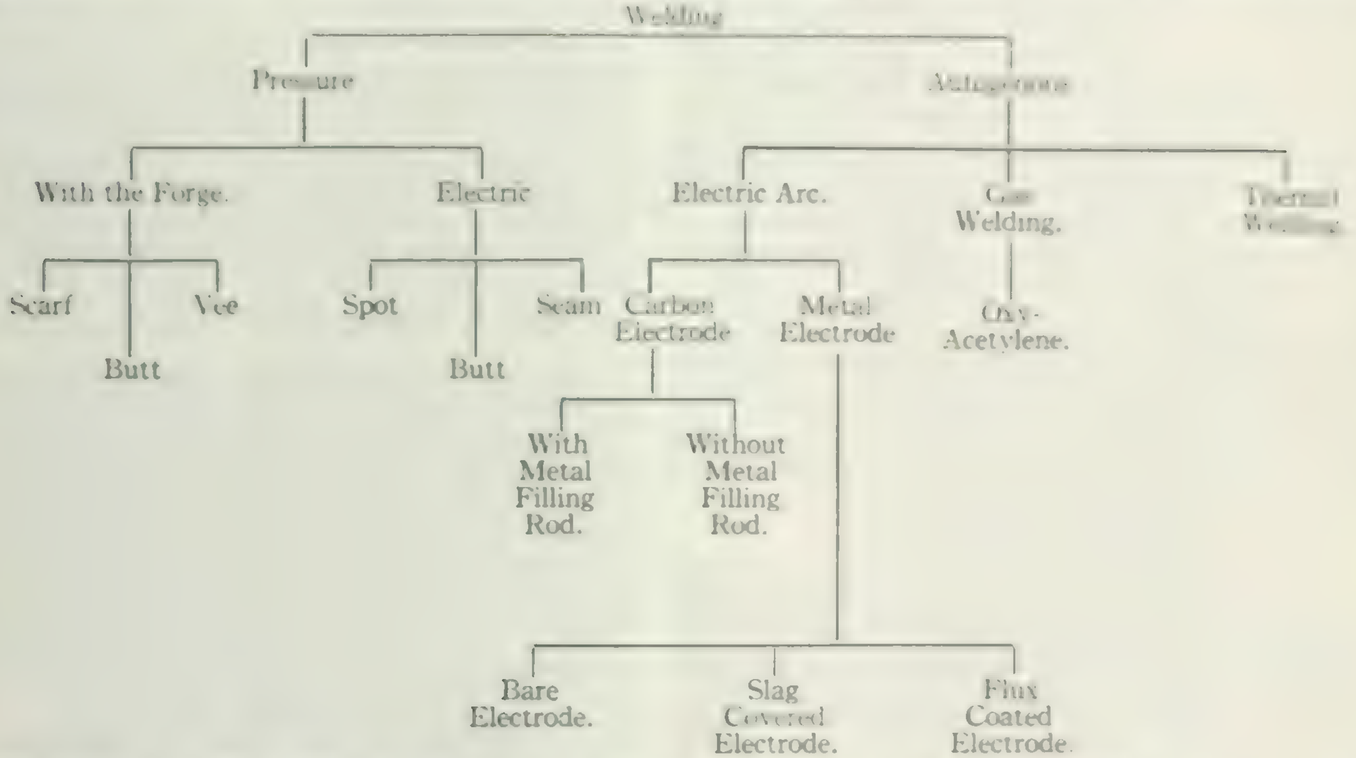
The demands of labour for more money and less working hours are resulting in many industries turning to the Electric Welding process for help in keeping the costs of operating and manufacturing down to the lowest level possible.

Many articles on the Art of Electric Welding have been written by men in various callings of life and it would be somewhat presumptuous of the writer to attempt to cover more than one or two phases of this most interesting and useful art in the short time available. A general review of the history of welding and the development of the electrical portion of welding will probably be about all that can be reviewed from what has already been written, in order that an understanding of welding may be had by the present meeting, without too much repetition.

The Encyclopedia Britannica has a very good description of the progress of the art of welding and for those who wish a more detailed account, the writer would suggest a perusal of its columns. The following brief and rapid review will however give a general idea of the most important features of this very interesting subject.

Welding (namely, the action of the verb "to weld") is the same as "to well", to boil or spring up, the history of the word being to boil, to heat to a high degree, to heat hammer iron, and has developed from the necessity of man requiring means of joining metals together other than the mechanical fastenings by bolts, rivets, clamps, hinges etc.

The following will give a comprehensive idea of the relation that the various methods of welding bear to one another:—



The steps by which this development has been brought to its present stage of perfection (some of which are still useful and of more or less importance commercially) may be briefly considered as follows:—

Pressure Welding

The process of uniting metallic surfaces by pressure exercised when they are in a semifluid condition, consists of heating the ends of the parts to be welded to a proper temperature and fusing them together by pressure, either by the smith's hammer and anvil, or, later, by the steam or air hammer, hydraulic press, etc. This is known as pressure welding. For successful welding care must be taken that the surfaces are made clean, and that the joints are rapidly brought together. Variations in the forms of this type of welding are many, depending upon the work in hand and the practice of the blacksmith or the shop wherein the work is done. The most common terms applying to the welds made by pressure welding are 'Scarf', 'Butt', and 'Vee'.

Scarf Welding

It is styled 'Scarf' welding where the two ends are made diagonally flat to give more surface for the weld (the end being slightly convex to allow the dirt to be forced out of the interior of the weld, should any remain, when the pressure is applied and thus assure as nearly a perfect welded joint as possible). The ends, in this case as well as in the others, are upset to give sufficient metal after the weld has been made, to enable the smith to finish the welded part in proportion to the adjacent parts, giving the finished article a neat appearance and sufficient strength for its requirements. Further care has to be taken to see that the surfaces are clean, chemically viz., free from oxides, and mechanically viz., free from dirt that the weld may be thorough.

In the case of Scarf, Butt and Vee welds these two conditions are obtained in the first instance by using fluxes of sand for wrought iron and borax for steel (the flux forming a slag which is forced from the joint upon the application of the pressure), in the second by using a clean hollow fire and brushing off, previous to joining, any particles of dirt that may adhere to the surfaces. Thoroughness in this respect should be rigidly applied in all welding.

Butt and Vee Welding

Butt and Vee welds are similar except that in the butt weld the surface is somewhat less than the scarf weld and the vee weld has more surface to be welded, involving the greater possibility of slag inclusions and requiring more care in preparing the end to be welded.

Temperature for welding is a most important factor, especially owing to the fact that each grade of iron or steel requires to be handled at a different temperature. In iron the ends may be melted, but in steel a low heat is required, that is, not over a moderate white heat must be used. Steel does not weld as readily as iron nor is the weld as reliable. Oxidation of the metal must be avoided as burnt metal cannot be welded.

As pressure welding proved limited in its uses, a further development was made, and welding without pressure resulted, (this is known as Autogenous Welding). In the first method, (pressure welding), a comparatively low heat and high pressure is required whereas in the second method, (autogenous welding), a comparatively high temperature and low or no pressure is necessary.

It may here be noted that while many new methods of welding have been developed, viz., Electric, Gas and Thermit, and great improvements resulting thereform, the heretofore described pressure welding is still much in use at the present time and while it is superseded in some of its uses by these new methods, it will without doubt retain much of its present usefulness and not, in time, become an antiquated process.

Pressure Welding (Electric)

In 1886 Elihu Thomson brought forward the process of resistance welding, which is a form of pressure welding wherein electric current of low voltage is used to produce the heat required for the welding, and pressure either by hydraulic or some mechanical contrivance is brought to bear for pressing the rods, wires, plates etc. together. The current may run as high as 100,000 amperes and the voltage as low as two or three volts or even lower.

There are two types of this kind of welding, viz., "Butt" and "Spot", the latter may be extended into what is termed "Seam" welding, or a continuous series of spot welds.

The heavy current required for "Butt" and "Spot" welding or, what may be termed and is known as resistance welding, makes the use of short leads to the plates or points of contact necessary, especially when alternating current is used. This is overcome by making these leads part of the secondary winding of the welding transformer (Thomson).

Butt welding is extensively used at the present time in various lines of manufacture, in the making of wire hoops, rubber tires (wherein the centre is a wire core butt welded), the welding of rods etc.

Spot welding is also in use extensively in various places, for instance, plate welding where it is used in the place of rivets (in this it is sometimes made continuous, that is, the spot welds are so close together that it becomes one continuous weld, it is then known as "seam" welding). Fence and various wire fabrications are also accomplished by this method; spot welding of sheet metal articles of numerious shapes such as helmets, cooking utensils etc., is carried on to a very large extent commercially, enabling the production of many useful articles, and simplifying as well as cheapening the manufacture of the same.

In the case of armour plate, this method is used to anneal portions for cutting or drilling. The current is passed through the spot to be softened and the portion brought to a red heat, by reducing the current gradually, the surrounding metal retains its hardness while the spot under the terminals is softened.

The bonding of rails and the welding of various alloys are accomplished by this process of Elihu Thomson. The field is not yet fully developed and many possibilities remain to be developed and commercialized.

By means of a rotary converter and transformer for changing and reducing the high Direct Current to very low voltage Alternating Current, the spot welding process is used for welding the bonds to the rails for the return circuit of Direct Current Electric Railway Systems.

Autogenous Welding (Gas Welding, Oxy-Acetylene)

In 1820 the oxy-hydrogen blowpipe was used for producing "limelight", later to fuse platinum and was finally utilized in lead burning and various forms of welding. The oxy-hydrogen process of welding was improved subsequently by using acetylene in the place of hydrogen. With oxy-acetylene and its higher temperature, a larger field was opened up. Cutting of metal parts by its flame is one of the uses of the oxy-acetylene flame. Improvement in the design of the apparatus concerned therewith has resulted in the use of this method of welding in almost every branch of metal work at the present day. There is considerable competition between it and the electric process, and so close has this contest between these two methods become, that it would be unfair to give either the position of leader. The rapid progress of the art of electric welding, as in the last few years, will necessitate on the part of the promoters of the oxy-acetylene process, much study and expenditure of energy if they is to keep even with the electric process.

Other gases have been used but none have as yet approached the oxy-acetylene in usefulness.

Autogenous Welding (Thermit)

The next form of welding originated in 1894 when C. Vautin found that when finely divided aluminum was mixed with such compounds as metallic chlorides, oxides, sulphides etc. and ignited, exceedingly high temperatures resulted from the rapid oxidation of the aluminum, about 3000 degrees C. being obtained.

It remained, however, for H. Goldschmidt to utilize this discovery in a practical way. He welded two bars of steel by combining molten iron, the two ends of the bars thereby producing a solid joint. The heat for this joint, or weld, was obtained by the rapid oxidation of finely divided aluminum and iron oxide. This process was termed "Thermit Welding".

Pure metals such as iron, chromium, manganese etc. were obtained from their oxides etc., by this method of reduction, and made use of in welding.

Thermit for welding iron and steel is made by mixing iron oxide with finely divided aluminum in a crucible lined with magnesia and having a cover to retain the molten mass during reaction, until poured. The molten mass, after the reaction, consists of two layers, the upper oxide of alumina, or corundum, and the bottom layer practically pure iron. The position of the molten iron relative to the slag necessitates the pouring of the iron through the bottom of the mould that surrounds the ends to be welded. Steel punchings are sometimes added to the charge before the reaction takes place, to absorb some of the excessive heat and to reduce the amount of iron oxide that otherwise would be required to fill the mould

The mould is prepared by building up a wax form to the shape of the finished weld around the ends to be welded and, surrounding this with the material used for building up the mould. The wax is then melted, withdrawn and weighed, in order that the required charge for the work which bears a certain relation of this may be calculated. Magnesium ribbon or wire is used to ignite the charge.

Care must be taken to prevent slag filling the mould, as would happen by premature pouring, and also to pour the metal sufficiently hot to melt the ends of the pieces to be welded. Preheating is used on large welds to avoid chilling of the fluid metal which would prevent the uniting of the ends and the molten metal.

This method of welding has been used to a great extent in welding large castings and girders, as well as smaller parts such as rails, bonds on rails, rims of fly-wheels, spoke and hubs of locomotive drivers etc., engine frames etc. It is much used at the present day, and where failures in its use occur, it is generally due to some foreign cause, miscalculation of the charge etc., or its use in places where a successful weld could not be obtained owing to the faulty design of the casting to be welded. It must be remembered that the resultant weld is cast metal and should be considered as such in designing its use.

Autogenous Welding (Electric Arc)

In 1874 Werdermann suggested the use of the flame gases of the electric arc blown upon the work by air or otherwise. This was later developed by Zerener, who utilized the effect of a magnet in blowing the flame of the arc upon the work, puddling the metal where the welding was being done. This meant that the method could be used only in working downward, no vertical or overhead work could be accomplished in this way. This method is now practically abandoned.

Arc welding really had its start in 1881 when de Meriteus used it for welding parts of storage batteries together. The metal parts (lead) were laid on a support or plate which was made the positive side of the arc and a carbon was used as the negative pole, the arc being established by touching and breaking the contact, the heat of the arc melting the ends or edges of these lead pieces and welding them together by the fusion of the same.

The next step in electric welding was by Bernardos and Olszewski who used the carbon as the positive and the work as the negative. A metal rod was used for filling in the necessary additional metal for making the weld, the arc being drawn long enough to allow the rod to be gradually fed into the flame of the arc by hand, the heat of the arc melting both it and the ends of the parts to be welded. The whole mass was then allowed to cool slowly, thus completing the weld. This form of electric welding is not completely satisfactory owing to the very high heat of the arc setting up strains that, in cast iron especially, are very dangerous, also a very much higher current is required, seldom less than 150 amperes and often 300 or 400 amperes.

The difficulties in using the carbon arc arise from the above causes and in addition to these, many kinds of work are impossible of accomplishment, due to the impurities of the carbon being deposited in the weld along with the metal. In the case of cast iron these result in a very hard brittle metal, impossible to machine.

An improvement over this method was developed by Slavianoff when he utilized the metal rod not only to provide the metal for filling or building up the weld, but also as the means to start and hold the arc. The metal rod may be either the negative, or the positive side of the arc. Later, the use of the rod as the negative was generally adopted, unless the work was very thin, in which case the reverse would enable the operator to keep the heat on the work low enough to prevent it from becoming overmelted.

In making the work positive the heat imparted to it is much higher, in proportion to the energy delivered, than when the work is negative. This is due to the comparatively recently noted fact that the positive side of the arc is the hotter.

A longer arc is required for the carbon electrode than for the metallic, it being in some instances as much as 3 inches. The voltage necessary to maintain the arc is proportionately higher and generally is about 150 volts.

Returning to the carbon arc welding process, this method, attributed to Bernardos, was the first to be used commercially in the welding of metals on a small scale, in about 1888, and shortly after Slavianoff brought forth the use of the metallic electrode as a process of great possibilities.

Rapid development in the art of arc welding, however, has been made in the last few years, and the greatest strides occurred during the last war, when speed in everything was so completely the order of the day. The development made then has proved so completely the advantages of arc welding that it is now being used in almost every plant of any size in Canada and the United States, and in every kind of iron and steel fabrication, as a glance at the following list of some of the present day applications of the electric arc for welding and cutting will illustrate:—

Applications of Electric Arc Welding

Steel Mills:—

Clearing the rolls of cobbles.
Building up wobblers.
Filling in steel forgings.

Foundries:—
- Cutting off risers and sinkheads.
- Repairing casks.

Machine Shops:—
- Filling up blowholes in partially machined castings.
- Repairing broken castings.
- Building up worm parts of crank pins.
- Welding broken crank shafts.
- Welding tool steel to mild steel shanks for lathe and other machine tools.
- Building up collars, or replacing metal that has been machined off by mistake.

Steam Railroad Shops:—
- Fabricating the greater part of fireboxes.
- Repairs to fireboxes, boiler and other plate parts.
- Welding in flues to the flue-sheet.
- Repairing engine frames, cylinders, crank pins etc.
- Building up slide-bars, guides, link gear parts, crank pins and various parts that are worn so much that it is inadvisable to shim them up, or compensate in other ways.

Electric Railways:—
- Fabricating gear cases.
- Repairing motor frames and armature shafts.
- Building up worn parts on motor frames, armature shafts, brake-beams and truck parts.
- Repairing frogs, crossings, turnouts and building up low rails at joints where wear is especially prevalent.

Ship Yards:—
- Repairing marine boilers.
- Welding tanks.
- Welding angle irons, handles, catches and numerous small fittings to the ship's plate.
- Welding broken parts of all kinds.

Electric Arc Welding today is principally by means of the metal electrode, and the welding plant may use either alternating or direct current for the welding.

The alternating current apparatus is a transformer with the primary winding suitably designed for the line voltage where it is to be used, and the secondary to give about 90 to 100 volts on open circuit and 20 to 30 volts on short circuit or when the arc is drawn.

The direct current apparatus is of many kinds. In general, however, the manufacturers are more or less at one in the principal features required for electric welding, through they may differ somewhat as to design.

The first welding outfits used were of the resistance type. In this a resistance was used to control the current, the voltage remaining constant. Taps in the resistance enabled the use of various sizes of electrodes. The regulation was somewhat crude as the drop across the resistance varied with the current. Extreme variations were checked. The regulation of the voltage across the arc and the current through it give approximately a constant rate of heating.

The next step was the use of D. C. generators, in which various arrangements were used in design to obtain a suitable regulation of the arc, and many of these are being used with satisfactory results today. These D. C. generators may be motor or belt driven and, in cases where electric power is not at hand, a gasoline or steam engine may be used for motive power.

It is a question in some minds as to which is the better current to use, alternating or direct. Both have advantages and disadvantages, and it seems that, for the present, the direct current is the more patronized. The writer has the idea that a mere visual examination of welds, or their test by pulling to the breaking point, without microscopic examination results in opinions of small advantage, and that a continued study of welds in actual work, with the microscope, will be the only method of determining the better of these two currents, for welding purposes.

The alternating current welding transformer is a newer development than the direct current generator and it has many advantages, viz:—No moving parts, and much smaller size in comparison to the current output. It has one great disadvantage, viz. a very low power factor, in some cases being as low as .35.

There are many types of D.C. welding sets and a few types of A.C. welding sets. The general method of procedure in welding is as follows:—an arc is established with the metal electrode, and as the rod is vaporized or melted by the arc, it is brought nearer the work and is kept close enough to maintain the arc until the whole rod is fed into the weld. It is kept moving in a circular motion, puddling the molten metal deposited by the arc, in order to obtain a neat weld, free from impurities. This operation and the neat appearance of the weld, as well as a good, clean, sound deposit, depends much upon the operator. Care should be taken to get standard reliable machines and the best welding wire. It will be shown by some of the microphotographs that the operator, welding apparatus, and wire may be the best and still a poor weld be the result, due to the poor material that is being welded.

The electrode for the general run of work may be Swedish or pure iron rods, sizes 3/32″, 1/8″, 5/32″ and 3/16″ round, and 14″ to 18″ in length.

The advantages of electric welding over gas welding are that in the former, the heat is kept low and localized and, in most cases, the preheating of any part of the work is unnecessary, whereas in gas welding, the adjacent parts are preheated by the gas before the weld can be made. The extreme heat from the gas affects the structure of the metal several inches back from the weld, and ofter results in a course crystaline structure of the parent metal.

The art of electric welding is now just beginning to be one of the indispensable factors in the iron and steel industry. It is to be most valuable to those who will value it most and who endeavour to find out why failures occur.

It is possible that the following photos will be of some service to those who are following the same line of research that the writer has under- taken, as they are intended to show that the material to be welded is an important factor.

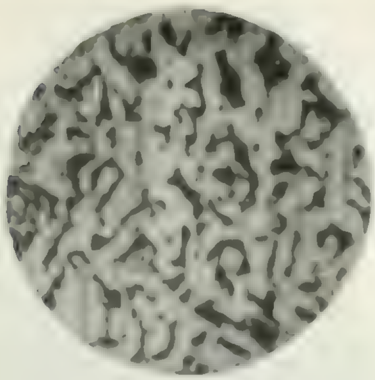


Figure 1.

Figure 1.—This is a cross section of a piece of boiler plate, the photograph was taken about one inch from the weld and is about [illegible] carbon steel. The light area is the ferrite and the dark is the pearlite. There is no apparent indication of ghost lines or impurities in this steel. The weld is shown in a following photograph and is very good, showing no impurities in the parent metal or the deposited metal. The next photograph show the change in the structure due to the heat of the arc. Magnification 100x.

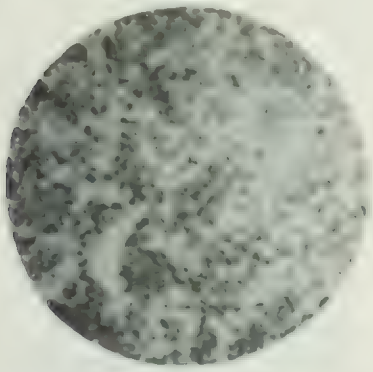


Figure 2.

Figure 2.—The structure shown in this photograph is that of the annealed portion of a piece of boiler plate taken between the weld and the original metal. In the weld, the area effected by the heat of the arc extended $\frac{3}{4}''$ from the line of the weld and graded off on the one hand to the original metal and on the other hand to a more refined structure close to the weld, both of these stages are illustrated in this paper. This weld was 70% bright fracture and 30% dull fracture when broken. The efficiency of the weld over the original was 89%. There were no apparent ghost lines in the best portion of the plate and they appeared very faintly in the remaining portion. It would thus be apparent that a very slight appearance of the ghost lines would cause poor welds. Further investigation of these lines is being conducted by the writer. Magnification 100x.

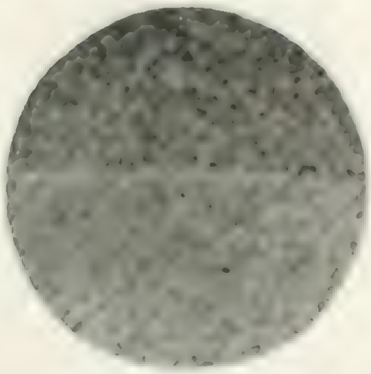


Figure 3.

Figure 3.—This photograph shows a good weld, the light side is the deposited metal and is of good structure. The dark is the parent metal and is in a more refined state than it was originally. The comparatively coarse structure of the original plate is first annealed by the heat of the electric arc as is shown in a preceding photograph, then as it cools off the portion near the weld becomes more refined and the line of the weld is very pure iron. The line of the weld is the narrow line diagonally across the photo. This weld was very strong and was 89% efficient as compared with the plate. When tested the break occurred through the weld and the fracture was clean and bright for about 70% of the area. Magnification 100x.

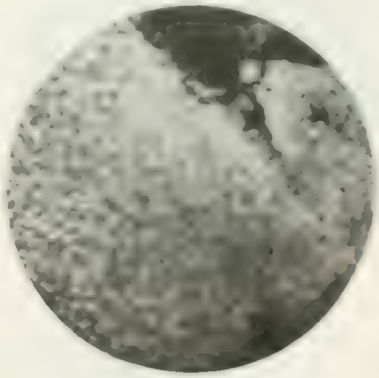


Figure 4.

Figure 4.—This shows a cross section of a weld at the edge of the bead showing that there was not a complete weld at this point. The welded metal shows slag of some kind separating the deposited metal and the original plate. This is probably an oxide of iron due to the plate not being properly cleaned and to an improper position of the electrode when the weld was made. The microphotograph shows up what could not be seen by the naked eye and gives a clear idea of what is taking place and is a means whereby the welder can be shown where he is going wrong. The change in the structure of the plate from the original to the structureless metal at the weld quite different from that shown in a preceding photo. To determine whether there is a fault in this result would require some time and study which if not already done, will be to the advantage of all concerned. This would give an idea as to whether the welder or the material is at fault. Magnification 50x.

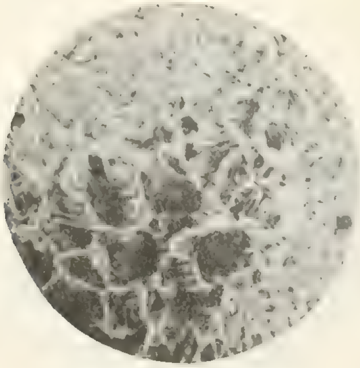


Figure 5.

Figure 5.—This photograph is a weld made with the electric arc on ½″ boiler plate, the close grain metal on the two sides of the point of coarse grain crystals is the deposited metal, the point is the parent metal and is not strong due to its coarse grain. A break would occur across this point providing that the welded metal was weak. The electrode used was "Quasi Arc" and the heat from the weld produced many grains of manganese silicate in the deposited metal weakening the same so that the combination of the course structure of the parent metal and the poor deposited metal gave a very low tensile strength viz. 28,000 lbs. per sq. inch when tested. Magnification 100x.

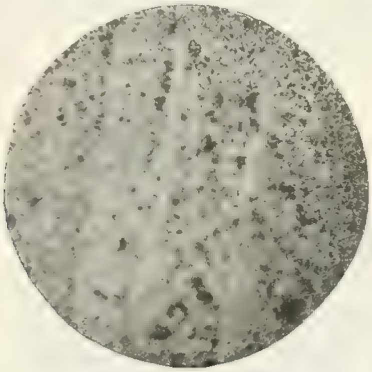


Figure 6.

Figure 6.—This is a microphotograph of the ghost-lines in a piece of ½″ boiler plate. These lines occur in the centre of the plate and extend to within about 1/8″ of either surface of the plate. The occurrence of these lines depends upon the quality of the plate and the location of the same in the section of the steel billet when rolled. A few spots (dark) show up in this photograph, but when the plate is subjected to a high heat the spots increase in number and size. In electric welding they extend into the welded metal and are the cause of much defective welding that is often attributed to other causes than this, the right one. The writer has found that in welding two plates together end to end, the effect of the heat from the electric arc changes these ghost lines into dark spots to a depth of at least 1/8″ and that the impurities from the molten portion of the plate extends into the deposited metal quite extensively and forms a sort of chain along which the line of break can take place providing no weaker link is offered. Several examples of the above statements are included in the following pages. Magnification 50x.

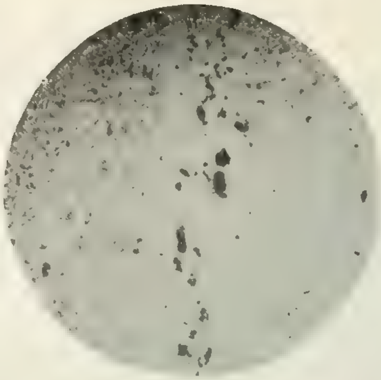


Figure 6A.

Figure 6*a*.—This shows the effect of the heat of the electric arc in electric welding upon the ghost lines in boiler plate. This line of dark spots extends along the location of the ghost lines about 1/8″ back from the line of weld and vanishes in the ghost line itself. These dark spots are a combination of manganese, silicon and iron; they are very brittle and therefore not satisfactory constituents to be included in the weld. The writer is including a microphotograph (Fig. 6*b*) showing the line of a fracture in a weld along a series of these spots, very clearly indicating that these form a constant source of weakness in welding, and that care should be taken whenever it is possible to avoid designing welds that assist the formation of these spots. It will be noticed that some of these spots are composed of two colours, the lighter of which is a sulphide of either manganese or iron or of both; this sulphide is ductile and does not effect the deposited metal as the silicate. The formation of these spots clearly indicates their composition, viz. the varying size of each in the group shows that they are not alumina spots which are small and even in size. Magnification 50x.

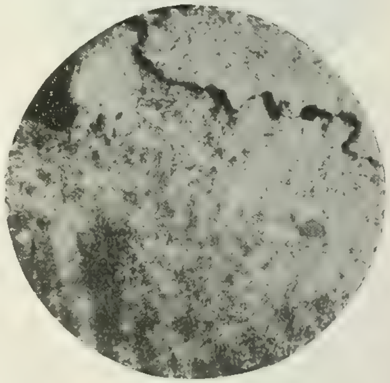


Figure 6B.

Figure 6*b*.—This shows a section through a tube and tube sheet, that to visual examination gave no indications that any break occurred in the weld during tensile stress. It will be noted that the thin line of rupture zig-zaged along the line of least resistance viz. the irregular row of silicate inclusions showing that the strength of the portions of silicate are the weak points in a weld. This portion of the break is in the deposited metal and runs along the edge of the original plate near the end where a mixture of silicate and sulphide occurs. The coarse area to the right is the original plate annealed by the heat. The light gray spot near the top of the photograph is a spot of sulphide, this, together with the silicate, originates in the ghost lines of the tube sheet. Magnification 100x.

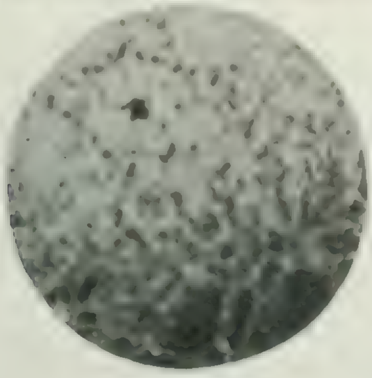


Figure 7.

Figure 7.—This photograph show the silicates in the weld and how they are arranged so as to aid in a rupture should a strain be put on the metal. The line of weld is shown in the lower part of the photograph at the right. The original plate was ½" boiler plate and the electrode was the "Quasi Arc" mild steel. Magnification 100x.

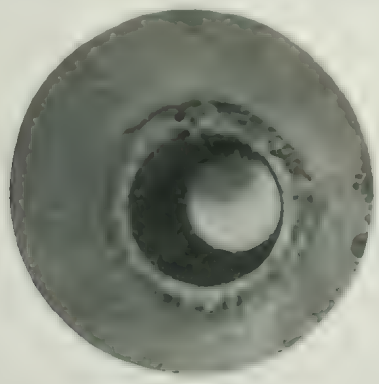


Figure 8.

Figure 8.—Showng one method of welding a boiler tube in the tube sheet. The tube extends through the sheel 1/8" and is weided. Considerable care must be taken in making this weld as the plate and surface of the tube must be perfectly clean in order to ensure a good weld. This method is easily executed and is sufficiently strong enough for the service required of it. The disadvantage is that the flames and hot gases are obstructed from entering the tube, also on account of the ends projecting beyond the tube sheet they are subjected to the flame and liable to rapid deterioration from the same. Tensile tests on this form of welding have in cases shown that the weld was stronger than the tube. The line of breaking is sometimes through the tube but generally the tube shears along the weld close to the tube surface. Magnification .5x.

Figure 9.

Figure 9.—This photograph shows front view of a tube welded into a tube-sheet after the same had been tested. The test gave a good tensile strength and this would appear to be a good method of welding. The tube and sheet were chamfered after the tube was rolled into place and the weld made on the beveled edge on both the tube and the sheet. The plate used was ½" boiler plate and as the weld was in the region of the ghost line that have been described herein it would be doubtful whether the percentage of welds could be relied upon. The writer has taken photos of the weld in this type of weld and has included a typical case in this paper. They all indicate that this is not as satisfactory a method as when the tube is welded to the outer 1/8" of the plate. It will be noticed that but a slight portion of the weld fractured and that where it did that the structure of the break was full of defects. Considerable portion of the weld gave away at the junction of the two metals and showed a poor weld, there were a lot of impurities which prevented a good weld. This is the result of the impurities in the plate and would be overcome if the weld was made in the proper place. The other way of overcoming this fault is to see that the very best plate be used. It must however be free from these ghost lines that cause the trouble. Magnification .5x

Figure 10.

Figure 10.—This is a tube welded into a tube sheet in a way to avoid the effects of the ghost lines that are prevalent in ½" boiler plate. The sheet is drilled for the tubes and chamfered about 1/8" deep, the tube rolled in, cut off even with the face of the plate and turned over

with a suitable beading tool. The tube is not beaded as is the usual practice and the edges are left as nearby square as possible. The weld is then made by welding the end of the tube to the sheet, filling the vee made by the chamfer and the end of the tube. It will be noted that the weld takes place without the range of the centre of the ½″ plate and thus clear of the ghost line infected centre of the plate. The tubes welded thus give strength, a nearly flush surface of plate and a clear entrance for the gases to enter the tube. Tests show that a good weld is obtained and that the tube shears first, the weld for the most part does not give away as it does in other cases. Magnification .5x.

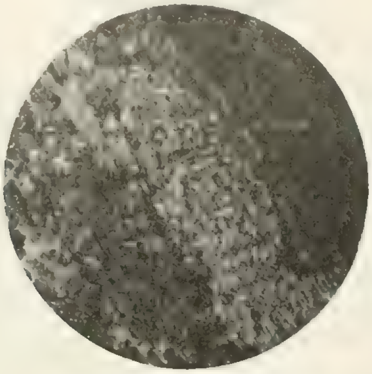


Figure 11.

Figure 11.—This is a photograph of a cast iron weld with a pure iron electrode with the electric arc and gives a clear idea of the structure that will always be found in a weld of this kind. The white lace work through the centre is a bank of cementite made by the uniting pure iron with an impure (high carbon) iron; this is brittle, has a strength of about 5,000 pounds per square inch, a very low strength even for a cast iron weld. The deposited metal at the top is similar to the ordinary deposit from a pure iron electrode, the bottom is the cast iron parent metal. Magnification 75x.

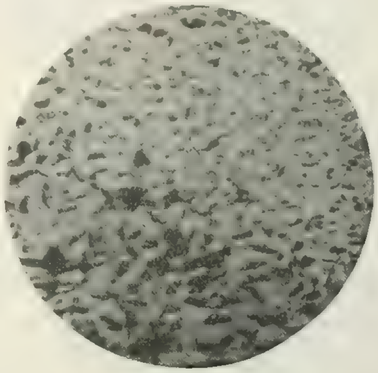


Figure 12.

Figure 12.—This is a photograph of a cast iron weld made with the electric arc with a cast iron electrode. The dark portion of the photo is the parent metal and it will be seen that it is not as uniform a structure as the deposited metal, also that the deposited metal is nearly a pure iron deposit that the graphite (dark areas) are small and not closely connected. This weld is easily machined and has a good tensile strength. No preheating nor after heating was required to get these results. Magnification 100x.

Hydro-Electric Power Development in New Brunswick

Outline of works on Musquash River and Shogomoc Developments, report by consulting engineers; proposed Lepreau Development.

Read at the General Professional Meeting, Halifax, October 15th, 1920.

C. O. Foss, M.E.I.C., Member and Chief Engineer N.B. Hydro-Electric Power Commission.

The great value of Hydro-Electric Power both as regards economy in cost and flexibility in operation has long been appreciated by the observant and thinking class, but the heavy initial cost of development and the difficulty of obtaining such broad powers of expropriation by private companies as are necessary to deal successfully with attempted holdups by human greed are such that private enterprise and private capital have been deterred from going into such developments to any great extent in the Maritime Provinces.

The Province of Ontario was the first to fully appreciate this truth and to undertake such development on a large scale as a government measure. This government has spent roughly fifty millions to date and though there has been more or less criticism and there has lately been a radical change of government, yet the work of enlarging and extending the system goes on and the Commission is expending some forty to fifty millions on what is known as the Chippawa development, which will add 275,000 H.P. The success and popularity of Hydro development in Ontario under a government commission, together with the rapidly mounting cost of coal and the difficulty of obtaining same, made the governments of the Maritime Provinces quite willing to lend a favorable ear to the solicitation of the federal authority, first the Conservation Commission and a little later to the earnest advice and assistance of the Dominion Water Powers Branch of the Interior Department. This Branch was established in 1911, and has been highly active and efficient from its inception. This department has been very fortunate in having had a most enthusiastic and highly efficient staff from the Minister and Deputy Minister down through the superintendent and district engineers.

Work Now Under Way

The Maritime Provinces are particularly fortunate in having had a district engineer sent here of the ability and enthusiasm of the present incumbent, K. H. Smith, A.M.E.I.C. Without wishing to give him any credit which is not fully due I but state my firm conviction that his excellent work and convincing personality have hastened hydro-electric development in these Provinces by some years, for we are a conservative people and have to be shown, and he has shown us. This is not said to flatter or throw bouquets for Mr. Smith has only done his duty, but has done it so well that those of us who are aware of this fact have every right to say so. In the Maritime Provinces Nova Scotia has taken the lead and is already engaged in the actual work of constructing a plant at Margaret's Bay for supplying power to this city and vicinity. In New Brunswick we are following closely, for we shall have actual construction work under way within a very short time. The most important development that we are undertaking, that on the Musquash River, is almost identical with that at Margaret's Bay in most of the salient features.—

They are both situated on the first bay West of the respective cities of Halifax and St. John.

They are nearly the same distance from these respective cities.

In both cases one stream is diverted into another; and the strangest coincidence is that the amount of power is identical — 8000 horse power.

Two of the three turbines at the Musquash River plant will operate under practically the same head as those at the tide water plant at Margaret's Bay.

The design will be made by the same firm of constructing and consulting engineers, Messrs. C. H. and P. H. Mitchell, of Toronto, in our case subject to the final approval of Henry Holgate, M.E.I.C., consulting engineer of Montreal.

The cost will be practically the same in both cases.

Features of Construction

The proposed construction will be of the simplest character — earth dams, earth spillways heavily paved, spilling into lateral depressions which will deliver the water back into the stream a considerable distance below the toe of the dam; earth canals for part of the distance from the dam to the power house in the case of the West Branch of the Musquash and the Shogomoc; concrete intakes and wood stave pipe laid on a bed graded in the same way as a railway road bed; at the East Branch concrete intake at the forebay and wood stave pipe on graded bed to the power house. In the case of the East Branch there will be three side dams:

One 400 feet long and 6 feet high
One 150 " " " 6 " "
One 40 " " " 6 " "

These will be left two feet below the top of the main dam so that in the remote possibility of an accident to a storage dam they will be overtopped and swept out, thus ensuring the safety of the main dam.

In the case of the dam on the West Branch we shall have the same safeguard arranged in a slightly different way.

At the Shogomoc the construction will be practically the same: protection against possible accident to storage dams will be provided by enlarging the section of the canal just below the dam and leaving the lower bank considerably below the crest of the dam which will act as an emergency spillway.

As Mr. Holgate, the consulting engineer to the Commission, has found it impossible to attend to the details of design and construction the Commission at his suggestion and upon his recommendation have engaged the firm of C. H. and P. H. Mitchell of Toronto to design and supervise the construction of the works; they have designed and are supervising the work at Margaret's Bay as above noted. To show the feasibility of the work above generally described the principal parts of their report to the New Brunswick Electric Power Commission are given below:

General Report on The Hydro-Electric Power Projects proposed on the Musquash and Shogomoc Rivers, New Brunswick.

[illegible] September, [illegible]

Messrs.

The New Brunswick Electric Power Commission,
St. John, New Brunswick.

Gentlemen:

Arising out of a request from your chief engineer, Mr. [illegible] through your consulting engineer, Mr. Holgate of Montreal, we have examined into the Hydro Electric Power Projects which you have in contemplation on the Musquash and Shogomoc Rivers. This we have done with the purpose of assisting your chief engineer in co-operation with the consulting engineer, and this report is intended to place before you in a preliminary manner, the results of this examination, especially as to the feasibility of construction and operation of the projects and the economic features involved in them.

We found on our preliminary interview with your consulting engineer and upon consultation with your chief engineer that the projects had already been advanced to the stage of asking for tenders for the main dams and canals based upon plans and specifications already prepared by your chief engineer, and the consideration of these is not included in this report except with respect to their general relation to the projects especially as to probable costs where included in the general estimates.

The general data based upon stream measurements and surveys already done has been placed in our hands by the consulting engineer and we have also had before us various maps and plans made from special surveys of the power sites done under the direction of the chief engineer. In addition to these we have both personally examined the locations and proposed sites of the various structures in company with the chief engineer. We have also discussed questions of water supply and [illegible] with Mr. K. H. Smith of the Water Power Branch of the Dept. of the Interior, and had access to his records and the information on file in his office at Halifax.

The Musquash Development

On September [illegible], we visited the vicinity of the proposed power development on the Musquash River, seeing the proposed sites of the main dam, canal and spillway on the West Branch, and the proposed site of the dam and intake on the North-east Branch. We also examined the possible site of the generating station. The whole scheme as outlined by your chief engineer appears quite feasible for development from a constructional point of view as well as attractive in its economic features.

The watershed of the two branches of the Musquash River above the power dam sites has been measured from maps as 140 square miles, approximately evenly divided between the two branches. As complete data for precipitation and run-off for this area has not been definitely obtained, the calculations for available water have been based on comparisons with similar watersheds adjacent. The precipitation over this area is known to be in excess of that of St. John which averages about 46 inches of rainfall per year, and the run-off is exceptionally high. The storage possibilities of the river seem to be excellent and while the dependable controlled flow has not yet been determined it seems conservative to allow 360 cubic feet per second as the continuous available water for power purposes. Assuming this amount evenly divided between the two branches, the flow available for power on each river would then be 180 cubic feet per second.

The proposed generating station site is on the coast road about twelve miles West of St. John and the tail water level of the plant would be at tide water although above low tide on account of the river estuary.

On the West Branch of the Musquash the gross hydraulic head to tide proposed is 125 feet but the period of low tide is much greater than that of high tide, so that with pipe losses etc. it would appear to be safe to say that the net head available as a working head would be about 117 feet.

In the same manner, on the North-east Branch, the gross head available is about 100 feet, of which we consider about 95 feet available as net working head.

It is proposed to incorporate the development of these two branches with separate units in the one station, one unit under one head and two units under the other as outlined below.

In estimating power available, the load factor of the system must be taken into account, especially in a system dependent on storage such as these powers are. The load factor in an hydro-electric power system is the relation of the average power demand to the maximum power demand. In this case we consider that the load factor of the whole development should be taken as about 40%, that is, the average continuous load is 40% of the maximum demand at any time. For economic reasons it is proposed to distribute or apportion the two parts of the development so as to make the West Branch work on a 66% load factor and the North-east Branch on a 27% load factor, the combined plant then being on a 40% load factor as proposed.

The Musquash generating station which we propose would under these conditions then contain three identical generating units, one being operated by the water from the West Branch and two being operated from the water of the North-east Branch. The two units would together produce under average conditions 8675 horse power and this power would make about 21,500,000 kilowatt hours available for sale in St. John, allowing for all generating and trsanmission losses.

The sites for intakes, pipe lines, and power station are all adapted for development purposes, and are conveniently situated for efficient operation.

It is proposed that transmission of power to St. John would be on duplicate circuits carried on a line of steel towers at generator voltage, 13200 volts. This will make the most economical transmission arrangement and would permit of use of power between the generating station and St. John without the use of complicated equipment. Provision is being kept in mind in this for subsequently changing the line over to higher voltage in case it is desired to connect other future stations in this locality to this as a main line to St. John.

The receiving station in St. John would make the power available for distribution in St. John.

The Shogomoc Development

The consideration of the Shogomoc Power Development can, to a great extent, parallel the foregoing regarding the Musquash Power.

The Shogomoc River empties into the St. John River approximately forty miles above Fredericton and about twenty miles from Woodstock.

The Shogomoc watershed is about 95 square miles in area above the proposed power dam site. The water supply after the complete storage system is installed as proposed, is estimated to be about 130 cubic feet per second, based upon the precipitation and run-off factor for this region. It is borne in mind, however, that under the conditions of the four successive low precipitation years of 1912 to 1916 it is estimated that only 120 cubic feet per second would have been available as continuous flow but as this exceptional condition has only occurred for the one period since 1874, 130 cubic feet per second might reasonably be taken as a working figure.

The power site was visited by us on September 14th. and the dam site and canal and pipe line routes were gone over. It appears quite feasible to secure a good arrangement of these portions of the work. The generating station would be located on a rock ledge on the bank of the St. John River and the surge tank, for hydraulic control, would be located on a ledge on the high bank behind the generating station.

The gross head to be obtained in this development would be about 285 feet and allowing for the usual hydraulic losses the average net head would be about 270 feet; (this is without reference to the short period during which the high water of the spring freshet on the St. John will temporarily reduce it). Under these conditions the output would be about 8000 horse power at 40% load factor, considered on the same basis as already outlined. This would produce about 19,000,000 kilowatt hours, power available for sale on the system.

There would be two units proposed in this plant, each having about 4000 h.p. output. The electric power would be stepped up at the generating station through transformers suitable for 33000 volt transmission.

Time of Completion

In working out a time progress programme of construction it is to be borne in mind that the time required for construction of the electrical machinery is largely the determining factor. Again on the long pipe lines and storage scheme such as comprised in these developments the various preliminary delays incident on getting the hyrdaulic system into operation must preferably be done in moderate weather and not in winter time.

It is highly desirable then that the plants should be ready for testing out and got ready for operation not later than the 1st. of December 1921 and earlier if possible; if this cannot be accomplished, delay due to the second winter would ensue. This can be best done by letting the contracts for the machinery by December 1st. of this year. If such is to be done it would be necessary to have specifications in the hands of the electrical and hydraulic machinery manufacturers by the latter part of October at the latest.

Conclusion

The two projects on the Musquash and Shogomoc Rivers are entirely feasible of construction from both an engineering and economic standpoint and the cost of power per kilowatt hour delivered is quite low and compares very favorably with other projects of similar hydro-electric undertakings.

The Lepreau Development

The investigations of the New Brunswick Water Power Commission which was appointed in June 1918 led to the plan of developing the Lepreau for supplying the City of St. John and vicinity and after the passage of the Electric Power Act in April last the surveys of that stream were pushed by the writer, who, in conjunction with Mr. Holgate had the plans of work at two sites, Lower Falls at the tide in Lepreau village and Big Falls, two miles up the stream, practically ready for tenders by the first of July. It was found that two reports had been made on the possibilities of power development on the Musquash, but the information contained in these reports was rather vague. It was also reported that it is feasible to divert the West Branch into the East but it was added that this diversion would have to be near Sherwood Lake and this is so far up the stream that half the drainage area would be lost, so that it was not thought worth the cost of development for what we could get. However, it was decided to make a barometrical reconnaissance, with the result that it was found to be possible to divert the West Branch at a point only about a mile from the tide. With this arrangement we can develop as much power in one power house as in the two we had under contemplation in the Lepreau, and as this is seven miles nearer St. John the writer recommended the development of the Musquash first, and this was approved by Mr. Holgate. As soon as this power has been absorbed, which I am sure will be almost as soon as it is developed, we can proceed with the development of the Lepreau, and when this has been absorbed we can go to the Magaguadavic. From these three streams we can deliver the following amounts of power, based on minimum seasonal rainfall:

Musquash,	12 miles from St. John	3000 h.p.
Lepreau,	19 " " "	12000 h.p.
Magaguadavic,	30 " " "	15000 h.p.
		30000 h.p.

In the case of the Shogomoc we can develop 8000 h.p. and as much on the Pokiok though two sites will have to be developed on the latter, as follows:

Shogomoc, 40 miles from Fredericton	8000 h.p.
Pokiok No. 1 at St. John River 37 miles from Fredericton	3000 h.p.
Pokiok No. 2, 38 miles from Fredericton	5000 h.p.
	16000 h.p.

For supplying the towns along the North Shore the Tetagouche flowing through a deep gorge in the rock falls 337 feet in the lower eight miles of its course and this can be developed in 4 steps:

No. 1	105 feet	3100 h.p.
2	132 "	3900 h.p.
3	66 "	1950 h.p.
4	35 "	1050 h.p.
		10000 h.p.

However, the Commission does not have to start construction on this stream, as it is practically assured that the Commission will be able to purchase current from the Bathurst Lumber Co. for a year or more until they have so increased their plant as to require all the power they can generate at their power house on the Nepisiguit.

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOL. III. November 1920 No. 11

Date of Annual General Meeting

The Annual and Annual General Professional Meeting will be held in Toronto on February 1st, 2nd and 3rd, 1921.

The Officers' Ballot for 1921

The following is the report of the Nominating Committee, on the Officers' Ballot for 1921, approved by the Council of *The Institute* at an adjourned meeting held on Thursday, September 30th and herewith published in accordance with the regulations for the information of the membership of *The Institute.*

President: J. M. R. Fairbairn, M.E.I.C., Montreal.

Vice Presidents: Walter J. Francis, M.E.I.C., Montreal; Arthur Surveyer, M.E.I.C., Montreal; A. A. Dion, M.E.I.C., Ottawa; E. G. Matheson, M.E.I.C., Vancouver.

Councillors:

District No. 1: Major F. L. C. Bond, M.E.I.C., Montreal; Lt.-Col. A. E. Dubuc, M.E.I.C., Montreal; F. P. Shearwood, M.E.I.C., Montreal; K. B. Thornton, A.M.E.I.C., Montreal.

District No. 2: A. B. Normandin, A.M.E.I.C., Quebec; S. S. Oliver, A.M.E.I.C., Quebec.

District No. 3: C. C. Kirby, M.E.I.C., St. John, N.B.; S. B. Wass, A.M.E.I.C., Moncton, N.B.

District No. 4: G. B. Dodge, M.E.I.C., Ottawa; Lt.-Col. Alexander Macphail, M.E.I.C., Kingston.

District No. 5: (Three years) R. L. Dobbin, M.E.I.C., Peterborough; C. R. Young, M.E.I.C., Toronto.

District No. 5: (Two years) A. H. Harkness, M.E.I.C., Toronto; Lt. R. H. Parsons, M.E.I.C., Peterboro.

District No. 6: (Three years) H. B. R. Craig, M.E.I.C., Windsor; A. J. Grant, M.E.I.C., St. Catharines.

District No. 6: (One year) A. C. D. Blanchard, M.E.I.C., Niagara Falls; M. E. Brian, A.M.E.I.C., Windsor.

District No. 7: T. R. Deacon, M.E.I.C., Winnipeg; W. M. Scott, M.E.I.C., Winnipeg.

District No. 8: H. S. Carpenter, A.M.E.I.C., Regina; A. R. Greig, M.E.I.C., Saskatoon.

District No. 9: Major H. B. Muckleston, M.E.I.C., Calgary; S. G. Porter, M.E.I.C., Lethbridge.

District No. 10: H. L. Johnston, M.E.I.C., Armstrong; Col. A. W. R. Wilby, A.M.E.I.C., Victoria.

Engineering Remuneration

It is hoped that the final report of *The Institute's* Committee on Classification and Remuneration of Engineers will go before Council at the regular November meeting. Owing to the summer season, and the fact that some of the Branch Executives have not reported, the Committee considered it desirable to postpone this final report to another month. The Branches who have reported, however, are unanimous in the approval of the suggestion of *The Institute's* committee regarding the adoption of Engineering Council's report on Classification and Remuneration of Engineers.

The progress report of the Committee from the Chairman, A. H. Harkness, M.E.I.C., of Toronto, presented to the meeting of Council on October 26th is as follows:—

"In the interim report of your Committee on Remuneration, your attention was called to the action this Committee had taken in requesting the Executive Committee of each Branch of *The Engineering Institute of Canada* to examine the report of the Engineering Council on "Classification and Remuneration of Engineers" and to express an opinion as to the desirability of using this report as the basis of the report of *The Engineering Institute of Canada*. Favorable replies have been received from the Montreal and Toronto Branches, and the Border Cities Branch prefers to leave the question in the hands of the Committee. As the different Branches are again getting active after the summer holidays, more replies should be received in the very near future. You will of course be aware that the Manitoba Branch has already drawn up a schedule of fees to which they have adopted the Classification of the Engineering Council.

It is the intention of the Chairman of your Committee to have a meeting of the Committee in time to have a final report on salaries for the next meeting of the Council.

The Toronto Branch has a large "Fees" committee at work. Its report will be complete within a couple of weeks. By using this as a basis it will probably be possible to include in our report a schedule of fees."

Formation of Moncton Branch

An important step forward in engineering circles in the Maritime Provinces was taken on the evening of Oct. 11th, at a meeting of engineers held in the City Hall, Moncton, N.B., at which a local branch of *The Engineering Institute of Canada* was formed.

The meeting was addressed by Fraser S. Keith, Secretary of *The Engineering Institute of Canada*, who gave a concise amount of the history of *The Institute* from its incorporation in 1887 down to the present day, and remarked on the development of its policy which gave it today the important place it holds in the industrial and economical progress of the country. He impressed upon those present the desirability of taking part in its activities and thus increasing the usefulness of *The Institute* to the local members of the engineering profession and to the public generally.

At the conclusion of the address, bye-laws for the government of the branch were discussed and adopted.

The bye-laws adopted by the new Moncton Branch follow closely the standard Branch bye-laws with the exception that, following the recent movement to give greater scope to Junior Members, a clause was passed giving power to Junior Members to vote and hold all offices with the exception of Branch Chairman.

The following executive committee for the management of the branch was elected:

Chairman — W. A. Duff, M.E.I.C.
Vice-Chairman — J. D. McBeath, M.E.I.C.
Sec.-Treasurer — M. J. Murphy, A.M.E.I.C.
Committee—Reid McManus, A.M.E.I.C., R. G. Gage, J. Edington, M.E.I.C., F. B. Fripp, A.M.E.I.C., S. B. Wass, A.M.E.I.C., H. J. Crudge, A.M.E.I.C.

After the election of officers, Mr. Keith was tendered a hearty vote of thanks for his address. The members thereafter adjourned to the Green Lantern Cafe where supper was served.

Institute Year Book

In the preparation of *The Institute* Year Book it is of the utmost importance that complete and accurate information should be available regarding every member. The Year Book is a standard work of reference and every member owes it as his duty to *The Engineering Institute of Canada* to supply full details regarding his present address and occupation to the secretary. It was the original intention of making a personal appeal by letter, but it was felt that an announcement in *The Journal* would be as effective.

All Members, Associate Members, Juniors and Students, whose position as well as mailing address were not given in the last Year Book, or who have made changes since July 1st, 1919, are urged to write at once to the secretary, giving full information regarding change of position and address, or to fill out the form which will be found in the advertising section of the Journal.

New Honorary Member

Brig.-Gen. Henry Norlande Ruttan, C.M.G., M.E.I.C., was unanimously elected to honorary membership in *The Institute* at a meeting of Council held on October 28th, 1920. His election to honorary membership is a tribute to the high place which General Ruttan occupies in the engineering, military and civic life of the Dominion. General Ruttan was one of the charter members of the Canadian Society of Civil Engineers, his name being included as one of those who constituted the corporate body under the charter granted June 23rd, 1887, of which body he was president in 1910.

Engineering and Physics

The relationship between engineers and physicists received some consideration at the January meeting of *The Engineering Institute of Canada* at Montreal, but no definite policy resulted.

The question is not a simple one, for the domains of physics and engineering only partially overlap. Thus Lord Kelvin might justly have been ranked both as a great physicist and as a capable electrical engineer. On the other hand, it would scarcely be correct to describe as engineers either Newton, Faraday, Rayleigh, Maxwell, Stokes or Rutherford. These are some of the great pioneers in science whose imaginations open new fields of experience and thought which gradually become accessible to engineers with most far reaching applied results.

One effect of the Great War has been to create a greater respect and a closer liaison between physicists and engineers, and this effect is not likely to be transient.

Recently in England nearly all the leading physicists have enrolled themselves in the new Institute of Physics, and a code of professional conduct has been laid down, regulating among other questions that of consultations.

It is an immediate question for physicists in Canada whether they will join the Institute of Physics as individuals, whether they will form a Canadian branch, or whether they would prefer in addition, or as an alternative to join a physics section of *The Engineering Institute of Canada*.

An interesting forward movement has been made in the authorization of a course in Engineering Physics by the Corporation of McGill University. This is a new venture, not merely at McGill, but at any University.

The scheme is an excellent one but it is likely to prove abortive unless the schools of Canada vastly improve their training in mathematics so as to send students to the university capable of availing themselve of such a course, since the requirements for matriculation limp hopelessly behind the required standard. Yet there is no reason why the abler boys of Canada at the age of eighteen should not have a sound knowledge of mechanics, analytical geometry and the calculus, for what is done in Western Europe can be done in Canada.

The new course is a wise blend of honour mathematics and physics in arts with the electrical engineering course in applied science.

When the whole ground is covered, in five years, and a suitable thesis in research work has been presented, the student will have obtained his B.Sc. and his M.Sc. in engineering physics.

Such a man can find an interesting and fairly lucrative career in many lines of work.

Certainly he will be welcomed as a professor in mathematics or physics or electrical engineering in any University in Canada. The importance of well trained professors with a wide outlook can scarcely be overrated. For the greatest asset of Canada today is young Canadians, and that will always be the case.

It is however only too probable that men trained in the new course will be snapped up by the great research laboratories of the famous electrical companies of the United States and elsewhere.

The worst export for Canada is its best brains. The only remedy is a large output of able and well trained men, and sufficient posts to hold the best of them in the Dominion.

Recent developments of radio-work, the wide use of thermionic tubes or valves, or high frequency transmission along existing wires, raise problems which neither the electrical engineer nor the physicist alone can solve. Sometimes it is better to work in double harness, in other cases the combined training in a single man will prove the more effective.

In any case we have to develop the ardent enthusiasm of our young radio amateurs so as to obtain highly trained and no less enthusiastic expert pioneers who will solve the many problems linking engineering and physics.

It is not sufficiently understood by schoolmasters, parents, boys and the public, that an honour course in mathematics and physics (Arts) is a most advantageous opening for a career at the present time.

For the training of a good sound engineer the faculty of applied science is an admirable school. Something more is today needed for those with special gifts. In particular the needs of research work and of research institutes require careful consideration, and I cannot lay down my pen with better grace than by quoting a statement by a leading authority, one of the chief physicists in the United States, who writes, "The difficulty of getting properly qualified research men is as conspicuous in the United States as it is in Canada. Money, apparatus and laboratories are easier to get than men. Almost everybody recognizes this, including men in industries, who have some experience of the methods and results of research. Our council has this problem very seriously in mind and we have some plans under consideration for attempting to capture a large number of promising undergraduates in our universities. It is, however, exceedingly difficult to say whether or not much can be done in this way."

A. S. EVE, D.Sc.

Righteousness versus Religion

Engineers have written over one hundred and fifty thousand books on engineering and allied subjects during the past seventy-five years, but as far as we have any record, no engineer has heretofore dared to become an author in the religious field until a few months ago when C. E. W. Dodwell, M.E.I.C., chairman of the Halifax branch of *The Engineering Institute of Canada*, with a strong courage of his convictions, a well stored mind and a literary pen of a high order, issued his book, "RIGHTEOUSNESS versus RELIGION".

In a signed copy presented to *The Institute* under date of September 28, Mr. Dodwell has inscribed the following:—

> *"Presented by the author to the Library of The Engineering Institute of Canada, less as a specimen of a dangerous and undesirable versatility of genius than as a warning to other members who may be tempted to stray from the terra firma of their legitimate activities into the stormy waters of religious controversy."*

The author's reason for producing this book, is in part explained in the preface as follows:—

> "For many years I have been looking in vain for such a presentation of the case of Righteousness versus Religion as I have here essayed. Had I been successful it is needless to say that I should not have emulated other fools in 'rushing in where angels fear to tread' into the glare and pillory of public criticism.
>
> For many years also, I have been profoundly convinced that we are on the wrong road to our ultimate good; that we have been using not merely inadequate, but wrong, means to the accomplishment of the object of our existence; that nothing will set us and keep us in the right path, short of the gradual, but ultimately complete demolition of the mischievous errors, falsities and debasing superstitions, the ignorance, hypocrisy and narrow-minded bigotry and intolerance that constitute modern dogmatic Christianity, and upon the ruins the establishment of Righteousness based upon Science, Experience, Reason and Common Sense. We must cast away the dogmatic, or religious accretions of Christianity and re-establish it in the Righteousness, Simplicity and Beauty which its founder taught and preached and lived for and died for.
>
> Jesus was 'immeasurably the best ethical teacher that the world has ever known,' but no dogmatist. Contrast the Golden Rule and the Sermon on the Mount, on the one hand, with the Athanasian, the Nicene and the Apostles' creed, on the other!"

In the initial chapter, under the heading of "Religion" Mr. Dodwell expresses his point of view in the quotation, "*Primus In Orbe Deos Fecit Timor*" In the Beginning, Fear created the Gods.

It is not intended to analyze Mr. Dodwell's book at this time, nor to review it to any extent. It is an exceedingly cleverly written and interesting book, revealing to a considerable extent the modern trend of thought as opposed to dogmatic orthodoxy.

As would be naturally expected from an engineer the conclusion is that more works and less faith are the need of mankind at the present time.

Every member of *The Institute* should read this book which is published by The Stratford Company, Boston, Mass. and which can be secured through a local bookseller or by dropping a card to the secretary of *The Institute*.

Livening Society Meetings

Every engineer who has attended engineering-society conventions knows how tiresome they are apt to be. Every society officer who has made up the program of such a meeting knows the difficulty of the job. The former remembers how often the programme is along list of dreary papers presented in an uneasy manner by men unaccustomed to public speaking; the latter is usually bound by the tradition that such a programme is a necessity which he cannot avoid. In the specialist societies, such as those devoted to water-works, testing materials and concrete, long lists of papers are to be expected. They need not be dreary, in fact they rarely are, and the men who deliver them and those who listen are equally expert and equally interested. But in the general societies, particularly the local ones whose members are of all branches of engineering and whose bond of sympathy is the fact that they are all members of the same profession, the problem is different, albeit the solution is generally the same. The consequences are that only a minority of those present are interested in any one paper and that the papers have to be multiplied interminably to offer something to everybody.

The Engineering Institute of Canada seems to have taken a step forward in its so-called "professional meetings" which well may be looked into by other societies. These are held in various parts of the Dominion and are under the direction of the local branch. They attract engineers of every specialty. Instead of trying to present a rounded survey of the state of the art and science of engineering, the program is centered on one or two of the outstanding engineering works of the district, which are made the subject of complete explanatory papers and the scene of actual inspection. At Niagara, for instance, the Welland canal and the Queenston-Chippawa power project, both of such importance that no engineer worthy of the name can afford to be ignorant of their details, were the only subjects discussed outside of a short session devoted to purely professional matters which also had universal appeal. The consequence is that those who attended the meeting learned something about these two great works and at the same time were not bored at any of the sessions. Better everything about something than something about everything.

In addition, the Canadian engineers emphasize the social side of their meetings. To be sure, in the past there have been criticisms that certain of our technical-society meetings are nothing but junkets, which only those with abundant leisure can enjoy. But there is a happy medium which permits the fullest of social intercourse, the necessary mingling of men of a common interest, and at the same time provides enough solid technical matter to justify a busy man spending his time and money. So at Niagara there were luncheons and dinners and smokers—in fact, only at breakfast was the visitor required to seek out food on his own resources. At the end of the three days these engineers knew each other better, which is a requisite of professional interrelation, and they had learned besides some things which were useful in their work.

There is no intention of claiming that only in Canada are these things done, or that there they are always done. But this is a recent instance of a pleasant and profitable society meeting which stands out among the many that it is the duty of a technical editor to attend. Now that the winter season is coming on, with its sectional and state society meetings all over the country, it seems a good time to call the attention of programme makers to the possibilities before them. Let them not be bound down to the tradition of having only dry descriptive papers, but seek out some subjects which will interest everyone and emphasize them. Then if they provide opportunities for the men to get together between sessions, they will find that their members will go home better pleased and more inclined to come again.

(Editorial, Engineering News-Record, Oct. 14, 1920.)

Convention at Halifax

Of eight general professional meetings of *The Institute* three have been held in the Maritime Provinces, showing that the men down by the sea have a full appreciation of the advantage to be gained by such gatherings. The Eighth General Professional Meeting held in Halifax, on October 13th, 14th and 15th, lacked no single feature that has contributed to the success of other professional meetings as far as the results achieved from the good work of the officers of the Branch in conjunction with the St. John Branch, were concerned. Greeted by the most delightful weather imaginable and by an earnest group of Halifax engineers, the visitors from outside the city were made to feel from the time of their arrival that the city and all that appertained thereto, was theirs. One notable feature in connection with the engineers' relations to men in public life, is the fact that it is immediately apparent to a non-resident that members of the engineering profession in the Maritime Provinces are in closer personal contact there with the men in public life than in other Canadian provinces. Following the precedent established by his predecessor, Mayor Schofield of St. John, was in attendance. Mayor Parker, of Halifax, welcomed as giving the freedom of the city to those gathered at the meeting. He placed his automobile and those of the city at the disposal of members, and personally conducted a party to St. Margaret's Bay. Then that good friend of engineers, Lieut.-Governor MacCallum Grant, who referred to President Dodwell, of the Halifax Branch, as the leading citizen of Halifax, not only welcomed the visitors to Nova Scotia, but took a personal interest in the meetings and was present on several occasions. The attendance of one hundred and twenty-five is as large a proportional representation as we have yet had at any professional gathering. The papers read were all interesting and contained much valuable information being on widely divergent subjects illustrating the breadth of interest of the engineers' work.

Eighth General Professional Meeting

Halifax, N.S., October 13th, 14th, 15th

Morning Session, October 13th

C. E. W. Dodwell, M.E.I.C., Chairman of the Halifax Branch of the E.I.C., was in the Chair and opened the Meeting. He stated that His Honour the Lieutenant-Governor and His Worship the Mayor of Halifax were present and had kindly consented to give a word of welcome to the engineers present; Mr. Dodwell eulogized both the Lieut.-Governor and Mayor Parker as being zealous in all good works and in the forefront of all activities that make for the interest and betterment of our citizens.

Continuing Mr. Dodwell stated that *The Engineering Institute of Canada,* founded in 1887, thirty-three and a half years ago, as The Canadian Society of Civil Engineers, with Headquarters at Montreal, had now a membership of four thousand engineers, engaged in developing the country, from the Atlantic to the Pacific, with branches in all the leading centres of population throughout the Dominion. There are now no less than nineteen branches, the nineteenth coming into existence on the 11th instant. These branches are in Halifax, Moncton, St. John, Montreal, Quebec, Ottawa, Kingston, Peterborough, Toronto, Hamilton, Windsor, Niagara Falls, Sault Ste. Marie, Winnipeg, Regina, Calgary, Edmonton, Vancouver and Victoria, and without exception all are doing good work for the development of the country.

On behalf of *The Engineering Institute of Canada* on the whole, and of the Halifax Branch in particular, he extended to His Honour the Lieut.-Governor and His Worship the Mayor of Halifax a cordial and respectful welcome.

His Honour MacCallum Grant, Lieut.-Governor of Nova Scotia, opened his remarks by extending to those Members present who were from out of town a welcome to the City by the Sea, and made some fitting remarks about the City itself. He then replied to some of Mr. Dodwell's remarks. He hoped he could live up to all the things Mr. Dodwell had said about him. In referring to the City itself he said that it was a little at a disadvantage being so far East, but a great deal of money had been spent in developing the town. He made a few brief remarks about the explosion of a few years ago and how it had hindered the city in a great many ways but helped it in others. He also mentioned the fact that nearly $20,000,000 had been spent in the construction of the new ocean terminals. The Lieut.-Governor also said that in all Canada one could not find a better body of men than engineers, nor men who were better informed. He thought we ought to cultivate and know better the engineer. In conclusion Mr. Grant said "I give you all a very warm welcome and if outside of Halifax we have the credit of being 'Blue Noses', we have red blood in our veins and the welcome which I extend to you comes from the heart. I intend to keep this button, which has been given me, as a memento of this meeting this morning."

The Mayor also extended a warm welcome to the engineers present to Halifax. He asked the members present to pay a visit to the North End of the city, to see what has been accomplished in the way of building since the explosion. And for this purpose he offered to put three cars at the disposal of the engineers. He also hoped they would pay a visit to the Hydro-Electric Power Plant at French Village.

After thanking the Lieut.-Governor and the Mayor for their cordial welcome Mr. Dodwell announced that, in order that the engineers could take advantage of the proposed trip to the Halifax Ship Yards, cars had, through the kindness of I. Macnab, M.E.I.C., been arranged for and would be at the Technical College at 2.30 sharp.

R. A. Ross, M.E.I.C., President of the E.I.C., from Montreal, was then asked to give a few remarks. Mr. Ross said this was entirely unexpected and a new item on the programme. He began by making a few amusing remarks about advice which had been given him when coming to this, his first visit, to Halifax. In referring to what engineers had done Mr. Ross said they had certainly developed the cities wonderfully but he would like to see this development spread into the country more. He said that not long ago two thirds of the people were in the country, now two thirds are in the cities. Mr. Ross said he welcomed these meetings, and especially the Professional Meetings; the meetings held recently at Niagara Falls and Banff had been most successful.

F. A. Bowman, M.E.I.C., of Halifax then read a paper by D. W. Robb, M.E.I.C., of Amherst on "The Development of the Steam Engine in the Maritime Provinces," (published in the October *Journal.*)

Following the reading of Mr. Robb's paper, Mr. Dodwell said that the paper was a very interesting and valuable contribution to the literature of the E.I.C. and had a proper place in *The Journal* of the Inst. "Mr. Robb has given us some very interesting facts and figures in regard to his subject and it is very gratifying to know of the development of the Steam Engine in the Maritime Provinces."

Mr. Bowman made some interesting and appropriate remarks and comments on the paper.

Mr. Macnab said he had served an apprenticeship with the Robb Engineering Works and spoke in the highest terms of the engines they had turned out, both as to the high grade of workmanship and the utility of the engines. He said that at the present time the Halifax Tramway Co. had in use two old engines made by these people which they had fixed up and which are now working quite as well as any new engine.

C. H. Wright, M.E.I.C., said that Prof. Nicholson of McGill University had paid a high tribute to the engines of the Robb Engineering Co. which were in use in the Mechanical Department of the College. He said they were pioneers in the development of the steam engine.

Mr. Wright offered a vote of thanks to Mr. Robb for this excellent paper. The vote was seconded by G. G. Murdoch, M.E.I.C., of St. John.

Mr. Dodwell presented the vote of thanks; he suggested that the Secretary of *The Institute* convey to Mr. Robb a vote of thanks.

Mr. Dodwell announced that Fraser S. Keith, the indefatigable Secretary of *The Institute*, from Montreal, was present and asked that Mr. Keith give a few words about the activity of the Central Office and the Branches.

Mr. Keith spoke in very high terms of Halifax. He spoke briefly on the work of the parent Branch of *The Institute* in Montreal and said he considered the work of the outside Branches of great importance. He gave a very interesting account of the recent meetings in Niagara Falls and Banff. Mr. Keith said this was the third Meeting of *The Institute* that he had attended in the Maritime Provinces and he expressed his opinion that these meetings are most valuable in promoting good-fellowship, etc.

Mr. Keith also spoke very forcibly on the salaries paid engineers at the present time and said the newly appointed special Committee on "Classification and Remuneration" was doing everything in its power to bring about a different schedule of salaries for the different grades of engineers. He pointed out that this Committee, and in fact *The Institute* itself, was doing everything possible to help the individual. He hoped everyone in Canada would realize what a splendid organization they had in the E.I.C.

Mr. Ross said that the engineer had always given service first without enough thought to his remuneration. He thought the time was past for this sort of thing and that the engineer must demand more money and a better status, and to gain this they must work together in a body.

A telegram was read from A. Gray, M.E.I.C., of St. John regretting that he would not be able to be present.

Mr. Ross expressed great regret at Mr. Robb not being present. He thought the latter's paper was of historical value to *The Journal*.

W. Rodger, A.M.E.I.C., made a few brief remarks relative to his connection with the steam engine and his experience with the Robb Engine in particular.

The Meeting adjourned at 12.30.

Evening Session, October 13th

In Mr. Dodwell's absence, F. A. Bowman, M.E.I.C., was in the Chair.

Papers were to be read by F. H. Williams, A.M.E.I.C., of Moncton and Frank Vaughan, M.E.I.C., of St. John, but as the papers were on the same subject—"Electric Welding of Iron and Steel"—Mr. Vaughan offered to hold his paper over until Friday morning.

Mr. Williams then read his paper (printed in this issue of *The Journal*), lantern slides being shown in illustration.

In comment on Mr. William's Paper Mr. Bowman said he thought there was no occasion for him to say very much, that the paper spoke for itself and gave forth some most enlightening views on the subject of electric welding of iron and steel. He thought both the paper and the preparation of the slides had meant a tremendous amount of work to get them into such a shape.

Mr. Bowman then extended a hearty vote of thanks to Mr. Williams for his reading of the Paper and showing of the lantern slides.

The Meeting adjourned at 10 o'clock.

Morning Session, October 14th

Mr. Dodwell not being present G. G. Murdoch of St. John was in the Chair and extended a hearty welcome to Mayor Schofield of St. John who was present. Mr. Bowman made some announcements relative to the programme for the day and also that of Friday.

Prof. Sexton then read his paper on "Secondary Education", (printed in this issue of *The Journal*).

In his introductory remarks he explained the meaning of his subject, saying that Secondary Education was the preparation for life, that one might include almost everything in that, except the sermon and admonition of the ministers who prepare us for the next life. Technical Education is preparation for making a living, and "I think you will agree with me," he said, "that this fills up a lot of consideration in this life — we hope it will not in the next".

"You will know what I am talking about in Secondary Education if you know that I am talking about people who work in the skilled and semi-skilled operations, and this education comes above the primary or common school education and prepares one for his job."

Following the reading of Prof. Sexton's paper Mr. Bowman, in a few brief words, expressed his appreciation, and gave an interesting account of the Telephone Company's experience in applying this technical education to their employees, or operators.

Mr. Bowman said he thought, as Prof. Sexton had said, that this was a subject in which engineers should be most deeply interested. He thought that firms and corporations did not take enough interest in the individual employees working under them, and that the only way to obtain satisfactory work was to teach the employees. The Telephone Company had a dummy switch-board on which the operators began their training. After weeks of this training they were taken in groups by a teacher and put on the regular boards and were educated right there.

R. McColl, M.E.I.C., then made a few comments on Prof. Sexton's paper. It gave one a great deal to think about, but it was his opinion that the general public and the Government did not take the matter seriously enough, even though there was a good deal of talk in favour of this technical education. He thought the colleges and schools, generally, had been a failure in a way. Their teaching was too systematic and they had not been teaching the students to think for themselves. Contrary to what Prof. Sexton had said in his paper relative to

"Leaders", Mr. McColl said that there never was there such a dearth of Leaders and never so much need of them.

Mr. Murdoch, on behalf of the Meeting, extended to Prof. Sexton a hearty vote of thanks for his very excellent Paper.

A Paper was then read by H. S. Johnston, A.M.E.I.C., on "The Development of the Sheet Harbour Water Power".

On account of the late hour there was no time for discussion and the Meeting adjurned for lunch.

Luncheon at Commercial Club

Members of the Halifax Branch who were also members of The Commercial Club of Halifax very kindly invited out-of-town members to a luncheon. Following the luncheon R. A. Ross, M.E.I.C., President of *The Engineering Institute of Canada*, was introduced by C. E. W. Dodwell, M.E.I.C., who gave a condensed history of the E.I.C. and the newly created Association of Professional Engineers of Nova Scotia. Mr. Ross gave a very interesting speech on the work of the Administrative Committee in Montreal, of which he is a member. Mr. Ross told of the difficulties accompanying the work, and gave a sketch of the financial arrangements which had been introduced by the Commission, and the efforts to improve the financial standing of the City. He outlined the work of the Charter Commission which is drawing up the formation of government for the city. The proposed Charter will provide for nine elected representatives, from whom the Mayor is to be chosen; the city manager, who will be responsible for all executive work. It is proposed to abolish the present system of wards, and it is hoped that the proposed form of government will be a success. Mr. Ross remarked on the fact that part of Montreal's population wished to have a political regime, and part to have a business regime, and concluded with the quotation that one could do a great deal for the community if it were not for the people in it.

Morning Session, October 15th

In Mr. Dodwell's absence F. A. Bowman, M.E.I.C., was in the Chair.

A Paper was read by C. O. Foss, M.E.I.C., of St. John on "The Progress of Hydro-Electric Development in New Brunswick," (printed in this issue of *The Journal*); this paper was illustrated by Lantern Slides.

Mr. Bowman, in making comment upon the paper, said he was sure the members present had listened with a great deal of interest to the paper which Mr. Foss had read. He said one thing that struck him as most interesting in connection with both papers which had been read on this subject, was the fact that both New Brunswick and Nova Scotia had a very much larger supply of hydraulic power than we ever imagined. And he said that we might consider that we are a great deal better off in water power than we thought.

Rod. McColl, M.E.I.C., said he appreciated Mr. Foss's Paper very much, but he thought it unfortunate that the author had to read such a paper from New Brunswick when he came from Nova Scotia. He thought the Government of Nova Scotia had made a great mistake in letting such a man go to another Province when it would have been to the advantage of the Province to keep a man such as Mr. Foss in it, with his knowledge of the development of water power.

He asked a few questions in regard to the extent of storage, etc., they had for this Water Power, which questions were answered by Mr. Foss.

Mr. Wright thought a chance should be given to discuss Mr. Johnston's paper, which had been read the day before.

Mr. McColl, too, wished to discuss the paper in question but as another paper had to be read at the Morning Session the Acting Chairman thought the time was too limited for this, unfortunate though it was.

Mr. Wright moved that a vote of thanks and an expression of appreciation be given Mr. Johnston for the preparation of his paper and slides, which must have entailed a tremendous amount of thought and labour.

The vote of thanks was seconded by Mr. Murdoch of St. John, who thought the vote of thanks ought to cover both papers which had been read on this subject—The Development of Water Power in both Nova Scotia and New Brunswick.

An excellent paper on "The Electric Welding of Iron and Steel" was then read by Frank Vaughan, M.E.I.C., of St. John, the paper being illustrated by a large number of Lantern Slides.

Mr. Vaughan, before beginning his paper, said he regretted that his paper overlapped with that read by Mr. F. H. Williams a few evenings previous, but he hoped that his paper would give some information that had not already been given.

Mr. Bowman said that when the Meeting started he was sorry that he, as a member of the Papers Committee had let two papers overlap, but that now he was very glad that both papers had been read, that though of the same subject, neither infringed on the other and both gave very excellent and detailed information and a wide conception of this work. He thought that the amount of work expended in getting up papers and slides in this connection showed that it could not be characterized as anything else but a labour of love.

Mr. Ross said he wished to echo everything that Mr. Bowman had said, and more too. He thought the papers did not overlap but were complementary to one-another. He also said that with the two papers published in *The Journal* engineers would have two of the most interesting articles they could possibly have on the subject.

Mr. Ross then asked a few questions in regard to the details of the paper, which were answered by Mr. Vaughan.

Mr. Macnab of the Tramway Company said that the paper appealed to him, especially the practical nature of it, on account of some similar work which he had had to do in connection with his company. As a matter of economy he thought the electric welding business was something that should engage the attention of every man who has anything to do with any kind of mechanical work. He said in their company they could show what electric welding could do in a mechanical plant. He said also that he had been trying to see if he could do anything in the matter of "flats" on cast iron wheels, building them up with this process.

Mr. Vaughan said he thought the building up of car wheels had been used quite extensively by this process. "Of course", he said, "cast iron is pretty hard to build up by any process and it is really a matter of experience. All welding depends entirely on the operator and as the operator acquires the experience he becomes expert. Not being a practical welder myself I am not in a position to tell you myself."

Mr. Hatfield of St. John said he had had some little experience with the process. He said they had welded some of the heavy frames that had broken on their locomotives, but in this case he thought acetylene was used. He said heavy welding was extensively employed even in motor trucks.

Mr. Macnab moved a vote of thanks to Mr. Vaughan for his paper. He said he thought it had shown a great amount of work and thought that Mr. Vaughan was entitled to the thanks of the Meeting for such a splendid paper and for the splendid way in which he had given it.

The vote of thanks was seconded by W. P. Morrison, A.M.E.I.C.

Votes of Thanks

Mr. Murdoch offered the following vote of thanks:

To His Honour Lieutenant-Governor MacCallum Grant,

His Worship Mayor J. S. Parker of Halifax,

His Worship Mayor E. A. Schofield of St. John.

The Nova Scotia Tramways & Power Co., (I. P. Macnab) For cars to shipyards and free transportation on cars to members.

The Halifax Shipyards (Mr. McClurg, general manager) and Mr. D. E. O'Brien, A.M.E.I.C., chief engineer), for the visit to the plant.

The Naval Authorities, for permission to visit His Majesty's Canadian Dockyards and conducting party through submarine, etc.

Dr. F. H. Sexton, Principal of the Nova Scotia Technical College.—use of building and also for his excellent paper on "Secondary Technical Education".

The Maritime Telegraph & Telephone Co., (W. A. Winfield and F. A. Bowman, M.E.I.C.).

Authors of Papers:—

D. W. Robb, M.E.I.C.;
Prof. F. H. Sexton;
F. H. Williams, A.M.E.I.C.;
H. S. Johnston, A.M.E.I.C.;
Frank Vaughan, M.E.I.C.;
C. O. Foss, M.E.I.C.

Nova Scotia Powers Commission (K. H. Smith, M.E.I.C.), trip to St. Margaret's Bay.

Halifax Branch Officers and Committees.

These votes of thanks were seconded by C. C. Kirby of St. John.

R. A. Ross, M.E.I.C., President of the E.I.C., made a few remarks before the closing of the Meeting, chiefly in regard to his first visit to Halifax.

He said he would like to stay in the city for a week or two and just poke around. He said the trip was a treat to him and that he was going away with a very clear idea of what the people here are doing, and hoped that if another Meeting was to be held here next year he would be able to attend.

He thought the Meeting was a very successful one and said "you are going to have a very strong organization down here some of these days and it is going to be a great thing for all of you".

Mr. Bowman, in concluding the Meeting, said that at the first Meeting, two years ago, one hundred names had been registered. At the St. John Meeting a year ago they went a few better than that, and at the present Meeting there were one hundred and twenty-five names on the Register.

As there was nothing further on hand to discuss, Mr. Bowman moved that the Meeting be adjurned.

Banquet

The functions of Friday's session were drawn to a close by a banquet held at the Green Lantern. This was a successful and enjoyable function, with over one hundred present. Among the guests were His Honour Lieutenant Governor Macallum Grant, Mayor Schofield of St. John, Mayor Parker of Halifax, and the Honourable E. H. Armstrong. Following the toast to the King, proposed by Mr. Dodwell, Professor Sexton proposed the health "Our distinguished guests." This toast was responded to by Lieut-Governor Macallum Grant, the Honourable E. H. Armstrong, Commissioner of Public Works, Chairman of the Nova Scotia Power Commission, Mayor Schofield of St. John, and Mayor Parker of Halifax, all of whom welcomed the engineers to Halifax very heartily. The Honourable E. H. Armstrong gave an interesting speech, and spoke on behalf of the provincial government, referring particularly to the Highways system, stating that, as in every sphere of public work the integrity of the engineers in charge of this work was a vital point. The toast to visiting members was proposed by K. H. Smith, M.E.I.C., and replied to by George Hare, M.E.I.C., city engineer of St. John, N.B., Geoffrey Stead, A.M.E.I.C., district engineer of the Public Works Department of Chatham, N.B. The Chairman called upon other members present for a speech, including F. W. W. Doane, M.E.I.C., city engineer, Halifax; H. S. Van Scoyoc, A.M.E.I.C., of Montreal; S. B. Wass, A.M.E.I.C., of Montreal; Mr. McAllum of Montreal, and Fraser S. Keith, Secretary of *The Engineering Institute*. Mr. Keith paid a high tribute to the Maritime Province engineers, especially to C. E. W. Dodwell, Chairman of the Convention meeting, to whom he referred as the father of engineering legislation in Canada.

Eighth General Professional Meeting,—Halifax, N.S., October 13, 14, 15, 1920

REGISTRATION

Allan, J. Lorn, Dartmouth, N.S.
Archibald, E. M., St. John, N.B.
Ashley, Barrington Passage, N.S.
Baker, E. Douglas, Halifax.
Barnes, H. C. R., Dartmouth, N.S.
Bayne, B. E., Moncton, N.B.
Beattie, A. E., Halifax.
Belliveau, J. E., Halifax.
Bethune, R. J., Antigonish.
Black, R. A., Truro, N.S.
Blois, E. B., Halifax.
Boswell, M. L., Halifax.
Bowman, F. A., Halifax.
Bray, J. L., Breton, N.S.
Buchanan, K. N., Halifax.
Cameron, K. G., Sydney, N.S.
Campbell, I. G. W., Truro, N.S.
Chapman, E. W. G., Truro, N.S.
Cooke, L. A., Halifax.
Copp, W. P., Halifax.
Cox, O., Halifax.
Crooks, C. M., Halifax.
Crookshank, A. R., St. John.
Curtis, A. C. R., Chicago.
Dawson, R. L., New Glasgow, N.S.
Dewolfe, Wm. J., Halifax.
Dickson, T. H., Pictou, N.S.
Doane, H. W. L., Halifax.
Dobson, A. L., New Glasgow, N.S.
Dodwell, C. E. W., Halifax.
Donkin, R. T., Halifax.
Doucette, A. L., Halifax.
Dryden, J. G., Moncton, N.B.
Dyer, A. F., Halifax.
Farnham, M.B., Halifax.
Faulkner, F. R., Halifax.
Foss, C. O., St. John.
Freeman, J. R., Halifax.
Freeman, Phil. A., Halifax.
Freeman, R. P., Halifax.
Fripp, C. F. B., Moncton, N.B.
Garnier, L., Halifax.
Goudge, M. F., Halifax.
Grant, Maccallum, Halifax.
Gray, F. W., Halifax.
Handy, E. F., Halifax.
Hayes, J. B., Halifax.
Hayes, St. C., Halifax.
Hayes, W. H., Halifax.
Hare, G. G., St. John.
Hare, W. G., Halifax.
Hatfield, G. N., St. John.
Heckle, G. R., Montreal.
Hunter, Wm. L., Halifax.
Innes, C. W., Halifax.
Jennings, F. P., Halifax.
Johnston, Harold S., Halifax.
Keith, Fraser S., Montreal.
Kerr, F. B., Halifax.
Kirby, C. C., St. John.
Leaver, Chas., Imperoyal, N.S.
Lewis, Chas., Yarmouth.
Lumsden, J. F., Halifax.
Macdonald, A. T., Halifax.
MacKenzie, N. K., Halifax.
Mackenzie, A. J., St. John.
Maclean, H. L., Halifax.
Maclean, M. J., Halifax.
McColl, Rod., Halifax.
MacMillan, M. J., Halifax.
Macnab, Ira P., Halifax.
MacNearney, C. A., Halifax.
Mahon, I. W., Halifax.
Marshall, Geoffrey J., Halifax.
Matheson, W. G., New Glasgow, N.S.
McMinn, G. D., Halifax.
Mechin, F. C., Imperoyal, N.S.
Moore, R. C., Halifax.
Morrison, W. P., Dartmouth, N.S.
Murdoch, Gilbert G., St. John.
Murray, R. R., Halifax.
North, V. E., Halifax.
O'Brien, D. E., Halifax.
O'Brien, F. G., Halifax.
Palmer, F. H., Halifax.
Parker, J. S., Halifax.
Peppard, Hugh, Springhill, N.S.
Picking, S. W., Halifax.
Poole, J. N., Halifax.
Putnam, H. N., Halifax.
Robertson, Chas. R., Halifax.
Rodger, N., Halifax.
Roland, J. W., Halifax.
Ross, R. A., Montreal.
Schofield, E. A., St. John.
Sexton, F. H., Halifax.
Smith, K. H., Halifax.
Spence, W. N., Halifax.
Stairs, Gordon, Halifax.
Stead, Geoffrey, Chatham, N.B.
Stiles, R. D., Halifax.
Stokes, Thos., Halifax.
Sutherland, Alex., Halifax.
Tapley, F. B., Moncton, N.B.
Thorne, E. L., Jr., Halifax.
Thurber, G. S., Chatham, N.B.
Turnbull, A. A., Digby, N.S.
Uniacke, R. F., Ottawa.
Van Scoyoc, H. S., Montreal.
Vaughan, Frank P., Halifax.
Walton, C. R., Halifax.
Wass, S. B., Moncton, N.B.
Wheaton, L. H., Halifax.
Whitman, C. O., Halifax.
Wickwire, D. S., Halifax.
Williams, Fred. H., Moncton, N.B.
Wilson, C. H. J., Halifax.
Wilson, W. R. C., Antigonish, N.S.
Winfield, W. A., Halifax.
Winter, F. H., Halifax.
Wright, C. H., Halifax.

Elections and Transfers

The following elections and transfers were effected at the adjourned meeting of Council held on the 28th September:—

Members

R. G. Gage, B.Sc. (Queen's Univ.) of Moncton, N.B., signal and elec. engr., Can. Nat. Rlys.; Jas. McGowan, (Shaw Street College, Liverpool) of Vancouver, B.C., Supt. engr., C.P.O.S. lines and B.C. Coast service, C.P.R.; J. W. Morris, B.A.Sc. (McGill Univ.) of St. John's, Nfld., Supt., elec. dept., Reid Nfld. Co.

Associate Members

J. G. R. Alison, (Grad. S.P.S.) of Niagara Falls, Ont., Bridge inspector, Hydro-Elec. Power Comm., Niagara Falls; A. M. Bremner, of Prince Rupert, B.C., chief draftsman, office of div. engr., G.T.P. Ry., Prince Rupert; M. T. Cantell, (Tech. Coll. Brighton, Eng.) of Winnipeg, Man., consulting engr., Munic. of Fort Garry; J. H. Clark, of Truro, N.S., senior transitman, Halifax div., C.N.R.; C. L. Foss, of Enniskillen, N.B., res. engr., St. J. & Que. Rly.; J. T. Fullerton, B.Sc., (C.E.) (McGill '14,) with Fullerton & Bell-Irving, civil engrs., Vancouver, B.C.; R. H. Goodchild, B.A.Sc., (McGill Univ.) of Calgary, Alta., with Dom. Govt. making irrigation, inspection and surveys in Sask. and Alta.; F. C. Higgins, B.Sc. (Acadia Univ. '14) of Ottawa, Ont., technical intelligence officer, Can. Air Board; J. A. Jette, B.A.Sc. (C.E., Laval Univ.) of Montreal, Asst. engr., City of Montreal, Water Works dept.; R. A. Kirkpatrick, (McGill Univ.) of Nelson, B.C., senior asst. engr., D. P. W., Kootenay Dist., B.C.; H. M. Lyster, B.Sc. (McGill Univ. '13), salesman and estimating, bldg. materials, H. H. Robertson Co. Ltd., Montreal, Que.; C. A. Macvey, (Univ. of N.B.) of Fredericton, N.B., first asst. engr., Prov. of N.B., D. P. W.; E. B. Martin, B.Sc. (Univ. of N.B. '12) of Moncton, N.B., comm'r. of streets and sewers dept., City of Moncton; R. McManus, B.Sc. (Mass. Inst. of Tech.) of Moncton, N.B., private practice; A. G. Scott, B.Sc. (McGill Univ. '14) of Montreal, Que., structural draftsman, Lockwood, Greene & Co. of Canada, Ltd.; R. L. Waycott, of New Glasgow, N.S., field engr., N.S. Steel & Coal Co.; Jas. Whitelaw, (Heriot Watt Tech. Coll.) of Moncton, N.B., asst. engr. in chief engr's office, C.N.R.; K. O. Whyte, of Montreal, Que., draftsman, Dominion Bridge Co., Montreal.

Juniors

A. F. Belding, (Univ. of N.B.) of Fredericton, N.B., asst. bridge engr., Prov. of N.B.; D. W. J. Brown, of Sydney, N.S., with Dominion Iron & Steel Co. Sydney, N.S. in mech. drafting office; W. H. Chisholm, B.Sc., M.E. (N.S. Tech. Coll.) of Halifax, N.S., with Nor. Elec. Co., Halifax Branch, sales dept.

Transferred from the Class of Associate Member to that of Member.

F. A. Brown, (Glasgow Tech. Coll.) of Auckland, New Zealand, consulting elec. & mech. engr., Northern Coal Co.; W. Dickson, B.Sc. (McGill Univ.) of Montreal, Que., asst. engr., Montreal Water Works dept.

Transferred from the Class of Junior to that of Associate Member.

C. R. McCort, B.A.Sc., (C.E.) (Univ. of Toronto), of Grand Mere, Que., supt. [illegible], Laurentide Co., Grand Mere, Que.

Transferred from the Class of Student to that of Associate Member.

J. G. Caldhaw, of Calgary, Alta., field [illegible] on reclamation work, Comm. of Irrigation, Calgary, Alta.

CORRESPONDENCE

Enquiry re Correspondence Course

Editor, *Journal:*—
Dear Sir:

I would be very glad if you would advise me of the efficiency or otherwise of the structural engineering and other correspondence courses sold by the Wilson Engineering Corporation, Hanover Mass., and if in the opinion of any of our members the courses are worth the money asked for them.

Yours truly,
K. M. Chadwick, A.M.E.I.C.

1534 Elford St.,
Victoria, B.C.
Sept. 27th, 1920.

Editorial Note:—Will members kindly forward the desired information to Mr. Chadwick.

LIBRARY NOTES

The Profession of Engineering

The following list of books and papers by Engineering Council has been compiled in response to requests, especially from parents and vocational advisers of high school boys, for information concerning the principal branches of engineering, the education and training requisite therefor, and the possibilities for making a livelihood therein.

Those works which are followed by a code number may be consulted by the general public in Engineering Societies Library, 29 West 39th Street, New York.

Engineering as a Career—Edited by F. H. Newell and C. E. Drayer—D. VanNostrand Co. 1916. [illegible]. (A collection of papers originally published in the "Cleveland Plain Dealer" and the "Scientific American" on various phases of engineering work.)

Opportunities in Engineering—Charles M. Horton—Harper & Bros. 1920. [illegible].

Engineering as a Career—Robert McCullough—David Williams Co. 1911. 620 M 139 E. (Subject matter based upon a series of addresses given before technical schools and associations of engineer assistants; published for information of parents.)

Engineering as a Career—Percival and A. A. Marshall, P. Marshall & Co., London 1916.

Addresses to Engineering Students — Edited and Published by Waddell and Harrington, Consulting Engineers, Kansas City, Mo., 2nd Edition 1912. 620 W 118 A. (Purpose of book is to give engineering students a broad conception of the profession.)

Engineering as a Profession — Milo S. Ketchum.—Bulletin of University of Colorado, 1916. No. 6. General Series No. 98.

Engineering as a Profession — Dean William G. Raymond, University of Iowa.—University Extension Bulletin No. 3. New Series No. 73, April 11, 1914.

Retraining Canada's Disabled Soldiers

By Walter E. Segsworth, formerly Director of Vocational Training, published by the King's Printers, in 200 pages.

This book describes in a very interesting way the remarkable work that has been done by the Department for Soldier's Civil Re-establishment in Canada. The Dominion has a good record in connection with this work, and great credit is due to the self-sacrificing men who have done so much for our returned soldiers. Among these may be mentioned Professor H. E. T. Haultain, M.E.I.C., whose work in the Toronto district is well known.

The scope of the book is indicated in print from the arrangement. Organization, Work Shops, Interviews, Industrial Reprinting, Industrial Surveys, Medical Aspects, Care of the Blind, Statistics, Costs, and After Care. There are also several very interesting appendices: Statistics to December 31st, 1919, Bibliography, Length of Courses In Other Countries, etc.

Standard Specification of Steel Highway Bridges

Received from Canadian Engineering Standards Association "Standard Specification of Steel Highway Bridges", published by the Association. This Specification is based on that published by *The Engineering Institute* (then The Canadian Society of Civil Engineers) in 1912 and has been brought up to date by a special committee which the chairman is G. H. Duggan, M.E.I.C. The new Specification has been drawn up to agree as far as possible with the Standard Specification of the American Railroad Engineers Association, and the American Society for Testing Materials. Copies may be obtained from Captain R. J. Durley, M.E.I.C., Secretary of the Canadian Engineering Standards Association, Room 112, West Block Parliament Buildings, Ottawa.

OBITUARIES

Ernest George Henderson, M.E.I.C.

Ernest George Henderson, M.E.I.C., president and general manager of the Canadian Salt Company and past-president of the Canadian Manufacturers' association, passed away in the Royal Victoria Hospital, Montreal, on October 13th, following an attack of pneumonia.

Mr. Henderson, who was 62 years of age, underwent an operation, and was doing fairly well, but pneumonia set in and his death resulted.

Mr. Henderson was born in Holywood, County Down, Ireland, on September 14th, 1858, the fourth son of the late Rev. Henry Henderson and S. Jane Henderson. He was educated in Hillbrook School and College, Belfast. Later he became an articled pupil to the engineer of the Belfast and County Down Railway, continuing this work for four years before his appointment to the position of assistant engineer of the Ulster division of the Great Northern Railway of Ireland. In 1883 Mr. Henderson came to Canada and was engaged on surveys and construction work on the main line of the C.P.R., and on re-measurement of certain sections of that railway north of Lake Superior where disputes had arisen between the C.P.R., and some of the contractors. In 1888 he was appointed assistant engineer of the C.P.R. at Toronto and later resident engineer at London. Under Mr. Henderson's direction the C.P.R., line between Windsor and London was constructed. Mr. Henderson left the employ of the C.P.R., in 1893 to superintend the construction of the plant of the Windsor Salt Works which was organized about that time by Sir William Van Horne and his associates. Mr. Henderson became, from the outset, general manager of the company and later was elevated to the presidency.

In spite of his heavy business responsibilities, Mr. Henderson found time to devote a great deal of attention to other interests. For many years he has been active in the affairs of the Canadian Manufacturers' Association and served as president of that body in 1916. At the time of his death he was a member of the C.M.A., executive. Mr. Henderson was for several years a member of the Windsor Board of Education and served as chairman, and was at one time president of the Windsor Board of Trade and later a member of the executive of the Border Chamber of Commerce. As a member of the Essex Health Association, with the late Dr. Smith, former collector of customs, Mr. Henderson shared a large measure of the credit for the construction of the tuberculosis sanatorium at Union-on-the-Lake. He was a delegate to the provincial and general synods of the Anglican church for twenty-five years and a member of the executive committee.

Mr. Henderson was intensely patriotic and devoted to the furtherance of every cause calculated to advance the interests of the British Empire. In the Sportsmen's Patriotic Association and the Soldiers' Aid he gave splendid service. The Children's Aid Society is another organization in which he was deeply interested.

Mr. Henderson was one of the original members of the Canadian Society of Civil Engineers, being elected a Member in January 1887; he was also a Member of the Institution of Civil Engineers of Ireland, the American Society of Mechanical Engineers and of several clubs. In politics he was a prominent Conservative.

At the weekly meeting of the Border Chamber of Commerce on October 14th, reference was made to the passing of Mr. Henderson and the following resolution was carried and placed upon the records of the organization, upon motion of Col. E. S. Wigle and Mayor F. B. Winter:

"Be it resolved at this general meeting that the members of the Border Chamber of Commerce deeply deplore the passing of Mr. E. G. Henderson, one of its oldest, ablest and most energetic members a true patriot, a sterling citizen and a staunch and faithful friend; and that the secretary be instructed to convey our sincerest sympathy to the wife and family of our late friend and fellowworker."

Harold Worsley Ebb Canavan, M.E.I.C.

Harold Worsley Ebb Canavan, M.E.I.C., one of the leading authorities on irrigation in Canada, died of pneumonia at Neihart, Montana, on September 22nd. Mr. Canavan was born in Toronto in 1867, and was a member of St. Andrew's Lodge, A.F. and A.M., and of the Benevolent Protective Order of Elks. For seven months previous to his death, Mr. Canavan was manager of the Flohart Silver Mines, Niehart, Montana. The late Mr. Canavan was educated at the Toronto Collegiate Institute. A civil engineer by profession he was one of the most prominent members of *The Engineering Institute* in Victoria, in which he was elected a Member on Oct. 12th, 1912. He had met with singular success in his chosen vocation. From 1884 to 1893 he was engaged in the Surveys Department of the C.P.R. and the Dominion Government in the Province of Manitoba, and was associated with the International Boundary Commissions in Alaska from 1893 to 1897. He resigned from the Government service in the latter year to enter private practice in Klondyke, Atlin and Alaska until 1904, when he opened a practice in Victoria, being a member of the firm of Canavan and Mitchell until the day of his death. One of his outstanding local achievements was the making of the first and most comprehensive development for the irrigation scheme of Saanich from Elk Lake.

The funeral took place in Victoria under the auspices of St. Andrew's Lodge, No. 49, A.F. and A.M. Mr. Canavan leaves a widow, three sons and three daughters.

Charles LeBaron Miles, M.E.I.C.

Charles LeBaron Miles, M.E.I.C., a well known railway location and construction engineer, died suddenly in Calgary, Alta., on Monday, September 13th-1920, from heart failure due to acute indigestion. He was active in his profession until the last week of his life, which ended practically 50 years of continuous service.

The deceased was born in Magerville, N.B. in 1850, and was descended from the United Empire Loyalist stock of the Miles and Perley families of Connecticut, U.S.A. He was a well known civil engineer, having started in the early days on railway survey work, which took him from New Brunswick to the Crow's Nest Pass, while in the service of the C.P.R.

Just before the Indian outbreak of 1885, Mr. Miles was at Blackfoot Crossing where the party was surrounded by Indians under Chief Crowfoot. Later, Mr. Miles walked from MacLeod to Regina and reported to Ottawa the conditions in the West, being one of the first to herald of the Indian rebellion.

From 1882 to 1885 he worked on the construction of the C.P.R. on the north shore of Lake Superior. He also served on the construction of the C.N.R. and the G.T.P. in New Brunswick and Nova Scotia.

The late Mr. Miles came to Calgary in 1912 and was a remarkably active man, considering his advanced age. He was in the civic service for a time on the construction of the Centre street bridge, and a member of the engineering firm of Hablin and Miles Ltd., at the time of his death.

He is survived by his wife, three sons and two brothers. His sons are: H. R. Miles, M.E.I.C., of Lethbridge, divisional engineer, who is covering his father's old surveys in the Crow's Nest country, E. L. Miles, M.E.I.C., of Toronto, Assistant chief engineer to the Toronto and York Roads Commission, and B. P. Miles, of Lethbridge, formerly an engineer with the G.T.P. Rly., and the C.P.R., and now in the mercantile business.

Mr. Miles possessed a remarkable memory for details in connection with his early experience in railway work, and was well known for his many stories of Western life in the early days. He also had a good supply of Eastern stories, and loved to recite Dr. Drummond's "Habitant" which he learned almost entirely by heart.

Mr. Miles was one of the original charter members of the former Canadian Society of Civil Engineers, having been admitted an Associate Member in 1888 and a Member in 1890.

John Cole Gwillim, M.E.I.C.

John Cole Gwillim, M.E.I.C., died in Kingston on August 19th. Mr. Gwillim's health had been uncertain for a considerable period, improving in the summer when he was exploring mineral lands in British Columbia and failing on his return to duty at Queen's University.

The late Professor Gwillim was born in 1868 at Laver Court, Clifford, Herefordshire, England, and at the age of 13 came to Canada with his parents, settling near Winnipeg. After preparation at St. John's College, Winnipeg, he entered McGill where he took the mining engineering course, and graduated in 1895. Until 1903 he was engaged in the practice of his profession as a mining engineer in the West, part of the time as a member of the Geological Survey. In 1903 he was called to Queen's University where he occupied the chair of mining engineering. In the summers he continued his field work in the West, for a number of years exploring the coal lands of the Canadian Pacific railway, and later the oil fields of Alberta for the same company. His last work in the field, done in 1919, was the exploration of the Peace River oil field. As a scientific explorer he had few equals in Canada and as a teacher he was beloved by his colleagues and students. Mr. Gwillim was elected a member of the Canadian Society of Civil Engineers on January 14th, 1904.

In October, 1900, Prof. Gwillim was married to Miss Jane Birch, Vancouver, B.C. who survives with one daughter.

PERSONALS

Garnet Rankin, S.E.I.C., is at present employed in the City Architect's Department, Toronto, Ontario.

*

Walter P. Copp, A.M.E.I.C., has been appointed Professor of Engineering at Dalhousie University, Halifax, N.S.

*

E. Ian W. Jardine, A.M.E.I.C., formerly of Winnipeg, is now with the Hydro-Electric Power Commission, Toronto, Ont.

*

John H. Curzon Esq., A.M.E.I.C., has recently been appointed to the staff of the University of Toronto as demonstrator.

*

Morris Knowles, M.E.I.C., recently gave an illustrated talk on City Planning to the Chamber of Commerce, London, Ontario.

*

F. W. Townsend, A.M.E.I.C., formerly of Regina, is now with the London & Pacific Petroleum Co., Ltd., at Talara, Peru.

*

H. L. Bunting, A.M.E.I.C., has left for England, and for the present will be resident in Nuneaton, Warwickshire, England.

*

C. Harry Fox, A.M.E.I.C., has been promoted from division engineer, Canadian Pacific Railway, to assistant district engineer, Canadian Pacific Railway, Manitoba division.

*

J. P. Robson Esq., A.M.E.I.C., has recently joined the staff of the Wayagamack Pulp & Paper Company Ltd., Three Rivers, Que.

*

G. F. Layne Esq., Jr.E.I.C., is at present employed in the technical department of Price Bros. & Co., Ltd., at Kenogami, Que.

*

John A. Macdonald, S.E.I.C., formerly at Halifax, N.S., is at present resident in La Paz, Bolivia, in connection with mining work.

*

R. F. Macdonald Esq., A.M.E.I.C., formerly with B. F. Goodrich Co., Akron, Ohio, has joined the staff of Harrington Howard & Ash, in Akron, Ohio.

*

Brigadier-General H. T. Hughes, A.M.E.I.C., is at present in Belgium in connection with the work of the Canadian Battle Exploit Memorials Committee.

*

H. T. Hazen Esq., M.E.I.C., in addition to being engineer of Maintenance of Way, C.N.R., will temporarily perform the duties of chief engineer, C.N.R. at Toronto.

*

G. P. Cole, M.E.I.C., has resigned from the Public Works Department and has accepted an appointment with the Mesopotamian government on irrigation development.

J. P. Anglin, M.E.I.C., addressed the annual meeting of the Royal Architectural Institute of Canada, on October 2nd in Ottawa on "Labour and the Building Construction Industry".

*

Reid McManus, A.M.E.I.C., has been elected a member of the Legislature of New Brunswick, and is the only engineer at present representing the province in its Legislative Assembly.

*

George W. Hudson, formerly with Dominion Foundry & Steel Company, of Hamilton, Ont., has accepted a position as demonstrator in laboratory work at Queen's University, Kingston, Ont.

*

John R. Dunbar, S.E.I.C., formerly with the Geodetic Survey in Nova Scotia has accepted a position with the engineering department of the Canadian Westinghouse Co., Ltd., Hamilton, Ont.

*

Peter Gillespie, M.E.I.C., who for nine years has been Associate Professor in the Department of Applied Mechanics in the Faculty of Applied Science, University of Toronto, has been promoted to the rank of Professor.

*

W. L. Reford Stewart, S.E.I.C., has recently been transferred from Kitchener to Montreal, his present address being c/o Lockwood Greene & Company Ltd., Canadian Consolidated Rubber Company, Guy Street, Montreal.

*

D. G. Calvert, A.M.E.I.C., recently on the engineering staff of Proctor & Gamble Company, Cincinnati, Ohio, has been appointed resident engineer of the construction of the Fort William Paper Company's Plant at Fort William, Ontario.

*

Lieut. J. F. Brett, Jr.E.I.C., who has been employed by the City of Montreal, since his return from overseas in March 1919, as asst. engr. P.W.D. was nominated by the administrative com'n. on Sept. 25th, as designing engr on the Montreal Water Board.

*

J. J. Macdonald, M.E.I.C., has recently been promoted from position of designing engineer to chief engineer of W. Alban Richards & Company Limited, engineers and contractors, London. Mr. Macdonald now has charge of several contracts, including the grain elevator at Bristol, costing $1,000,000.00.

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Brig.-Gen. C. J. Armstrong, C.M.G., C.B., M.E.I.C., has been appointed Hon. President of the Montreal Infantry Association, which was formed at a mass meeting of the infantry officers of the Montreal active militia held recently. At the same meeting Brig.-Gen. G. E. McCuaig, C.M.G., D.S.O., A.M.E.I.C., was appointed President of the association.

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B. L. Barnes, M.E.I.C., of the Can. General Electric Co., Peterborough, has been notified recently that he has been appointed a member of the Committee on Electrical Machinery of the A.I.E.E., for the year beginning August 1st, 1920. This is one of several technical committees formed to promote and coordinate Institute activities in their respective fields, and to recommend standardization and nomenclature to the Standards Committee.

J. A. Heaman, M.E.I.C., has recently been appointed assistant chief engineer, Western Lines, Canadian National Rys., and Grand Trunk Pacific Ry., Winnipeg. Mr. Heaman was born at Memphis, Tenn., was educated at Collegiate Institute, London, Ont., and McGill University, and has been with the Grand Trunk Pacific Rly., and Grand Trunk Rly., since graduation, having risen from resident engineer to his present position of assistant chief engineer of the combined Western Lines.

W. J. Dick, M.E.I.C., published some months ago a pamphlet on "Pulverized Fuel, Its Use and Possibilities", through the Commission of Conservation, Ottawa. The demand for this pamphlet has been very great, and indicates the interest taken in the search for a low price fuel of high efficiency. Mr. Dick, formerly mining engineer to the Commission of Conservation, is a recognized authority on Canada's fuel and power problems, and his research work has gone far towards indicating the methods by which these problems must be solved.

Samuel J. Hungerford, M.E.I.C., has been appointed vice-president, operation and maintenance, of the Canadian National Rys., headquarters at Toronto. Mr. Hungerford was born near Bedford, Que., in 1872, and has been in railway service since 1886. Mr. Hungerford has been successively assistant foreman, general foreman, superintendent of C.P.R. Locomotive Shops, Winnipeg, and in 1910 was appointed superintendent of rolling stock, Canadian Northern Ry., at Winnipeg. In 1918 Mr. Hungerford was appointed general manager of the Eastern Lines, C.N.R., and in December, 1918, assistant vice president, operation, construction and maintenance, Canadian National Rys., Toronto.

Joseph Gaston Legrand, M.E.I.C., has recently been appointed bridge engineer, Western Lines, Canadian National Rys., and Grand Trunk Pacific Ry., Winnipeg. Mr. Legrand was born at Sompuis, Marne, France, in 1861, and held positions both in connection with military engineering work in France and construction of mining plant in Wales. Mr. Legrand has been in Canada since 1891, and has been with the Grand Trunk Pacific Rly., since 1906. During his service with the Grand Trunk Pacific Rly., Mr. Legrand has been responsible for the design of its permanent bridges, stations, locomotive houses, coaling and fuel oil stations, power and heating plant, warehouses and wharves. He is a member of the American Railway Engineering Association.

F. W. W. Doane, M.E.I.C., city engineer, Halifax, N.S., has been appointed a member of a commission of three, to enquire into the Nova Scotia highways situation, of which commission Mr. Justice Mellish is chairman. The commission is empowered to inquire into:

(1) All such acts and transactions as relate to the construction of Federal Aid Roads (so-called) in the Province of Nova Scotia, including (but not so as to restrict the generality of the foregoing), the question of the correctness of the measurements of quantities and the classification of materials actually removed from the Federal Aid Road known as St. Margaret's Bay Road, and from other Federal Aid Roads in said Province.

(2) whether the roads mentioned are [illegible] in cost and whether the extent of the work [illegible] necessary;

(3) the purchase of machinery and other materials acquired by or for the Provincial Highway Board, and to report to the Lieutenant-Governor.

EMPLOYMENT BUREAU

To make this department more valuable it is proposed that in future advertisements of situations vacant should state salary, and give details of requirements.

Situations Vacant

Instrumentman

Instrumentman for two or three months. [illegible] experience advisable. Salary depending upon qualifications; about $6.00 a day, and expenses. Box 166.

Civil Engineer for Railroad Location

Civil Engineer. Of good experience on railroad location and construction. Wanted by a railway company of Quebec to take charge of a locating party in district of Lake St. John and between Chicoutimi and Quebec. Employment of several years for competent man. Salary $250.00 a month. Box 168.

Assistant Engineer for Railroad Location

Assistant Engineer. To take charge of the instrumental work on locating survey of a railroad in district of Lake St. John and Chicoutimi. Salary, $150.00 a month. Box 169.

Railway Draughtsman

Draughtsman for railway office in Montreal. Several years experience necessary. Salary about $175.00 per month. Box 171.

Transitman

Transitman at about $[illegible] per month, and leveller at about $125.00 per month for railway in Quebec. Salary proportionate to experience. Box 172.

Mechanical Draughtsman

Mechanical draughtsman, familiar with machine layout and design, also general maintenance work, preferably with pulp and paper mill experience, for large pulp and paper Company in northern Ontario. Salary $150.00 to $[illegible] per month, depending on experience. Box 175.

Two or three Designing Draughtsmen

Two or three designing draughtsmen for timber and steel construction plant at Niagara Falls. Salary about $[illegible] per month. Box [illegible]

Mechanical Engineer for Pulp and Paper Company

First class mechanical engineer for Pulp and Paper Company in Ontario. Electrical experience desirable. Salary about $5000.00 a year. Box 177.

Salesman

Young man with thorough knowledge of steam power plant equipment wanted as sales engineer. Previous selling experience preferable, applicant should not be over thirty years of age. State experience, education, age, married or single, present occupation. Box 178.

* * *

The Civil Service Commission of Canada hereby give public notice that applications will be received from persons qualified to fill the following positions in the Civil Service of Canada:—

Superintendent, Aircraft Repair Section

1624. A Superintendent for the Aircraft Repair Section, Air Board at Camp Borden, at an initial salary of $2,940 per annum, which will be increased upon recommendation for efficient service at the rate of $180 per annum, until a maximum of $3,300 has been reached. This initial salary will be supplemented by whatever bonus is provided by law.

Duties.—Under direction to lay out and direct the work of overhauling, repairing, assembling, and erecting aeroplanes, seaplanes, and flying boats and to direct the work of making aircraft parts from plans and specifications; to supervise the work of an aircraft repair section whether employed upon construction or repair work; and to perform other related work as required.

Qualifications.—Education equivalent to high school graduation; at least ten years of experience as a carpenter or similar woodworking tradesman; five years of which shall have been in a supervisory capacity; extended experience in the construction, rigging, and repair of aircraft; ability to handle men.

Examination.—Subjects and Weights as follows: Education, Training, and Experience, 4; Oral Interview, if necessary in the opinion of the Commission, 1.

This position was advertised September 2nd, 1920, and is now readvertised.

Situations Wanted

Civil Engineer

A.M.E.I.C., 14 years with Canadian Railway Company, Draftsman, Instrumentman, and Engineer in charge, thorough training in Building Construction and Quantity Surveying, desires position in Eastern Canada. Box 43-P.

Construction Engineer

Construction Engineer, B.Sc., A.M.E.I.C., with 17 years experience on design and detail of bridges and structures, steel and concrete, superintendent and engineer of buildings and public work, desires position, as construction engineer with corporation, or as superintendent with contractors or as designer with consulting engineers. Full particulars of experience and references furnished. Box 44-P.

Reinforced Concrete Design

Reinforced concrete designs and estimates, plans executed. Box 44-P.

Members' Exchange

Transaction Inst. C.E. For Sale

Set transaction Inst. C.E. 1881 to date 12 vols. for sale, are bound, should be worth $100.00 to any member acquiring eng. library. Box 3-A.

For Sale

Transit and level for sale. Box 9-A.

BRANCH NEWS

Montreal Branch

J. L. Busfield, A.M.E.I.C., Secretary-Treasurer.

The following programme has been arranged for the first half of the 1920-21 season.

Oct. 14—"Some Problems of a Consulting Engineer", By T. Kennard Thomson, M.E.I.C.

Oct. 21—"Pipe Casting by the Centrifugal Process", By Andrew F. Macallum, M.E.I.C.

Oct. 28—Moving Pictures.

Nov. 4—"Modern Superheater Practice", By H. B. Oatley.

Nov. 11—"Commercial Air Service in Canada", By H. P. Hamilton.

Nov. 18—"Heating and Ventilation of Paper Machine Rooms", By E. A. Ryan, A.M.E.I.C.

Nov. 25—"Some Financial Aspects of Canadian Forest Resources", By R. O. Sweezey, M.E.I.C.

Dec. 2—"The St. Francis River Water Storage", By A. Duperron, A.M.E.I.C.

Dec. 9—"13,000 Volts Surge Protectors", By Read & Cunha.

Dec. 16—"Overall Thermal Efficiency in Everyday Engineering Practice", By G. P. Cole, M.E.I.C.

Meetings are held every Thursday evening at 8.15 p.m. sharp. Visiting members from out of town who are able to attend any meetings are requested to communicate with any of the members of the Reception Committee, as it is the desire of the Montreal Branch to extend a cordial welcome to members from other Branches.

On October 14th, T. Kennard Thomson, M.E.I.C., gave an address on "Some Problems of a Consulting Engineer". There was a very large audience, in fact so great that a large number of the audience had to stand.

The first part of Dr. Thomson's address was devoted to a discussion on the water power possibilities at Niagara Falls. The five pioneer companies which went into Niagara power, developed about 600,000 horse power at a cost of about 65 million dollars, or about 100 dollars per horse power. The Canadian "Hydro", backed by the Province of Ontario, bought much of this power from the pioneer companies at from nine to ten dollars per horse power, borrowed money by the hundreds of millions, built transmission lines and retailed this power at from 1½c. to 3c. per kilowatt hour, corresponding to $100.00 to $200.00 per horse power. Not having enough power to supply the demand the Hydro commenced the Chippawa Creek development, involving the construction of a canal about 12½ miles long, with a capacity of 10,000 cubic feet per second, giving a head of 300', resulting in an output of something less than 300,000 horse power. If the Hydro had simply extended their intake and corrected the discharge, a head of about 200' could have been obtained at the falls, thereby obtaining two-thirds of the power without the expensive canal construction. The additional 100,000 horse power will cost Ontario from $500.00 to $1000.00 per horse power, as against $100.00 per horse power of the five pioneer companies, and $50.00 per horse power as could be obtained by a dam proposed by Dr. Thomson in the Lower Niagara River, in the rapids at Foster's Flats, some four miles below the falls, taking advantage of the drop of 102 feet in the Niagara River from the base of the falls to Lewiston. The construction of such a dam would involve no serious engineering difficulties and will permit the entire use of the minimum flow of the river, which is about 22,000 cubic feet per second. This will develop two million horse-power at a cost of less than $100,000. The speaker emphasized the present ice troubles in the neighbourhood of Niagara Falls and stated that they would be largely obviated if the proposed dam were constructed.

He illustrated his talk with a number of lantern slides showing various phases of the proposed scheme.

In the second part of his address Dr. Thomson showed a number of slides illustrating the history and growth of the City of New York from the time of the first settlers to the present day, and he discussed methods of improving traffic conditions by building elevated roadways around the water-front and a proposed sextuple tunnel to take the place of the twin highway tunnel under the Hudson River, the construction of which has recently been commenced. He also showed slides illustrating his scheme of reclaiming many square miles of land and diverting the East River.

The second meeting of the season was held on October 21st. at which a paper by A. F. Macallum, M.E.I.C., on "Pipe Casting by the Centrifugal Process" was read by F. W. Hudson, of the National Iron Corporation of Toronto in the absence of the author. The chair was taken by Mr. Combe and a "standing-room-only" audience was present.

After dealing with the history of cast iron pipe manufacture the author stated that the present specifications for cast iron pipe are based on iron having a tensile strength of 19,000 pounds. When higher standards are given under the present foundry practice and mixtures, the pipe is apt to be brittle. On account, however, of new methods being adopted in manufacturing cast iron pipe, consideration is being given to the revision of the specifications to meet these new conditions. This new pipe, developed by de Lavaud, a French engineer, is now being manufactured and introduced in this country, after exhaustive tests with the ordinary standard cast iron pipe. The new type of pipe involves the application of the principle of centrifugal force to molten metal when poured into a permanent mould. A regulated quantity of molten metal is introduced into a revolving water-cooled cylindrical mould, whereby the centrifugal force exerted the molten metal is spread uniformly upon the inner surface of the mould. Within a few seconds the pipe is withdrawn from the mould at a red heat. The pipe is brittle after leaving the mould on account of the outer surface being chilled, but after passing through an annealing furnace it becomes tough and much stronger than ordinary cast iron pipe. It also has a decided contrast in structure to pipe cast in sand moulds and has not the segregation of impurities often found in sand cast pipe. As a consequence the pipe is a homogeneous, dense, fine-grained iron throughout, having no water or gas bubbles, and has a very high tensile, cross-bending and resistance to shock values. It can therefore be made very much thinner than the sand moulded pipe, for example, a 12 ft. length of 6 in. pipe weighs 280 lbs. as compared with 430 lbs. for a sand cast pipe of the same diameter. The author also dealt with a number of other advantages of this process of manufacturing pipes, and the method was well illustrated by means of a moving picture film specially prepared for the purpose.

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At the formation of "Electrical Co-operative Association of the Province of Quebec" held in Montreal, the following members of the Montreal branch were elected to the executive of the new Association:—

President, K. B. Thornton, A.M.E.I.C., Montreal Public Service Corporation; Vice-Presidents:—J. B. Woodyat, A.M.E.I.C., Dr. L. A. Herdt, M.E.I.C., Consulting Engineers:—J. M. Robertson, M.E.I.C., DeGaspe Beaubien, A.M.E.I.C.

The new Association plans to unite the interests of the manufacturer, the contractor-dealer, the jobber, and the central station.

Kingston Branch

W. P. Wilgar, M.E.I.C., Secretary-Treasurer

The annual meeting of the Kingston Branch of *The Engineering Institute* was held in Carruthers Hall, on Thursday, October 14th., Colonel Macphail in the chair.

After the presentation of the financial report the following officers were elected:—

Chairman: J. M. Campbell, M.E.I.C.

Vice-Chairman: Alexander Macphail, M.E.I.C.

Secretary-Treasurer: W. P. Wilgar, M.E.I.C.

Branch Executive: Chairman, Vice-chairman, Secretary and A. L. Clark, A.E.I.C.

Committee on Policy: Chairman, Vice-chairman, Secretary, L. M. Arkley, M.E.I.C., D. W. Munn, A.M.E.I.C.

Committee on Remuneration: Chairman, Vice-chairman, Secretary, W. L. Malcolm, M.E.I.C., D. W. Munn, A.M.E.I.C.

Committee on Meetings and Papers: Convenor: D. S. Ellis, A.M.E.I.C.; Secretary: A. Jackson, A.M.E.I.C.; Members: A. L. Clark, A.E.I.C., L. T. Rutledge, A.M.E.I.C.

The following were elected Affiliates of the Kingston Branch:— T. F. Twiss, Royal Military College, Kingston Ont.; F. H. Day, Royal Military College, Kingston, Ont.

The first professional meeting of the Branch will be held in Carruthers Hall, on Tuesday, November 2nd, and future meetings on the first and third Tuesdays of the month.

The committee on Meetings and Papers has in hand the preparation of a programme for November and December,—lectures on technical subjects of interest to the different branches of the profession.

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Professor D. S. Ellis, A.M.E.I.C., has designed and installed several important additions to the Hydraulic Laboratory at Queen's.

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T. S. Scott, M.E.I.C., has a contract on the provincial highway construction at Brockville, Ont.

Peterborough Branch

R. L. Dobbin, M.E.I.C., Secretary-Treasurer.

The opening meeting of the Peterborough Branch was held in the Board of Trade Rooms, on Thursday, October 14th, 1920. R. H. Parsons, M.E.I.C., City Engineer and Chairman of the Branch presided.

The Speaker of the evening was Hon. W. A. McLean, M.E.I.C., Deputy Minister of Highways for Ontario, who described the provincial highway system to the large audience present. By means of motion pictures and lantern slides the making of various types of roads and pavements was shown in detail.

Mr. McLean was accompanied by George Hogarth, M.E.I.C., chief engineer of the Highways Department, who also addressed the meeting.

Among those present were the reeves of the surrounding townships, the warden of the County, and the mayor of the City.

Before the meeting, the guests were entertained at a supper in the Empress Hotel Grill Room by the members of the Branch. Mr. McLean, in a short speech told of the interest he felt in the affairs of *The Institute*, and complimented the local Branch on the progress since its inception a year ago.

Henry Holgate, M.E.I.C., who is making a report on the water power situation on the Trent watershed, was also present, and congratulated the Branch on its active appearance.

Toronto Branch

H. A. Goldman, A.M.E.I.C., Secretary-Treasurer.

At a meeting of the Executive Committee of the Toronto Branch, held on September 30th, a resolution was adopted to appoint a Membership Committee to inaugurate a campaign to raise the membership of the Branch to at least five hundred.

The following members were appointed to the Membership Committee:— Messrs. W. E. M. Bonn, A.M.E.I.C., A. E. K. Bunnell, A.M.E.I.C., H. J. Caldwell, C. D. Dean, A.M.E.I.C., T. U. Fairlie, A.M.E.I.C., F. B. Goedike, A.M.E.I.C., E. A. Gibson, A.M.E.I.C., W. J. Smither, A.M.E.I.C., E. M. Proctor, A.M.E.I.C., R. B. Young, A.M.E.I.C., J. Jack, A.M.E.I.C., A. B. Jupp, A.M.E.I.C., M. A. Stewart, A.M.E.I.C., Geo. Phelps, A.M.E.I.C., I. H. Nevitt, M.E.I.C., J. M. Oxley, A.M.E.I.C., O. H. Shenstone, Jr.E.I.C., E. Dean Wilkes, A.M.E.I.C. Mr. J. M. Oxley to convene the first meeting.

The Committee has the power to increase its membership.

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The Opening Meeting of the Toronto Branch was held at the Engineers' Club on Thursday, October 7th, 1920 at 8.15 P.M. The Chairman, R. O. Wynne-Roberts, M.E.I.C., presided.

Mr. Wynne-Roberts delivered an excellent address on the work that *The Institute* could and should do. He outlined ten questions on policy which should form the ground work for discussion at the meeting on October 14th, when the whole evening will be given up to a discussion of the policy for the E.I.C. He urged all members to assist in the canvass for new members. The aim is to bring the membership up to 500. The number at present stands at 330.

Mr. Wynne-Roberts lamented the fact that many engineers are remaining outside of any organization. Special emphasis was placed by the Chairman upon the necessity of *The Engineering Institute* participating more actively in matters pertaining to public welfare, municipal improvement and the development of Canada's natural resources. In connection with this phase, Mr. Wynne-Roberts suggested for discussion the advisability of securing men of acknowledged prominence to address *The Institute* upon such matters as labor questions and economic subjects.

The speaker referred to the duty of engineers to bring all parties together in cases of dispute between Capital and Labor, in so far as engineers are the middlemen. "Our meetings should be forums of public discussion," stated Mr. Wynne-Roberts.

In outlining a policy for the future discussion of the local Branch members, the Chairman suggested that the annual dues be doubled. If adequate funds are not forthcoming, it is the opinion of the Chairman that the activities of *The Institute* will suffer curtailment. He hopes that the members will feel the necessity of dealing with this matter in conjunction with the canvass for new members.

Various other matters of policy dealing with organization details were outlined in the Chairman's address. Brief reference was made to the proposed annual convention in Toronto next February.

A regular meeting of the Branch was held at the Engineers' Club on Thursday, October 14th, 1920 at 8.15 P.M. R. O. Wynne-Roberts, M.E.I.C., presided.

After Mr. Wynne-Roberts called the attention of the meeting to the fact that A. F. Stewart, M.E.I.C., is being transferred from Toronto to Moncton, the following resolution was carried:—Moved by C. H. Rust, M.E.I.C., seconded by H. K. Wicksteed, M.E.I.C., "That the Secretary be instructed to convey to Mr. Stewart the appreciation and thanks of the Branch for the activities and useful work performed by Mr. Stewart while a member of this Branch, and also express the regrets of the Branch for his removal to another city, and wishing him success in his new field of activity."

Mr. Wynne-Roberts then outlined his ten points on the policy of *The Engineering Institute of Canada*:

1. To what extent should *The Institute's* policy be revised with regard to the economic welfare of its members? In other words, what can *The Institute* best do to protect its members in the matter of adequate remuneration?

2. Should the members of *The Institute* be divided into different grades? If grades are desirable, are the present titles sufficiently expressive to indicate what they mean?

3. Should all members resident in Canada be attached to branches, regardless of location of residence?

4. Should *The Institute's* future policy be to grant home rule to the Provinces and to the Branches with reference to local business, and thus relieve the council of some of its work?

5. Should the Branches constitute the starting-point in all matters relating to business and to the nomination and election of all representatives? In other words, should the Branches be the nursery and training school, and service thereat be an essential qualification for election to all offices?

6. Should our annual dues be doubled so as to enable *The Institute* in all its ramifications to carry on aggressive work more effectively and on a larger scale?

7. Should other recognized technical societies be encouraged to affiliate with *The Institute* so as to have one great Canadian organization, representative of all classes of professional engineers, and, if so, how is this desirable consummation to be attained? Also, what is necessary to be done to induce absentee engineers to join?

8. Should *The Institute* take a more prominent part in the conservation of Canadian resources and in the promotion of engineering enterprises?

9. Should *The Institute* persistently urge upon the government and other public bodies the importance of appointing one or more engineers on commissions or investigations concerning matters relating to engineering?

10. Should *The Institute* adopt a policy of participating in work which has for its object the improvement of the country's social fabric?

A lively discussion followed in which a large number of members took part. Debate on question 1 was postponed and debate centred chiefly around questions 2, 4, 7 and 10. The opinion of the meeting was in favour of changing the present grades of membership in *The Institute*, alternative suggestions being made. A greater measure of home-rule for Branches was also favoured. In connection with question 10 the following resolution was moved by T. L. Crossley, A.M.E.I.C., seconded by Geo. Phelps, A.M.E.I.C., and carried: "That a committee be formed whose functions be to report from time to time on subjects dealing with Social Service, Education, Public Utilities, and other matters of community or national welfare, to keep in touch with movements along these lines and to inform the members on occasion [illegible] of matters pertaining to these subjects whenever occasion may call for it."

The following members were appointed to this Committee: Messrs. Bradley, Barnell, Carson, Phelps and Crossley; Mr. Crossley to convene the first meeting.

Niagara Peninsula Branch

Rex P. Johnson, A.M.E.I.C., Secretary-Treasurer.

The first meeting of the Branch Executive for this season was held on Oct. 14th. The most important feature of the meeting was the determined stand taken by the Committee in regard to *The Institute's* work in connection with salaries.

The Chairman of the Remuneration Committee of *The Institute* has asked the Branch Executive to act as a committee of the Branch on this subject and advise his committee of the findings and opinions of the Niagara Peninsular Branch.

The Executive determined to immediately study this matter as individuals and hold a special meeting at as early a date as possible. The Secretary was instructed to secure for each member of the Executive certain published data on classifications and salaries of engineers and this has been sent for. Upon the receipt of this, a week's time is to be given for study before the special meeting is held. By the time the November *Journal* appears the committee will have completed their investigations and members will be advised of the result at the first opportunity.

In connection with salaries the subject of "Policy of *The Institute*" is also to receive the attention of the Executive and it is expected that some concrete proposals will be set forth for the consideration of *The Institute's* Committee on Policy.

The executive feel that these two matters, "Remuneration" and "Policy" are the most important phases of activity upon which *The Institute* should centre its energy. It is realized that Legislation for the Province of Ontario is going to take a long time to secure and there are some doubts as to its benefits when it is secured.

This, then, leaves "Salaries" as the channel offering the greatest prospect of an improved condition of the engineering profession in the community. The temper of the Executive Committee of the Niagara Branch on this subject is not mild in any sense and a determination has been made in a very positive manner to throw the whole weight of our influence into getting something done and done soon.

Border Cities Branch

J. E. Porter, A.M.E.I.C., Secretary-Treasurer.

The regular monthly meeting of the Border Cities Branch was held in the Auditorium of the Chamber of Commerce, Windsor, Ont., Oct. 1st.

M. E. Brian, A.M.E.I.C., gave the members a brief account of the Ontario Professional Meeting at Niagara.

H. Thorne, M.E.I.C., reported the progress of the Membership Committee and J. J. Newman, M.E.I.C. that of the Town-Planning Committee since last meeting.

A. J. Stevens, M.E.I.C., addressed the meeting, giving an interesting description of the navigable waterways of Western Canada. He prefaced his address by a brief historical sketch from the discovery of the Hudson Bay to more recent dates. Mr. Stevens then described the various water routes and navigable channels.

A large portion of the address was devoted to a description of the movable dam and lock for navigation in the Red River at the foot of St. Andrews Rapids Lockport, Manitoba, reference being made to local conditions determining its location and its economic necessity. The dam is of the camera type, first used on the River Seine, France, and not previously used in America. The lock and dam have fully met all expectations and proven a great benefit to the city of Winnipeg.

Many photographs and illustrations were used to illuminate the address.

At the conclusion mention was made of the many engineers employed in the design of various parts and the execution of the contract work.

A hearty vote of thanks was moved to Mr. Stevens by J. C. Keith, A.M.E.I.C., seconded by G. F. Porter, M.E.I.C.

D. A. Molitor, M.E.I.C., then gave notice of motion, after considerable discussion, that at the next regular meeting he would move to have the bye-laws of the Branch, Sec. 8, Paragraph 1, changed so as to read "Ordinary Meetings shall be held on the second Friday of every month from October 1st to 31st, inclusive or on other days as the executive Committee may determine."

Winnipeg Branch

Geo. L. Guy, M.E.I.C., Secretary-Treasurer.

A special meeting was held on the 7th. September to hear the report of the Salary Committee. The Committee, which has been working on the matter during the summer months, presented a very full and complete report. The report included a complete classification of the various branches of engineering activities in the Province, together with minimum salary for each position.

The report divided engineering work into two main classifications: professional and sub-professional, each of these classes being further sub-divided and the minimum salary being allocated to each class. The report was very thoroughly discussed and was adopted by the meeting with practically no amendments.

The meeting was one of the largest ever held and there was no doubt of the attitude of the members on this matter and their full sympathy and approval with the finding of the Salary Committee.

The first general meeting of *The Institute* was held on the 16th. September, when the Hon. A. B. Hudson, Attorney General of the Province, read a paper before the Branch on "Popular Forms of Government". The paper was listened to with great interest by the members present and a long and interesting discussion took place, indicating the interest the members felt in this subject.

Mr. Hudson traced the forms of government from ancient history down to the present date, with a brief forecast of what might be in the future and, taking as his example the two most well known forms of government, namely, the British and American, discussed the differences and the advantages and disadvantages of the systems.

The business of the meeting included the appointing of a Remuneration Committee, with instructions to carry out the report of the Salary Committee.

The Paper Committee have this year secured a complete series of papers for presentation at the meetings of the Branch and an interesting and successful session is to be anticipated.

On 12th. October the members of the Branch extended a complimentary Smoker to the students of the Engineering Faculty of the Manitoba University. The Smoker was very well attended, the students being in strong evidence. The concert included a large number of musical items, together with chorus singing, which was enthusiastically entered into by the students.

Saskatchewan Branch

J. N. de Stein, M.E.I.C., Secretary-Treasurer.

The Saskatchewan Branch began the season 1920-21 under very favorable auspices with a regular meeting on October 14th, at which Capt. E. A. Baker, M.C., Croix de Guerre, was a guest of the Branch. Captain Baker is General Secretary of the Canadian National Institute for the Blind and in charge of the Federal Government Department caring for blinded soldiers.

After the monthly dinner of the Branch, the business meeting was called to order, presided over, in the absence of Chairman Prof. A. R. Greig, M.E.I.C., and Vice-Chairman W. R. Warren, M.E.I.C., by D. A. R. McCannel, A.M.E.I.C., a member of the Branch Executive.

A number of important questions were discussed: legislation, participation at the program of sessional meetings in connection with the Annual Meeting of *The Institute* in February 1921, salary schedule and fees for engineers in private practice, etc.

At the conclusion of the business session a paper was read by C. W. Dill, M.E.I.C., superintendent of highways for the Provincial Government on "Present and Future Road Development in Saskatchewan". This is the first of a series of papers arranged by the Branch, taking up questions of public interest. In view of the Federal Road Grant for Saskatchewan, amounting to about $1,800,000, making a total expenditure in the Province of about $4,500,000 in order to gain the Federal grant, this is rather an important question. The extensive discussion following the excellent paper, demonstrated the general interest of the members.

* * *

R. C. F. Chown, A.M.E.I.C., engineer of construction for the Saskatchewan Government, hopes to return to England for the practice of his profession.

Lt.-Colonel A. C. Garner, M.E.I.C., chief surveyor Land Titles Office, Regina, returned from a lengthy exploration trip into Northern Saskatchewan.

J. Marshall, A.M.E.I.C., is resident engineer for the Town of Gravelbourg on construction of sewer and water supply.

F. H. Small, A.M.E.I.C., formerly with the Dept. of Highways, Regina, is superintendent of construction with the I. U. McManus Co., of Moose Jaw.

C. F. Wilkins, A.M.E.I.C., formerly resident engineer with the Parsons Engineering Company of Regina, has been appointed building inspector for the C.P.Ry. in Southern Saskatchewan.

The Association of Professional Engineers of Nova Scotia

The first regular general meeting of the Association of Professional Engineers of Nova Scotia, was held in the Technical College, Halifax, October 14th, 1920, commencing at 2.30 P.M., with an attendance of thirty-five.

The President of the Provisional Council, C. E. W. Dodwell, M.E.I.C., then opened the meeting with a few well chosen remarks. He sketched the history of the formation of the Association from the inception of the idea up to the present time. This movement, he stated, had started in Canada thirty.four years ago. In 1887 a General Committee of the Canadian Society of Civil Engineers met in Montreal, and later a Committee was formed in Nova Scotia of which only two are now alive, Mr. Matheson and himself.

At this time an Act respecting the Engineering Profession became law in the Province of Quebec, but met with defeat in the Province of Nova Scotia. About two years ago the matter was again brought up at the Annual Meeting of *The Engineering Institute* in Montreal, and each province was asked to send to Montreal a delegate to form a Central Committee to prepare a uniform Bill for introduction to all the Legislatures of the Dominion.

This Committee met in Montreal in April 1919 and he, (Mr. Dodwell), had been selected by the Nova Scotia engineers to represent them. The Committee held three sessions, working very hard, and as a result drafted a Bill which with some few amendments to suit local conditions had been presented to the Nova Scotia Legislature. This Bill with some further amendments made in the Legislature became law on the 22nd of May 1920.

The successful passage of the Bill, Mr. Dodwell attributed to two facts viz that it was introduced by Mr. Daniels the Attorney General, and the fact that D. H. McDougall, M.E.I.C., consented to act as Vice-President. (Mr. Dodwell was very modest in not mentioning his own efforts, which undoubtedly aided materially in obtaining a successful result.)

Mr. Dodwell stated that in fifteen states of the United States Engineering Acts had been passed, and that Great Britain also was becoming very much interested in Engineering Legislation.

The financial statement was then read by the Secretary, Mr. Morrison. It was received and adopted. The Secretary also stated that from a list of 330 engineers which he had compiled that 216 applications for membership had been received, and that 187 had been approved.

The Bye-Laws were then taken up clause by clause and with a few amendments were adopted on motion of Mr. Winfield, seconded by J. L. Allan, M.E.I.C.

It was decided to issue Convention Stamps with the Bye-Laws and not have any more copies printed until after the next meeting when further amendments might be made.

J. L. Allan, M.E.I.C., and K. H. Smith, M.E.I.C., were appointed auditors.

The Scrutineers report was then received with the following results:

President: C. E. W. Dodwell, M.E.I.C.

Councillors: Prof. F. H. Sexton, W. P. Morrison, M.E.I.C., Prof. Faulkner, M.E.I.C., K. H. Smith, M.E.I.C., I. P. Macnab, M.E.I.C., J. W. Roland, M.E.I.C., A. F. Dyler, A.M.E.I.C., F. A. Bowman, M.E.I.C.

The above list constituted the eight members of Council which were elected by the members by ballot.

The members selected by the Governor in Council were as follows: J. L. Allan, M.E.I.C., T. J. Brown, M.E.I.C., W. G. Matthewson, M.E.I.C., C. M. Odell, M.E.I.C., D. W. Robb, M.E.I.C., L. H. Wheaton, A.M.E.I.C.

It was moved by F. W. W. Doane, M.E.I.C., seconded by P. A. Freeman, M.E.I.C., and carried unanimously that D. H. MacDougall, M.E.I.C., be Vice-President.

The President in his closing remarks said that he hoped that the Association would be able to show that the Legislature had not made a mistake and that the Engineering Association would be fully worthy of being deemed a regular profession.

Moved by F. A. Bowman, M.E.I.C., seconded and carried that the meeting adjourn to come together again at the Annual Meeting to be held in Halifax on the third Thursday of January, at such time and place as may be fixed and determined by Council in accordance with clause one of the Bye-Laws.

Members of Council for 1920

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*For 1920 †For 1920-21 ‡For 1920-21-22

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Preliminary Notice

of Applications for Admission and for Transfer

[illegible] October, 1929

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, they should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in November, 1929.

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:— [illegible]

[illegible] (that of Canada in particular), Arithmetic, Geometry Euclid (Books I.-IV. and VI.), Trigonometry, Algebra [illegible]

[illegible]

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

[illegible]

[illegible]

DALKIN—GEORGE ROBERT, of Montreal, Que. Born at Co. Durham, England, Dec. 4th, 1889; Educ., Technical College, Darlington, England. Assoc. Member Inst. Mech. Engrs., England; 1905-10, ap'ticeship as mech. engr., Teasdale Bros. Ltd., Darlington, England; 1910-11, dftsman with above firm; 1911-12, on mech. staff of Cleveland & Durham Electric Power Co., on design & lay-out of electric power stations; 1912-16, on staff of City Engr., Edmonton, 1912-14, chief drftsman on underground constrn., 1914-16, office asst. in charge of underground constrn.; 1916, sapper, Can. Engrs.; 1916-18, Imperial Munitions Board, Engr'g. Dept.; 1918 to date, with Jardine & Co., Montreal, on design and lay-out of mach. for wooden ships, and other marine and mech. engr'g. work. Now junior member of firm.

References: F. B. Brown, R. J. Gibb, R. J. Durley, A. W. Haddow, J. B. Briggs, J. M. Begg.

DAVIDSON—ROBERT CHEVES, of Prince George, B.C. Born at Longside, Aberdeenshire, Scotland; Dec. 11th 1886; 1902-06, evening school, 1902-07, ap'ticeship with Burgh Surveyor, Water Engineer and Sanitary Inspector, Peterhead, Scotland; 1907-12, with N. T. C. Rly., as rodman, on location and constrn., instr'man on constrn., and dftsman; 1912-13, instr'man on constrn., G.T.P. Rly., B.C.; 1914-19, overseas with Railway Constrn. Corps., and 327th Siege Bty., R.G.A., Lieut. when discharged; 1919 to date, instr'man, on constrn., G.T.P. Rly.

References: H. J. Mackenzie, A. M. Macgillivray, L. C. Jacobs, J. A. Heaman, M. A. Burbank, W. S. Fetherstonhaugh.

DOULL—GEORGE ROY, of Moncton, N.B. Born at New Glasgow, N.S., Jan. 26th, 1891; Educ., I.C.S. course in structural engr'g., 2 yrs. night school, structural and machine design; 1909-13, with Wm. P. McNeil & Co., (Maritime Bridge Co.), New Glasgow, designing and detailing; 1913-14, with N.S. Car Works Ltd., Halifax, N.S., designing and estimating; 1914-16, with Can. Govt. Rlys., at Halifax Ocean Terminals, designing and detailing; 1916 to date, engr., designing and detailing bridges, bldgs., wharves, etc., C. N. Rlys., Moncton, N.B.

References: C. B. Brown, W. A. Duff, F. B. Fripp, R. M. Emmerson, J. McGregor, F. I. C. Goodman, F. B. Tapley.

EASTWOOD—JOHN HUBERT, of Peterboro, Ont. Born at Pickering, Ont., May 17th, 1895; Educ., B.A.Sc., University of Toronto, 1916; 1912 (5 mos.) Toronto Power Co., survey; 1913 (3 mos.), rodman Trent Canal; 1915 (3 mos.), with Speight & Van Nostrand; 1915-19, Lieut. and Capt., C.E.F.; Feb. 1920 to date, Asst. engr., Morrow & Beatty, Ltd., Peterboro, Ont.

References: H. L. Trotter, J.McD. Gilchrist, W. B. Crombie, E. V. Moore.

FAIRHURST—THURSTAN WILLIAM, of Vancouver, B.C. Born at Manchester, England, April 27th, 1889; Educ., 4 yrs. ap'tice course Univ. of Manchester, England; 1st Class College of Preceptors; 1904-09, ap'tice to Crossley Bros. Ltd., Manchester; 1909-12, representing above firm in Ireland and Canada; 1912-14, with same firm in India, in charge of business and uncompleted contracts: Prior to War engaged largely in utilization of refuse fuels in gas production. Responsible for successful adaptation of rice husk to this purpose; 1914, enlisted as Sapper in Royal Engineers, promoted to Capt. and served to end of war, in charge of install'n of filtration and pumping stations in Egypt and Palestine; At present with Messrs. Vancouver Machinery Depot Ltd., Vancouver, B.C. as Sales Engineers, concerned with mech. forestry equipment, hydraulic contracts, etc.

References: G. A. Walkem, A. D. Creer, J. S. Connell, C. E. Cartwright, H. K. Dutcher.

FREW—JAMES FORREST, of Vancouver, B.C. Born at Larkhall, Scotland, Dec. 20th, 1879; Educ., 1903-05, 2 yrs. Glasgow University Eng. Classes, A.M.I.C.E. London, England; 1897-1902, ap'tice to Messrs. Wharrie & Colledge, Engrs. Glasgow; 1902-03, asst. on dock and railway work with above firm; 1905-07, with Strain & Robertson, Engrs., Glasgow, on design of Nitrate of Soda Plants and design & constrn. of steam plants; 1907-08, asst. engr. at constrn. of plant, Canadian Portland Cement Co., Port Colborne, Ont.; 1908-09, res. engr. Sec. 2, Trent Canal; 1909-11, private practice, Vancouver, B.C.; 1911-15, managing director of P. E. Harris Co. Ltd., Vancouver, B.C.; 1915-17, with above firm making shells; 1918 to date, Consulting Mechanical Engineer, Vancouver, B.C.

References: H. P. Archibald, J. B. Holdcroft, J. Muirhead, P. P. Brown, R. G. Swan, C. Brakenridge, D. Cameron, T. E. Price.

GARVIE—ROBERT ANDREW, of Saskatoon, Sask. Born at Owen Sound, Ont., Nov. 24th, 1887; Educ., 2 yrs. C. E. course, School of Mining, Kingston, 1 yr. C.E. course, University of Saskatchewan; 5 yrs. with Murphy and Underwood, Consulting Engineers, Saskatoon, employed as follows, one year in charge of field work, surveying, dfting and levelling, 3 yrs., town res. engr., Assiniboia, Sask., one year, town res. engr., The Pas, Man.; At present, 4th year student, civil engineering, University of Saskatchewan.

References: A. A. Murphy, J. E. Underwood, C. J. MacKenzie, A. R. Greig, K. P. Johnston, R. W. E. Loucks.

HARRISON—JAMES ARTHUR, of Dartmouth, N.S. Born at Dartmouth, N.S., Mar. 31st, 1899; Educ., 3 yrs. Engr'g. Course, Dalhousie University; 5 months asst. in engr'g. dept. Nova Scotia Constrn. Co. Ltd.; At present instructor and asst. in engr'g. dept. Dalhousie University.

References: A. F. Dyer, J. N. Finlayson, J. L. Allan, W. P. Copp, R. A. Spencer, W. P. Morrison.

HENDERSON—HENRY BANKS, of Winnipeg, Man. Born at Brooklyn, N.Y., U.S.A.; Educ., B.S., Brooklyn Polytechnic, 1892, M.E.; 1894, M.M.E. 1895, Cornell University; 1895-96, with Brooklyn Rapid Transit Co.; 1896-1904, not engaged in engr'g. work; 1904-10, sec. treas., Riverside Foundry & Machine Works, designing machinery, etc.; 1911-12, western manager, Chapman & Walker of Toronto, Install'n. of pumping and lighting plants, etc., (Firm now out of business); 1913, travelling; 1914, cost investigation of Empire Elevator, Fort William; 1915 to date, sec. treas., Cowin Fee, Ltd., Winnipeg, vice-pres., Cowin & Co., Inc., Minneapolis, structural engrs. in reinforced concrete. Designing concrete bldgs. bridges etc.

References: J. Cowin, D. A. Ross, J. H. Puntin, H. Edwards, T. B. Campbell, E. V. Caton.

HODGSON—WALTER SIDNEY, of Peterboro, Ont. Born at Brooklyn, N.Y., U.S.A., April 5th, 1882; Educ., Peterboro Collegiate Institute, American School of Corr., Civil Engr'g.; 1905-07, rodman on mtce., C.P.R.; 1907-09, instr'man City of Port Arthur; 1909-12, instr'man and transitman on mtce., C.P.R.; 1912-13, dftsman and res. engr. on constrn., C.P.R., Winnipeg; 1913, entered business; 1916-17, C.E.F., 2nd Tramway Co., later Sgt., Can. Engrs., in charge surveys and track work. Wounded Nov. 1917; At present in production dept., Can. Gen'l. Electric Co., Peterboro, Ont.

References: C. R. Crysdale, L. M. Jones, A. Richardson, P. L. Allison, C. E. Sisson.

HOOLIHAN—HARRISON DOUGLAS, Jr., of Ottawa, Ont. Born at Chelsea, Que., July 10th, 1895; Educ., Collegiate Institute and private tuition; 1912-14 and 1916, rodman, dftsman and leveller, Ottawa Water Works Dept.; 1915, with N.Y. Central Rly., Niagara Falls; 1916-17, asst. pitometer operator; 1917-18, with R.A.F.; 1919-20, pitometer operator, Ottawa Water Works Dept.

References: W. F. McK. Bryce, F. C. Askwith, A. F. Macallum, R. Henham, C. V. Putman.

JOHNSON—JAMES ALBERT, of St. Catharines, Ont. Born at Chicago, Ill., Sept. 19th, 1878, 1892-1900, cost work, Western Electric Co., Chicago, Ill.; 1900-04, asst. chief cost acct., Fairbanks-Morse Mfg. Co., Beloit, Wis.; 1904-10, asst. to supt. Beloit Iron Works; 1910-18, efficiency engr., C.G.E. Co., Peterboro, Ont.; 1918 to date, supt., Can. Crocker Wheeler Co. Ltd., St. Catharines, Ont.

References: B. L. Barns, R. W. Leonard, C. E. Sisson, G. R. Langley, W. P. Near.

JONES—ALAN HERBERT, of Moncton, N.B. Born at Liverpool, England, Feb. 16th, 1884; 1900-03, dftsman, car shops, England; 1903-05, dftsman, Jewett Car Co., Newark, Ohio; 1905-06, dftsman, Brooklyn Rapid Transit Co.; 1906-08, dftsman, New York Central Rly., New York City; 1908-11, with Delaware & Hudson Co., at Scranton, Pa., on surveying and mapping in office and field, and in Montreal in charge of right of way matters; 1911-15, with C.P.R., at Montreal in chief engr's. office on yard and terminal plans, and at Trenton, Ont., as instr'man on constrn.; 1915-17, with C.N. Rlys., res. engr., dist. No. 4, New Glasgow, N.S.; 1917 to date, with C.N. Rlys. as asst. engr. in office of chief engr., Moncton, N.B.

References: C. B. Brown, Jr. F. D. Anthony, J. D. Evans, J. M. R. Fairbairn, J. W. Orrock, J. S. O'Dwyer, R. C. F. Alexander, W. A. Duff, C. C. Kirby.

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References: C. R. Young, P. Gillespie, T. R. Loudon, M. A. Stewart, G. G. Powell.

McNEIL—MICHAEL JAMES, of East Wabana, Nfld. Born at Glace Bay, N.S., March 18th, 1873; Educ., Mines Manager Cert., from govt. night school; 1909-13, overman, Dominion Coal Co., at Caledonia and Waterford Mines; 1913-19, underground manager, No. 2 mines, Wabana Iron Mines, Dominion Iron & Steel Co.; Feb. 1919 to date, asst. mgr. at Wabana Mine, for Dominion Iron & Steel Co.

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WILLIAMS—GUY MORRIS, of Saskatoon, Sask. Born at Crete, Neb., U.S.A., Jan. 12th, 1888; Educ., B.Sc. (C.E.), Nebraska University; 1911 to Sept. 1920, with U.S. Bureau of Standards, Washington, D.C., In charge of cement and concrete investigations in laboratory and field, and in charge of constrn. of several reinforced concrete bldgs. erected by Bureau; At present Junior Professor in Civil Engineering, University of Saskatchewan, Saskatoon.

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WOLFF—AAGE OSCAR, of Brownville Jct., Me. Born at Copenhagen, Denmark, May 14th, 1888; Educ., Diploma in Railroad Engr'g., I.C.S., 1914; 1908-13, Rodman and transitman, C.P.R., Montreal; 1913-15, asst. engr. in charge of office work, District Engr's. Office, C.P.R., Montreal; 1915 to date, div'n. engr., with same company in charge of mtce. work.

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WOODWARD—ERIC RAYMOND, of Montreal, Que. Born at Liverpool, England, Dec. 28th, 1892; Educ., 3rd year student, App. Sc., McGill University; 1911-12, survey party, constrn., Algoma Central Rly., Franz, Ont.; 1912-14, on prelim. survey and constrn., Pacific Great Eastern Rly., B.C., July to Aug. 1914, instr'man; 1916-17, Lieut., Can. Engrs.

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YOUNG—ERNEST JAMES, of Mount Dennis, Ont. Born at Sherbrooke, Que., Jan. 29th, 1883; Educ., Collegiate Institute, North Bay, Ont., I.C.S. (Mech. & Elect.); 1900-03, constrn. and operation of electric power and transmission line and hydro-elec. plant, Sault Ste. Marie, Ont.; Chief operator, Michigan Lake Superior Power Co., Sault Ste. Marie, Ont.; 1908-12, electrical engr., Temiskaming & Northern Ontario Rly., in charge all electrical work; 1912-14, chief elec. engr., N.T.C. Rly. in full charge design and install'n. of power plants etc.; 1914-19, with Can. Engrs., joined as sapper, promoted to Major, twice wounded, awarded M.C.; March 1920 to date, engr. in charge, service dept., Super Cement Ltd., Mount Dennis, Ont.

References: D. A. Evans, J. Murphy, S. B. Clement, D. G. Kilburn, E. W. Reed-Lewis, C. S. L. Hertzberg, F. M. Dawson, J. L. H. Bogart, D. S. Ellis.

FOR TRANSFER FROM THE CLASS OF ASSOCIATE MEMBER TO THAT OF MEMBER

CAMERON—KENNETH MacKENZIE, of Ottawa, Ont. Born at Strathroy, Ont., Nov. 1st, 1880; Educ. Grad. R.M.C., 1901, M.Sc., McGill University, 1903; 1903-04, inspecting and office engr., Canadian Niagara Power Co.; 1904-06, lecturer in surveying and time observer, McGill University; 1906-07, instr'man., Pennsylvania R.R., North River Tunnels, New York; 1907, inspecting engineer, Bar Harbour & Union River Power Co.; 1908, res. engr. for Ambursen Hydraulic Constrn. Co., and engr. with Smith, Kerry & Chace, Toronto; 1908-11, prin. Asst. engr., Public Works of Canada, London, Ont.; 1911-12, asst. engr., Sherbrooke, Que.; 1912-18, supervising engr. dredging branch; 1918 to date, asst. chief engr., Dept. of Public Works of Canada.

References: A. R. Dufresne, A. St. Laurent, W. P. Anderson, E. Brydone-Jack, H. B. R. Craig, J. M. Wilson.

DILLABOUGH—JAMES VIDAL, of Drumheller, Alta. Born at Dundela, Ont., April 29th, 1880; Educ., B.Sc. (C.E.), Queen's University, 1904. D.L.S. 1910; 1904-05, Surveyor General's Staff, Dept. of Interior; 1905-07, transitman, N.T.C. Rly.; 1907-11, N.T.C. Rly., res. engr. in charge of constrn., Transcona Terminals, Red. River Bridge and high level entrance into City of Winnipeg; 1911-16, office engr., in charge of design, Hudson Bay Rly.; 1917-18, Major and Chief Engr., 6th Bn. Can. Railway Troops; 1918-19, asst. dist. engr., Can. Nat. Rlys., Western District; 1919 to date, div'n. engr., in charge of additions and betterments in the Drumheller Coal Area, Can. Nat. Rlys.

References: J. Armstrong, W. Burns, J. G. Legrand, N. B. MacTaggart, J. W. Porter.

FOR TRANSFER FROM THE CLASS OF JUNIOR TO A HIGHER GRADE

SPROULE—GORDON ST. GEORGE, of St. Lambert, Que. Born at Montreal, Que., April 23rd, 1885; Educ., B.Sc., (Mining), McGill University, 1908; 1904-06, worked under Mr. C. B. Smith; 1907, practical work in Nelson Lead Smelter; 1908-09, Research Fellow and Demonstrator, McGill University; 1910-14, wheel inspector, and asst. engr. of tests, C.P.R.; 1914-16, engr. of tests, C.P.R.; 1916-18, asst. inspector of steel, Imperial Ministry of Munitions; 1918 to date, Lecturer in Metallurgy, McGill University.

References: A. Stansfield, J. B. Porter, H. M. MacKay, H. W. B. Swabey, H. H. Vaughan, W. H. Winterrowd, S. B. Clement.

FOR TRANSFER FROM THE CLASS OF STUDENT TO A HIGHER GRADE

BETOURNAY—JOSEPH NOE, of St. Lambert, Que. Born at St. Lambert, Que., Jan. 24th, 1898; Educ., B.Sc., McGill University, 1920; Summer 1916, dfting office, Dom. Bridge Co.; Summer 1917, dfting office, Armstrong & Whitworth & Co.; 1918 to 19, Lieut., R. A. F.; 1920, engr'g. dept., Brompton Pulp & Paper Co.; At present in Engr'g. Dept., Laurentide Pulp & Paper Co.

References: H. M. Mackay, F. O. White, R. deL. French, H. M. Lamb, J. A. Dickinson.

HAWKINS—STANLEY HORACE, M.C., of Calgary, Alta. Born at Shrewsbury, England, March 14th, 1886; 1902-05, articled pupil to W. B. Chancellor, City Engineer, Litchfield, England; 1905-07, dftsman, transitman, N.T.C. Rly.; 1907-14, res. engr., N.T.C. Rly.; 1914-19, overseas with Can. Infantry and Can. Engrs., latterly as Capt. and Adjutant of 10th Bn., C.E.; At present in charge of field party on irrigation surveys under F. H. Peters, Calgary, Alta.

References: A. E. Doucet, W. P. Wilgar, A. L. Ford, G. Grant, A. Ferguson, J. H. Holliday, A. Dick, F. A. McGivern.

MITCHELL—HUMFREY GEORGE, of Winnipeg, Man. Born at Miniota, Man., Oct. 1st, 1894; B.Sc. (Elec. Engr'g.), University of Manitoba, 1920; 1913 (5 mos.), rodman on location survey, G.T.P. Rly.; 1914 (3 mos), elect'l. constrn., Manitoba Rolling Mills, Selkirk, Man.; 1916-19, overseas; 1919 (June to Sept.), asst. operator, 1st substation, City of Winnipeg Light & Power Dept.; May 1920 to date, engr'g. staff, City of Winnipeg Light & Power Dept.;

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Railway Construction with the Royal Engineers in Palestine

Bridging the Suez Canal, building the Desert Railway, difficulties in maintenance, fighting the Turks, commercial possibilities of the Desert Railway.

Lt.-Col. G. A. B[illegible], M.E.I.C.

Read at the Western Professional Meeting, Banff, B.C., August, 1920

You will all remember in the spring of 1915 the wonderful attack that the Turk made on the Suez Canal. They came down from Palestine and brought their transport and field artillery one hundred and fifty miles across the Sinai Desert. It was a most wonderful feat and it awoke the British to the danger of attack from that quarter.

The British troops were held on the West bank of the Suez Canal. The Suez Canal runs North and South, and not East and West as is generally supposed. When the Turks got to the Suez Canal after marching across the Sinai Desert they were exhausted. They had no water, as there was no water on the Sinai Desert that human beings could drink, and they were "all in". The British did not cross to attack them, but the Turks made an attack on the British across the Canal. Some of them managed to get across by swimming. They had a few collapsible boats they had brought with them, which they launched, and they actually launched a mine in the Bitter Lakes, which mine damaged a ship. This part of the campaign was not a credit to the British Army; in fact a high official sent out from England sarcastically asked the General in charge whether he was defending the Suez Canal or whether the Suez Canal was defending him.

Bridging the Suez Canal

The bridge to cross the Suez Canal was put in by the Egyptian State Railways. In peace time, before the War, to take care of the heavier rolling stock and heavier traffic the Egyptian State Railways found it necessary to replace a number of their iron bridges. They had three bridges up in the Soudan, which they used to bridge the Canal. Two piers were built in the Canal an equal distance from each bank, and two of the spans were used as fixed spans and formed the shore part of the bridge. The third span was the longest and was a swing span. One end of it was pivoted on the concrete pier on the West side of the bank, and the other end was permanently carried by means of a floating pontoon equipped with hydraulic jacks to raise and lower the bridge a slight amount. The bridge stayed open all day, or when traffic was passing through the Canal. The railway was allowed so many hours at night to pass their traffic across the bridge. When the time came the span was swung around into place and lowered from the ponton on the east pier. When the operation of transferring from the east to the west bank, or vice versa, was finished the end of the bridge was jacked up once more, the pontoon taking the weight, and it was swung open. This was feasible because there is practically no tide in the Mediterranean, the extreme being one foot or perhaps eighteen inches.

The Desert Railway

A new defense scheme was decided on, and it was resolved to run light railways out into the Desert, and to make the advance posts fifteen miles from the Canal. About six or eight of these railways were constructed, starting from various points along the canal, from Port Said to Suez. They were two foot gauge, with the track in sections on steel sleepers, the whole being laid down in sixteen foot lengths. These, however, did not prove very satisfactory. They found that they could not transport large forces of men and provisions on railways of that kind. Their usefulness is extremely limited, and about one year after the attack it was decided to build a standard gauge railway 40 kilometres, or roughly 25 miles, out into the Desert.

Kartara, which was forty kilometers from Port Said, was chosen as the point to start the railway. This place is at the end of the caravan route, over which route from time immemorial armies from Egypt have gone out to attack Palestine, and armies from Palestine have come down to attack Egypt. It runs near the sea coast, and is undoubtedly the very path that Joseph and Mary with the infant Jesus went over on their flight into Egypt. The Sinai Desert is the desert where Moses and the children of Israel are reputed to have wandered for forty years, and the only way to cross the Desert is by the route above mentioned, which follows the sea. Not that the sea helps any, because an immense sand dune has been washed up by the Mediterranean, but under certain circumstances transport might be brought along in boats.

Construction Methods

In the construction of the railway we did not follow the English method but used what we call the American construction. We had 75 lb. steel rails, standard sleepers made of fir, jarrah wood, or in fact anything that was available at various times. Some of the sleepers were hardwood and were hewed, but the most of them were sawn. The rails for the first section of the line came from the States, but eventually a rolling mill was started in India and the last material all came from there. We used bearing plates under each rail, we broke joints, and we built the railway in every way equal to the best American practice.

Owing to the unlimited space which we had we were able to adopt one standard frog for the whole system — a No. 7. When we first started out we had a few eights and one or two tens, but these were afterwards taken up and nothing but No. 7 frogs used. I dare say that this is the first time on record where a railway has been built, all sidings and yards put in, with only one style of frog.

We got our railway material landed at Port Said or Alexandria. At Alexandria or Port Said if it came from America, and at Suez if it came from India. If it was landed at Alexandria it was hauled by the Egyptian State Railway and unloaded on the west bank. If it was landed at Port Said or Suez it was put into lighters and brought up to Kantara, where we unloaded it. Eventually we built our own docks and unloaded all this material right at the site of Kantara.

Rolling Stock

Our rolling stock consisted firstly of locomotives which were built in England fifty years ago; to be more exact in 1868, which the Egyptian State Railway found much too light for their ordinary traffic, and which they practically scrapped. These were stored at the back of the round-houses when the War broke out and they were resurrected, overhauled in the shops in Cairo, and delivered to us to operate the military railway. The trucks were old trucks, also requisitioned from the Egyptian State Railway, but what we called stiff-legged stock — no bolsters, and very hard on the track. These were supplemented later by four wheeled coal wagons built in England, and with this stock the campaign was conducted. Later on a few more Baldwin locomotives were got from the Egyptian State Railway, and some more freight locomotives from the London & Northwestern, but these were not very satisfactory. You can imagine that with this class of stock on a new railway over a desert derailments would be frequent.

Labour

The entire railway was built with hand labour. There was not a mechanical appliance on the job. The labor was done by Ascaries, who are natives who have served their time in the Egyptian Army and have been transferred to the reserve. After their transfer to the reserve they are still liable to serve a year, and they were called up for the particular purpose of working on the construction of the railway. Besides these to do the rough work we eventually enlisted 56,000 of the fellahin. These however were not for railway purposes alone, but were to do the general work required in a campaign of this kind, such as handling the army supplies, doing the sanitary work, cleaning camps, etc.

The Ascaries, whom we used principally in building the railway, are very fine men. They were divided into gangs under their native officers, and one, two or three gangs, as the case might be, worked on a shift. The skilled work was either done or supervised by a company of the Royal Engineers. There were actually two companies on construction, each consisting of 240 sappers. These men did the spiking, bolting up, and the skilled work generally required in the construction of a railway, while the Ascaries carried the rails, the sleepers, did the earth work, and generally all the rough labor. These men used a basket and what is called a fass. A fass is something between a hoe and a mattock. It has a wide mouth and the basket is put between the feet and the sand raked into it with the fass. One man will fill baskets for twelve or fifteen men, and it is incredible what a lot of work they will do in this way.

We worked double shifts; that is one railway company worked eight hours, when the other took over, and we built roughly a mile a day. The material was all loaded on railway trucks down in the Canal, in units consisting of a complete quarter of a mile of track; that is enough sleepers, rail, spikes, bearing plates, etc. to lay a complete quarter of a mile. When the construction gang went out in the morning they took two of these with them, and their day's work was completed when these had been unloaded and put in the track.

Difficulties with Sand

In the Sinai Desert it very seldom rains, and for one hundred and fifty miles we never had a culvert or a bridge except at the Wadi El Arish or "Ancient River of Egypt". The line was not ballasted except with sand, and while sand makes a very excellent bed it has its disadvantages. In the Spring we get a hot wind from the South for three days at a time, and this wind is so strong that the particles of sand are carried and they actually flail you. To go against the wind you have to hold up your hand to protect your face. During that time the sand drifts like snow. It would fill up the cuts, and not only that but it would undermine the sleepers, so that when the storm was over you would find your cuts half filled and your banks had blown away. That, fortunately, only happened during the months of January, February, March and April.

Coping with Sand Difficulty

There grows on the Sinai Desert a shrub called Camel Thorn. This shrub is very much like our sage brush. We used to send out gangs to scour the desert and to gather this camel thorn, which was brought in by means of camels to the side of the railway. We made hedges of this by sticking the ends of the shrub in the sand. The hedges would be in three or four successive rows, starting from the tops of the banks alongside the cuts and continuing outward. On the slopes or fills we started a row about a foot below the top of the bank, and if the fill was high enough we continued rows right down the bank, three feet apart.

We found that this was very effective to take care of the individual storm which was blowing at that time, but sand is not like snow, and if you allow it to pile up, the result is that you just raise your bank a little and then the sand drifts into the cut as badly as ever.

Another trouble was that this shrub used to dry out rapidly after it was planted, and the sparks from the locomotive set it on fire and it burnt up.

As I said, sand is not like snow. You cannot let your cuts fill up and trust to the Spring to thaw them out. After each storm we went into the cuts and shovelled them well back; that is we removed the sand from the sleepers for about five feet from each end. This gave us some such way to take care of the sand storm. To do this on the line between Kantara and Rafa, which is 150 miles, we had 3,000 men of the Egyptian Labor Corps.

That will be one of the problems in the commercial operation of the line, how they are going to keep it clear of sand. The sand on the desert shifts all the time. The slightest wind blows it and there are some parts of the desert where the sand is extra fine, where it is impossible to keep it clear. A branch of the railway ran four miles down to the sea, to a general hospital. Eventually as the campaign progressed this hospital was taken out and moved further up the line, but the track was left there for the Winter. In the Spring when we went to remove the steel we found that the sand had filled the cuts in some places so that the telegraph wires were completely covered. No snow plow is any good to handle this. A street sweeper or something of this kind might do the work. There was a suggestion to rig up a tank car and spray the sides of the fills with a mixture of water and cement, and thus stop the sand from blowing and the ties undermining. We had no facilities for trying that experiment, however, but undoubtedly it will be tried some time.

Although the original idea was only to run the railway out to Pelusium it was finally decided, after the attack of Romani, to run right across the Desert. Some companies of the Royal Engineers were brought out from England, and they were amalgamated and formed into what was called the Railway Operating Division of the Royal Engineers. They took over after the construction parties and operated the railway.

When I joined the Royal Engineers I told them that I was a Mechanical Engineer, presuming that they would put me in the mechanical department, but that is not the British Army's way, and they gave me charge firstly of the maintenance of the railway — a Civil Engineer's job — then charge of the construction of a portion of the double tracking, constructing of the yards, etc. Eventually we double tracked the line.

The operation of the railway was a hard proposition. No water could be got for our locomotives and we had to rig up water tanks and haul the water across the Desert for the locomotives, for the working parties out ahead, and for 10,000 troops out ahead of the working parties acting as a screen together with their camels, etc. The water was got from the Sweet Water Canal after it had been chlorinated and purified by the water companies of the Royal Engineers. Eventually they ran a 10" and 12" lap welded steel pipe across the Desert. This was absolutely necessary for the operation but did not help in the construction very much.

We had fights at various places along the line where the Turks made a stand. The first was at Romani, the second at El Arish, the third at Rafa, the fourth at Gaza, and the fifth and final one seven miles north of Jerusalem.

Floods

The work started in January 1916, and we were about a year and a half getting to Rafa — 135 miles. When we got to Rafa the character of the country changed. Instead of sand we got clay, and instead of absolute dryness we got torrential rains between November and May.

This country is not timbered, as there is no timber in Palestine or Syria. The rain that falls in the Judean hills all goes down around the end of the Dead Sea and into the Mediterranean through the Wadi Ghuzza near Gaza.

As it was impossible to get steel for bridges, and as the railway had to be pushed forward, instead of building permanent bridges we made deviations and went through the bottoms of the wadis. When we saw a heavy rain, or what was practically a cloud burst, we looked out for trouble. We got out first trouble about the first of November, when the troops were pretty well forward. I was stationed in Kantara at the time. I had resident engineers at various parts of the line, and I got word from Gaza, from my engineer there, that the river was in flood and was running four to six feet over the track. We had anticipated something like this and we put a watchman on the East bank with a telephone. His duty was to walk across to the other bank and back every half hour. He started across one night on dry sleepers, but before he got within a hundred yards of the other shore the water had started to come up, and he had to run, and before he was safely to the bank there was water over the track. It was impossible to actually do anything when the flood was on but prepare for its subsidence. We gathered huge bodies of laborers on either side of the wadi with sand bags, which they filled, and as the water started to go down we followed it out. The track was buried in debris of all kinds — dead camels, dead Turks, artillery trucks, telephone reels, mud, hay, etc. etc. The natives carried this all away with their hands, eventually picking up the track bodily with their hands, instead of using jacks, and packing underneath with sand bags. They worked in the water, rolling up their "gharabies", and as they wear no shoes or stockings this work was not a hardship on them.

Eventually we got the whole line lifted and packed except for a space in the center, where the water was still roaring through like a mill race. We built here a culvert consisting of twelve 75 lb. 36 foot steel rails laid on sleepers and sand bags on each end for about twelve feet, leaving a 12 foot sluice in the center. We then worked a construction train across, and while it looked as if it would derail every minute, and the track sank and squirted water up into the engineer's face, by going dead slow we got across safely. We then picked up the low places and ordered a freight train which was waiting at the end, forward. We got a pusher engine on the back of this, and by going dead slow managed to work this train across. Between trains we would better our track and eventually would get it into shape for fast running once more. The first train that went through wakened the Engineer in Gaza and he came out of his tent to see what was the matter. He had not figured on getting a train through for a week, and this particular train was got through in just over twenty-four hours. This could not have been handled in this way except for the fact that we had plenty of labor. Until we got the bridge finished on the 16th of February we had this trouble, and I think we must have used a quarter of a million sand bags there, at roughly a shilling each.

Our next trouble was the cotton soil. When we had the rain there was a portion of the track from Ascalon to Lydda that would almost entirely disappear. To look at it you would not know a track was there. Although the country was full of sand we could not spare the personnel or the equipment at that time to operate ballast trains. as we had to feed about 300,000 troops at the front. We therefore let the line sink, cleaning the mud off the top of the rails as best we could, until we thought it was absolutely dangerous, and then we would pick it up.

The country through there is all old Biblical country. We ran a spur out to Beer Sheba, which is where Abraham and Sarah lived and is the first place mentioned in Genesis. We ran through Gaza, which was where Samson carried away the pillars of the temple, and Delilah is reputed to have come from about six miles away, at a place also on the line.

The old crusaders used Ascalon as their headquarters. From there they marched up and down the coast and from it attacked Jerusalem. Lydda is where St. George, the patron saint of England, is supposed to be buried. The burial place is now a mosque.

To go back to the campaign and leave the railway for awhile.

Fighting the Turks

We fought at Romani, which is twenty-five miles from Kantara. We again fought at El Arish, which is about two-thirds across the Sinai Desert; we fought at Rafa, which is on the border of Asia Minor; and for five months we lay holding a line from Beer Sheba, through Gaza, and down to the Mediterranean. We attacked once here and were repulsed. Eventually however we defeated the Turks severely here and they retreated to a line seven miles north of Jerusalem and seven miles north of Jaffa on the coast. They held the line from the Mediterranean to the Jordan River, right across the Judean hills. The Germans had when they retreated destroyed the railway going up to Jerusalem. They had started also to build a railway down to Gaza to meet us, but they did not get it completed as far as that. We took this line and eventually took the Jerusalem line, but we could make very little use of it as it was metre gauge with very light rails. We eventually standardized it. The British held the line from North of Jerusalem to the Red Sea from about Christmas 1917 until the final advance in September 1918, when they drove back and absolutely wiped out the Turkish army.

Rebuilding Narrow Gauge Lines

During the period mentioned we extended our line through the cotton soil up to Lydda, where we met the French railway — a metre gauge — running from Jaffa to Jerusalem. We took this up and re-laid it with standard gauge track. We first tried to operate the metre gauge to feed our men in Jerusalem and in the valley of the Jordan, but were not able to get very much tonnage over the railway. From Artuf to Jerusalem is a straight

2% grade without a let up except at crossing places—roughly 50 kilometres. This railway runs up a canyon which compares very favorably for its scenery with the Kicking Horse Canyon, except that it is a dry watercourse for ten months of the year.

The French when they built this railway never tunnelled a hill; they went around. They used little steel and brought stone-masons from Bethlehem and built retaining walls where we would tunnel. They did most excellent work, and they had miles and miles of cut stone retaining walls, which must have taken infinite labor to build. When we standardized this road we tried to follow their curves and grades, but with our heavy rolling stock and 75 lb. steel we found the curves were so sharp that we had extreme difficulty. It was figured out that we would be able to haul 15 wagons at 10 tons each with one locomotive, instead of which, owing to the curvature, all we could handle was 10 wagons with two locomotives. I was supplied with a push trolley for inspection purpose, pushed by two natives who ran along the rails, and I would ride up to Jerusalem on one of the trucks with the trolley, and ride back almost to Lydda without a push from the Arabs who operated the trolley.

In the operation of the main line before it was double tracked I think we made a record. With passenger trains, hospital trains and goods trains we one day operated twenty-six trains each way over a single track. This could only be done where stations are close together, and we put them on this section of the line every $4\frac{1}{2}$ kilometers.

We had lots of personnel, as we drafted men who had had experience in railway operation from the fighting units.

Maintenance

The uncertainty about maintenance of track in Palestine is that you can never tell where the water is coming. We would build a culvert where we had a washout, and the next rain would wash the track out a couple of hundred feet up the line, while this culvert would be practically dry. Eventually we got over the water difficulty by using our Egyptian labour corps to build a little canal on each side of the track, from Rafa practically up to Ludd.

I am often asked if the road will be a paying proposition. It was built as a war measure. Palestine, and especially lower Syria, is a marvellous country. The Turks had taken all the young men away and left only the women and the old men behind. The people of the country use a wooden plough drawn by a little donkey yoked with a heifer, just the same as they did in the days of Christ, and merely tickle the soil, turning it up three or four inches. They sow their seed on the ground before ploughing, and when the ploughing is done the villager puts his plough over his shoulder and takes it home to the village. They get enormous barley crops there. On the ditch we dug we threw the spoils pretty well out of the track. The natives came along and sowed their grain in this soil, and where it was scattered out the barley came six or seven feet high, that you could not push your way through, whereas in the field it was thin and not more than two feet high, but was good barley and a good crop. It shows that if modern agricultural machinery were used to plow this country thoroughly, an immense amount of grain could be grown. They also have magnificent olive and orange groves.

It will undoubtedly also be a connecting link between Africa and Asia, and eventually, if the country is administered by England, I have no hesitation whatever in saying that it will be a paying proposition.

Before we finished we ran an express on this that started from Jerusalem in the afternoon about three o'clock and got to Cairo, over the Egyptian State Railways, by one o'clock the next day. This is different from the old days when tourists and pilgrims used to visit Jerusalem. They used to go up by boat to Jaffa, and some times if the surf was rolling they had to wait and make two or three trips before they could land.

We did not have many wrecks, taking everything into account. I dare say that this was the only line that was platted with what I call a sleeper diagram. We would get a cargo of Douglas fir ties, then a cargo of Australian hardwood, then a cargo of jarrah wood from Asam. I knew just where these sleepers were used, and if there was a derailment at any point where the Douglas fir or hardwood sleepers were laid I did not bother about it. If the jarrah wood, I ordered out big gangs, because I knew that for the distance that the derailed truck or trucks were dragged (and it was usually a half a kilometre) that every one of those ties would be broken, so that we would have to tear up the entire track and replace it.

There were no brakes on the trucks – not even hand brakes. They used three links for coupling up and had what they called shunting poles for use at the stations. You can imagine when you rode in the guards van at the end of a train of this kind, and the locomotive would take up slack, the jerk at the end was tremendous. Very often the train pulled apart, when the back part of the train would run down the grade until it came to an up-grade, when it eventually came to rest.

The building of the railway was a great feat, principally through the difficulties encountered. It was very hot, the water difficulty was tremendous, and altogether the building was a magnificent feat, and it gave me a great respect for the Royal Engineers. I had the idea that they had set rules and they had to stick to those rules. This may apply to the field companies, but the railway troops certainly could get out and do a job when they wanted.

Practical Applications of Electric Welding

Survey of electric welding methods, resistance, carbon arc, metallic arc and quasi-arc; methods of application, tables of power consumption, etc.; training the welder, protection devices.

F. P. Vaughan, M.E.I.C.

Read at the Eighth General Professional Meeting, Halifax, N.S. October 15th, 1920.

Electric Welding is a subject that should be of particular interest to the engineer, and during the late war, much research work was carried on in an effort to conserve both material, and labor, by manufacturers of war material and by the possibilities offered by its application to the ship-building industries, and as a direct result, much of the ignorance and mystery, in which this subject was surrounded, has been cleared away, and we find to-day, that electric welding is rapidly taking its place in modern engineering, and Industrial work.

The Resistance Process

The Resistance or Incandescent process, known as the Thompson process, is especially adopted for manufacturing work, where more or less standard welds are to be made, and is used for butt lap and spot welding and also special methods, known as ridge, point, and projecting welding.

This process consists of passing a large amount of current through the two pieces of metal at the point to be welded; the current being largely in excess of that which the metals can carry. The point of greatest resistance is the point to be welded and it is there that the maximum amount of heat is developed, this being sufficient to fuse and weld the metals together.

In making welds it is important that the distribution of the temperature over the face of the joint should be as uniform as possible.

It is not practical to butt weld two pieces of different areas, on account of the necessity of uniform temperature distribution, as the smaller piece will become much hotter than the larger one; For the same reason it is not practical to butt weld very large surfaces, as the current will not distribute itself uniformly over the section. The current usually employed in this type of welding varies from 40 amperes, with a machine for welding small wires together, up to 7,000 amperes, for a machine to butt weld wheel tyres.

To obtain these large current values it is necessary to use alternating current, owing to the difficulty and expense of obtaining direct current apparatus for these large current outputs. The voltage required at the weld varies with this class of work, but is usually from 5 to 6 volts. The parts to be welded are held between two clamps which are a part of the welding machine and terminals of low voltage and high amperage. The clamps are brought together under pressure, completing the circuit through the metal to be welded, the current passing to the metal from one clamping electrode to the other. These clamping terminals are usually water cooled.

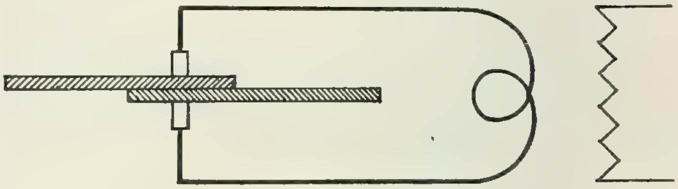


Diagram Spot Welder

Spot Welding Mild Steel Plates.

Thickness of Plates.	Total Welded Thickness.	Power.	Time.
24 S.W.G.	0.044 in.	4.3 K.W.	0.6 sec.
22 "	0.056 "	4.6 "	0.8 "
20 "	0.072 "	4.7 "	1 "
18 "	0.096 "	5.3 "	1.2 "
16 "	0.128 "	6.3 "	1.8 "
14 "	0.160 "	6.6 "	1.8 "
12 "	0.208 "	8.0 "	2.5 "
10 "	0.256 "	9.0 "	3.0 "

Power Consumption of Resistance Welding Plants.

Section of Metal at the Weld.	Approximate Power Consumption.		
	Max. K. W. per Weld.	Duration of Weld.	B.O.T. Units per Weld.
.25 sq. ins.	10	15 seconds	.075
.5 "	15	20 "	.13
.7 "	20	30 "	.2
1 "	25	35 "	.3
2 "	40	60 "	.7
3 "	50	90 "	1.25
5 "	65	208 "	3.75
7 "	80	315 "	7 0
9 "	95	400 "	10.5
10 "	105	428 "	12.5
11 "	115	453 "	14.5
12 "	125	475 "	16.5

In the above table the power consumption for a given area of weld covers ordinary bar iron, wheel rims, tyres, cycle rims, shafting, and piping and various forms of rods, etc.

Butt Welding Round Copper Rods

Size		Power	Time
Diameter	Area		
1/4 in.	0.05 sq. square	[illegible] K.W.	4 secs.
3/8 "	0.11 "	[illegible] "	5 "
1/2 "	0.20 "	14 "	7 "
5/8 "	0.31 "	19.5 "	9 "
3/4 "	0.44 "	[illegible] "	11 "
7/8 "	0.60 "	35 "	14 "
1 "	0.79 "	[illegible] "	17 "
1 1/8 "	0.99 "	63 "	21 "

(1) While it has been generally supposed, that spot welding was limited to metal not more than three-eighth of an inch in thickness, until the recent developments made by the General Electric Co., Mr. J. M. Wood of the above company states that this supposed limit was due rather to the capacity of the apparatus which had been available for doing the work and that the General Electric Company had developed a machine with a welding current capacity of 100,000 amperes at 20 volts and a pressure capacity of 75,000 lbs. The maximum current at which it has been used is about 72,000 amperes and a maximum pressure 30,000 lbs. The maximum thickness of material welded was three thicknesses of one inch plate.

The welding of mild steel gives the best results; butt welds with hard steel up to about 75% carbon can also be successfully carried out, although in the latter case the points of connection of the material to the welder are inclined to become glass hard and often have to be annealed to prevent fracture. The strength of iron and mild steel welds is greater than the material itself, but with high carbon steel wires, the weld strength is only about 60% of the ordinary material. Copper, gun-metal, brass, (if percentage of zinc is not too high), aluminum, nickel silver and their respective alloys butt weld under proper working conditions.

The spot welding of light, solid and hollow ware metal articles has revolutionized the ordinary methods of construction, where drilling and riveting used to be employed and there is hardly an industry, manufacturing or repairing metallic articles where an electric welding plant cannot be used to great advantage. The rapidity of the work and the low power consumption of the spot welder is remarkable, owing to the short time the current is flowing for the actual welding. H. Lemp, states that the energy required to bring iron to the welding temperature is approximately 7 H.P. minutes per cubic inch of metal.

(1) G. E. Review, Vol. XXI No. 12 1918

Electro Percussive Welding

This process as originally developed was for work of small sections. It depends upon the discharge of a large capacity condenser through the points to be welded, together with a forging effect which is practically simultaneous. The apparatus consists of a small direct current generator in parallel with a condenser usually of the electrolytic type, suitable resistances and inductances together with a forging machine or welding tool.

One of the chief advantages in this type of welding is that welds can be made without any apparent change in the metals to be welded. The process being practically instantaneous, metals of different melting temperatures can be welded and also material of unequal sections. There is also a saving in time as the operation is very rapid. D. Hamilton, and L. Oberg state that the power used in the weld is one sixteenth of that required for butt welding.

Electro-percussive welding has already found application in the joining of aluminum wires, the welding of platinum and nickel, platinum and copper.

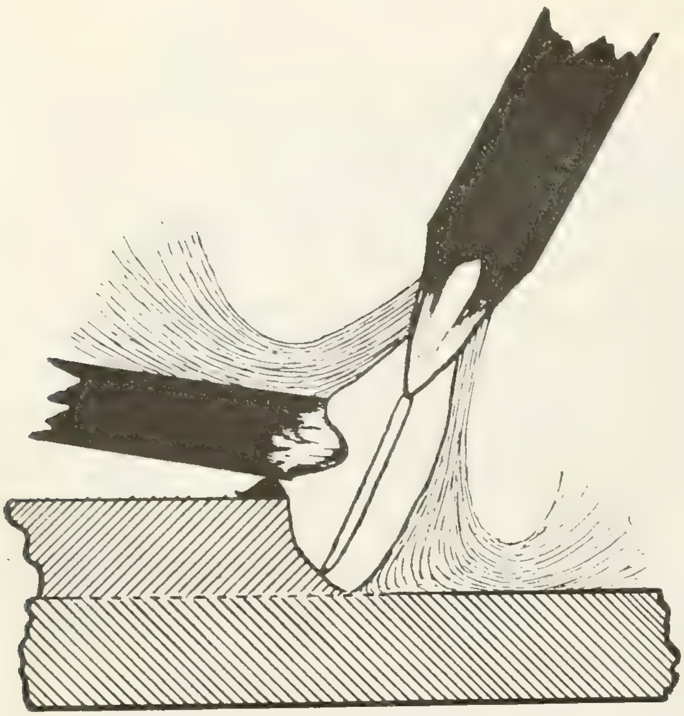
(2) D. F. Miner of the Westinghouse Co. states that within the last year equipment has been developed which successfully welds stock up to [illegible] inch. The same principle is used but stored electromagnetic energy replaces electrostatic energy, the total time required for the weld being only one-tenth of a second. Tests show strength of weld [illegible] lb. per sq. inch for steel to steel and 40,000 lbs. per sq. inch for copper to steel and a thorough fusion without oxidation.

Carbon Arc (Barnados) Process

This is probably one of the oldest methods of arc welding, having been in use for thirty-five years, the Barnados patent having been granted in 1885. In this process, the heat of the arc is utilized to bring the metals to be joined to a welding temperature and melt a filler of the same material, which is introduced into the joint, to fill the space between the metals to be welded. The system is used at present for practically all kinds of repair work and is extensively employed in iron and steel construction work, ship yards and railway repair work, foundries, boiler shops and general engineering work. The work includes the dismantling of iron and steel buildings, bridges and ships by cutting through the girders with the arc, the welding of cast iron and steel, building up of metal surfaces, as a means of saving worn machinery and parts, such as shafts, frames, cracked spindles and etc., melting and cutting scrap metal, filling holes in castings and has many other applications too numerous to mention.

The electric carbon or graphite arc is used for the production of a high temperature ranging from 6,000° F to 7,000° F. In welding with a carbon or graphite arc, direct current is usually employed in preference to alternating current, although the latter is sometimes used.

(2) Journal A. I. E. E. [illegible]



The parts to be joined are connected to the positive side of the circuit and the carbon electrode to the negative.

This has two advantages.

First. The greatest amount of heat in an electric arc is liberated at the positive pole.

Second. Particles of carbon are not carried into the weld and which is a condition to be avoided in making a good weld.

The operator holds the carbon or graphite electrode by means of an insulated holder and strikes an arc by touching the work with the carbon electrode and drawing it back quick by forming an arc of suitable length. The operator then moves the electrode from side to side of the weld, giving a semi-circular motion, while at the same time moving the electrode along the weld. This process as originally used, was improved by adding a fused metal filler to the molten surface of the metal. The carbon or graphite electrode process is generally employed where fast melting is required and to heat over a large area, (such work as filling in large holes in castings etc.), and is always used in cutting. The carbon arc requires a large current, generally from 250 to 600 amperes and 50 to 100 volts; very heavy welding and cutting requiring up to 1500 amperes. A graphite or hard carbon electrode about ½ to ¾ inch in diameter sharpened to ¾ inch point is used for average work, and lighter or heavier electrodes are used depending on the requirements of the work. The maximum currents for carbon electrodes are approximately as follows:

¼ inch..........	100 amperes
½ inch..........	300 amperes
¾ inch..........	500 amperes
1 inch..........	1000 amperes

It is necessary on account of the large area heated by the flame of the arc to use extreme care, so as to avoid stresses and distortion due to temperature changes. When cutting metal, the carbon electrode must be used; the arc is held in one position long enough to fuse the metal and allow it to run off. The arc is then advanced slowly along the desired line, the molten metal dropping out below. The width of a cut with a skilful operator is only slightly wider than the diameter of the electrode.

(3) The length of a 250 amp. arc should not be less than ½ inch and for a 500 ampere arc, should not be less than ¾ inch. The maintenance of excessive arc lengths causes the exposed hot metal to be rapidly oxidized or burned. For most purposes a 250 ampere arc should not exceed a length of 1 inch and 500 ampere arc should not be more than 1½ inch long. The surfaces to be welded should be chipped clean, and where they are scarfed the angle should be wider enough to enable the operator to draw an arc from any point without danger of short-circuiting the arc.

On account of the intense glare and heat produced, the operator must wear gauntlet gloves and a shields, completely covering the head and shoulders to protect the skin and eyes.

(4) Tests on a 25 kw. d.c. generator direct connected to a gasoline engine and mounted on a truck required 20 minutes to cut through a 15″ I—beam, and required 250 amperes at 90 to 100 volts.

Tests on an alternating current plant consisting of 4-20kw. single phase transformers connected in multiple required 650 amperes at 50 volts and in an 8 hour day, 10 ft. of steel piling were cut, the cut varying from ½ inch at the centre of the pile to 3½ inches at the ends. The consumption being 250 kw. hours. By this method $10.00 a day was saved, to say nothing of the time.

Cutting Mild Steel.

(Carbon Electrodes.)

Thickness of Plates.	Current.	Rate of Cutting.
1/2 inch	275 to 325 amperes	15 to 20 feet per hour
3/4 "	450 to 550 "	14 to 18 "
1 "	650 to 750 "	12 to 15 "
1-1/2 "	900 to 1000 "	10 to 12 "
2 "	900 to 1000 "	6 to 8 "

The Metallic Arc Process (Slavinoff)

About 90% of the electric arc welding that is accomplished today is by this process a modification of the Barnardos process, differing in that an iron or steel electrode instead of carbon is used, this being melted by the arc and serving to fill the space between the pieces to be welded. The metals to be joined are clamped in position and connected to the positive side of the circuit. The edges of the joint are beveled either from one or

(3) Elec. World. Vol. 74-22. O. N. Eschnolz.

(4) S.H.B.E.E. Sec. 22, P. 1730.

both sides, the bevel being so chosen to permit the insertion of the electrode to within less than 0.125 inch of the surface to be welded. Chemical composition, electrode covered or bare, not over carbon 0.18%, manganese 0.50%, phosphorus 0.05%, sulphur 0.05%, silicon 0.08%. For welding iron and steel the metallic electrode should be iron wire or high grade as soft and pure as possible; for welding other metals, the electrode should be in general the same metal as the metal to be welded; the composition of the welding electrode is an important factor in determining the success of the weld. Cost of metal electrode, 8 to 12c. per lb., bare, 20 to 75c. per lb. covered.

In the Bernardos process it is difficult to prevent absolutely the introduction of carbon into the weld; this is prevented in a large degree by the Slavianoff process, as by using a small arc the carbon deposit is greatly reduced and the heat is only spread over a small area, enabling the operator to deposit the metal very accurately on the edges of sheets and plates etc. The metallic arc process requires a comparatively low value of current, viz. 50 to 200 amperes and an arc voltage of 20 volts.

The metal deposited by this method is more uniform, and a weld so made is slightly stronger and has a smoother and more regular appearance than one made by the carbon electrode. For these reasons the metallic electrode is usually employed when strength and appearance is important.

The current values corresponding to the various electrode sizes are given in the following table and while they may be varied slightly under certain conditions they represent safe average. The arc should be kept constant in length to insure uniformity in the metal deposited.

Arc Welding Mild Steel.
(Metal Electrodes.)

Thickness of Plate	Diameter of Electrode	Current	Rate of Welding
1/16 inch	[illegible]	[illegible] amperes	[illegible] feet per hour
1/8 "	[illegible]	[illegible]	[illegible]
3/16 "	[illegible]	[illegible]	[illegible]
1/4 "	[illegible]	[illegible]	[illegible]
5/16 "	[illegible]	[illegible]	[illegible]
3/8 "	[illegible]	[illegible]	[illegible]
1/2 "	[illegible]	[illegible]	[illegible]
5/8 "	[illegible]	[illegible]	[illegible]
1 "	[illegible]	[illegible]	[illegible]

In welding a seam the electrode should be moved in a semi-circular path, advancing along the seam. For long seams the edges should be 1/8" apart at the end where the weld is started and the space should be 1/8" plus 1 1/2% of the length at the far end. Tack welding is another method of handling expansion. In starting the arc the electrode should just touch the work and immediately be withdrawn to the proper distance. It is necessary to be sure that the arc plays over the entire surface of the joint.

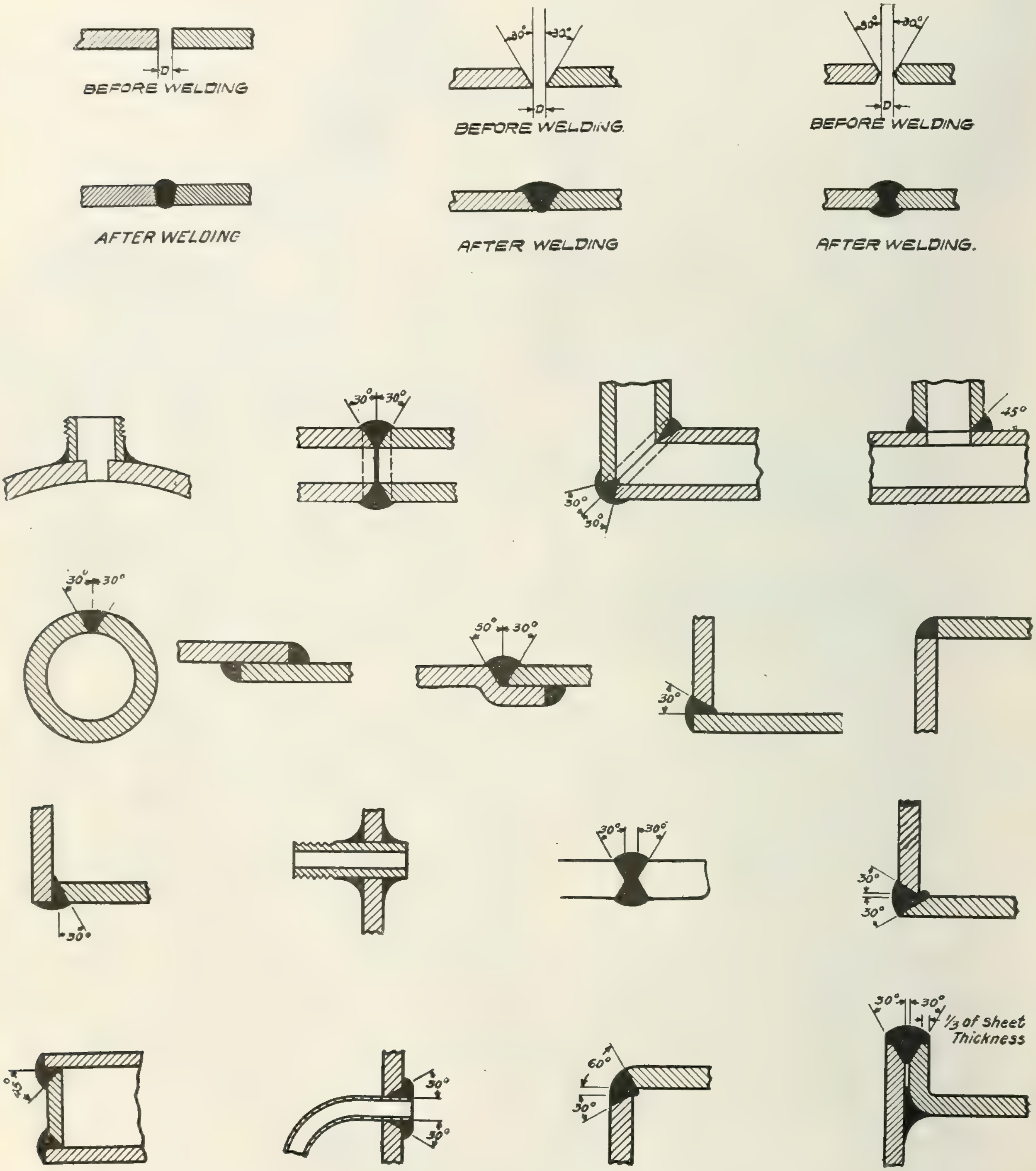
The metal is fused by the direct impact of the arc, and if the molten metal merely runs ahead of the arc over the solid metal of the work it will not result in a weld. The metallic electrode used is generally 14 inches to 18 inches long, and may be gripped either at one end or the middle to suit the operator. The operation of overhead welding is the same as in normal welding, but requires considerable skill and practice on the part of the operator. If the arc length is kept constant, the metal will be successfully deposited.

Electric Welding.

Thickness of plate Inches	Speed (feet) welded per hour	Power consumption (at arc)					Costs per hour (based on [illegible])				Total cost per foot	[illegible]
		Amperes	Volts	Mean power output K.W.	Power input K.W. at [illegible]	Electrode consumed lbs. per hour	Power [illegible]	Electrode [illegible] lb.	Labor at [illegible] hr.	Total cost per hour		
1/16	20	40	20	.8	1.78	.9	[illegible]	[illegible]	$0.60	[illegible]	[illegible]	[illegible]
1/8	16	75	20	1.5	3.34	1.4	[illegible]	.140	.60	[illegible]	[illegible]	[illegible]
3/16	12	90	20	1.8	4.00	2.3	[illegible]	.230	.60	.9130	[illegible]	[illegible]
1/4	10	100	20	2.0	4.45	3.1	.0890	.310	.60	[illegible]	[illegible]	[illegible]
3/8	6.5	125	20	2.5	5.56	3.6	.1112	.360	.60	[illegible]	[illegible]	[illegible]
1/2	4.3	140	20	2.8	6.22	3.8	.1244	.380	.60	[illegible]	[illegible]	[illegible]
5/8	2.8	150	20	3.0	[illegible]	3.4‡	.1334	.340	.60	[illegible]	[illegible]	[illegible]

‡ Single Bevel used on thickness below and including one half inch.

Double Bevel used on thickness above one half inch.



Method of making various types of weld

Preparation of the Weld

In the preparation of the weld it has been found that metal that is clean is much more likely to make a good strong weld. Scale, rust, grease, sand, and foreign matter will contaminate the weld and such inclusions necessarily weaken it or else make it hard. Impurities also may make the metal porous and spongy, due to liberation of gas; pieces of foreign matter may prevent the molten metal filling all parts of the weld.

Various methods of cleaning are in use, viz: pickling for small parts, washing with gasoline or lye, boiling with lye, sand blasting, chiseling, scratch brushing etc., the method depending on the local conditions.

Preparatory to welding locomotive tubes to the sheets, it is sometimes advantageous to send the locomotive out on a run to burn off the grease and then clean off the oxide and soot by sand blast; another method is to heat the boiler to normal steam pressure and then clean by sand-blasting or scratch brushing. Washing with lye will also remove grease.

In welding heavy sections where it is necessary to deposite several layers of metal, the surface of the preceding layer should, always be cleaned before starting the next.

There has been a good deal of discussion with regard (5) to the use of a flux in electric welding and it has been the source of considerable discussion for some time. The early metallic electrode was a mixture of pulverized carbon and borax, together with other materials of more or less imaginary benefit, while the present flux-covered electrodes contain various additional elements to assist in producing high class welds. While undoubtedly such coatings have more or less beneficial effects under certain conditions it is the experience of a great majority of welders, that flux of any kind is unnecessary in welding, and further that it is a source of danger, in that there is a liability to contaminate the weld. By keeping the work clean, and if care is taken in the operation of the arc, a good weld can be made without flux, and if these attentions are lacking, flux will not make a good weld.

Preparation of Seams for Butt Welding

Dimensions in inches

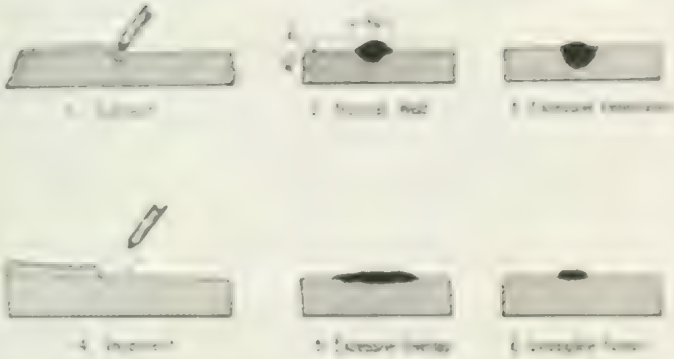
Thickness of Plate in Inches	Space D
0 to 1/16	1/32
Above 1/16 to 1/8	[illegible]
Above 1/8 to 1/2	[illegible]
Above 1/2	[illegible]

In all electric welding care must be taken, (6) otherwise there is apt to be extreme penetration which is caused by excessive current and improper electrode material and has a tendency to weaken the weld; on the other hand if the current is too low overlap and small penetration results.

The diameter and character of the electrode used must be carefully selected, for if the electrode has too high a melting point in comparison with the metal to be welded, extreme penetration will result; on the other hand if the electrode material has a low melting point compared with the work itself, overlap and small penetration result.

For a good weld it is necessary to have good diffusion of the fused metal into the work. To secure good penetration, a short arc should be used together with the conditions as set forth above.

The following sketches show some of the conditions referred to:



General Electric Automatic Welder

One of the most recent developments in metallic arc welding apparatus, which is just being placed on the market by the General Electric Co., is the G. E. Automatic arc welder.

General Electric Arc Welder

14" Shaft with 5 ft. increased [illegible] in diameter by Automatic Arc Welding Process

This is a device for automatically feeding a bare wire electrode into the welding arc at the exact rate required, which permits of a metal building process with minimum attendance. This device consists of a small direct

(5) G.E. Review, vol. 21-22, p. 550, J. A. Seede.

(6) Elect World, vol. 74-13, 1919, O. H. Eschholz.

current motor, geared to feed rolls, and electrically connected across the welding arc through control, with the result that the speed of the motor and consequently the rate at which the wire is fed into the arc varies with the voltage across the arc with, therefore, constant current. The length of the arc can be maintained at a minimum, with the result that the metal has little opportunity of being oxidized. The metal deposited is of higher and more uniform character than is possible with hand operation.

This method is especially recommended for building up shafts, car wheels, welding tanks, seam work and etc. in all of which applications it produces a more effective weld and is 2 to 5 times as fast as the hand process. The machine has few moving parts, is entirely automatic and self-adjusting to the demands of the work, and maintains a uniform arc length and weld throughout the entire operation. It is adjusted to operate continuously unwatched for long periods and can be used on any D.C. welding current outfit.

Quasi-Arc Welding

A system of welding which has found particular favor in England is known as Quasi Arc Electric Welding. The Quasi Arc Co. of London, England, were the pioneers of electric welding as applied to ship construction and were the originators of the coated metal electrode. The Quasi Arc Electrode according to the British patent specifications 11,079,12 and 13,538,12 consists of a steel wire core with an aluminum wire running beside it, and is covered with a wrapping of blue asbestos suitably treated.

In making a weld or reinforcing a worn surface by this process, the electrode is held in an insulated holder, connected by flexible leads, to the positive pole of a generator. An arc is struck between the work, which is connected to the negative side of the circuit and the electrode; this arc is immediately destroyed and a quasi (or partial) arc formed and maintained owing to the blue asbestos covering passing into the molten state and acting as a secondary conductor maintaining electrical connection between the work and the matallic core of the electrode.

The welding operation is continued by holding the point of the electrode just under the surface of the molten slag; the quasi arc is thus maintained and metal is deposited on the work continuously and with regularity. Blue asbestos being a ferrous silicate and an acid flux, can in a molten state combine with and remove oxide and scale from the work, so that it is not necessary to clean the same in order to obtain a good junction, between the electrode metal and the work. The molten steel and adjacent work from the time of fusion until in a solid condition are covered with this acid flux so that oxygen from the atmosphere is prevented from entering the weld oxidizing the steel and forming gas holes, an additional aid being the presence of the aluminum wire, which readily takes up oxygen. The slag formed on the weld is most useful as it covers the weld uniformly and allows the steel to cool much more slowly, thus adding to its mechanical strength; when cool is easily removed. The heat of the arc is localized to the weld and the junction between the work and the welding metal is complete and free from oxide inclusions and shows a gradual diffusion of carbon from the work into the metal.

The following tables give the comparative strength of rivited and quasi-arc welded joints.

Table showing Comparative Tensile Tests of Quasi-Arc Electrically Welded Joints, against Riveted Joints.

QUASI-ARC WELDED LAP JOINTS

Specimens of Mild Steel	Dimensions			Sec. tional area sq. in.	Tons Max. Stress		Remarks
	Over-lap	Breadth	Thick-ness		Total	Per sq. in	
Plain bar....		5.5 in.	.25 in.	1.375	39.3	28.55	
Welded bar.	1.5 in.	6 in.	.25 in.	1.5	40.1	26.7	Broke 6 in. clear of weld
Plain bar....		2 in.	.50 in.	1.0	28.4	28.4	
Welded bar..	2 in.	5 in.	.50 in.	2.5	64.75	25.9	Broke 5 in. clear of weld
Plain bar....		2 in.	.75 in.	1.5	42.0	28.0	
Welded bar..	2.25in.	5 in.	.75 in.	3.75	89.5	23.85	Broke 5½ in. clear of weld

TREBLE RIVETED LAP JOINTS

Specimens of Mild Steel	Dimensions			Rivets		Sertional Area sq. in.	Tons Max. Stress		Remarks
	Over-lap	Breadth	Thick-ness	Dia-meter	Spacing		Total	per sq. in.	
Plain bar...		2 in.	.50 in.			1.0	27.4	27.4	
Riveted bar	7.5 in.	18.25 in.	.526in.	¾ in. dia.	2.625 in.	9.6	165.5	17.21	.Broke .through .outer line .of rivet .holes.
Fiveted bar	9 in.	18.625in.	.489in.	⅞ in. dia.	3.125 in.	9.1	172.0	18.91	

The Quasi-arc process has been authorized by the British and Foreign Admiralties, Lloyds Register of shipping and the British Corporation for the Survey of Shipping for use in the more important parts in ship construction.

Training

Electric welding is an art and as such requires special training to obtain satisfactory results, just as much so as in any other of the trades. The welder must be thoroughly familiar with the proper use and manipulation of the apparatus and understand certain fundamental principals, which must be observed. The degree of success attained in electric welding depends almost entirely upon the skill and intelligence of the operator. Some workmen become experts in a compartively short time, while others experience considerable difficulty and are never able to produce satisfactory results.

A good electric weld has great strength and can also be quickly made. On the other hand, a poor electric weld may have very little strength and may be very deceptive in appearance. It is therefore very important that the electric welder should be well trained and thoughly skilled before being employed on important construction work.

In the majority of cases when welds have been tested and proved faulty, the fault has been traced to one of the following causes:

Current too low.
Arc too long.
Incompetent operator.
Incorrect size or faulty electrode.

The value of the welding current has a considerable effect on the ultimate tensile strength of the weld, and with welds of 100 amperes and over, the tensile strength may vary as much as 50% with a difference in the welding current of 20 to 30%.

In the United States during the late war, there was a demand for skilled welders for the Emergency Fleet Corporation and for this reason the General Electric Co., established a school for training of commercial electric welders and were able to turn out a finished welder in 4 to 8 weeks, depending on the ability of the pupil. The G. E. Co. will maintain this school for the benefit of their customers. Similar schools were also established and are maintained for the same purpose by the Quasi-Arc Co., Brooklyn, N.Y., and the Lincoln Electric Co. of Cleveland, Ohio.

Protection for the Welder

In electric welding the operator must be protected from invisible infra-red rays, visible light rays and invisible ultra-violet rays, generated by the arc and also from drops of hot metal which splatters from the weld.

Ultra-violet rays radiating from the arc produce an effect similar to sunburn if any part of the operator's body is exposed to the rays for many minutes at a time, for this reason it is necessary for the operator to wear closely woven clothing. For the protection of the hands and wrists, gloves, mittens or gauntlets are used; these are sometimes made of asbestos. For the protection of the neck and head, a helmet made of metal or non-conducting material is used. Helmets are provided with an opening in front, containing suitable colored lenses; the colour of the lenses being such as to protect the eyes properly, against the injurious rays of the electric arc. These consist of various combinations of red, blue, amber, glasses of various tints, so that combinations can be made to suit the various kinds of arc welding.

Colored goggles are sometimes used but mostly by welding inspectors, who are not continuously exposed to the effects of the arc.

Metallurgy of Arc Welds

The metallurgy of the arc welds as shown by the microscope may be of interest.

(7) W. E. Ruder of the General Electric Co's Research Laboratory says: The physical properties of a weld will depend upon five district factors, viz:

(1) Crystal structure, (2) Gas-holes, (3) Slag Inclusions, (4) Impurities, (5) Composition.

From the study of the crystal structure of a large number of welds it appears that a very fine grain is produced by rapidly depositing the metal in thin layers, but as the plate heats up the grain changes to an entirely coarse structure, and columnar crystals begin to form with their resulting brittleness. Gas-holes are to be found in all electric welds and are an important source of weakness. Carbon is one of the worst offenders in producing gas holes. The carbon in the plate is also an important factor in this connection. Welds made on carbon free iron with a carbon free electrode showed only an occasional small gas hole. Slag inclusions are a common source of weakness in welds, particularly where covered electrodes are used by inexperienced workmen.

Impurities: microscopic examination reveals the presence in most welds of a large number of lines or plates, which bear a close resemblance to those seen in iron that has been highly nitrogenized.

Nitrogen is one of the most effective elements for making steel brittle, as little as 0.05% will reduce the elongation on a 0.2% carbon steel from 25% to 2%. It is confined to regular steel only in very small amounts varying from 0.02% in Bessemer steel to 0.005% in open hearth. The elimination of these nitrides and oxides must be accomplished before the weld can be made ductile.

Other impurities that may occur in a weld are sulphur and phophorus. It is doubtful if enough sulphur will remain to do any great harm, but phosphorus forms a dangerous phosphide eutectic with iron, and should be kept at an absolute minimum both in plate and electrode. Sufficient research work has not been carried out to warrant satisfactory conclusions as to the results brought about by the intentional addition of such elements as nickel, chromium, manganese, cobalt, copper, molybdenum, and tungsten.

Theory of Arc Welding

(8) The theory of metallic arc welding and the process by which the transfer of metal which occurs has been investigated by R. G. Hudson of the Massachusetts Institute of Technology and Harvard University, and O. H. Escholtz research engineer of the Westinghouse E. Mfg. Co. and a photographic record of the mechanism of metal transfer from electrode to plate indicates that 80% of the metal is carried across the arc in liquid form by molecular forces. O. H. Escholtz points out that there may be three somewhat distinct causes for the flow of metal across the arc.

First: The occluded or generated gases in the end of the electrode may blow out a certain quantity of liquid metal.

Second: Complete vaporization of the metal and its transport into the arc stream.

Third: The liquid metal may be transported by the ordinary molecular forces that cause surface tension and adhesion of one substance to another. Mr. Escholtz believes the last cause to be the effective one.

(7) [illegible]

(8) [illegible]
[illegible]

He estimates that of the total energy required per pound of electrode carried away, 60% goes into liquidation of material, approximately 26% into vaporization of some portion of this liquified material, and about 14% into ordinary thermal losses.

A cycle of deposition would appear to be as follows:

(1) After forming the arc, appreciable time is required to liquify the electrode end.

(2) The liquified end assumes a globular form, enlarges, decreasing the arc length and arc voltage, while increasing the arc current.

(3) When the globule has enlarged sufficiently to bridge or short circuit the arc stream, the arc voltage drops to practically zero, and the arc current increases to short current value.

(4) The short circuit condition exists until the globule is no longer in contact with the wire electrode.

(5) At the instant of detactment the current decreases, while the voltage rises sufficiently to re-establish the flow of the welding current in the partially deionized arc gases.

Equipment

With regard to current supply for spot or butt welders, if single phase alternating current is available, no difficulty is experienced in connecting a welder direct on to the mains, but with two or three phase supply, there is always the difficulty of maintaining a balance, if only one phase is connected to a welder, particularly if it is of large size.

The most suitable method of connecting single phase current from a polyphase supply without unbalancing, is to employ a synchronous or induction motor driving a generator, or if a direct current supply is available a D.C. motor can be used or a single phase rotary employed; the efficiency of the latter is the highest of all types of converting apparatus and the results are highly satisfactory.

For arc welding, direct current is usually preferable to alternating current, and with certain systems, direct current only can be employed. The direct current generator designed to supply a single arc welding plant can be arranged to work with a drooping voltage characteristic, which limits the current of the generator when short circuited to about 20 to 25% above the normal full local current. One of the latest developments along this line by the General Electric Co. is the new type Arc Welding Generator, which embodies the characteristic of constant energy output, the Westinghouse Co. have developed a similar machine the short circuited current being a full load welding current.

The high economy with both systems of welding, especially when working of single phase AC supply is due to the very small light load losses and the fact that power is only consumed when the machine is actually welding.

There are now on the market a number of different types of electric welding apparatus; which can be divided into three main classes, viz:

Motor generator sets, gasoline engine driven sets or power driven.

Welding Structural Steel

(10) The welding of structural steel work is another advance that has recently been made in the application of electric welding and offers unlimited possibilities.

While the building erected was not a large one, being a warehouse 40′ x 60′, there is no reason why this method cannot be applied to all classes of building construction.

In the 40 ft. span roof trusses the contract price for rivetting would have cost $85.00 per truss, whereas the welding was done at $50.00 a truss, allowing the same profit as for the rivetting. Actual test proved conclusively that the welded steel structure were stronger than rivetting. The trusses were designed for a live load of 40 lbs. per sq. foot, each truss supporting a panel 800 sq. ft. They were tested at a load of 120 lbs. per sq. foot or a total of 48 tons on the two trusses.

The official reports of the building Dept. of N.Y. says. "From the above it is evident that electric welding is a dependable method of uniting structural members and is stiffer than rivetting, if the work is properly performed.

(11) An electrically welded freight car which was built in 1911, before electrical arc welding was in universal use, was built by spot welding in two thirds the time required to rivet a similar car. Tests on the completed car showed that it was much more rigid than with rivetted construction and that it showed no slip or permanent set. The car was loaded to 150% capacity and the usual tests applied and proved satisfactory in every way.

It was placed in actual service by the Burlington Road, and has been in operation since that time.

(10) Elect. World, vol. 75, p. 1422.
(11) G. E. Review, vol. 21-22, J. A. Osborne.

Sheet Harbour Hydro-Electric Powers

Hydro-Electric Power for Pictou County, Nova Scotia, various schemes proposed with tables of run-off, etc., details of two principal schemes, at Malay Falls and Tidewater.

Harold S. Johnson, A.M.E.I.C.

Read at the Eighth General Professional Meeting, Halifax, Oct. 14th, 1920

One of the most eminent engineers on the North American Continent has recently written,—

"The coal costs all over the world have advanced from 80 per cent to 300 per cent, and there is now no relief in sight to correct the ever-increasing tendency to still higher prices."

"Based on present day costs of construction material, labor and coal, a kilowatt hour from central steam stations will cost an average of one and a half times the cost of a kilowatt hour from water power."

These statements are particularly applicable at the present time to the County of Pictou, Nova Scotia. This county has derived its power to date mainly from coal fired units, and due principally to the increased cost of coal, industrially the County is suffering from excessive power costs. In an endeavor to alleviate this situation, the Nova Scotia Power Commission has been investigating the Sheet Harbour Rivers with a view to the transmission of hydro power to the County and the following forms a synopsis of the writer's report and proposals as made to the Commission.

Pictou County

No other part of Nova Scotia outside of the Sydney section, is so distinctively industrial as what may be termed the "Five Town District" of Pictou County, comprising the towns of Pictou, Westville, Stellarton, New Glasgow and Trenton. The foundation of these towns was laid in the years from 1798 to 1809.

Thorburn, a coal mining centre is next in size to the five towns mentioned. The balance of the County's population is mainly rural, being concentrated more particularly along the valleys of the main rivers.

The County population in 1901 was 33,459. In 1911, [illegible],858. The county area is 1124 square miles, and it stands third in Nova Scotia in density of population per square mile, by the 1911 census having 31.9. Omitting the five towns first mentioned, and also Thorburn, the balance of the County population becomes 15,000 which may be termed rural and which statistics would show to be living in about 3,000 dwellings. At the most, it would never be possible for more than 1500 of these to receive the advantages of the distribution of power to rural districts. Assuming a consumption of 300 kilowatt hours per annum per capita, which records indicate as being the average in similar districts in Nova Scotia, the total annual power used would be 450,000 kilowatt hours. This figure will be used later.

The power at present used in Pictou County is mainly consumed in the five towns first mentioned, and more particularly in Stellarton, New Glasgow and Trenton.

Pictou operates a steam municipal plant for power and lighting service. The cost of operation, without including fixed charges, was 7.5c. per kilowatt hour in 1919, and has naturally increased since then. The power rates charges range from 15c. to 8c. per kilowatt hour at the consumers' meters. For lighting the charges are 16c. per kilowatt hour with a maximum discount of 12½ per cent. The maximum load on the plant is 250 kilowatt, average load 40 kilowatt, kilowatt hours per year generated 398,000.

The Pictou County Electric Company situated in Stellarton operates a tramway system, supplies the lighting service for Westville, the domestic lighting and some small power for Stellarton, the entire lighting service in Trenton and New Glasgow, and a very considerable small power load in New Glasgow. In 1918, the cost of power at its switchboard, without including fixed charges, was [illegible], and at the present date is at least 10c. Such costs are very largely due to the nature of the load carried, the nature of the diversity factor, etc. The maximum load at the switchboard is 580 kilowatt, average load 275 kilowatt, total consumption 1,440,000 kilowatt hours. Power charges are from 12c. to 9c. less 10 per cent, for lighting 17c. to 15c. less 10 per cent.

The Eastern Car Company, in the town of Trenton, has a most efficient, economical and well arranged steam power plant, supplying its own demands for power. Its load factor is high,— 51.4 per cent. The maximum load carried is 880 kilowatt, average load 457 kilowatt, total consumption per annum 3,362,000 kilowatt hours.

The Nova Scotia Steel & Coal Company in Trenton, also operates its own steam power plant for the supply of its own power needs. Its maximum load would be 3000 kilowatt, if fully electrified, average load 1250 kilowatt, load factor 41 per cent, annual consumption 9,200,000 kilowatt hours.

The Acadia Coal Company in Stellarton, operates a modern and up-to-date power plant. This plant is steam turbine driven, operating two 3-phase, 50-cycle, 3,150 volt, 1500 kilowatt A.C. generators and one 4,000 kilowatt generator with same characteristics. The motor driven equipment is 50-cycle. The power is used for the Company's coal mining operations in all its pits. It is fully believed that this plant stands in the first rank, for its size, in efficiency, economy and service. It is hoped and planned to utilize this plant as a steam standby and reserve, in connection with the hydro system. The 50-cycle machines, however, cause complications, as the Nova Scotia Power Commission's standard will be 60-cycle but as described later, arrangements will be made to take care of this. The plant's load factor is high — 53.4 per cent. The maximum load is 2,400 kilowatt, average load 1,283 kilowatt and annual consumption 9,438,000 kilowatt hours.

In addition, in the "Five Town District", there are smaller industrial plants, producing their own power, with capacities between 30 kilowatt and 200 kilowatt in electrical terms. Their costs for power range as high as 12c. per kilowatt hour. The consumption of all these smaller plants runs about 3,776,000 kilowatt hours annually.

Typical load curves have been obtained for each individual plant and a summation made; the maximum load is 7,480 kilowatt, the yearly average load 3,362 kilowatt, the average working day load 3,981 kilowatt, the yearly load factor 45 per cent, the daily working load factor 53.2 per cent.

The distribution of sectional consumption to total consumption is represented in the table given herewith. It is, therefore, apparent that the Nova Scotia Steel & Coal Company with its subsidiary, the Eastern Car Company and its controlled plant, the Acadia Coal Company, exert a predominating influence on the power demand.

Sectional Consumption in Percentage of Total.

Refer. No.	Consumer	Total Consumption 100%	Total Consumption 100%
1	All Plants etc., outside last 4........	12.8%	18.92%
2	Pictou County Electric Company.....	6.12	
3	N.S. Steel & Coal Co.	37.35%	81.08%
4	Eastern Car Co......	11.69%	
5	Acadia Coal Co......	32.04%	

It is difficult to make any estimate of the possible increase in future years in the present power consumption of 29,500,000 kilowatt hours. An extension to rural districts as already noted would only give 450,000 kilowatt hours. We all hope that the Nova Scotia Steel & Coal Company will expand through its merger with the British Empire Steel Corporation. With cheap power, there is no doubt that new industries will spring up and existing industries extend their activities. A survey has led the writer to believe that the consumption may be 41,000,000 kilowatt hours in six years from the advent of cheaper power into Pictou County, an increase in six years of 41 per cent.

The present operation costs for power in Pictou County, without including fixed charges, range from 1.65c. to 12c. per kilowatt hour. As will be shown later, it is proposed to supply hydro power to Pictou County at an initial estimated cost of 1.25c. An estimate has been made that there would be a saving annually to Pictou County with the bringing in of hydro power based on present power consumption of $500,000 or about $1,350 per day.

For a continuous dependable output, all of the hydro powers of Nova Scotia are very much dependent upon storage reservoirs. Pictou County is particularly lacking in natural storage reservoirs, such as lakes, and there is available in its rivers no water power in capacity sufficient to satisfy its demand. Recourse has, therefore, been had to the Sheet Harbour Basin, as the nearest source of supply.

Location, Geology, Climate, etc.

Reference to the Map No. 1 shows that the drainage basins of East River and West River, Sheet Harbour are contiguous, discharging into separate inlets from a common estuary on the south eastern coast. The East River drainage basin has an area of 228 square miles. The basin is 54 miles as the crow flies from Halifax and 45 miles from New Glasgow. The nearest railway is at Upper Musquodoboit, 28 miles distant, but coastal steamers call at both East and West River harbours.

The basins are well timbered, particularly the East River Basin, which has not been cut for some 23 years. The East River lies in a deep valley, with the crests of the enclosing slopes distant one half mile to one and a half miles from the river.

From meteorological records of the nearest stations and by balancing, the average precipitation in the basins for the four years from October 1, 1915 to October 1, 1919 was estimated to be 46.77". Fortunately for our purposes, comparison of records, etc. would tend to show that these first three years of the four constitute a period of exceedingly low precipitation and consequently low run-off. It is also fortunate that records are available as taken by the Dominion Water Power Branch, co-operating with the Nova Scotia Power Commission, for the daily run-off for these same four years. This period while far too short to give a reliable basis for estimation of dependable flow, is of particular value in this instance due to three years of the four being what may be called "dry years".

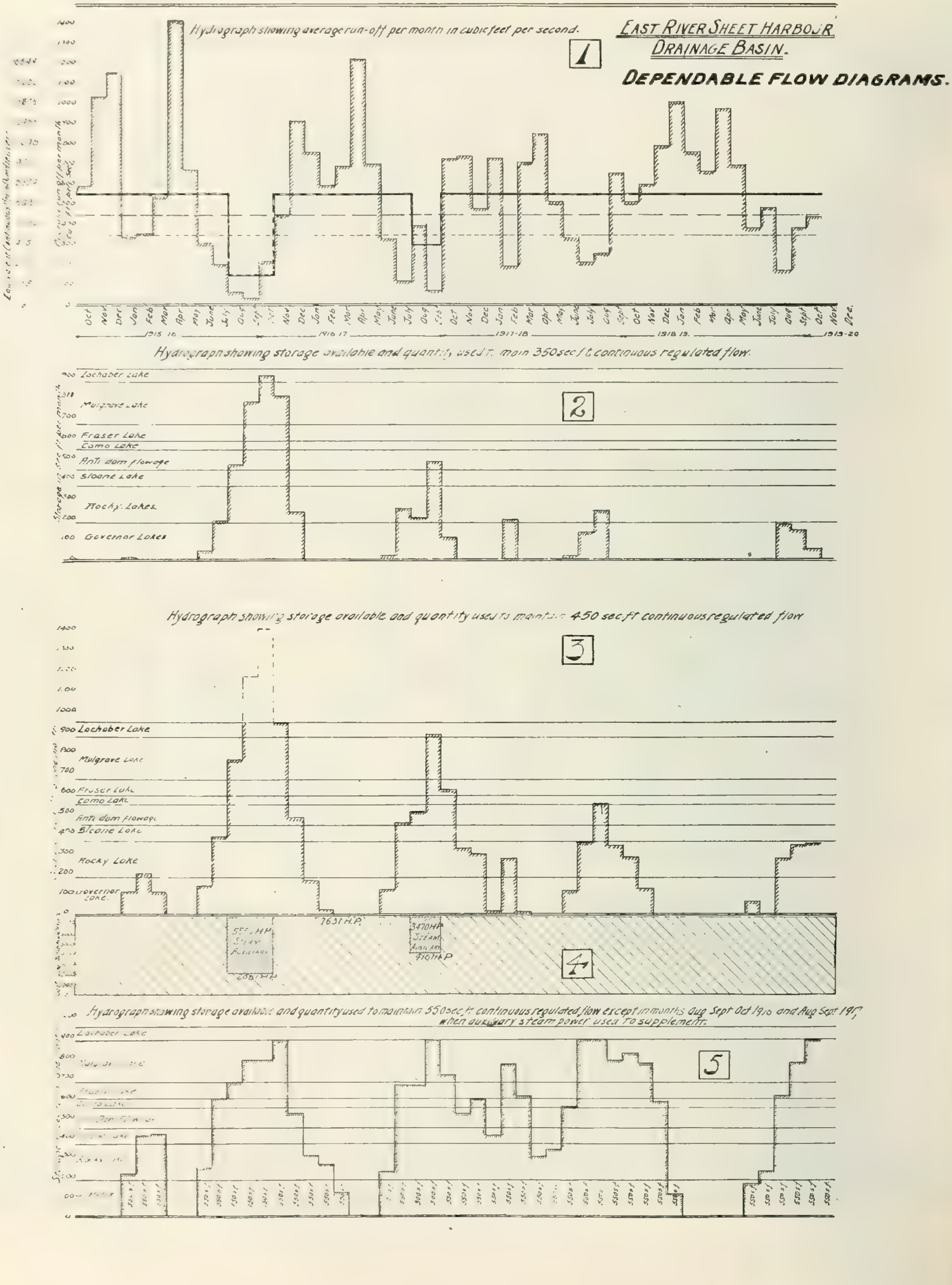
The run-off records will be referred to later under the reference to "Dependable Flow". It might, however, be stated that the maximum flow recorded for East River Sheet Harbour is 3550 cubic feet per second, and the minimum has been as low as 25 second feet making absolutely certain the necessity for very large storage basins to obtain the maximum use of the water available.

Storage Possibilities — East River

A glimpse of the general map will show how studded with storage sites these basins are. Unfortunately none are very large. In the East River valley, storages are available of greater or lesser extent on Governor Lakes, Rocky Lakes, Sloane Lake, Como Lake, Fraser Lake, Lake Mulgrave, Anti Dam Flowage, Ten Mile Lake, Lochaber Stillwater, Diamond Lake, Smith Lake, Fraser Lake and Abraham Lake. Their very number is disconcerting for operation. However, the latter four are small and will not be initially developed. The first nine will all be developed. The unfavorable position of the largest lake area — Governor Lakes, will be noticed and also the Rocky Lakes. The very favorable position of Mulgrave Lake and its feeders, Como Lake and Fraser Lake gives considerable advantage for prolonged power peak periods.

Lochaber Stillwater has a present area of 730 acres and the development plans make this what might be called the head pond for the river system, as its dam will also

be the head power dam. The level will be raised 20 feet over present level, having then a conservatively calculated surface area of 1350 acres, forming a pond about 5½ miles long and 1¼ mile wide. It is proposed to allow for a drawdown of three feet on this which would give an available storage of 4050 acre feet. It is not intended to use the other 17 feet even as seasonal storage, but simply to give power head. In addition to Lochaber Stillwater, Ten Mile Lake when developed, has not been


EAST RIVER SHEET HARBOUR DRAINAGE BASIN.
DEPENDABLE FLOW DIAGRAMS.
Hydrograph showing average run-off per month in cubic feet per second.
1
1915-16
1916-17
1917-18
1918-19.
1919-20
Hydrograph showing storage available and quantity used to maintain 350 sec ft continuous regulated flow.
2
Lochaber Lake
Mulgrave Lake
Fraser Lake
Como Lake
Anti dam flowage
Sloane Lake
Rocky Lakes
Governor Lakes
Hydrograph showing storage available and quantity used to maintain 450 sec ft continuous regulated flow
3
Lochaber Lake
Mulgrave Lake
Fraser Lake
Como Lake
Anti dam flowage
Sloane Lake
Rocky Lake
Governor Lake
7631 H.P.
3470 HP
4
Hydrograph showing storage available and quantity used to maintain 550 sec ft continuous regulated flow except in months Aug Sept Oct 1916 and Aug Sept 1917 when auxiliary steam power used to supplement.
5
Lochaber Lake

considered in arriving at a figure for dependable flow, but will be considered wholly as reserve in case of extreme drought conditions and to account for losses beyond those foreseen and allowed for. It is known that the storages assumed are very conservative in quantity, and there is no doubt that the extensive surveys necessary will show that considerable greater quantities of storage will be available. No account has been taken of flowage, and it is believed that this with the conservative estimates made will balance losses of water due to evaporation, seepage, ice formation, etc., etc. — and will be more or less in quantity depending upon how quickly the water is let down, upon the season of the year, the shape of the river channel, the nature of the river channel, etc. Careful estimates made show that it is certain that the storages can be filled to the capacities proposed.

The tabulation of these storages for East River — shows that 52,496 acre feet proposed to be developed for use and 7,130 acre feet developed for reserve, and the possibility for the future development of some 5,000 acre feet additional.

East River Sheet Harbour-Hydro-Powers Storage Basins and Details.

Refer No.	Storage	Storage Acre-Feet to be Developed and Used	Storage Acre-Feet Developed for Reserve
1	Lochaber		4,050
2	Mulgrave	12,000	
3	Fraser (Mulgrave) . . .	4,740	
4	Como	2,610	
5	Governor		
	Little Governor . . .	10,856	
6	Sloane	4,800	
7	Lower Rocky		
	First Rocky	10,990	
8	Auto Dam	6,000	
9	Ten Mile		3,080
	Present Developments Total	52,496	7,130
10	Diamond		1,930
11	Fraser (12 mile)		1,810
12	Smith East.		1,013
13	Abraham		770
	Present and Future Totals	52,496	12,653

The West River is similarly endowed with natural storages but more particular reference will not be made to them, as the intention is to confine the detail to the East River.

Dependable Flow with Storage and Auxiliary Steam Plant

To obtain the results under this heading for East River, a series of diagrams have been plotted as shown in Figure 2.

Diagram 1 is a hydrograph showing the average run off per month in cubic feet per second from October 1915 to October 1919 (both inclusive) based on the actual readings as taken on the Malay Falls gauge for the East River Basin. The ordinate gives not only a scale in cubic feet per second but also in continuous kilowatt of power delivered at Pictou County based upon the amount of water used under a net head of 195 feet from Lochaber Stillwater to Mean Sea Level, which head will be referred to under a subsequent heading. Across this diagram, there are drawn horizontal lines of constant flow — 350 second feet — 450 second feet and 550 second feet which are referred to in the formation of the other diagrams. As an example, take the month of December, 1915, the average run off per month was 1127 second feet, which might have given, delivered in Pictou County, under 195 feet head — 16,023 continuous kilowatt of power. It has already been pointed out that the period the diagram covers was probably a very low runoff period, as low as and possibly lower than any other that occurred in 31 years.

Diagram 2 is a hydrograph showing storage available and quantity of this storage used during the whole period under discussion to maintain a continuous regulated flow of 350 cubic feet per second. As ordinates, there have been shown the various storage proposed to be developed and used. All these storages have been reduced to their equivalent flow in cubic feet per second if allowed to discharge themselves completely in one month. It is apparent that with storages alone under the worst conditions of which we know, it would not be wise to depend upon obtaining a greater flow than 350 second feet continuously throughout the year. Diagram 2 shows also that the most economical use (in obtaining the greatest amount of power for the capital invested in creating storages) is not being made of the storages for at least three years out of the four shown. The proportion of blank space in diagram 2 to "hatched" space plainly indicates this.

Diagram 3 is prepared similarly to 2, except that a continuous flow of 450 second feet is assumed. It is apparent that in September and October 1916, there was not sufficient storage even using Lochaber Stillwater to maintain this flow. It does show, however, a much greater use being made of the storages available during the other low water periods under discussion, but even yet it is felt that a flow can not be assumed giving the greatest possible economic use of the run off that the basin affords during year after year of varying precipitation. This is evidenced by the large amount of unused storage in the summer of 1918 and 1919.

Diagram 5 is prepared again similarly to 2 and 3 using, however, a continuous flow of 550 second feet, but considering no use being made of Lochaber Stillwater storage — nor of Ten Mile Lake emergency storage not shown. It is very apparent from diagram 5 that during the months of August, September, October and November 1916 and September and October 1917, there would be a very considerable deficiency of storage. We will, therefore, supply all deficiencies to maintain 550 second feet from storage up to the end of July by which time, it should be possible to know the nature of the summer low water flow, then dropping to some point of continuous flow which will carry through until such time as the Autumn rains again replenish. For the summer of 1916, it will be noticed that this figure was 150 second feet for the months of August, September and October. For August and September, 1917, this figure was 300 second feet. During the summer of 1918 and 1919, the flow of 550 second feet could be maintained from storage and natural flow. Now examining diagram 5, it is apparent that we are approaching the point of the greatest use of the storage available. However, during the summers of 1916 and 1917, it would not be possible with storage only to continue to supply the same amount of power as during the summers of 1918 and 1919. As all industrial operations are based upon a continuous, uninterrupted supply of power, and as further storage is not available, it is, therefore, proposed to make use of the Acadia Coal Company's steam plant in Stellarton to supply this deficiency, acting mainly as reserve for cases such as the summers of 1916 and 1917, also partly as a guarantee against interruptions to the power supply through accidents to transmission lines or machinery, caused by changing winds, ice accumulations, lightning, etc., all beyond the present control of man.

Diagram 4 is to visualize the amount of such steam power that would have to be supplied to carry through the deficiencies of storage. During August, September and October 1916, there was only 150 second feet continuous flow giving 2,081 continuous horse power delivered. The balance between that and the normal supply of 7,631 continuous horse power by 550 second feet of water would have to be made up by steam power, or a quantity equivalent to 5,550 continuous horsepower for three months. Similarly in August and September 1917, the steam plant would operate to produce 3,470 continuous horse power for two months. The "double sectioned" spaces in diagram 4 represent steam power supplied, the "single sectioned" hydro power supplied.

We will, therefore, conclude to calculate upon a continuous regulated flow of 550 second feet with the use of the Acadia Coal Company's plant as a steam reserve.

Similarly for the West River, with the aid of steam reserve, a regulated flow of 300 second feet has been assumed under a net head of 73.5 feet, where with storage only not more than 150 second feet could be depended upon.

Flow and Heads for Respective Developments

In all calculations — total losses from the water entering the turbines to the power at the low tension side of the Terminal station in Pictou County have been assumed as 34 per cent made up as follows,—

Turbine	15 % loss.
Generator	6 % loss.
Transformers up	2½% loss.
Transmission line	8 % loss.
Transformers down	2½% loss.
	34%

A direct summation is actually incorrect, but we are erring on the safe side. It is hoped and it may yet be possible to cut these losses to 25 per cent.

For the East River, the present normal level of Lochaber Stillwater is 175.00 — taking mean sea level as zero datum. This it is proposed to raise to 195.0. To utilize the drop fully, therefore, between Lochaber Stillwater and mean sea level, there would be available 195 feet gross head. The endeavour has been to regulate as completely as possible the entire run off of the river. Consistently then, it should also be the intention to utilize to the limit this 195 feet of gross head available.

As developed more fully later, this has been done in two proposals,—

1. By means of one development only, with the whole gross head of 195 feet utilized, which on account of various hydraulic losses would be reduced to a net head of 185 feet. The generating station would be at Tidewater. This development for brevity will be referred to as No. 1 Tidewater.

2. By means of two developments of which the upper with generating station at Malay Falls would have a gross head of 80 feet, — reduced to 76.5 feet net head at the turbines — referred to as No. 2 Malay Falls. And a lower development with 114.5 feet gross head reduced to 112.5 feet, with generating station at Tidewater and referred to as No. 2 Tidewater. The total gross head utilized is therefore, 194.5 feet, and the total net head 189 feet. The net head obtained on account of lower hydraulic losses is four feet greater than under the first proposal.

Remembering that 350 second feet is the maximum continuous flow available with storage only and 550 second feet with steam reserve and storage and having the net heads, and assumed losses, we can arrive at the kilowatt hours, delivered per annum in Pictou County both for the alternative East River developments and the West River as shown below.

Kilowatt Hours Delivered in Pictou County.

Scheme	Storage Regulation, Only	Stor. Regulation and Steam Reserve		
		Hydro	Steam	Total
West River Tidewater Development	5.431,000	8,060,928	2,801,472	10,862,400
No. 1 Tidewater....	31,903,920	40,945,360	9,190,800	50,136,160
No. 2 Malay Falls..	13,192,560	16,932,744	3,798,422	20,731,166
No. 2 Tidewater....	19,403,400	24,896,352	5,594,705	30,491,057
Total No. 2......	32,595,960	41,829,096	9,393,127	51,222,223

As before stated the total estimated present consumption of power in Pictou County is 29,500,000 kilowatt hours, and it is very probable that this would not become all hydro for possibly two years after its advent, though this period would be materially shortened with the adoption of a proposal later advanced.

Examining the table given, there are three combinations that would supply Pictou County alone for a period of possibly two years from the introduction of hydro power and cover a period of about four years from the present date. The word "alone" is used advisedly, for if there were demand for a block of power over Pictou County's needs, than the combinations listed below would be too small in every case.

1. No. 1 Tidewater complete without steam reserve and using storage only.
2. No. 2 Tidewater and No. 2 Malay Falls without steam reserve and using storage only.
3. No. 2 Tidewater alone with steam reserve and storage.

A serious objection applies to both No. 1 and No. 2. Being without the expense of steam reserve, either would give lower unit power costs, and either would have the advantage of lower capital investment due to lessened machinery, and lower water conduit costs, capacity being necessary for only 250 second feet against 300 second feet with steam reserve. Neither combination, however, utilizes the full capacity of the river, and neither combination would allow for expansion beyond Pictou County's present consumption. Even the addition of the West River development without steam reserve would only give 5,431,000 kilowatt hours which is too small to justify the additional investment. It must, therefore, be apparent that both Combination 1 and Combination 2 must be ruled out.

Combination No. 3 — No. 2 Tidewater with steam reserve and storage — would appear the logical development for present needs. It involves the valuable steam reserve, promises the final utilization of the full value of the river, and provides opportunity for expansion,—

the matter of capital invested has to be considered, and the annual fixed charges contingent thereon. These are considered later.

Proposed Types of Development

Figure No. 9 covers the East River from Tidewater to Lochaber Outlet — a distance of 3 miles.

A close study has been made of all types of and location for developments. Conditions on the West side of East River through lack of roads, difficulty of access, deep river inlets, low heights above and near the river and wide creek valleys prejudice developments on that side, and affect seriously the matter of canals and pipe lines. It was also found that economic development meant the sacrifice of a considerable amount of the 116 feet gross head.

The East side presents better opportunities. Even here extensive investigation was necessary to decide the location of the water conduits, — and the most economical type to be adopted — whether pipe or canal. Preliminary investigation showed the necessity of two developments to utilize the 116 feet gross head, — involving two generating stations, and a consequent approximate doubling of

Figure 9

1. By the building of the No. 2 Malay Falls development.

2. By the building of West River Tidewater development. It would also, of course, call for the development of all the storages.

If there were in sight a demand for a block of power outside of Pictou County's needs at the time of beginning construction, then the choice comes to either,—

1. No. 1 Tidewater with steam reserve and storage.

2. No. 2 Tidewater and No. 2 Malay Falls with steam reserve and storage.

The first involves less annual operation charges and will give better and easier operating conditions as compared with the second proposal. On the other hand

operating staff and therefore operation charges. There are also the greater electrical difficulties attendant upon tying two generating stations, which while easily overcome, bring more complicated design and additional capital charges. The annual operation charges for a typical generating station would be approximately $18,000 — covering salaries, wages, supplies, etc., for the generating station only. It would then appear that equitably the sum of $18,000 capitalized at say 6 per cent would represent approximately the additional capital that might be invested towards the attainment of one generating station in place of two. This represents the sum of $300,000. After considerable investigation, a scheme using one generating station to develop the full gross head of 116 feet was obtained, and comparisons of investment involved will be made later.

We have then two proposed schemes which are,—

1. Single Development with head dam at Lochaber Stillwater and generating station at Tidewater. For brevity, reference will be made to this development as before said as No. 1 Tidewater.

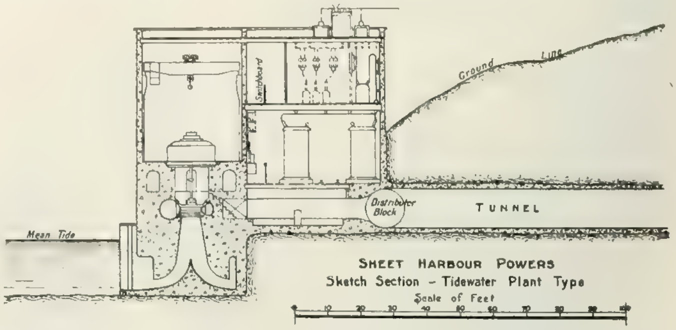
2. Two developments with the Upper Head dam situated as above at Lochaber Stillwater and with the generating station just below Malay Falls. This development will be referred to as No. 2 Malay Falls. The lower development will have the head dam a short distance above Ruth Falls and the generating station at Tidewater, located exactly as for No. 1 Tidewater. Development scheme No. 2 requires a control station. It has been recommended that the Tidewater station be this control, mainly on account of its accessibility to the outside world, its central position, having in mind the possible future West River development, the lessened handling required on transformers weighing possibly ten tons each, and its priority for construction in the development of the complete scheme.

The details of developments may be summarized as follows,—

No. 1 Tidewater Development

Eight different sections were studied for the head dam for this development, which would also form the head dam for the alternative No. 2 Malay Falls development. The final location would be at the head of Marshall Falls and of sufficient height to raise Lochaber Stillwater twenty feet, forming as aforesaid a head pond 5½ miles long and averaging ¾ mile wide. The overflow section of the dam would be of mass concrete, the East end being retaining wall section with concrete core wall and earth body. Provision would be made for a log run, fish way and unwatering sluices. The foundation would be on bedrock.

The water conduit is not taken from the dam but at a distance to the West, consisting of a canal with the entrance flared to lessen hydraulic entrance losses, protected by a boom and with provision made to close off the water with stop logs. The canal would be concrete lined and made of sufficient size so as to allow for a drawdown on the pond of three feet and still not increase the velocity beyond the economic limit. The sides would be on a 45°slope, so as to obviate the necessity of forms for the lining, and to take care of any ice pressure that might develop. For the first 1200 feet this canal is common to both No. 1 Tidewater and No. 2 Malay Falls developments. For the power scheme under description the canal continues down the valley as shown in Map No. 4 at varying distances from the river following contour 190. In places where the canal crosses a deeper creek valley, it is more economical to cross on a fill rather than follow around the contour. The canal length is 20,900 lineal feet terminating in concrete headworks set well down into the crest of the hill. To obviate the necessity of wasting a large amount of water at a time of the year when the water should be conserved through driving logs down a river obstructed with large boulders, and with rapids and falls, it is proposed to carry the log drives down the canal, discharging them just above the headworks at the end of the canal into a timber log sluice carried across the bog, over the road and down to the main river, discharging a short distance above the generating station. The limits on the upper river have not been cut for 23 years, and within probably 5 years, the cut will be begun.



SHEET HARBOUR POWERS
Sketch Section – Tidewater Plant Type

From the headworks at the end of the canal, which will be housed and provided with trash racks, closing gates and gate mechanism,— a 10′ 6″ wood stave pipe — 5500 feet long — will carry the water to the crest of the hill above the power house, here it will enter a steel thimble surrounded with a concrete block and forming a part of a vertical pipe carried to a height of about 50 feet to form a surge tank. On account of the very steep slope, the consequent necessity of heavy anchorage, and the vibrational effect from heavy surges, instead of the usual penstocks, it has so far been considered that a penstock tunnel should be built, carried down as a shaft from the surge tank,— 12 feet in diameter, lined with concrete, (figure 4), and then carried horizontally to the transformer house wall, this section being an arched tunnel, and which will discharge into a steel distributor in a concrete block from which branch two six foot and two 4′ 6″ diameter steel pipes controlled with hydraulic valves placed next to the spiral — steel cased — vertical shaft turbines set in mass concrete,— as shown in the sketch, and connected directly to the three phase, 60-cycle alternating current generators with exciters also on same shaft. The water discharges from the turbines through concrete draft tubes into a tailrace excavated to the river with provision made to utilize the low tide level. It will be noticed that a different type of draft tube is proposed, it being intended to make use of either the Moody Flaring type or White's Hydraucone both of which have recently been utilized in the two new 37,500 horse power turbines at Niagara Falls and where there has been attained the remarkable efficiency of 90 per cent from the canal headworks to the tailrace, due in part to this new type of draft tube, which regains as high as 72 per cent of the velocity head of the water when leaving the turbine runner, and which also tends to reduce to a minimum the vibrational effect often present in curved draft tubes with long penstocks. The type shown in the section is Moody's Flaring type. The superstructure will probably be of concrete. Back of the power house above the steel distributing pipes will be placed the "transformer house", holding the low tension switching equipment, low tension bus bars, transformers and high tension switching equipment, lightning arresters, etc. Due consideration will be given to an outdoor transforming installation, which is increasing in favour, but which does not appear as yet as being applicable to the conditions here in Nova Scotia.

No. 2 Malay Falls Development

The head dam, canal entrance and [illegible] feet of canal will be similar to the alternative No. 1 Tidewater Development first described. The canal will terminate in a concrete headworks, housed, with trash racks, ice run, closing gates and gate mechanism. From this will exist a 10' 6" wood stave pipe of a total length of [illegible] feet laid on a graded foundation, and connecting near the power house to a differential surge tank on the crest of the hill elevation 17[illegible], from thence carrying on in 10' 6" wood stave pipe to a generating station similar to that described previously,— distributing the water, however, through two 7-foot steel pipes to the two turbines. No service transformers will be necessary in this station, so the structure back of the power house will be comparatively small, housing only the low tension switching equipment, properly protected, and from the low tension bus bars the current will be transmitted to the control station at Tidewater. The station will be placed just below Malay Falls, and the tailrace discharge will be into the river at a normal elevation of 115, where a pond will extend to the head dam for No. 2 Tidewater Development, just above Ruth Falls.

No. 2 Tidewater Development

Referring again to Map No. 4 of the whole valley, the head dam is a short distance above Ruth Falls where a four foot drop occurs. The dip and strike of the exposed bedrock are such as to make an extremely good dam foundation. The dam would be of mass concrete of a maximum height of 34 feet, having both overflow and retaining wall section. Provision would be made for fishway, trash and ice way, and for unwatering sluices. The crest of the overflow section would be elevation 114.5. The pond formed would be 2½ miles long. On the eastern end of the dam, there would be the splayed entrance to the canal, protected by a boom. The normal section of the canal would be 11 feet wide at the bottom with 45° side slopes — lined with 6 inches of concrete and made sufficiently deep so as to allow for a drawdown of one foot on the pond without increasing the maximum velocity to a point causing uneconomical friction head loss. A greater drawdown should not be necessary as the operation of the two plants should always be such that the amount of water passing through the turbines of the two generating stations would be approximately the same. The course of the canal would follow contour 115 along the side hill below the road. Such a canal in first cost would be considerably cheaper than a wood stave pipe of equal capacity and would involve only a fraction of the friction head loss of the wood stave pipe for such a distance as this — 8300 lineal feet. The canal would terminate in a concrete headworks on the hillside above Tidewater at approximate elevation 114.0; it would be housed and provided with the usual trash racks, ice run, gates and gate mechanism. It will have been noticed that no provision is being made in the head dam at Ruth Falls for a log chute. The intention is to bring all log drives down the canal, discharging the logs just above the headworks, by means of a motor operated log roll, into a timber sluice using just sufficient water to "grease" the steep chute, and discharging into the river just above the generating station. The headworks would be protected from bark and trash by another set of special racks. Due to the short distance from the headworks to the turbines, and also on account of the open canal, a surge tank would not be necessary according to present calculations. Also, similarly to No. 1 Tidewater development it has been recommended that the penstock instead of being the usual wood stave or steel pipe or pipes should be a permanent penstock tunnel in the form of a 12 foot diameter shaft and arched tunnel, concrete lined, running to the wall of the "transformer" house, and operating through a steel distributor to two 7-foot pipes to the two turbines. Otherwise the generating station and transformer house would be similar to that for No. 1 Tidewater development except that it is smaller with two machines instead of four of No. 1 Tidewater. Of the two stations under No. 2 Scheme, this would be the operating control. The necessary transformers would, therefore, be placed here.

Summary of Schemes Proposed

The two generating stations under No. 2 Scheme would be approximately four miles apart, with the Tidewater station as operation control and Malay Falls as water control. With both plants in operation, an addition to operating expenses would be necessary for the salary of an operating superintendent, which might be avoided under No. 1 Scheme with one development, where a chief operator would suffice. A wharf would be built on the East bank of the river, about 400 feet below the Tidewater generating station, which could very conveniently be reached by small ocean going vessels, as there is a swing span in the steel highway bridge, a mile below the wharf. The heavy machinery and transformers for the Tidewater station could be very easily handled, therefore, and at a minimum of expense. There are apparently no suitable gravel and sand available in the valley above Tidewater. At the mouth of the river estuary, it is understood that clean washed gravel and sand are available which could be taken out by steam shovel, loaded onto scows, brought up to and unloaded at the wharf, carried up the 170 ft. hill from Tidewater by an inclined hoist to storage bins, for distribution to the points where wanted. Such an arrangement would possibly prove more economical that the use of crushed aggregate, and would solve a problem of considerable consequence where larger quantities of concrete are necessary.

Turbines and Generators

With due regard to economics, it has been the endeavour to plan the development so as to obtain the maximum capacity of the river as a power producer, utilizing the whole of the gross head available between Lochaber Stillwater and Tidewater, and cutting down hydraulic losses to the economic limit. Consequently also the turbine characteristics should be arranged to obtain the highest possible efficiency — not at one particular point of the machine capacity, but through all the normal operating range. By using a high specific speed, it is possible to obtain a lower cost for generating machinery, and also a relatively high turbine efficiency, but unfortunately only over a very small range of the machine capacity, — around [illegible] per cent of that capacity, — and dropping off rapidly towards both half load and full rated load. To conserve water, we would, therefore, be inclined to sacrifice extremely high efficiency to a fairly flat efficiency curve between one half load and full load, and also so to select the number of the turbines and therefore their individual capacities that at no time would it be necessary to operate a "wheel" at less than half its rating. It has been shown that the summation of all present loads in Pictou County gives a working day load factor of 53.2 per cent. 50 per cent has been used in allowing for total machine capacity, when in the usual generating station design it is customary to use from 33 1/3 per cent to 40 per cent. It is also necessary to allow for turbine ratings to take care of short duration peaks, running 25 per cent over the average peak, and this is particularly necessary for loads such as those that would be given by the Nova Scotia Steel & Coal Company and to a lesser extent by the Acadia Coal Company and the Eastern Car Company. The generators would be rated in kilovolt amperes, at 90 per cent power factor and up to this short duration 25 per cent overload, as it is the latest practice to rate them for the maximum load carried even for short periods. The 90 per cent power factor would be gained through the utilization of the Acadia Coal Company's steam plant as a reserve, and consequent also upon arrangements proposed later incidental to hydro power being supplied that Company.

The machines to be used would then be,—

No. 1 Tidewater	— 2 — 4300 h.p. turbines.
	2 — 8000 h.p. "
	2 — 3350 K.V.A. Generators.
	2 — 6250 K.V.A. "
No. 2 Malay Falls	— 2 — 5000 h.p. turbines.
	2 — 4000 K.V.A. generators.
No. 2 Tidewater	— 2 — 7500 h.p. turbines.
	2 — 5800 K.V.A. generators.

The turbine efficiencies would approximate at least at

1/2 rated capacity	— 80.5 per cent.
5/8 " "	— 84.5 " "
3/4 " "	— 87 " "
7/8 " "	— 88 " "
Full " "	— 84 " "

and it is hoped that these may be increased materially by the use of the draft tube previously described.

The generators will be three phase, 60-cycle, 6600 volts, and with these characteristics, the generating stations will be adaptable for connection to any general system of distribution for the whole Province, and conform, therefore, to the main characteristics of the St. Margaret's Bay stations of the Commission.

Electrical System and Transmission Lines

In No. 2 Scheme, the 6600 volt current from Malay Falls station would be carried to the Tidewater control station on the poles of the main outgoing transmission lines running from the control station to Pictou County. At the control station, the current passes to the low tension busses, designed of sufficient capacity not only to carry the maximum low tension current of the two plants of No. 2 Scheme, but also that of the future West River station. Two banks of three single phase transformers would step up the voltage from 6600 volts to 44,000 volts, and with the usual protective devices, the current would pass to the transmission lines. Similarly for No. 1 Scheme except that there would be avoided the paralleling of stations necessary under No. 2 Scheme.

Referring to the general map, from present information and data it would be proposed to carry finally two aluminum circuits on one line of steel poles, following the river along the canal right of way and then practically due North on the East side of Lochaber Stillwater between Rocky and Sloane Lakes, into Pictou County, to Sunnybrae on the railway, thence along the railway right of way to Eureka, thence North, again along the railway right of way to the main terminal station in the near vicinity of the Acadia Coal Company's steam plant outside Stellarton,—making connection through transformers to the power house of the Pictou County Electric Company for the supply of power to them. Due to the use of 50-cycle current by the Acadia Coal Company, frequency changers would have to be installed, which could be reversed to turn the 50-cycle Acadia Coal Company's current into the main transmission line as necessary. The usual step down transformers would of course be present.

From the terminal station, the line would continue across country West of New Glasgow to opposite the Nova Scotia Steel & Coal Company's plant, spanning the river to a substation with transformers for the supply to Nova Scotia Steel & Coal Company and the Eastern Car Company.

From this substation a 13,200 volt single circuit will be carried back across the river, following the road on steel poles to Abercrombie Point, spanning the basin on special steel structures to an out door substation on the outskirts of Pictou, for the supply of Pictou and vicinity.

Power would be metered for sale and payment at the low tension side of the switchboards of the various substations. The total length of the line to Trenton substation would be 56 miles, and from Trenton substation to Pictou substation about 7¾ miles. Detailed surveys may modify the general route but not the main proposals.

Steam Reserve and Proposal for Prior Utilization

For supply to the Acadia Coal Company, frequency changers are proposed to be installed, which would be utilized when necessary to take power from the steam reserve.

If either No. 1 or No. 2 scheme complete were adopted, the construction period would be from 20 to 24 months.

If the Tidewater station of No. 2 scheme were initially adopted the construction period would be 12 to 15 months. From the present date, at the very best, there would be a period of two years before the advent of hydro power to alleviate the present high power cost situation. To relieve this situation during the hydro-construction period, a proposal is advanced on which a memorandum has been prepared by Professor J. F. Lumsden, Electrical Engineer to the Commission, of which the following is a synopsis,—

The Nova Scotia Steel & Coal Company has been proposing the immediate electrification of its plant, obtaining the power necessary at 60-cycles from the Acadia Coal Company's steam plant by the installation of a new 3000 kilowatt, 60-cycle steam turbine driven generator, and at the same time supplying the Eastern Car Company; 60-cycle current being used so as to conform to the hydro standard. To do this, in addition to generating machinery at 2150 volts, there would be necessary transformers at the power end from 2150 volts to say 13,200 volts, substation at Trenton to reduce to say 2300 volts, and transmission line from Stellarton to Trenton — 3¼ miles long. All of these would have to be scrapped or used elsewhere with the coming in of hydro power. It is, therefore, proposed that the Nova Scotia Power Commission proceed immediately with the installation of Stellarton, Trenton and Pictou substations, and transmission line from Stellarton to Pictou,— all of a permanent nature and of the final hydro-standard.

Without increasing total capital expenditure for the complete system, the Nova Scotia Power Commission could complete this portion earlier and supply power to consumers from the Acadia Coal Company's plant at least 12 months sooner than would be otherwise possible, and during this period prospective consumers would electrify their plants and connect to the lines, so that later with the complete hydro in operation, the initial load would be beyond the "development period" stage, in other words the usual awkward small load "development period" would be materially shortened, and during this shortened period only a small fraction of the final fixed charges would have to be carried.

The Nova Scotia Steel & Coal Company and the Eastern Car Company would also be saved a considerable capital expenditure for substations, transformers and transmission lines.

An agreement would, of course, be necessary that the Acadia Coal Company supply the Commission with all the power available over and above the requirements of the three companies.

The power available at present from the steam plant is	7000 K.W.
The present maximum demand of the three companies is, (including transmission losses)	6534 K.W.
The balance available is, therefore	466 K.W.

This is a small margin. The town of Pictou's maximum alone is 250 kilowatt, but it is hardly possible that the Nova Scotia Steel & Coal Company will draw more than a fraction of the maximum for some time after this line is in operation, so that it is estimated that the steam plant could both supply the town of Pictou's maximum demand of 250 kilowatt, the Pictou County's Electric Company's maximum of 500 kilowatt and a portion if not the whole of the smaller companies' loads, during the 12-month period before the hydro enters.

It will be noticed that the full capacity 7000 kilowatt is considered available from the steam plant, though only

Data, Capital and Operating Costs and Reductions.

Item	No. 2—[illegible] with Steam Res. and Storage	No. 1—[illegible] with Steam and Storage	No. 2 [illegible] and No. 1 [illegible] Falls with Steam and Storage
Annual Capacity — K.W. Hrs. delivered — Hydro	[illegible]	[illegible]	[illegible]
" " " " " — Steam	[illegible]	9,196,800	[illegible]
Total System Capacity—delivered—K.W. Hrs.	[illegible]	[illegible]	[illegible]
Total rated Turbine H.P. Installed	[illegible]	[illegible]	[illegible]
" " Generator K.V.A. Installed	[illegible]	[illegible]	[illegible]
Initial rated Turbine H.P. Installed	[illegible]	[illegible]	[illegible]
" " Generator K.V.A. Installed	[illegible]	[illegible]	[illegible]
Assumed Daily Load Factor	[illegible]	[illegible]	[illegible]
Estimated Present Annual Consumption	[illegible]	[illegible]	[illegible]
Total Capital Costs	[illegible]	[illegible]	[illegible]
Initial Capital Costs	[illegible]	[illegible]	[illegible]
Capital Costs per Final H.P. Installed — 50% L.F.	[illegible]	$139.27	[illegible]
" " " " " " — [illegible]% L.F.	117.00	113.00	[illegible]
Annual Operating Costs and Fixed Charges — F.	$376,171	[illegible]	[illegible]
" " " " " " — I.	[illegible]	[illegible]	[illegible]
Max. Sale price per K.W. Hr. to [illegible] all Charges			
Annual Sale — [illegible] K.W. Hrs.	[illegible]	1.94c.	
" " — [illegible] " "	1.25c.	[illegible]	
" " — [illegible] " "		[illegible]	[illegible]
" " — [illegible] " "		[illegible]	[illegible]
Smallest Load that will give Required Revenue assuming no Sinking Fund Payments.			
Rate Charged	[illegible]	[illegible]	
Smallest Load — K.W. Hrs.	[illegible]	[illegible]	

1.00c. per K.W. Hr. on the ordinary commercial H.P. rating with 100% Load Factor is equivalent to $[illegible] per H.P. per year.

the one new 4000 kilowatt machine at 60-cycle is to be installed, the remainder — 2 — 1500 kilowatt machines— remaining 50-cycle. It is hoped that the Acadia Coal Company will take the hydro power,— and that ultimately frequency changers,— consisting of synchronous motor generator sets, will be installed, allowing for the change from the hydro 60-cycle to the mine 50-cycle. If the e were installed immediately, the full 7000 kilowatt capacity would become adaptable for Pictou County. When these synchronous motor generator sets are obtained, it is proposed that the aggregate capacity be such as to carry not only the rated kilowatt load of the sets, but also sufficient reactive K. V. A. so that by their proper operation, the power factor of the transmission lines from Sheet Harbour can be maintained at 90 per cent. To do this the 60-cycle end of the sets would have to have their aggregate rating increased 1000 K.V.A. To further the proposal advanced, it is proposed to instal one at least of the two frequency changing sets at the present time, so that the full capacity of the plant may be available. It is estimated that the Acadia Coal Company's load at 50-cycle will never drop below 1500 kilowatt on the average, so that no advantage would be gained by the installation of more than one of the 1500 kilowatt sets immediately.

Capital Expenditure, Operating and Fixed Charges

The information under this heading is tabulated below. Only three arrangements are considered,—

1. No. 2 Tidewater development with complete storage, utilizing steam reserve, but with only one circuit transmission line on steel poles capable of carrying a future additional circuit.
2. No. 1 Tidewater Scheme complete with entire storage, steam reserve, and two circuit transmission on single line of steel poles.
3. No. 2 Scheme complete of two developments with storage and steam reserve and two circuit transmission.

The first division of the table shows data already referred to. It will be noted that the final capacity of both schemes is almost identical — approximately 51,000,000 kilowatt hours, also that the No. 2 Tidewater development with steam reserve and storage will supply the complete present Pictou County load.

The estimated capital expenditure with No. 1 Scheme complete costing actually $50,000 more than No. 2 Scheme complete,— but on "paper" being about $250,000 cheaper due to capitalizing of saving in operation charges.

The capital expenditures per horse power installed is shown both on the 50 per cent load factor as figured and on the usual 40 per cent, due allowance being made for additional generating machinery, enlarged water conduits, etc. It should be noticed particularly that these unit costs are closely comparable with pre-war figures in spite of the present enormously increased construction costs.

In various divisions, figures are given for initial expenditure, it being intended that no more money be invested initially than necessary to cover the initial power demand. In No. 1 Scheme — a machine would be left out,— and in both No. 1 and No. 2 complete—one circuit of the line would be held over, etc.

The next division covers annual operation and fixed charges, both final and initial,— the initial being without allowance made for the use of steam and having lessened fixed charges. The Nova Scotia Power Commission will sell power at cost but must include in this cost not only interest on the capital expenditure, but also annual sinking fund payments, and an approximate equal annual payment into a "depreciation fund" for renewals.

The next division covers the maximum sale price per kilowatt hour for various annual consumptions — progressing according to the plant capacities.

The heading describes the last division. It is felt that those customers who are sufficiently enterprising to become motorized quickly so as to avail themselves of hydro-power during the "development period", should not be penalized for those who delay. A reasonable way to affect equalization would be by deferring payments into the sinking fund during the "development period" — say three years,— during which the load would build up to its normal proportions. With an initial rate of 1.25c. per kilowatt hour, the No. 2 Tidewater plant would require a load of 19,000,000 kilowatt hours to cover the annual charges, and which it could under the worst conditions known, carry without the use of steam reserve. Similarly at 1.15c. per kilowatt hour, complete Scheme No. 1 would require a load of 27,500,000 kilowatt hours, which it could carry without the use of steam reserve.

Conclusions

1. Present steam power costs in Pictou County range from 1.65c. to 12c. per kilowatt hour without fixed charges included. The present consumption is approximately 29,500,000 kilowatt hours. Hydro-power can be furnished, at from 1.25c. to 1.15c. per kilowatt hour. This would mean a saving of $500,000 per year to Pictou County or $1350 per day.

2. During the hydro construction period a marked alleviation of high power cost conditions might be made with the adoption of the proposal advanced for prior utilization of the steam plant.

3. With no other load than that of Pictou County, it would be wisdom to proceed initially with the Tidewater plant of No. 2 Scheme, allowing for increasing demands over its capacity to be met by the installation of the Malay Falls Development, and later the West River development.

4. With an initial load in sight of 40,000,000 kilowatt hours annually, the complete No. 1 Scheme should be proceeded with, this might ultimately be increased beyond its 51,000,000 kilowatt hour capacity by the West River Development.

The writer's thanks are very much due to Professor J. F. Lumsden, acting as Electrical Engineer to the Commission, for material aid in the preparation of the original report, and also to the Nova Scotia Power Commission, through its Chief Engineer, K. H. Smith, M.E.I.C., for permission to use the matter of the original report which has just recently been submitted to the Commission.

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOL. III. December 1920 No. 12

Date of Annual General Meeting

The Annual and General Professional Meeting will be held in Toronto on February 1st, 2nd and 3rd, 1921. The Annual General Meeting is announced for January 25th at Montreal, as provided in the by-laws, and will be adjourned to Toronto.

Remuneration

This is a burning subject with many members, or rather, the lack of what is considered adequate remuneration, and is the cause of considerable unrest at the moment.

Although *The Institute* Committee on Remuneration and Classification of engineers has been hard at work for some months and is being loyally supported by a number of the Branches, so many are the considerations and so varied the investigations being carried out, that it has been impossible for the Committee to complete its work and report what members of the Committee consider a satisfactory schedule. Active work is being continued however, which the profession in general and members in particular will receive with due appreciation and with the expectation that the results will be highly beneficial. The Committee on Policy has been asked to submit suggestions as to the best method of bringing into effect the various schedules which *The Institute* will adopt.

Innovation at Professional Meetings

Commencing with the annual meeting held at Ottawa the precedent of holding, in conjunction with the annual meeting, a general professional meeting, has developed a definite procedure which has already become firmly established as an attractive means of providing an interesting annual gathering.

At Montreal a year ago the large attendance and general enthusiasm made it one of the most notable gatherings that engineers have yet held in this country. At that time it was generally understood that the next annual meeting would be held in Toronto and shortly after, the proposal having been approved, the officers and members of the Toronto Branch set about planning for an even greater assembly of engineers than any previously held. A strong committee of the Branch has been hard at work for months, a partial result of which is embodied in the general tentative programme published in another column of this issue. The Toronto Branch will have entire charge of the details of the professional side of the meeting and members are assured of sessions full of interest and sufficiently attractive to justify making a long journey to be present.

A notable feature of the professional meeting and a departure from usual practice, is a division of the programme into sectional sessions, which will enable a greater number of papers to be presented and enable members to hear those in which they are most particularly interested. There will be no sectional sessions while papers of general interest are being presented.

Other details are well in hand giving promise of surpassing all previous gatherings. The Committee of the Branch having this work in hand includes: Col. H. J. Lamb, M.E.I.C., Chairman; H. L. Seymour, A.M.E.I.C., Secretary; O. M. Falls, Jr.E.I.C., Assistant-Secretary; H. G. Acres, M.E.I.C., J. R. W. Ambrose, M.E.I.C., E. T. J. Brandon, A.M.E.I.C., W. A. Bucke, A.M.E.I.C., J. B. Carswell, A.M.E.I.C., Willis Chipman, M.E.I.C., Geo. Clark, A.M.E.I.C., J. R. Cockburn, A.M.E.I.C., E. L. Cousins, A.M.E.I.C., T. L. Crossley, A.M.E.I.C.,

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Thirty Fifth Annual General and Professional Meeting, Toronto

1st, 2nd, and 3rd February, 1921

The Annual General Meeting will be called in Montreal on Tuesday, January 24th, when scrutineers and auditors will be appointed after which the meeting will adjourn to meet at King Edward Hotel, Toronto, on Tuesday February 1st.

PROGRAMME

Tuesday, February 1st.

9.00 A.M.	Registration at King Edward Hotel.
9.30 A.M.	Address of Welcome.
10.00 A.M.	Calling to Order Annual Business Meeting.
12.45 P.M.	Adjournment until 2.30 P.M.
1.00 P.M.	Luncheon.
2.30 P.M.	Resuming of Annual Business Meeting. Reception of Reports: New Business, etc.
3.45 P.M.	Reception of Reports of Scrutineers.
4.00 P.M.	Address of Retiring President.
4.30 P.M.	Inauguration of Incoming President.
4.50 P.M.	Closing of Annual Meeting.
5.00 P.M.	Reception, King Edward Hotel.
8.00 P.M.	Smoker, King Edward Hotel.

Wednesday, February 2nd.

9.15 A.M.	Opening of Professional Meeting. (Sectional Sessions).
12.45 P.M.	Adjournment.
1.00 P.M.	Luncheon.
2.15 P.M.	Resuming of Professional Meeting, (General Papers).
5.00 P.M.	New Business and General Discussion.
6.00 P.M.	Adjournment.
7.30 P.M.	Annual Banquet of the Institute, King Edward Hotel.

Thursday, February 3rd.

9.30 A.M.	Excursions.
2.15 P.M.	Resuming of Professional Meeting. (General Papers).
5.00 P.M.	New Business and General Discussion.
6.00 P.M.	Closing of Professional Meeting.
8.30 P.M.	Dance to be given jointly by the Engineering Society of the University of Toronto and E.I.C. at Hart House.

Engineering Standards

The work undertaken by the Canadian Engineering Standards Association, the establishment of which is the result of the vision and enterprise of a number of members of *The Institute*, is being conducted on a basis which will in a few years enable Canada to have proper standard specifications for many phases of engineering activity for which we have heretofore been dependent upon Great Britain and the United States. One of the chief functions of this organization is to harmonize British and American engineering practice, and this offers a wide field of usefulness.

All of the standard specifications of *The Engineering Institute of Canada* have been turned over to the C.E.S.A. to be revised and brought up to date as they may require. It is intended to keep copies of the various specifications of the C.E.S.A. at the headquarters of *The Institute* for the convenience of members, as it is not intended that *The Institute* shall issue further specifications.

British Engineering Conference

Members of *The Institute* will be interested to know that during the coming summer a general engineering conference will be held at London, England, under the auspices of the Institution of Civil Engineers. An invitation to attend this gathering is embodied in a letter from Doctor J. H. T. Tudsbery, Secretary, reproduced herewith.

* * *

The Secretary,
The Engineering Institute of Canada,
176 Mansfield Street,
Montreal, Canada.

My dear Sir,

I am directed by the Council to inform you that it is proposed to hold at this Institution in the Summer of next year, probably at the end of June, another general Engineering Conference — the series of which was unfortunately broken by the European War. At these Conferences which have been generally of three days' duration, questions are introduced, with a view to discussion, on important problems of the day arising in or affecting the various departments of Engineering, including the Education and Training of Engineers and in the past these discussions have enjoyed very considerable support and success.

The Council now wish me to say to you, and through you to the members of *The Engineering Institute of Canada*, that any members of your Society who may be in England at the time of the Engineering Conference referred to are cordially invited to take part in it, and to contribute to the discussion of the subjects that may be submitted at the Conference.

I am,
My dear Sir,
Yours faithfully,
J. H. T. TUDSBERY,
Secretary.

The Institution of Civil Engineers,
Great George Street, Westminster, S.W.I.
29 October, 1920.

Engineers' Extending Influence.

It was been claimed in the past, that one of the greatest features in the failure of the engineering profession to exert a proper influence outside its own sphere has been due to unwillingness to take part in activities outside the immediate work of the profession. The importance of the engineer as a factor in the industrial, economical and even social life of the nation is neither known or appreciated to any extent outside his own profession. While the charge that engineers have not interested themselves in other activities may be true of a large number, there are many in the profession whose public spiritedness and active participation in all worthy causes is not surpassed by the members of any of the other learned professions, and in proportion to the extent that this becomes true or otherwise, of the great majority of the profession will our influence broaden or merely continue to increase at a slow rate.

There are hundreds of men in *The Engineering Institute of Canada* capable of writing authoritative editorials on the many phases of the profession's activities wherein the general public is affected, which would be quoted by the daily press throughout the land. If each branch of *The Institute* would undertake two such editorials a year, there would thus be three available for each issue of *The Journal.* By sending galley proofs of these to the various newspapers for reproduction and comment, there would result a much greater interest in the profession on the part of the public.

Some of our members are doing splendid work in contributing on subjects affecting social matters. In this connection it is timely to point out that the title of a corporate member of *The Institute* represents a standing in the profession and should be used by all members when contributing articles. The November issue of "Social Welfare" the organ of the Social Service Council of Canada, is a striking example of the manner in which engineers are taking a prominent part in discussing social problems. In this issue appear articles by four members of *The Institute:* "The Protection of the Family Shelter by Statute", by H.L.Seymour, A.M.E.I.C., "Private Ownership and Municipal Politics versus Public Enterprise in the Housing Problem", by F. A. Dallyn, A.M.E.I.C., "Modern Living Conditions and the Play of the People", by A. G. Dalzell, A.M.E.I.C., and "A National Solution of the Housing Problem", by C. J. Yorath, M.E.I.C. The work of our members in this direction will no doubt be an incentive to others to similar efforts, and thus continue to extend the influence of the profession.

Meeting of the Main Committee of the Canadian Engineering Standards Association

A meeting of the Main Committee of the C.E.S.A. was held in Ottawa on November 8th, the following members being present: H. H. Vaughan, M.E.I.C., Chairman; Dr. E. Deville, A. A. Dion, M.E.I.C., Prof. L. W. Gill, M.E.I.C., Dr. L. A. Herdt, M.E.I.C., Col. W. J. Keightley, Dr. J. B. Porter, M.E.I.C., Dr. A. B. Macallum and R. J. Durley, M.E.I.C., Secretary.

In accordance with Minute No. 75, the Executive Committee recommended the re-nomination of Dr. Porter as nominee of the Institution of Civil Engineers, and A. Boyer as nominee of Laval University. These recommendations were unanimously approved, and Dr. Porter was re-appointed on the Executive Committee.

Distinctive Mark of the Association

The Secretary reported that, in the opinion of the Registrar of Trade Marks, the Association cannot register its distinctive mark as a trade mark, as the Canadian Trade Marks Act makes no provision for the registration of collective trade marks, or trade marks other than those intended to identify the product of a single firm or organization. It would thus appear that if no special steps are taken the use of the Association's distinctive mark will only be protected to the extent that, if applied to an article not in accordance with C.E.S.A. Specifications, such application would constitute a false trade description, and the parties so using the mark would be liable accordingly on action being taken by the purchaser.

Considerable discussion took place, and it was suggested by Dr. Herdt that the distinctive mark of the Association might possibly be registered as a label in a somewhat similar manner to that of the Pulp and Paper Association, being used on the letterheads and publications as well as on articles purporting to be in accordance with C.E.S.A. Specifications. The Secretary was requested to see the Registrar of Trade Marks again regarding this matter and report further. In the meantime, the use of the distinctive mark on letterheads and title pages was authorized with a view of bringing the mark so far as possible to the knowledge of the public.

Nomination of Member of Main Committee by Board of Railway Commissioners

Regarding the suggestion that the Board of Railway Commissioners should be asked to nominate an *ex-officio* member on the Main Committee in the same way as is done by other important Government Departments, this was unanimously approved, and the Secretary was directed to write to the Board accordingly.

Report re Sectional Committee on Rail and Track

The Chairman, J. M. R. Fairbairn, M.E.I.C., reported that at a recent meeting of this Committee, it was decided that since important action on the part of the A.R.E.A. was shortly expected, it was desirable for the Sectional Committee to be informed as to the policy of the A.R.E.A. before drafting its own specification, and such information was accordingly being awaited.

Report re Sectional Committee on Wire Rope

The two Sub-Committees on Wire Rope have not yet been able to meet, but a draft Specification has been prepared and is under consideration and criticism by all members of both Sub-Committees. It is expected that arrangements will shortly be made for a joint meeting of both Sub-Committees, at which members' comments will be considered.

Specifications now in force in Canada for wire strand have been collected and tabulated, and the work of the Sub-Committee is proceeding.

Report re Sectional Committee on Steel Bridges and Construction

The Secretary reported that the Specification for Steel Railway Bridges prepared by this Sub-Committee has been published and is available for distribution. A considerable number of free copies have been sent out, and the specifications for bridge material have been published as a separate pamphlet.

The personnel of this Sub-Committee has been appointed, and preliminary information has been gathered in preparation for the first meeting, which it is hoped will shortly be held. Various suggested amendments to the E.I.C. Specification are being circulated amongst members for their consideration.

Report re Electrical Sectional Committee

Dr. Herdt reported that two meetings of the Special Committee on Canadian Electrical Code had been held, and laid its Report before the Main Committee for action.

Letters from F. A. Gaby, M.E.I.C., J. M. R. Fairbairn, M.E.I.C., and other members of the Main Committee not present, were presented in this connection, expressing approval of the Special Committee's Report, and a full discussion took place, especially with regard to the answers given by the Special Committee to the various questions embodied in their Terms of Reference.

On the motion of Dr. L. A. Herdt, M.E.I.C., seconded by Professor L. W. Gill, M.E.I.C., the Report of the Special Committee was unanimously adopted, and it was accordingly resolved that the formulation of specifications relating to the proper construction, methods of testing, and approval of appliances, fittings and materials used in connection with interior installations should be first dealt with, as it was felt that this work would be a necessary preliminary to the consideration of installation rules. It was further decided that a Sub-Committee should be formed to work under the Electrical Sectional Committee, and to undertake the work as recommended in the Special Committee's Report.

On the motion of Professor Gill, seconded by Colonel Keightley, it was unanimously resolved that the formation of a Sub-Committee should be proceeded with, with membership generally in accordance with the Report of the Special Committee.

The Chairman of the Electrical Sectional Committee presented for final approval the Report of the Sub-Committee on Transformers dealing with Single-phase Distribution Transformers. Dr. Herdt stated that the Electrical Sectional Committee desired the attention of the Main Committee to be drawn to the fact that this document embodies the decisions reached by representatives of the leading transformer makers and users in Canada as to certain points in transformer construction in regard to which agreement was very necessary. The document is, however, not a complete specification, inasmuch as it does not deal with many points of transformer construction in regard to which the practice is already standardized or as to which no agreement is at present likely.

After discussion, during which hearty appreciation of the work carried out by the Sub-Committee on Transformers was expressed, it was resolved on the motion of Mr. Dion, seconded by Professor Gill, that the Report of the Sub-Committee on Transformers, dated July 13, 1922, as forwarded through the Electrical Sectional Committee, be approved, and that the Secretary be directed to arrange for its publication and issue, the title as presented being changed to read as follows: "Standard Requirements for Single-Phase Distribution Transformers." It was further decided that the Report when published should include the necessary lists of Committees concerned, and should also include a brief preface describing its origin and preparation.

One meeting of the Sub-Committee on Incandescent Lamps has been held. The general scheme of the proposed specification has been outlined and individual points of importance are being studied by small panel committees in preparation for the next meeting of the Sub-Committee.

A draft specification has been prepared for Telegraph and Telephone Wire in accordance with the recommendations of the meeting of 12th March, and has been circulated to the members. Their comments and replies will be considered at the next meeting of the Sub-Committee which it has been impossible to arrange for earlier, as a number of the members are away on construction work during the Summer, but which has been called for the 17th inst.

On a recommendation of the Electrical Sectional Committee, at its second meeting on September 20th, the formation of a Sub-Committee on Wood Poles for Transmission Lines with the following membership was unanimously authorized:

Chairman: G. E. Templeman, chief engineer, Electrical Commission of City of Montreal;
E. T. J. Brandon, A.M.E.I.C., Hydro-Elec. Commission, Toronto;
A. A. Dion, M.E.I.C., Ottawa Electric Co., Ottawa;
W. J. Duckworth, G.N.W. Telegraphs, Toronto;
J. G. Glassco, M.E.I.C., Winnipeg Light & Power Dept.;
H. Hulatt, G.T.R. Telegraphs, Montreal;
L. A. Kenyon, A.M.E.I.C., Montreal Light, Heat & Power Consolidated, Montreal;
J. McMillan, C.P.R. Telegraphs, Montreal;
W. H. Winter, Bell Telephone Co., Montreal;
W. R. Warren, A.M.E.I.C., Saskatchewan Government Telephones, Regina;
Nominees of
Alberta Government Telephones,
Manitoba Government Telephones,
N.B. Telephone Co.,

Maritime Telephone & Telegraph Co.;
C.N.R. Telegraphs;
Toronto & Niagara Power Co.;
Dominion Power & Transmission Co.;
B.C. Electric Co.;
Canadian Electrical Association;
Canadian Lumbermen's Association, and
Winnipeg Electric Railway Co.

It was decided, in accordance with the original suggestion of the officers of the Hydro-Electric Power Commission, and in accordance with the views of the Electrical Sectional Committee, that the Sub-Committee should be asked to consider the possibility of drawing up Canadian specifications for the purchase of wood poles for transmission lines and also for their preservative treatment, and if thought desirable, should proceed to draft these specifications.

In accordance with a recommendation of the Electrical Sectional Committee at its second meeting on September 20th, the formation of a Sub-Committee on Watt Hour Meters was unanimously authorized, with the following membership:

Chairman, Prof. L. W. Gill, M.E.I.C. Dept. of Labour, Ottawa; P. A. Borden, Hydro-Elec. Commission, Toronto;
R. J. Cochrane, City Electrician, St. John;
A. G. Grier, Can. General Electric, Toronto;
E. Holder, Shawinigan Water & Power Co., Canadian Electrical Ass'n.;
S. L. B. Lines, Chamberlain & Hookham Meter Co.;
Scott Lynn, Sangamo Meter Co.;
E. G. Ratz, Can. Westinghouse Co.;
E. J. Turley, A.M.E.I.C., Montreal Light, Heat & Power Co.;
J. H. Trimingham, A.M.E.I.C., Southern Canada Power Co.;
F. T. Wigman, Packard Electric Co.
Nominees of:
Electric Inspection Branch, Dept. of Trade & Commerce;
Can. Associated Mfgrs. of Elec. Supplies;
Ass'n. of Mun. Elec. Utilities of Ont.;
Ferranti Meter & Transformer Mfg. Co.;
Toronto & Niagara Power Co.;
City Electrician, Winnipeg.

It was further decided, in accordance with the original suggestion of the Canadian Electrical Association, that the Sub-Committee on Watt Hour Meters be requested to consider the advisability of preparing specifications for Watt Hour Meters.

Sectional Committee on Steel

The Special Committee on Steel Forgings, under the Chairmanship of G. D. Macdougall, M.E.I.C., has sent a questionnaire to a number of firms and parties interested and the replies are now coming in.

Sectional Committee on Cement and Concrete

The Secretary reported that the Sectional Committee had held its first meeting in Toronto on November 5th, at which the organization work had been completed.

The Secretary of the Sub-Committee on Cement reported a communication from the Chairman of the Sectional Committee advising that he had requested Professor E. Brown, M.E.I.C., to take the chairmanship of the Sub-Committee, but that no final answer had yet been received, and that if Professor Brown found himself unable to undertake the work, Professor Peter Gillespie, M.E.I.C., would himself act as Chairman.

The Committee expressed approval of Professor Gillespie's action, and approved his appointment as Chairman of this important Sub-Committee, in case Professor Brown cannot take the position.

Sectional Committee on Machine Parts

The Secretary of the Sub-Committee on Gearing reported that this Sub-Committee had presented for consideration, through Mr. Goldie, the Chairman of the Sectional Committee. a report, but that since receiving this communication, C. B. Hamilton, M.E.I.C., had written stating that the A.G.M.A. would probably recall the standard in question for some slight modification. In view of this and in order to give an opportunity for the matter to come before the C.E.S.A. through the American Engineering Standards Committee, it was decided that no action was advisable at present.

Adoption or Approval of Standards

Discussion followed as to the general policy to be pursued by the Association in regard to the adoption or approval of standards formulated by standardization authorized outside of Canada, as to whether these should be formally adopted, re-printed with permission, and published by the C.E.S.A., or whether they should simply be approved, and announcements, periodical or otherwise, issued advising the public of this fact, giving a general idea of the standards so approved, and referring to the original source for further information. No definite decision was reached, the opinion of the Committee being that each case would probably have to be decided upon its merits.

Sectional Committee on Mining Machinery

Sub-Committee on Mining Drill Chucks and Steel

The Committee felt that in view of the importance of this subject at the present time, it was desirable that the work of the Sub-Committee should be proceeded with with as little delay as possible. The Chairman of the Sectional Committee undertook to confer with the Chairman of the Sub-Committee regarding this matter.

Standardization Rules for Electrical Machinery

Professor Gill drew the attention of the Committee to the British Standardization Rules for Electrical Machinery as revised September 1917, and to the Standardization Rules of the American Institute of Electrical Engineers, as revised 1918, pointing out that while these Rules were in many respects in accord, they were not completely so, and that the latter had received very wide acceptance in Canada. Professor Gill pointed out that the A.I.E.E. Standardization Rules were, as a matter of fact, referred to in several places in the C.E.S.A. Committee's Report on Distribution Transformers and that certain of these provisions would undoubtedly have great influence on the work of many of our Electrical Sub-Committees.

The formation of this Sub-Committee on Standardization Rules for Electrical Machinery was unanimously approved, and the Chairman of the Electrical Sectional Committee was requested to nominate its members, such nominations to be subject to the approval of the Main Committee before becoming effective.

International Aircraft Standards Commission

The Secretary reported that a Convention regarding this Commission is to be held in Paris in November, and, with the approval of the Air Board, a request has been addressed to Air Commodore R. K. Bagnall-Wild, Director of Inspection, Air Ministry, who will be one of the British Delegates, to represent the interests of the Canadian Government and of the Canadian members of the various Advisory Committees of the Commission. It is understood that at this meeting the United States will be for the first time be among the countries represented, and that the future status and activities of the Commission, together with its relation to any technical commissions or bodies operating under the Air Convention, will be thoroughly worked out.

Representation of Air Board on Main Committee

The Secretary reported to the Main Committee the correspondence with the Air Board regarding its nomination of an *ex-officio* member on the Main Committee, a letter dated November 3rd, 1920, having been received requesting the appointment of Lt.-Col. E. W. Stedman, Director of Technical Staff, Air Board. Col. Stedman's nomination was welcomed, and his appointment as *ex-officio* member of the Main Committee was unanimously approved, such appointment to continue during the pleasure of the Air Board.

Engineering Institute of Canada

A letter from the Council of *The Engineering Institute of Canada*, dated October 27th, was laid before the Committee, in which it is suggested that certain changes be made in the E.I.C. Specification for Roadbed and Ballasting. As at the third meeting of the Main Committee, this Specification was considered, and it was decided at that time no action was advisable, the Secretary was directed to communicate with the Secretary of the E.I.C. informing him that while it was not considered advisable to proceed with the revision of this specification at the present time, the suggested amendment would be brought to the attention of any committee which might be in future appointed to deal with the question.

The Secretary reported receiving a communication from the E.I.C. forwarding an appeal from the American Institute of Weights and Measures inviting action in opposition to the compulsory adoption of the metric system. The Secretary's reply to this was approved.

American Engineering Standards Committee

The Secretary reported that various activities of the A.E.S.A. are of interest to our Main Committee as involving possibilities of co-operation. Among these may be mentioned the formulation of a national electrical code covering both life and fire hazard, the possibility of adopting or approving the American standards on reports, gearing, the preparation of Anglo-American Standards for structural steel sections, etc.

Attention was drawn to an interesting feature of the A.E.S.C. work, the system of group representation. For example, the Electrical Manufacturers Council has been admitted to representation on the Main Committee of the A.E.S.C. and comprises the Electric Power Club, the Associated Manufacturers of Electrical Supplies, and the Electrical Manufacturers' Club. Similarly the Fire Protection Association, the National Board of Fire Underwriters, Underwriters' Laboratories, and the Associated Factory Mutual Fire Insurance Company. The Committee was of opinion that possibly, as the work of the C.E.S.A. develops, some arrangement of this kind might be found advantageous, although it is not clear how it could be carried out without a modification of the Charter.

Discussion followed as to the course to be pursued in cases where co-operation with the A.E.S.C. appeared desirable, but where divergence from the American practice appeared necessary in order to suit Canadian conditions, and it was considered that in such cases complete independence of specifications would be essential.

European Standardization Bodies

The Secretary reported that in accordance with the decision of the Executive Committee, correspondence has been initiated with the following with a view to the exchange of publications and information:

Belgium, Association Belge de Standardisation, Brussels;
France, Commission Permanente de Standardisation, Paris;
Holland, Central Normalisatie Bureau, Delft;
Sweden, Sveriges Maskinindustrieforening, Stockholm;
Italy, Comitato Generale per l'Unificazione nell' Industria Meccanica, Milan;
Switzerland, Standards Committee, Verein Schweizerischer Maschinen-Industrieller, Baden.

Cordial replies have been received from Belgium, Sweden, Switzerland and Italy.

Financial Statement

The Meeting concluded with the appointment of auditors and the presentation of the financial statement to October 31st 1920, the latter being approved.

CORRESPONDENCE

Importance of Physicists Recognized

Editor:—*Journal.*

In a recent Number of *The Journal* of *The Engineering Institute of Canada*, there is an interesting article by Professor A. S. Eve of McGill University.

The new course at McGill described by Professor Eve is only one indication of the tremendously increased prestige that physics has gained during the last few years. Many other indications of this might be cited but at this time I wish merely to point out that Professor Eve was in error when he stated that this course was a new venture in any university. There has been a similar course in the Massachusetts Institute of Technology for a number of years. Also such a course was adopted by the Faculty of Applied Science at Queen's University two years ago and students have already graduated in the work of this course and a number of others are enrolled in the course.

We anticipate that the growing need for physicists in Canada will be met, partially at least, by the adoption of this course. It is expected that the majority of those who graduate will undertake post-graduate work later.

Yours very truly,

A. L. Clark, A.E.I.C.

Editorial Note

In speaking of the course in engineering physics at McGill University as a new venture, Dr. Eve had reference to the fact that for the first time there has been established a five year course in Engineering Physics leading to the degree of M.Sc. combining a high standard of Honour Mathematics and Physics with a sound training in Electrical Engineering.

* * *

Addresses Wanted

The records of *The Institute* show that the present addresses of the following members are missing. It is highly desirable that as many of these addresses as possible be in the hands of the Secretary.

Members

Arendt Angstrom	Sir Chas Hartley
J. W. Astley	Ed. A. Hebert
A. E. Ashcroft	Ira G. Hedrich
John R. Barlow	Robt. E. Hunter
W. W. Bell	Adolphe Jacquemart
F. F. Busteed	R. R. Keely
C. M. Caniff	B. B. Kelliher
Cyrus Carroll	L. R. Ord
Oscar Englund	J. N. C. Patton
J. P. E. Eude	E. H. Pierce
E. A. Forward	W. J. Press
Chas. Garden	B. J. Saunders
F. J. George	Owen W. Smith
John H. Gray	P. W. Sothman
	Robt. C. Stewart

EMPLOYMENT BUREAU

To make this department more valuable it is proposed that in future advertisements of situations vacant should state salary, and give details of requirements.

Situations Vacant

Young Industrial Engineers

Manufacturing firm has openings for prospective industrial engineers. Successful applicants would undergo course of intensive training for about six months. Expenses paid during period of instruction. Sound knowledge of industrial and economic principles required. Age, under 27 years. Box 180.

Engineer for Pulp and Paper Company

Paper Mill in Western Ontario requires 1919 or 1920 graduate to act as assistant to resident engineer. Mechanical graduate preferred but this is not essential. Duties partly draughting, otherwise general work in connection with alterations and additions proposed. Excellent opportunity to become familiar with Paper Mill Engineering. Good opportunities with company for advancement both in engineering and operation. Salary $150.00 to $200.00 per month depending on qualifications. Apply Box 182.

Mechanical Engineer

Wanted, a mechanical engineer, either travelling extensively or with good connections, to handle machinery, plant, etc., on commission. Box 183.

Draftsman

Draftsman for municipality in Quebec, preferably speaking French and English. Salary $30 per week. Box 184.

Electrical Draftsmen

Station layout electrical draftsmen for Ontario, should have experience in station layout, preferably with knowledge of electrical construction work. Permanent position. Salary $150 to $200. Box 185.

Land Surveyor

A young Ontario Land Surveyor with registered certificate, preference will be given the applicant who is also a graduate of a recognized Engineering School. Application must be in by December 1st, 1920.

Apply: E. R. Gray, City Engineer, Hamilton, Ont.

Hamilton, Nov. 18th, 1920.

Civil Service of Canada

The Civil Service Commission of Canada hereby give notice that applications will be received from persons qualified to fill the following positions in the Civil Service of Canada:—

Patent Examiner Mechanical Engineering

Patent Examiner, Mechanical Engineering, at an initial salary of $1,980 per annum which will be increased upon recommendation for efficient service at the rate of $180 per annum until a maximum of $2,800 has been reached. This initial salary will be supplemented by the bonus provided by law.

Note.—Patent Examiners appointed to act as members of a board of five to advise the Chief of Patent Office in the hearing of appeals, shall receive an additional salary of $20 per month while so appointed.

There is one vacancy at present in this class in Examiner's Division, of the Patent and Copyright Office, Ottawa.

Assistant Engineer

An Assistant Engineer at an initial salary of $2,100 per annum which will be increased upon recommendation for efficient service at the rate of $120 per annum until a maximum of $2,580 has been reached. This initial salary will be supplemented by whatever bonus is provided by law.

The only vacancy at present in this class is at Cornwall, Ontario, in the Ontario–St. Lawrence Canals Branch, Department of Railways and Canals.

Research Engineer

A Research Engineer, Natural Resources Intelligence Branch, Department of the Interior, Ottawa, at an initial salary of $1,800 per annum, which will be increased upon recommendation for efficient service at the rate of $120 per annum, until a maximum of $2,280 has been reached. This initial salary will be supplemented by whatever bonus is provided by law.

Duties.—Under direction, to make research investigations relating to the natural resources of the Dominion; to write articles for publication; to devise promotional plans for developing public interest in natural resources, and to perform other related work as required.

Dominion Analyst

A Dominion Analyst at an initial salary of $1,800 per annum, to be increased upon recommendation for efficient service at the rate of $120 per annum, until a maximum of $2,400 has been reached. This initial salary will be supplemented by whatever bonus may be provided by law.

Duties.—Under direction, to make chemical, physical, and microscopical examinations and analyses of foods, drugs and fertilizers for the purpose of administrating legislation affecting the adulteration and standards of commercial products; and to perform other related work as required.

PERSONALS

George Phillips, A.M.E.I.C., is now with the Department of Naval Service, Ottawa.

G. D. MacKinnon, A.M.E.I.C., has been elected president of the Rotary Club at Sherbrooke, Que.

N. C. Cameron, A.M.E.I.C., has accepted a position with the Imperial Tobacco Company of Canada Ltd., Montreal.

H. W. Tate, A.M.E.I.C., has accepted a position with the Toronto Transportation Commission, Kyle Bldg., Toronto.

G. W. F. Ritson Evans, A.M.E.I.C., is at present with the Great Eastern Paper Co., Ltd., River Madeleine, Gaspe, Que.

Geo. Hull, A.M.E.I.C., has accepted an appointment with the Mesopotamian Government on irrigation development.

Arthur Fairbairn Smith, S.E.I.C., formerly of Chicago, is now production engineer of the McKinney Company, Evanstown, Illinois.

G. S. Conway, A.M.E.I.C., has recently sailed for England, and will be resident for some time in [illegible]-on-Tyne, Durham, England.

F. A. Dallas, A.M.E.I.C., has been appointed secretary-treasurer of the Automatic Telephone and Time Recorders Ltd., Toronto.

H. H. Pinch, A.M.E.I.C., formerly with Harstone Bros., Winnipeg, is now with the Grand Trunk Rly., Valuation Commission, Montreal.

G. M. Thorpe, S.E.I.C., has accepted a position with the International Nickel Co., of Canada, Ltd., as assistant surveyor, at Creighton Mine, Ont.

Thomas W. McMillen, A.M.E.I.C., has been appointed rating engineer Pennsylvania Compensation Rating & Inspection Bureau, Harrisburg, Pa.

L. T. Rutledge, A.M.E.I.C., has been recently appointed assistant professor of mechanical engineering, Queens University, Kingston, Ont.

J. H. Hooper, A.M.E.I.C., formerly of Port Colborne, has been appointed chief engineer for the Standard Steel Construction Co., Ltd., Welland, Ont.

*

Gerald O. Case, A.M.E.I.C., formerly vice-president of the Tidal Engineering Corporation, New York, is now with the F. W. Loughran Co., New York.

*

E. V. Deverall, A.M.E.I.C., has been temporarily transferred from the Toronto office to the Montreal office of the Dominion Bridge Co., Ltd., Lachine, Que.

*

U. R. Moore, Jr.E.I.C., formerly with the Chase Tractors Corp'n Ltd., Toronto, has accepted a position with the Toronto Harbour Commissioners, Toronto, Ont.

*

J. W. Porter, M.E.I.C., formerly with the Canadian National Railway, Winnipeg, is at present engaged with the Grand Trunk Railway Arbitration Commission, in Montreal.

*

M. L. Walker, Jr.E.I.C., formerly with the Brompton Pulp and Paper Co., has accepted a position in the engineering department of the Imperial Oil Co., Ltd., at Sarnia, Ont.

*

Fred. H. McKechnie, A.M.E.I.C., has been appointed vice-president of the Engineering Equipment Co., Ltd., this company has been organized recently to deal in mining and industrial machinery.

*

Chas. Robertson, A.M.E.I.C., recently severed his connection with the Department of Railways and Canals, joining the firm of Schultz Co., Ltd., manufacturers, builders and contractors, Brantford, Ont.

*

C. Collingwood, A.M.E.I.C., late of Kamloops, and until recently with the Irrigation Department of Public Works in Mesopotamia, has accepted a position with Messrs. Wilkinson & Son, London, England.

*

Major G. R. Turner, A.M.E.I.C., formerly of Fredericton, N.B. is at present taking a two year course of military engineering in England, and is stationed at Brompton Barracks, Chatham, England.

*

R. F. Hayward, M.E.I.C., formerly general manager of the Western Power Co., of Canada Ltd., Vancouver, B.C., has resigned his position to accept that of general manager of the Chilean Rly. & Light Co., Santiago, Chile.

*

W. B. McDonald, M.E.I.C., has resigned his position as chief engineer for the town of Barrie, to accept a position as resident engineer with the Department of Public High ways of Ontario, with charge of the Hamilton, London section.

*

E. S. Winslow, A.M.E.I.C., has recently been appointed general sales manager, Canadian Ingersoll-Rand Co., Ltd. Mr. Winslow has been assistant to the general manager of the same company for the last five years, and had an important part in this firm's munition production during the war.

Norman M. Campbell, A.M.E.I.C., has been appointed president of the Engineering Equipment Co., Ltd., which has been organized to deal in mining contracting, and industrial machinery and supplies. He was formerly general sales manager of the Canadian Ingersoll-Rand Co., Ltd., more recently sales manager of the General Combustion Co., Ltd., Montreal.

*

Awarded Telford Medal

P. L. Pratley, M.E.I.C., has been awarded the Telford Gold Medal of the Institution of Civil Engineers (Great Britain) for his paper "The Design and Erection of St. John Arch", upon which honour he is receiving the hearty congratulations of his fellow-engineers.

P. L. PRATLEY, M.E.I.C.

Mr. Pratley was born in Liverpool, England, in 1884 and was educated in the same city, graduating from the University of Liverpool as Bachelor of Engineering, later taking the degree of Master of Engineering. After coming to Canada Mr. Pratley was for some time draughtsman with the Locomotive and Machine Company of Montreal, later joining the staff of the Dominion Bridge Company, Limited. Specializing in bridge design, Mr. Pratley was engaged by the Government Board of Engineers for the Quebec Bridge; later he was designing engineer for the St. Lawrence Bridge Company, also in connection with the Quebec Bridge. In Dec. 1910, Mr. Pratley was appointed assistant designing engineer, Dominion Bridge Company. In addition to his connection with the design of important bridges Mr. Pratley has had charge of design of several large steel structures. Besides to being a Member of *The Engineering Institute* he is a Member of the Institution of Civil Engineers.

LIBRARY NOTES

Correction

On page 556, November Journal reference was made to new Specification for Steel Highway Bridges issued by the Canadian Engineering Standards Association, this should have read "Specification for Steel Railway Bridges."

Journal of the Town Planning Institute of Canada

The first number of the Journal of the Town Planning Institute of Canada has just been received. The Institute, which includes many members and associate members of *The Engineering Institute of Canada*, has for objects both the study of civic design and the training of town planners; this interesting journal will be of value in knitting together the membership from coast to coast. The first number is introductory, explains the objects of the publication and contains a number of reports of interest to the town planning brotherhood. The editor, Alfred Buckley, M.A., Town Planning Branch, Commission of Conservation, Ottawa, is to be congratulated on this first number of what promises to be a valuable addition to the technical publications of the Dominion.

OBITUARIES

Stanley A. Button, A.M.E.I.C.

Stanley A. Button, A.M.E.I.C., who died August 2nd, 1920 at Brandon Hospital, was born at Forest Gate, Essex, England, November 1881, and served his time as articled pupil to J. Ashby & Company, engineers and contractors, Lowestoft, England. For four years following 1903, Mr. Button was with W. Patterson Ltd., engineers and railway contractors of London, England, as assistant estimator and supervisor of works in the London district. Coming to Canada in July 1907, Mr. Button was successively, instrumentman with the Manitoba Government Telephone Conduit System, and resident engineer in charge drainage district number 5 and 8, Manitoba Government. In 1912 Mr. Button was appointed engineer on the Manitoba Good Roads staff; in 1914 he was appointed district engineer in charge of the Varden Good Roads Board of Manitoba, comprising 84 Townships. During his connection with the Good Roads Board Mr. Button prepared systems and repairs on work amounting to $140,000,000 of reinforced concrete bridge culverts. Mr. Button was elected an Associate Member of *The Engineering Institute of Canada* on May 21st, 1918.

The late Charles LeBaron Miles, M.E.I.C.

BRANCH NEWS

Halifax Branch

F. R. Faulkner, M.E.I.C., Secretary-Treasurer

The regular November meeting of the Halifax Branch was held at the Green Lantern, Wednesday, November 17th. In the absence of C. E. W. Dodwell, M.E.I.C., Chairman of the Branch; F. A. Bowman, M.E.I.C., presided.

No formal paper had been prepared for the meeting and the evening was spent in an animated discussion of fees and salaries in the engineering profession. The Secretary read extracts from reports of Committees of other Branches and of other organizations in order that the members could form an idea as to what had already been done.

The discussion was participated in by the majority of those present, and it was evident that the consensus of opinion was in favor of taking some official action. Accordingly, on motion of Messrs. Allen and Rodger, a committee of five was appointed to bring in a report on a classification of Engineers on which a schedule of salaries and fees could be based. The committee was then elected by ballot as follows:

F. R. Faulkner, M.E.I.C., F. W. W. Doane, M.E.I.C., Ira P. MacNab, M.E.I.C., W. A. Winfield, M.E.I.C., A. F. Dyer, A.M.E.I.C.

They were instructed to have a preliminary report ready for the next meeting. The meeting then adjourned.

Moncton Branch

M. J. Murphy, A.M.E.I.C., Secretary-Treasurer

Fraser S. Keith's most interesting address delivered at the formation meeting of the Moncton Branch has incited an interest in *The Institute* as well as our Branch which will be sure to bear fruitful results and a number of engineers have signified their intention of joining at an early date.

The regular Monthly Meeting was held in the City Hall on November 4th and great interest was manifested by those present, numbering about twenty-five. It was decided to hold meetings twice a month and alternate meetings to take the form of a Luncheon at which outside speakers would be invited to give short addresses. A Committee of five were appointed to work with the Executive to select a programme for the future meetings. The five elected were Messrs. A. F. Stewart, M.E.I.C., F. B. Tapley, M.E.I.C., F. Williams, A.M.E.I.C., K. S. Pickard, A.M.E.I.C. and W. B. MacKenzie, M.E.I.C. These Members met with the Executive on November 8th and selected an Entertainment Committee of three, composed of R. McManus, A.M.E.I.C., Chairman, J. Whitelaw, A.M.E.I.C. and E. G. Evans, M.E.I.C., and a Papers Committee of five composed of R. G. Gage, M.E.I.C., Chairman, F. B. Tapley, M.E.I.C., K. S. Pickard, A.M.E.I.C., W. B. MacKenzie, M.E.I.C., and F. Williams, A.M.E.I.C. These Committees are to arrange the programme of future meetings and there is no doubt that our Branch will forge ahead being in such capable hands.

*

A. F. Stewart, M.E.I.C., formerly of the Toronto Branch is now located in Moncton, holding the position of chief engineer of the Canadian National Railways, and will be a most valuable acquisition to our Branch. He has manifested a deep interest at our meetings, and what will be Toronto's loss will undoubtedly be our gain.

*

C. B. Brown, M.E.I.C., formerly located at Moncton as chief engineer, Canadian National Railways, has been promoted to the position of engineering assistant to the vice-president, Can. Natl. Rlys., and will have his headquarters at Toronto. While his departure will be regretted by all, still, his well earned promotion is deservedly popular. Mr. Brown has always taken a very keen interest in all matters relating to the engineering profession and was elected Vice-President of the Professional Engineers Association of New Brunswick at their first meeting. Mr. Brown leaves Moncton for his new field of endeavours with the best wishes of all. Prior to his departure for Toronto his staff presented him with a silver tea and coffee service, the following address being read by J. S. O'Dwyer, M.E.I.C.:—

Moncton, N.B.,
November 18th, 1920.

C. B. Brown, Esq.,
Late Chief Engineer,
Canadian Government Railways,
Moncton, N.B.

Dear Mr. Brown:—

On this, the eve of your departure to a larger sphere of action at the Head-quarters of the Canadian National Railway, we, your former employees in the Moncton Offices, wish to express to you our unfeigned regret at losing you as our Chief,—your gain is certainly our loss,—and to tender you our most sincere congratulations on your preferment. The past seven years under your supervision will ever remain a pleasant memory with us.

We feel that we may, in your case, fittingly quote from the tablet to the memory of the celebrated Architect of England's Valhalla—

"If you would see his monument, look about you".

Will you kindly accept, for yourself and your charming consort, the accompanying souvenir, with our very best wishes to you, Mrs. Brown and family, for health and happiness in your new home.

Signed on behalf of the Staff."

Mr. Brown in a few well chosen words thanked the Staff for their gift and good wishes.

*

Dr. Martin Murphy, M.E.I.C., a Member of the Ottawa Branch, and formerly consulting engineer of Canadian Government Railways and a past president of *The Institute* spent a few days in Moncton lately, visiting his son, M. J. Murphy of the Moncton Branch.

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Reid McManus, A.M.E.I.C., Member of the Executive Committee of the Moncton Branch, resigned his position as a Member of the Hydro-Electric Power Commission of New Brunswick to accept the nomination as Member for Westmorland County in the Provincial Legislature and was successful in his election polling a very large vote. It might further the interests of the Engineering Profession if more Members would taken an active part in our politics.

St. John Branch

Harry F. Bennett, A.M.E.I.C., Secretary-Treasurer.

A regular meeting of the St. John Branch was held in the Old Post Office Building, Nov. 11th., C. C. Kirby, M.E.I.C., occupied the chair and twenty-four members were present.

The Advertising and Employment Committees reported activities. The Civic Centre Committee which was appointed to aid the Municipality in taking definite steps towards the erection of new City Buildings, reported that the preparation of preliminary plans was well advanced, that the Municipality has voted $1500 for competitive plans, a call for which would be made on information gathered by this committee and approved by the Municipal Council.

The Concrete in Sea Water Committee reported having completed the casting of test blocks and the placing of these in the water for observation.

A Committee consisting of G. H. Waring, M.E.I.C., R. H. Cushing, M.E.I.C., C. L. Archibald, A.M.E.I.C., and A. G. Tapley, A.M.E.I.C., was appointed to interview the School Board and Council on the inadvisability of using an area set out for a Public Square for the location of a new school building in West St. John.

An Entertainment Committee consisting of G. N. Hatfield, A.M.E.I.C., A. G. Tapley, A.M.E.I.C., G. G. Murdoch, M.E.I.C., Jas. Gilchrist and D. L. Hutchinson, was appointed to assist in the preparation of a comprehensive programme for the season.

C. O. Foss, M.E.I.C., chief engineer of the New Brunswick Electric Power Commission read a paper on the "Progress of Hydro-Electric Development in New Brunswick" (printed in the November *Journal*), with recent additions due to changes in design at one of the sites.

In addition to the information given in the published copy of the paper, Mr. Foss stated that the Commission had been authorized by the Executive Council to accept the tender of the New Brunswick Contracting Company for the sum of $248,000, this to include the grading of the embankment for the pipe lines and the construction of mass concrete dams on the West and Northeast Branches of the Musquash River. Future contracts will call for smaller storage dams on each of the rivers, wood stave pipe lines 8 feet and 10 feet in diameter and approximately 10,000 feet long, power house with equipment, and twelve miles of transmission line to a sub-station at or near St. John. The construction of the pipe lines, power house and transmission lines is in the hands of Messrs C. H. and P. H. Mitchell of Toronto and it is expected that contracts will be let for this work before the end of November. The total cost of the power is estimated at $157 per horse power developed.

Mr. Foss stated that the pipe line will be of New Brunswick black spruce which he believes can be used more cheaply and serve equally as well as imported material. The areas where the pondage and storage basins will be located were burned over 17 years ago and are practically barren, and it is not anticipated that any large sum will be required to compensate for the riparian rights.

Already industries are seeking information as to the time when the power will be available, the cost to them, and the amount they will be able to get. Other powers will be developed shortly to carry out the purpose of the Commission to electrify the entire Province.

Montreal Branch

J. L. Busfield, A.M.E.I.C., Secretary-Treasurer

On October 28th the meeting was devoted largely to the presentation of a number of motion pictures. The first picture screened was entitled "Salmon Fishing in New Brunswick". Another film pictured the various processes of paper manufacturing, starting from the wood pulp and going right through to the finished product. Another film which was received with very great interest and much applause was one entitled "McGill University,—What it is and does for Canada". Other films featured the mining of salt, goat-hunting in the Rocky Mountains, and some views taken on the Barmen Overhead Mono-Rail Railway System. During the intervals between the films short addresses were given by Messrs. Dodwell of Halifax, and Keith and Busfield of Montreal, each dealing with different phases of The Company's activities. There was an attendance of about 225 members and guests at this meeting and the Chair was occupied by Mr. Duchastel.

On November 4th, an extremely interesting paper was presented by H. B. Oatley of New York, on "Modern Super-Heater Practice". This paper will be published in *The Journal*.

On November 11th an address on "Commercial Aviation in Canada" was given by R. R. Dewilde, the Montreal aviator, in the course of which he stated that both Canada and the United States were far behind Great Britain and other European countries in the post-war development of aviation. The slow development in Canada was attributed to lack of capital and general distrust of aviation as a practical and safe method of transportation, coupled with a comparatively small population and immense distances. The slow development in the United States he attributed to the fact that they, having failed to become parties to the Peace Treaty, had also failed to adopt the air regulations provided at Versailles, adopted by all the Allies except the United States. Owing to this there had been little Government control of flying in the United States, with the result that pilots who should have been prohibited from flying had carried passengers in machines about which they knew nothing, many of them in a state of neglect, with the result that there had been a comparatively large number of accidents. So far as Canada was concerned, working under the Versailles aerial regulations, the accidents had been so few that figures had not yet been tabulated.

The author quoted figures as to the results of the past year's experience of highly developed commercial aviation in and from England during this period, when the number of accidents had been so few as to make it appear that aviation transport was becoming one of the safest methods, as well as the speediest even if still the most expensive. During a recent recorded period of seven months there had been 400 machines engaged in England which had made 35,000 flights, covering 593,000 miles, with 64,000 passengers and 67,000 pounds of freight. In all of these there had only been eighteen accidents, resulting in the killing of three flying personnel and the injuring of five, while only one passenger had been killed and three slightly injured.

As to the expense the author considered that the high cost, especially in Canada, was due to the restricted turn-over, due to lack of support, which meant that the overhead costs were tremendous in comparison to the work done. The lack of aerodrome facilities also tended to make the costs high. As the use of air service increased he considered that ground costs would decrease so that the more aviation was used as a practical service the less would the relative cost become, and it was hoped that the present extremely high insurance rates would be gradually decreased. In his general address Mr. Dewilde gave a sketch of the growth of aviation and spoke of the tremendous advances that have been made during the war in this line of enterprise, with the result that a number of the reconnaissance and bombing machines that had been developed during the war had since been turned over for commercial purposes. He also spoke of the future of the work in Canada, especially with regard to survey work for timber limits, the mapping of undeveloped regions, and aerial photography.

There was an attendance of over one hundred at the meeting and there was an animated discussion in which many members took part. S. F. Rutherford, A.M.E.I.C., presided.

Peterborough Branch

R. L. Dobbin, M.E.I.C., Secretary-Treasurer.

Annual banquets are, generally speaking, accurate gauges of an organization's progress. They tell unmistakably, whether it has moved forward during the twelve months, or the reverse; whether it has lived up to the ideals laid down at its foundation.

The first annual banquet of the Peterborough Branch was held on Thursday, November 11th, and it revealed concretely that there had been considerable progress during the last year. The Branch has blossomed from uncertain infancy into sturdy childhood, and the untiring efforts of its officers have shown fruit.

The Chairman of the Branch, R. H. Parsons, M.E.I.C., presided, and introduced the principal guests of the evening, who were, Julian C. Smith, M.E.I.C., and Frederick B. Brown, M.E.I.C. of Montreal, R. O. Wynne-Roberts, M.E.I.C. of Toronto, and A. J. Grant, M.E.I.C., of St. Catharines.

The Chairman read telegrams of regret from President R. A. Ross, M.E.I.C., and Dr. L. A. Herdt, M.E.I.C., who had promised to attend; but at the last moment were unable to do so.

The Chairman, after the toast to the King had been fittingly honored, referred to the date on which the banquet was being held, and proposed a toast to "Armistice Day" which was honored in silence.

C. E. Sisson, M.E.I.C., one of the members of the Executive Committee of the Branch, proposed the toast to *The Institute*. He recalled the installation of the Branch a year ago, and said there had been found, as is usually found, returns about equal to the effort spent in the work. Some misgivings were experienced by electrical engineers, who feared that they would lose their identity in the larger body, but this had all been disproved. The officers and members had put forth their best efforts, and progress had resulted. He read the motto of *The Institute* and declared that it should have the attention of all the members.

Julian C. Smith, M.E.I.C., responded in part as follows,—"On behalf of the President and Members of Council of *The Institute*, I wish to express their appreciation of the efforts of the Peterboro Branch during the past year. No other Branch has done better."

Mr. Smith told how twenty years ago he had joined *The Institute* in Montreal, then composed largely of civil engineers as a "mere electrical engineer," and had worked up through the various offices, until at present he was a member of the Council.

The officers of the past as well as the present had only one object, to advance the engineering profession in Canada. As the population of Canada increased, *The Institute* would undoubtedly become enlarged, until it would equal in size the national engineering societies of Europe and the United States.

He urged on the members that to be successful, not only must there be a large membership, but the highest types of engineers must be in office.

Frederick B. Brown, M.EI.C., also responded to this toast, and referred to the part that engineers were taking in the city government of Montreal. He also described the work of the City Commission, and the many reforms that it had introduced.

Mr. Brown's advice to the Peterborough Branch was embodied in the following words,—"All education is self-education. Self-education begins with self criticism, and ends with self control."

Mr. Brown told a few humorous anecdotes in his own inimitable style.

The toast to the Branches was proposed by P. P. Westbye, M.E.I.C., member of the Executive Committee of the Peterborough Branch, who told of the awakening of the engineers from coast to coast.

R. O. Wynne-Roberts, M.E.I.C., Chairman of the Toronto Branch responded, and brought greetings from his brethren. He congratulated the local Branch on its growth, and drew attention to the policy of *The Institute* in encouraging the Branches in every way possible.

Alex. J. Grant, M.E.I.C., represented the Niagara Peninsula Branch, and outlined the work of that branch during the past year.

At the conclusion of the Toasts the Chairman drew the attention of the members to the Annual Meeting of *The Institute* in February, some of the details of which were announced by Mr. Wynne-Roberts.

During the evening several solos by Walter Evans, were much enjoyed. W. H. Barry accompanied him at the piano. Both of these gentlemen, are Affiliates of the Branch.

G. H. Duggan, M.E.I.C. Past President of *The Institute* arrived on the early morning train with Messrs. Smith and Brown, but was unable to remain for the banquet. He accompanied the other visitors on a trip through the works of The Wm. Hamilton Co. and the Canadian General Electric Company, through the courtesy of P. P. Westbye, M.E.I.C. and E. G. Patterson, respective managers of the two plants.

At noon the guests were entertained by Mr. Patterson at a luncheon at the Empress Hotel, the party including the members of the local Executive Committee.

During the afternoon, other manufacturing plants, and objects of interest were visited.

Toronto Branch

H. A. Goldman, A.M.E.I.C., Secretary-Treasurer.

Meetings of the Toronto Branch of *The Engineering Institute of Canada* are held every Thursday evening at 8.15 p.m. sharp. The members of the Branch and visitors are showing their appreciation of the excellent programme arranged for the season by attending in large numbers and taking an active part in the discussion following each lecture. This is a tribute to the efforts of the Executive Committee of the Branch.

On Thursday, October 21st, C. D. Dean, A.M.E.I.C., of the Imperial Oil Co., Ltd., addressed the Branch on General Oil Refining Practice. The economic and engineering features of plant layouts were outlined by the speaker, who pointed out that the location of plants depended chiefly on transportation, fuel and water facilities. The mechanical equipment of plants was extensively discussed. A series of moving picture films were thrown on the screen to illustrate all the processes from the crude oil stage to the refined product.

On Thursday, October 28th, at a regular meeting of the Branch, the Chairman, R. O. Wynne-Roberts, M.E.I.C., extended a hearty welcome to the students who were present, and expressed the hope that more students would in the future avail themselves of the benefits to be derived from attending the meetings of the Branch.

J. M. Oxley, A.M.E.I.C., Chairman of the Committee appointed to review the City of Toronto Building By-laws, submitted his report on behalf of that Committee. It was decided that the report be accepted and copies forwarded to the City Architect.

A. H. Harkness, M.E.I.C., Chairman of the Fees and Remuneration Committee, in reporting the progress made by that Committee, stated that the proposed adoption of Engineering Council's classification had been approved by all the Branches that had answered the enquiries of the Committee regarding same. Prof. C. R. Young, M.E.I.C., suggested that, in forwarding this report to headquarters of *The Institute*, they should impress upon Council the urgent necessity of so placing the matter before the employers of Engineers, that they can be prevailed upon to grant the proposed remuneration.

The speaker of the evening, P. W. Ellis, Chairman of the Queen Victoria Park Commission of Niagara Falls, then addressed the Branch on the functions and activities of that Commission. The Commission are trying to satisfy the existent demand for a national playground along the Frontier. Last year 80% of the million and one half people who visited the Frontier from the United States crossed into Canada. This showed their appreciation of the natural beauties of the district on the Canadian side.

In referring to the finding of the Committee on Conservation of Natural Resources in the United States that there would be no coal left in that Country in about one hundred years, the speaker pointed out that this was of vast importance to Ontario, since Ontario is credited with 51% of the products of Canadian industry. In view of the fact that every electrical horsepower is approximately equivalent to 20 tons of coal, the 350,000 h.p. being distributed in Ontario from Niagara Falls represents at present prices for coal an equivalent money value of $100,000,000 per annum. It might, therefore, be advisable in the future to impose an embargo on the use of coal in Ontario for purposes for which electrical power could be utilized. The development of Niagara as a power centre was described from its inception.

Capt. J. B. Bond, assistant superintendent of the Queen Victoria Niagara Falls Park, then gave a lantern slide display of that district in which the various scenic, engineering and constructional undertakings were portrayed in a most interesting manner.

Mr. Ellis then gave a brief but very interesting talk to the students present on "Cause" and "Pep" in Business, which was highly appreciated by them.

On Thursday, November 4th, F. M. Dawson, A.M.E.I.C., of Super-cement (America), Ltd., addressed the Branch on Super-cement.

Some years ago, the U.S. Bureau of Standards found, by means of microscopic analysis, that large masses of unhydrated cement remain in all mixtures of concrete. Mr. Dawson stated that in the effort to reduce this amount of unhydrated material it was found that by the addition of a certain material to the clinker during the manufacture of Portland Cement, the desired result—that of greater hydration—had been obtained. Photomicrographs, comparing concretes made from Portland Cement and Super-cement, were thrown on the screen, to show that concrete made from Super-cement contained more hydrated particles than that made from Portland Cement. As a result the density and waterproofing quality of the mixture would be increased and the strength augmented. This had been fully borne out by a series of tests extending over several years. The product so obtained had been named Super-cement. Messrs. E. M. Proctor, A.M.E.I.C., G. A. McCarthy, M.E.I.C., W. J. Smithers, A.M.E.I.C., Frank Barber, A.M.E.I.C., J. M. Oxley, A.M.E.I.C., J. C. Krumm, M.E.I.C., W. Storrie, M.E.I.C., and R. B. Young, A.M.E.I.C., took part in the discussion which followed.

In reply to questions, Mr. Dawson further stated that Super-cement required the same amount of water—for the same consistency—as for Portland Cement Concrete. Although it set more slowly than Portland Cement Concrete yet the normal excess of strength was 10% in 29 days and 16 to 20% in 3 months. A 1:3 mortar of Super-cement had the strength and waterproofing quality of a 1:2 mixture of Portland Cement. The material also offered great resistance to the action of sea water. Tests were being made to determine the effect of alkali waters on it.

On November 10th an Open Forum Meeting of the Toronto Branch was held in the Mining Building, University of Toronto. O. E. Fleming, Chairman of the Canadian Deep Waterways and Power Association, Major A. C. Lewis, Secretary of the Association, and E. L. Cousins, A.M.E.I.C., manager and chief engineer of the Toronto Harbour Commissioners, were invited to discuss the economic and engineering phases of the St. Lawrence Canalization and Power Project.

Mr. Fleming gave a general outline of the whole scheme for the canalization and power development. Of the 2,700 miles of waterways throughout the Great Lake route only 97 miles had to be canalized. The power project should be constructed at the same time as the Canal, as this would be the most economical course. The four million horsepower to be developed could be marketed as it was needed.

Mr. Cousins in discussing the engineering features of the proposed scheme stated that, in view of the meagre data at present available, no engineer was justified in hazarding even approximate figures for the cost and earnings of an undertaking of such magnitude. But as it would be a potential factor in the development of the country, its value could not be estimated in dollars and cents. He emphasized the fact that a 30 foot canal should be built, otherwise the ultimate expenditure for the new Welland Ship Canal and the Toronto Harbour development would be wasted.

Major Lewis gave some interesting figures to show the saving that could be effected in transportation as a result of the canalization.

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Members of *The Institute* will be interested to learn of the formation of an E.I.C. Students' Committee in "Junior School," Toronto, to co-operate with the Executive of the Toronto Branch.

The object of the Committee is to create interest in the affairs of *The Institute*, to direct attention to the regular meetings of the Branch to which all Students are invited, and to increase the student membership by bringing in keen live undergraduates.

A. M. Reid, S.E.I.C., Chairman of the Committee has been appointed to the "Membership Committee of the Toronto Branch".

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Brig.-Gen. C. H. Mitchell, M. E. I. C., has been selected as the sole arbitrator for the purpose of fixing the rate at which The Electrical Development Co. shall supply power to the Hydro-Electric Power Commission.

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Arthur Hewitt, General Manager of the Consumers Gas Co., Toronto, has extended an invitation to any engineers in Canada who wish to visit and inspect their Station "B", the largest and newest in Canada. Parties not larger than 25 will be guided through the Works.

Hamilton Branch

J. A. McFarlane, M.E.I.C., Secretary-Treasurer

The first general meeting of the Hamilton Branch of *The Engineering Institute of Canada* was held on October 26th, 1920 in the Assembly Hall, Hamilton Public Library.

The meeting, which was well attended and a most successful one, was called to order by H. U. Hart, M.E.I.C., Chairman, promptly at 8.15 P.M.

Mr. Hart thanked the members for electing him as Chairman and promised to use every effort to make the coming year a successful one. He briefly outlined the work and announced that the Papers Committee had a good programme in view and speakers promised for nearly all meetings on subjects which would be interesting to the members. He then introduced Major Alex. Lewis, Secretary of the Canadian Deep Waterways and Power Association. Major Lewis spoke on the St. Lawrence river project, the great international scheme whereby ocean going vessels can reach the Great Lakes. He considered this question as one of the greatest before the Canadian people since Confederation and a solution of the transportation problem for Canada. The speaker discussed the question from the point of view of the general public, not going into any of the engineering features, and discussed his subject under the following headings:—

1. Present transportation conditions
2. The remedy
3. The cost of the undertaking
4. Method of financing

Major Lewis' splendid address was enjoyed by all present and the general discussion which followed was supported by a number of speakers. A hearty vote of thanks was tendered Major Lewis for his interesting and able address. In responding he referred to the very great assistance given by the City of Hamilton to the Commission in furthering this project.

H. B. Dwight, A.M.E.I.C., Chairman Papers Committee, reported that his committee had been successful in securing papers for the winter months, also that it was decided to hold the Annual Dinner in December.

F. W. Paulin, A.M.E.I.C., was elected Chairman of the Membership Committee and he has rallied to his assistance a number of good lieutenants and an active membership campaign is being carried out.

Applications of several affiliates were considered and their names added to the present membership.

It was decided to hold the November meeting on Wednesday November 17th. Geo. Hogarth, M.E.I.C., chief engineer Department of Public Highways of Ontario will be the speaker; he will talk on public highways with special reference to Hamilton as a highway hub.

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A very successful meeting of the Branch was held in the Assembly Room of the Public Library on Wednesday Evening November 17th. H. U. Hart, M.E.I.C., Chairman, presided and introduced Geo. Hogarth, M.E.I.C., chief engineer of the Department of Public Highways who gave an interesting and enlightening talk on the new Provincial Highways. The meeting was largely attended and the lecture was enjoyed by all present.

Mr. Hogarth first outlined briefly the work being undertaken by the Government, stating that 1820 miles of roads had been taken over and their intention was first of all to make these roads passable for traffic. Maps showing the roads were distributed and showed at a glance the entire system. The construction of new roads would be carried out as opportunity and funds permitted. The work being done at present would be chiefly developing the present highways especially those leading from cities. During the past few weeks a paved road from Hamilton to Dundas had almost been completed. A break had been left at Hodder's at the railroad crossing as it was the intention to construct a subway. In the next few years great improvement would be noticed in the roads especially those in the vicinity of cities. The Toronto-Kingston Highway had been greatly improved during the past season and was now in such condition that a 20 ton roller could travel safely the whole length of the road. The work in the Eastern division had been summed up and the totals were 136 miles of road graded, 136 miles gravelled, 40¼ miles of macadam road, 630 concrete culverts constructed, 17 bridges built and 1250 men, 936 teams, 16 steam shovels and 21 crushers used in the work. The enterprise would have been carried out on a larger scale but for shortage of materials and the difficulty in getting contractors to engage in the work for the Government.

Mr. Hogarth then went into details of construction and used upwards of 100 lantern slides to illustrate his remarks. He showed cross sections of standard types of highway adopted, sections of roadbed before and after being repaired, apparatus used in the various operations and pictures of culverts and bridges of which the Rouge River Bridge proved to be the most interesting. The same type of bridge would be used on the Toronto-Hamilton Entrance and it was hoped that all bridges on this work would be completed early next Spring. Slides showing portions of the Hamilton St. Catharines road, the proposed road up the mountain on the Hamilton Brantford Highway, also portions of completed sections of various roads all proved interesting to the audience.

An interesting discussion followed which brought out many features in regard to road building.

A vote of thanks was tendered Mr. Hogarth for his splendid address.

The December meeting will take the form of a dinner and a committee consisting of Messrs. Hart, Palmer and Paulin was appointed to make all arrangements.

The applications of a number of affiliates were approved and their names added to the Membership list.

Chas. Robertson, A.M.E.I.C.—Box 29 Brantford, Ont., formerly of Peterboro, Ont., and E. V. Deverall, A.M.E.I.C., of the Hamilton Bridge Works Company drawing office staff, formerly of Montreal, have been added to the membership.

Niagara Peninsula Branch

Rex P. Johnson, A.M.E.I.C., Secretary-Treasurer

Members of the Niagara Peninsula Branch made a visit and inspection of the works of the Ontario Paper Co. and the Beaver Board Co. at Thorold on Saturday afternoon, Oct. 23.

At the plant of the Ontario Paper Co. the visitors were shown the process of making newsprint from pulp wood logs to the finished product, rolled and cut to size for shipping.

The pulpwood logs are floated up to the grinders placed in hydraulic presses and forced against great revolving grindstones driven by direct connection to motors. A very special feature of these motors is that they are operated at 12,000 volts, an unusual high distribution voltage, and therefore requiring no transformers.

The most interesting and spectacular part of the process was the paper machine. In the first section of the machine the finely ground pulp is run in a thin sheet over a wide, inclined screen which allows part of the water to fall out and carries the remaining pulp with sufficient fluidity to flow on to the rolls and be conveyed through a series of these on a broad canvas belt. Each set of rolls removes more water until the pulp passes into a stage of being a very thin wet sheet of paper about twelve feet wide and travelling at a great speed. The critical stage in the process is where this wet sheet leaves the supporting canvas belt and passes over a great number of large revolving steam drying cylinders to the rolling and cutting stage. The visitors were very much interested in watching the operators start the paper over the steam rolls after a break in the sheet. This required great skill and speed on the part of the operators, not only in starting the very fragile sheet, but in leading it through the series of steam cylinders.

The output of this mill is 240 tons of newsprint per day.

The works of the Beaver Board Co. were visited next and a process very similar to that of the Ontario Paper Co. was witnessed during the grinding and tank stages. The process of rolling out the pulp into paper differed in that the thickness of the paper was much greater and the travel over the rolls and drying cylinders slower. The product resulting from this process is a stiff cardboard, four layers of which are pasted together to form beaver board. The equipment for making and testing the finished product was viewed with great interest by the engineers.

The appreciation of the Branch is extended to the two companies for granting the opportunity of seeing their processes.

Border Cities Branch

J. E. Porter, A.M.E.I.C., Secretary-Treasurer

A special dinner meeting of the Border Cities Branch and the Border Chamber of Commerce was held in the Chamber of Commerce Auditorium on Wednesday Evening, November 3rd.

H. B. R. Craig, M.E.I.C., Chairman of the Branch, introduced Charles E. Fowler, M.E.I.C., M.Am. Soc. C.E., consulting civil engineer of New York. Mr. Fowler gave a very interesting illustrated talk on "Harbours and Bridges of the World". He took his audience on a trip down along the Pacific Coast from Vancouver, B.C. to Valparaiso, Chile, and then up along the Atlantic Seaboard, stopping long enough at the principal seaports to point out the interesting features.

At New York the Brooklyn, the Manhattan, the Queensborough, and Hellgate Bridges were shown in detail. Mr. Fowler having slides showing some of these bridges under construction.

The audience was then shown bridges and harbours of the Old World, particular mention being made of the architectural lines and the strength of some of the bridges built many years ago for foot and wagon traffic, but which with some very minor changes are now handling heavy trains and motor trucks.

Returning to Canada, Mr. Fowler showed many scenes along the St. Lawrence River and the Great Lakes and emphasized the need of the much talked of "Lakes to Ocean Route". In his opinion, Montreal had the best harbour commission laws and regulations of the North American Continent, if not of the World. Toronto was commended very highly for the harbour improvements they were carrying on.

Sketches of the proposed international bridge between Detroit and Windsor, a proposal which Mr. Fowler has fathered, were next flashed on the screen. This project was briefly outlined.

A hearty vote of thanks to Mr. Fowler, was moved by A. Simmers of the Chamber of Commerce and seconded by A. J. Riddell, A.M.E.I.C.

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The Border Cities Branch held the regular monthly meeting in the auditorium of the Chamber of Commerce, Friday Evening, November 12th, H. B. R. Craig, Chairman, of the branch presiding.

After the regular business of meeting, the speaker of the evening, J. J. Newman, M.E.I.C., O.L.S., addressed the branch on "Practical Workings of the Ontario Drainage Act from the Engineer's Standpoint". Mr. Newman traced the history of agricultural drainage from the drainage of the fenlands in England at the time of the Roman Conquest to the present time.

Coming down to the drainage laws of Ontario, he showed the development from scattered sections through the municipal act as the law existed prior to 1894. About the year 1891 a Royal Commission was appointed to enquire into the workings of the drainage laws, as litigation at that time was more prevalent than useful drains. This commission brought in a report with recommendations from which the Government drafted the drainage act of 1894, and this act forms the basis of the present drainage act.

Mr. Newman then took up the workings of the various sections of the present drainage act as it affects the engineer, commencing with section No. 3 which is the section under which new work is undertaken by petition, and ending with section No. 90 which section gives the municipality power to assume a drain constructed under the Ditches and Watercources Act and make it a municipal drain.

A hearty vote of thanks was moved by L. T. Bray, A.M.E.I.C., seconded by C. A. MacDonald, S.E.I.C., to Mr. Newman for his instructive and excellent address.

On motion of D. A. Molitor, M.E.I.C., seconded by A. J. Riddell, A.M.E.I.C., the Branch bylaws section No. 8, paragraph 1 were amended by substituting in said paragraph "the second Friday of every month" in place of "the first Friday of every month".

M. E. Brian, A.M.E.I.C., then gave the meeting much appreciated information re the gas situation in the Border Cities at the present time.

Winnipeg Branch

Geo. L. Guy, M.E.I.C., Secretary-Treasurer.

At the regular meeting held on 21st. October a paper was read by J. A. Davies, engineer of the Manitoba Steel Foundries, Limited, on Electric Furnace Operating. Mr. Davies dealt with the various essential requirements for the successful operation of electric furnaces and described particularly the equipment at the rolling mills at Selkirk.

The Mining Institute of Canada held their annual meetings on the 25th., 26th. and 27th. October in Winnipeg. A large attendance of outside members was present, among whom were several members of *The Engineering Institute.*

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On 2nd. November, at the invitation of the management, through T. R. Deacon, Esq., M.E.I.C., the members of the Branch visited the Manitoba Rolling Mills at Selkirk and inspected the electrical furnace and the new open hearth steel furnace which is being operated with pulverized coal, being the pioneer installation of this kind of furnace in Canada. Over fifty members took advantage of the opportunity and a very interesting afternoon was spent.

On 5th. November Professor J. W. Dorsey, A.M.E.I.C., read a paper on electrical transmission. Professor Dorsey's paper dealt with the necessity of fully utilizing all power resources in Canada to save to the country the excessive amount of money which is now being spent on American fuel. He pointed out that the efficient utilization of the available power resources of Canada depended upon the economical and efficient means of transmission of energy. He discussed at length the well known theoretical advantages of direct current transmission at high voltages and proposed a scheme by which this could be done at constant potential instead of the constant current method which up to the present time has been used for high voltage direct current transmission. While this method would necessitate the development of extra high voltage direct current machines he claimed that by a special method of "rectifying commutation" devised by him the direct current machines could be built for voltages approaching those for which alternating current machines are now built, and in fact suggested even higher voltages might be possible. The means of developing these machines was only lightly touched upon, the paper confined itself chiefly to the efficiencies in transmission to be obtained by high voltage, direct current and operating advantages which would accrue through the use of this method.

Owing to the length of the paper it was impossible to discuss fully Professor Dorsey's paper and it was decided to continue the discussion at the regular meeting on the 2nd December. Due to the publicity which Professor Dorsey's scheme has lately been given in the public press, the meeting was largely attended, the room being packed to capacity.

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On Thursday, 4th November, the Engineering Society of Manitoba University gave a dance at the Fort Garry Hotel, to which members of the Branch were invited. A large number accepted the invitation and an enjoyable evening was spent by all.

Vancouver Branch

J. N. Anderson, A.M.E.I.C., Secretary-Treasurer.

The Vancouver Branch held a dinner on Saturday, 16th October, in the University Club, Lt.-Col. R. Leckie, D.S.O., Head of the Operations Branch, Dominion Air Board, being the guest of honour.

Earlier in the day the First Annual General Meeting of the Association of Professional Engineers of the Province of British Columbia was held, and this social meeting proved a very delightful ending to an outstanding day among Engineering events in this City.

Professor E. G. Matheson, Chairman of the Vancouver Branch, presided.

Those present were Lt.-Col. R. Leckie, D.S.O.; the following Victoria members, Messrs. A. E. Foreman, D. O. Lewis, J.B.Holcroft, H.M.Bigwood, Smith and Icke; the following Vancouver members and engineer friends: Major R. W. Brock (Dean of the Faculty of Applied Science, University of B.C.), Major W. G. Swan, D.S.O., Major G. A. Walkem, Major C. R. Crysdale, Messrs. Wm. Anderson, S. Anderson, J. N. Anderson, Bates, Blackman, P. P. Brown, Connell, Creer, Dalzell, Devey, Dunbar, Frew, Frith, Irwin, Jamieson, Lighthall, Muirhead, McMurray, Philip, Powell, H. L. Robertson, Scott, Smith, Smeltzer, Smaill, Stirratt, Swift, Snodgrass and Todd.

The only toast was that of the King.

In introducing Lt.-Col. Leckie, the Chairman congratulated the guest of honour on his epoch—making flight from Halifax to Winnipeg, a distance of over 2000 miles, and reminded those present of the Colonel's splendid record as an airman during the War, he having been the first to attack successfully and bring down a Zeppelin from a sea-plane.

Lt.-Col. Leckie, in opening his remarks, said he wished to speak, not as a soldier but as a citizen, and that he would confine his talk to Civil Aviation.

Then followed a most interesting description of the Halifax-Winnipeg flight, during which the audience learned of the frequent dangers and occasional humours of the undertaking, and the constant need of grim endurance. Col. Leckie had for his companion Major Hobbs of Vancouver, to whom he paid a high tribute. The flight was made by seaplane on account of the large areas of water in the Eastern part of Canada, it being stated that two-thirds of the world's fresh water was in Canada, largely east of Manitoba.

The organization of the Dominion Air Forces, Military and Civil, was explained, and the speaker proceeded to discuss Civil flying, pointing out that stunting, whilst of great military significance, was entirely uncalled for in civil or commercial practice. Statistics of British and Canadian Commercial flying were quoted, showing the great strides which aviation has made, and also the safety with which large numbers of passengers have been carried, the fatalities being as low as .01 per 1000 in Britain in the course of 230,000 miles flown.

Col. Leckie has given much attention to the economic side of his profession, and his studies have led him to these findings.

The depreciation due to "wear and tear" on high-power war type aircraft limited the life of the machine to approximately 600 flying hours, while a good pilot averaged a crash every 700 flying hours.

From this it was deduced that a war type machine put in the field for a period of six months and flown 300 hours was depreciated approximately 60 per cent, so that before flying can become a profitable business project the lifetime of a plane must be very considerably increased. Extensive alterations are therefore required in the design and construction of machines.

Before and during the War, aircraft were built of glued wood, piano wires and fabric. This was undoubtedly good business during the War when the average life of a plane in France was 100 flying hours; but with peace conditions the speaker was of the opinion that the design and construction of aircraft was the work of the engineer, he being the most fully equipped by training to produce the necessary all-metal plane which would fulfil the conditions imposed on aircraft.

Under the terms required by the Allies, Germany was called upon to deliver to the Allies or to destroy all aircraft; but this condition has not prevented the Germans, largely engineers and chemists, from producing since the War, many valuable adjuncts to the aeroplane, and it is known that Germany has now a large number of newly constructed, so-called commercial aircraft, and further has successfully built all-metal aeroplanes.

The speaker stated that he was not one of those optimists who imagined the last war has been fought, and that he was fully of the opinion that the next one would be under such conditions that aircraft would be the essential arm of warfare. When it was understood that a commercial craft can be turned into the most complete military machine in about an hour it behooved Canada, if she would hold her place in the World's affairs, to consider this fact. The cost of such a vessel as H.M.S. "Hood" would cover 800 bombing planes, a statement which, when considered, must give food for thought and at once show the full import of the civil or commercial flying machine.

Unfortunately, as yet, no aircraft factories have been established in Canada, but Col. Leckie looked to the time, at no distant date, when this would be remedied and hoped that the engineer would play the most prominent part in putting Canada in the forefront of aircraft manufacturers.

A vote of thanks to Lt.-Col. Leckie was moved by Major Swan, seconded by Mr. Lewis and responded to with musical honours.

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The first General Meeting of the Association of Professional Engineers of the Province of British Columbia was held in the Auditorium, Board of Trade Building, Vancouver, B.C. on Saturday 16th October, at 2.30 p.m.

There was a large turnout of members, all branches of engineering being well represented as were also the various parts of the Province.

Professor E. G. Matheson, Provisional President, outlined the history leading up to the passing of the B.C. "Engineering Profession Act" early this year, and gave a full report of the work done by the Provisional Council appointed by the Lieut.-Governor-in-Council, which has examined the credentials and registered over 400 Engineers.

Draft By-laws were submitted to the meeting and ratified after some amendments had been made.

The following Nominating Committee was appointed to nominate candidates for the Council for 1921-1922: Messrs. R. W. Brock, J. N. Anderson, A.M.E.I.C., A. S. Wooton, C. Brakenridge, M.E.I.C., O. W. Smith, M.E.I.C., G. S. Elridge, T. H. Crosby, W. W. Fraser, J. F. Frew, P. P. Brown, M.E.I.C., P. Philip, A.M.E.I.C.

This Committee will also nominate candidates for the Council for 1920-1921, under a special provision in the By-laws for the election of the first regular Council.

Eighth General Professional Meeting, Halifax, N.S.

Victoria Branch

H. M. Bigwood, A.M.E.I.C., Secretary-Treasurer.

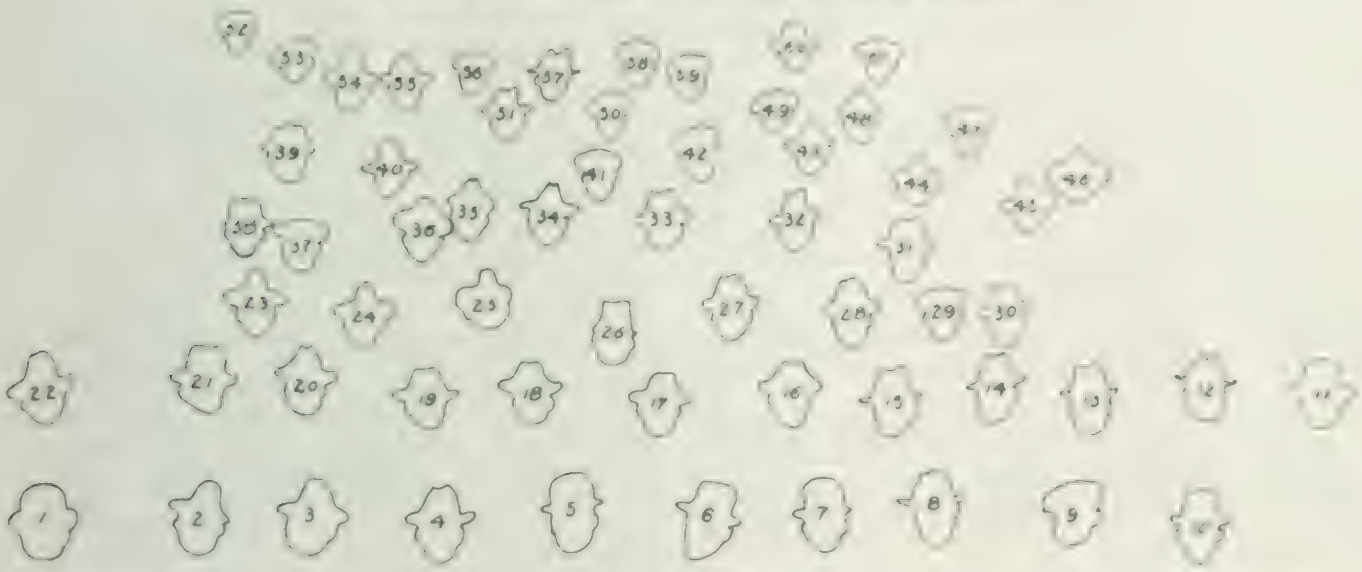
The Branch opened its season on Thursday October 21st, with a meeting to which the public were invited, when Colonel R. L. Leckie, D.S.O., Director of Civil Aviation, had kindly consented to speak on his experiences during the flight across Canada and on Aviation generally.

Unfortunately the distinguished aviator was recalled to Vancouver on Air Board business almost immediately after his arrival in Victoria, and so was unable to attend, but he had prevailed upon Major Hobbs, who had been his companion during the first stage of the flight, from St. Johns to Winnipeg, to take his place and address the meeting in his stead.

A. E. Foreman, M.E.I.C., the Branch Chairman, presided and introduced the speaker. With him on the platform were N. A. Yarrow, A.M.E.I.C., and Mr. Marriner, the general manager of Yarrows Ltd., Scotland.

Major Hobbs opened his remarks by outlining the organization of the Air Board at Ottawa, and gave a short synopsis of the work of the three branches, Military, Civil and Operations.

Key to Group Photo, Eighth General Professional Meeting



1	W. G. Matheson	New Glasgow, N.S.
2	G. G. Murdoch	St. John, N.B.
3	Fraser S. Keith	Montreal
4	Major Schofield	St. John, N.B.
5	R. A. Ross	Montreal
6	C. E. W. Dodwell	Halifax, N.S.
7	F. R. Faulkner.	Halifax, N.S.
8	S. B. Wass	Moncton, N.B.
9	R. F. Uniacke	Ottawa, Ont.
10	F. A. Bowman	Halifax, N.S.
11	F. H. Palmer	Halifax, N.S.
12	F. P. Vaughan.	St. John, N.B.
13	[illegible]	St. John, N.B.
14	G. N. Hatfield	St. John, N.B.
15	K. H. Smith	Halifax, N.S.
16	G. S. Stairs	Halifax, N.S.
17	J. G. W. Campbell	Truro, N.S.
18	F. P. Jennings	Halifax, N.S.
19	G. G. Hare	St. John, N.B.
20	G. Steel	Chatham, Ont.
21	A. R. Crookshank	S.t John, N.B.
22	H. N. [illegible]	Halifax, N.S.
23	C. St. J. Wilson	Halifax, N.S.
24	E. M. Archibald	St. John, N.B
25	H. S. Van Scoyoc	Montreal.
26	C. O. Foss	St. John, N.B.
27	H. W. Mahon	Halifax, N.S.
28	Harold S. Johnston	Halifax, N.S.
29	E. S. Fraser	New Glasgow
30	R. J. Bethune	Antigonish
31	H. W. L. Doane	Halifax, N.S.
32	R. F. Freeman	[illegible]
33	C. O. Whitman	[illegible]
34	G. R. Hesler	[illegible]
35	M. J. MacMillan	[illegible]
36	W. G. Hardy	[illegible]
37	H. McL. Peppard	[illegible]
38	C. M. Crooks	[illegible]
39	M. L. [illegible]	[illegible]
40	A. T. McDonald	[illegible]
41		
42	B. M. Bayne	[illegible]
43	W. P. [illegible]	[illegible]
44	L. G. Gauvin	[illegible]
45	C. A. McNearney	[illegible]
46	R. M. Gill	[illegible]
47	T. H. [illegible]	[illegible]
48	A. A. Turnbull	[illegible]
49	St. C. J. Hayes	[illegible]
50	[illegible]	
51	A. J. [illegible]	[illegible]
52	K. G. [illegible]	[illegible]
53	A. F. [illegible]	[illegible]
54	F. G. [illegible]	[illegible]
55	T. F. [illegible]	[illegible]
56	C. F. Robertson	[illegible]
57	R. D. [illegible]	[illegible]
58	A. H. Whitman	[illegible]
59	A. L. [illegible]	[illegible]
60	M. F. Goudge	[illegible]
61	K. [illegible]	[illegible]

Speaking of the flight across Canada, the speaker stated that they had hoped to get through sooner, but that bad weather had held them up time after time. The actual flying time was 48 hrs. 20 minutes for the journey of about 3300 miles, from the Atlantic to the Pacific.

Ill-fortune overtook them soon after leaving St. John's when they ran into a gale blowing fifty miles an hour. Fog and engine trouble delayed them at various times between Ottawa and Winnipeg.

The portion of the flight from Winnipeg to the Coast was not dealt with by the Major, who had not taken part in it, and the reports of which were not at the time complete, but it had been completed satisfactorily and without difficulty.

The use of wireless to give an aviator his location was described, and the work of the R.N.A.S. during the war was touched upon, patrols upon the "cobweb system" being described.

In speaking of the construction of aeroplanes the Major said that it was necessary to get away from the flimsy construction of the essentially war-time machine and standardize a type which would deteriorate less rapidly.

Figures were given to show that aerial travel was not the dangerous experience people generally supposed, in England where a year's figures were available the proportion of passengers killed to the number carried was one per thousand. At present Canadian casualties were three times this number, but this condition would soon be remedied.

The vote of thanks to the speaker was proposed by Mr. Yarrow and seconded by D. O. Lewis, M.E.I.C., the mover recalling the pioneer journeys across the continent in earlier days by wagon and railway; he reminded his audience that this flight just completed was also a pioneer adventure.

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A. E. Foreman, M.E.I.C., the Chairman of the Branch, has resigned his post as Public Works Engineer for British Columbia to take a position with a large firm of United States engineers, as their representative for the Province with headquarters in Vancouver. It is the hope of the members of the branch that Mr. Foreman's active support will not be lost, but that his new position will still enable him to take the same active interest in local matters affecting the engineerin profession which he has previously done.

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The Papers Committee, under the chairmanship of Capt. W. M. Everall, A.M.E.I.C., have every expectation that the list of subjects to be dealt with during the winter, will be of such a varied character that members in each branch of the profession will find their pet subject included. A full list will appear later.

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A particular effort is being made to interest young men who are starting their career in engineering, in *The Institute*, with a view to their admission as Students. It is felt that there are many such who have not had the opportunity to go to the University but are beginning as juniors in drawing offices who should be encouraged to enter the students grade and then work up in the meantime for their examinations to qualify as Juniors.

Elections and Transfers

At a meeting of Council on Nov. 23rd, the following elections and transfers were effected:—

Members

Bertram, H. Graham, B.Sc., (Queen's '10), of Dundas, Ont., Ch. Engr., John Bertram Sons & Co.; Fraser, Daniel Macfarlane, (Heriot Watt College), of Toronto, Ont., Estimating Engr., Can. Gen'l Electric Co.; Phillips, Thomas Caleb, (Univ. of Wales & Engr'g Academy), of Ottawa, Ont., Consltg. Engr. to the Dept. of the Naval Service, Canada.

Associate Members

Addison, George Dickson, of Vancouver, B.C., Ch. Dftsman., Vancouver Harbor Comm'rs.; Auger, Albert, B.A., B.C.E., (Univ. of Manitoba), of Prince Rupert, B.C., Asst. Engr., G.T.P.; Belcher, John Tresilian, B.A.Sc., (Univ. of Toronto '14), of Cameron Falls, Ont., Dftsman. and office asst., H.E.P.C.; Buchanan, Frank Montgomery, B.A.Sc., (Univ. of Toronto '15), of Montreal, Que., Mgr. of Road Dept., Dom. Tar & Chem. Co., Montreal; Calvin Jonathan David, B.A., B.Sc. (Civil), (Queen's Univ. '07), of Montreal, Que., Supt. of Docks for the Century Coal Co., Montreal; Clifford, Arthur, LePoer Trench, (Engr'g Dept. Univ. Coll., London, England) of Hamilton, Ont., Checker in dftg dept., Hamilton Bridge Works Co.; Creighton, Charles Pearse, B.Sc. (E.E.), (McGill Univ. '20), of Cedars, Que., with McDougall & Pease, Consltg. Engrs.; Greer, John, B.A., B.E., (Royal Univ. of Ireland '10), of Montreal, Que., Asst. Engr., Portland Div'n., G.T.R., on Valuation of bridge substructures; Hanley, Alphonsus Edward, B.Sc., (McGill Univ. '13), of Montreal, Que.; Harrison, Thomas Francis, of Kingston, Ont., Engr. on bridge surveys, C.N.R., Kingston, Ont.; Hollaman, John Emmanuel, (Glasgow & West of Scotland Tech. Coll.), of Hamilton, Ont., Ch. Asst., in charge of Engr'g Dept., Hamilton Harbour Comm'rs.; Jepson, Thomas Cecil, B.Sc., (Cambridge Univ. '11), of Toronto, Ont., Ch. of party and instr'man on surveys, York Township; Kean, David Jacques, C.E. (S.P.S. Toronto, '09), of Whitby, Ont., County Road Supt., County of Ontario; Lester, James Frederick, (York Place Science School, Brighton, England), of Winnipeg, Man., Asst. Supt., Sydney E. Junkins Co., Constructors & Engrs., Winnipeg; Lester, Leonard William, (School of Science & Arts, Brighton, England, College de Dieppe, Dieppe, France), of Winnipeg, Man., Surveying Engr., Manitoba Power Comm'n.; Lynch, Goria, B.Sc. (C.E.), (Queen's '15), of Creighton Mine, Ont., Asst. on Engr. Staff, Mines Branch, International Nickel Co. of Canada, Copper Cliff, Ont.; Murray, Alexander Durand, (McGill), of Montreal, Que., Valuation Dept., G.T.R., Montreal; Paget, Benj. Walter, of Capreol, Ont., Res. Engr. in Ruel Sub. Div., Capreol to Foleyet, C.N.R.; Paget, James R., of Winnipeg, Man., Res. Engr., C.P.R., Weyburn-Lethbridge Branch Line; Parkinson, Norman Frederick, B.A.Sc. (Honors), M.A.Sc., (Univ. of Toronto '13), of Ottawa, Ont., Deputy Minister, D.S.C.R., Ottawa; Robinson, Frederick Algernon, (Diploma School of Science, Univ. of Toronto '08), of Toronto, Ont., Secretary, Hydraulic Dept., H.E.P.C., Toronto; Tidy, William Edgar, of Capreol, Ont., Concrete

Inspector & Res. Engr. on mtce of way, C.N.R., [illegible]; Walter Charles, (Great Southern & Western Rly. Tech. Inst., Dublin, Ireland), of Ottawa, Ont., Mech. Engr., Comm'nr. of Lights Branch, Dept. of Marine, Ottawa; Wilson, Walter [illegible], B.Sc., (Cornell Univ.), of Montreal, Que., Chem. Engr., Standard Chemical Co., Montreal.

Juniors

Campbell, George Wilfred, of Winnipeg, Man., Asst. to Dist. Engr., Reclamation Dept., Manitoba Govt.; English, William Campbell, of Peterboro, Ont., Can. Gen'l. Electric Co., Peterboro; Goulet, Siroy, (Mount St. Louis Scientific Course), of Peterboro, Ont., Ch. Mech. Dftsman., & Asst. to Mech. Engr., Can. Gen'l Electric Co., Peterboro, Ont.; Horton, Rowland Osborne Charles, (Royal Masonic School, Bushey, England, Cambridge Junior Cert. '10, Senior Cert. '11), of Winnipeg, Man., Struct. detailer, Dominion Bridge Co., Winnipeg; King, Perry, of Niagara Falls South, Ont., H.E.P.C. (Niagara Developments Lands Surveys); Madgett, George Henry, (Collegiate Inst., Hamilton, Ont.,), of Hamilton, Ont., Designing Engr., W. J. Westaway, Hamilton, Ont.; Mansbridge, Alfred Swatton, of Walkerville, Ont., Dftsman., Trussed Concrete Steel Co. of Canada Ltd., Walkerville, Ont.; Scanlan, Charles Edward, (London Univ. '05), of Vancouver, B.C., Charge of party on mtce., C.N.R.; Shanly, James, (McGill Univ.), of Kenogami, Que., Dftsman. & Asst. Engr., Price Bros. & Co., Kenogami; Wilcock, William Stanley, B.A.Sc., (Univ. of Toronto), of Flesherton, Ont., Asst. Surveyor, Dept. of Mines Surveys, International Nickel Co., Copper Cliff, Ont.; Wilson, Thomas Henry, (First Class Diploma, Mech. Engr'g, City & Guilds of London), of Norwood, Man., Chief Engr's Office, C.N.R., Winnipeg.

Transferred from the Class of Associated Member to that of Member

Farmer, Frank Harvey, B.Sc., (Liverpool Univ.), of Winnipeg, Man., Dist. Engr., Canadian Westinghouse Co., Winnipeg; Kaelin, Frederick Thomas, (Federal Technical University, Zurich, Switzerland), Ch. Engr., Shawinigan Water & Power Co., Montreal; Mackenzie, Chalmers Jack, M.C., B.E. (Dalhousie Univ.), M.C.E. (Harvard '10), of Saskatoon, Sask., Professor of Civil Engr'g., Univ. of Saskatchewan; Thornton, Kenneth B., (Technical College, London), of Montreal, Que., Chief Engr. & Operating Mgr., Can. Light & Power Co., Ch. Engr., Montreal Public Service Corp'n., and General Mgr. both companies; also Consltg. Engr., Montreal Tramways Co.

Transferred from the Class of Junior to that of Associate Member

Bovey, John Francis, (Tech. Coll. [illegible]), of Montreal, Que., Designing Engr., Montreal Water Board; Cooper, Ralph H., ([illegible]), of Winnipeg, Man., Consltg. Civil Engr., Winnipeg; Hutchison, Walter Beamish, ([illegible] S.P.S. Toronto), of Calgary, Alta., Special Inspecting Engr., Irrig. Branch, Dept. of the Interior, Prov. of Sask.; Jones, Wilmott Henry, B.C.S. (Univ. of Manitoba '14), of Winnipeg, Man., Engr. & Mgr., Can. Insulation Co. Ltd., Winnipeg; Layne, Geoffrey Francis, B.Sc. (Honours, McGill Univ. '14), of Kenogami, Que., Mech. Engr'g Asst., Technical Dept., Price Bros. & Co. Ltd., Kenogami; Murray, A. H., C.E. (McGill Univ. '1?), Struct. Engr., J. Pringle & Son, Montreal; Plummer, Alex. Alfred, of Vancouver, B.C., Contracting Engr., Vancouver, B.C.; Saunders, Walter Laidlaw, (S.P.S. Toronto), of Conrad, Sask., Instr'man on constrn., C.P.R., Conrad, Sask.; Slinn, William Harmon, B.Sc., (Queen's '10), of Sherbrooke, Que., Asst. engr. on constrn., Cape Constrn. Co., Sherbrooke, Que.; West, Charles William, B.A.Sc., (Univ. of Toronto '10), of Thorold, Ont., Asst. Engr., Dept. Rlys. & Canals, Section 2, Welland Canal.

Transferred from the Class of Student to that of Associate Member

Allan, Edward Blake, B.A.Sc., (Univ. of Toronto '16), of Hamilton, Ont., Asst. to Road Engr., Hamilton, Ont.; Lyons, Edward Leslie, B.Sc., (McGill Univ. '1?), of Montreal, Que., with J. M. Robertson, Consltg. Engrs., Montreal; McIntosh, Ernest Donald, B.Sc., C.E., (McGill Univ. '19), of Carleton Place, Ont., Asst. Engr., Consltg. Engr'g Dept., G.T.Ry.; Meikle, Angus Urquhart, M.C., B.Sc., (Queen's '12), of Ottawa, Ont., with the D.S.C.R., Ottawa.

For transfer from the Class of Student to that of Junior

Clarry, Arthur Reeser, B.A.Sc., (Univ. of Toronto '19), of Kingston, Ont., Instructor of Chemistry, R.M.C., Kingston, Ont.; Elderkin, Karl Osler, B.Sc., (Mech.), (McGill Univ. '20), of New Glasgow, N.S., Dftsman., Nova Scotia Steel & Coal Co., New Glasgow, N.S.; Emrey, Desmond Joseph, (Queen's Univ.), of Kingston, Ont.; Milot, Camille, B.A.Sc., C.E., (Laval Univ. '19), of Quebec, Que., Dept. of Public Works, Bridge Division, Quebec; Rowan, John Cuthbert, of Winnipeg, Man., Dftsman., Dom. Bridge Co., Winnipeg; Ryan, Charles Wilbert, B.Sc., (McGill Univ. '16), of Lisbon Falls, Me., Supt. for Turner Constrn. Co., on new addition Worumbo Mfg. Co., Lisbon Falls, Me.

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CLASSIFICATION AND REMUNERATION OF ENGINEERS

A. H. HARKNESS, Chairman
E. R. GRAY
FREDERICK B. BROWN
A. R. DECARY
J. B. CHALLIES

Preliminary Notice

of Applications for Admission and for Transfer

14th Nov., 1930

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the applicant.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, they should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in December, 1930.

FRASER S. KEITH, Secretary.

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*The professional requirements are as follows:—

Every candidate for election as MEMBER must be at least thirty years of age, and must have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. The term of twelve years may, at the discretion of the Council, be reduced to ten years in the case of a candidate who has graduated from an engineering course. In every case the candidate must have had responsible charge of work for at least five years, and this not merely as a skilled workman, but as an engineer qualified to design and direct engineering works.

Every candidate for election as an ASSOCIATE MEMBER must be at least twenty-five years of age, and must have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in some school of engineering recognized by the Council. In every case the candidate must have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years.

Every candidate who is not a graduate of some school of engineering recognized by the Council shall be required to pass an examination before a Board of Examiners appointed by the Council, on the theory and practice of engineering, and especially in one of the following branches at his option: Railway, Municipal, Hydraulic, Mechanical, Mining or Electrical Engineering.

This examination may be waived at the discretion of the Council if the candidate has held a position of professional responsibility for five years or more.

Every candidate for election as JUNIOR shall be at least twenty-one years of age, and must have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the Council, if the candidate is a graduate of some school of engineering recognized by the Council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: Geography, History (that of Canada in particular), Arithmetic, Geometry (Euclid Books I-IV and VI), Trigonometry, Algebra up to and including quadratic equations.

Every candidate for election as AFFILIATE shall be one who by his pursuits, scientific acquirements or practical experience is qualified to cooperate with engineers in the advancement of professional knowledge.

> The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

[illegible]

References: [illegible] T. R. Deacon.

[illegible]

FOSNESS—ARTHUR WILLIAMS, of Winnipeg, Man. Born at Winnebago, Minn., U.S.A., Nov. 19th, 1890; Educ., Engr. of Mines, University of Minnesota, 1911; 1911-13, with C. A. P. Turner Co., Minneapolis, detailer & designer in re-inforced concrete design; 1913-20, in charge of design and supervision of all Canadian work for above firm; Jan. 1920 to date, designing engr., Carter-Halls Aldinger Co., Winnipeg.

References: J. Woodman, W. M. Scott, J. G. Legrand, B. S. McKenzie, J. F. Greene, F. W. B. Scholefield.

HAMER—THURSTON MOSELEY, of Montreal, Que. Born at Mexico City, Feb. 22nd, 1892; Educ., B.Sc., McGill University, 1913; 1913-16, rly. engr'g. with C.P.R.; 1916-17, Travelling Car Service Agt., C.N.R.; 1917-20, Long Distance Tel. Engr., Bell Tel. Co.; At present engr. salesman, railway track supplies, R. J. Mercur Co., Montreal.

References: E. Brown, H. O. Keay, V. I. Smart, J. B. Porter, T. Eardley-Wilmot.

HARLOW—ROLAND ALDEN, of Prince Rupert, B.C. Born at Brewer, Me., U.S.A., Mar. 22nd, 1889; 1907 (June-Sept.), helper elec. dept., Great Nor. Paper Co., Millinocket, Me.; 1907-10, clerk supt., Trans. B. & Ar. R.R., Bangor, Me.; 1910-12, timekeeper, clerk & rodman, engr'g. dept., G.T.P. Rly., Prince Rupert, B.C.; 1912-17, instr'man with above rly.; 1917-19, with U. S. Engrs.; 1919-20, instr'man, G.T.P. Rly.; March 1920 to date, roadmaster, G.T.P. Rly., Prince Rupert, B.C.

References: J. A. Heaman, W. S. Fetherstonhaugh, W. H. Tobey, J. H. Pillsbury, A. L. Ford, A. M. Bremner, H. W. Tooker.

HARVEY—OSCAR ROBERT, of Montreal, Que. Born at Lyndhurst, Ont., Oct. 29th, 1891; Educ., 1 year Science, Queen's University; 1911, insp. on sewer install'n, Saskatoon; 1913, power plant work, Rosetown, Sask.; 1915-19, with Can. Engrs., enlisted as private, Capt. when discharged; 1917 (summer), instructor of mil. engr'g., England; At present Sales Engr., Wire & Cable Sales, Northern Electric Co., Montreal.

References: J. D. Hathaway, J. S. Cameron, J. B. Harvey, T. Eardley-Wilmot.

HENDERSON—JOHN ARCHIBALD HAMILTON, of Ottawa, Ont. Born at Smiths Falls, Ont., April 19th, 1895; Educ., 3rd year student, Faculty of Science, Queen's University 1913, asst. on Ottawa Vicinity Survey; 1916-19, overseas, Engrs.; 1912-1920 (with exception of military service and 1913), rodman etc., Geodetic Survey of Canada.

References: G. A. Mountain, J. B. McRae, J. L. Rannie, N. J. Ogilvie, W. P. Wilgar.

JAMES—EDWARD HENRY, of Vancouver, B.C. Born at Farnham, England, Dec. 30th, 1886; Educ., Assoc. City & Guilds of London, 1906. Ass. Mem. Inst. of C. E., England, 1913; 1907-09, improver & asst. on struct. steel & bridge work with A. Handyside Co. Ltd., Derby, England; 1909-13, asst. engr. with Easton Gibb & Sons Ltd., contractors for H. M. Dockyards, Rosyth, Scotland; 1913-14, asst. supt. at Little Current, Ont., for The Foundation Co. Ltd., Montreal; 1914 (June-Oct.), with J. S. Metcalfe Co. Ltd., Montreal; 1914-19, overseas, Lieut. with Royal Engrs., Wounded 1918. Instructor in explosives, Monmouth R. E. Training centre, and asst. bridging officer, G. H. Q., France; 1919-20, ch. asst. to A. D. Swan, Montreal; Aug. 1920 to date. res. engr. for constrn. of Ballantyne Pier, Vancouver, B.C. for A. D. Swan, consltg. engr. to Van. Hbr. Comm'n.

References: A. D. Swan, H. Holgate, W. I. Bishop, R. E. Chadwick, J. W. Doty, J. Forgie, H. Rolph, J. L. H. Bogart.

JARDINE—HUGH, of Moncton, N.B. Born at Rexton, N.B., March 16th, 1864; Educ., Student of Engr'g., University of Edinburgh, Scotland; 1897-1900, Assoc. Member Can. Soc. C. E.; 1887-88, res. engr., Chicago, Madeson and Northern Rly.; 1899, res. engr. on constrn., Dexter & Piscataquis Rly.; 1889-92, mining engr., Consolidation Coal Co. of Maryland; 1893-95, res. engr., Bangor & Aroostock Rly.; 1900-1920, asst. engr., I.C.R., C.G.R., now Can. Nat. Rlys., Moncton.

References: W. B. MacKenzie, C. B. Brown, W. A. Duff, J. Edington, M. Burpee, J. S. O'Dwyer.

LAPPIN—WILLIAM DAVID, of Toronto, Ont. Born at Toronto, April 30th, 1899; Educ., 2nd year student, Faculty of App. Sc., University of Toronto; On summer vacations worked for W. C. Hunt, Brass Works Toronto, Gutta Percha Rubber Co., Toronto, Allis Chalmers and Chapman Double Ball Bearing Co.

References: C. H. Mitchell, P. Gillespie, J. R. Cockburn, C. R. Young, T. R. Loudon.

MacKEEN—DAVID WHITNEY, of Halifax, N.S. Born at Glace Bay, N.S. Sept. 20th, 1894; Educ., R.M.C. 1914; 1914-19, Lieut., R.C.A.; 1919, foreman Anglins Ltd., Halifax Shipyards; At present student Civil Engr'g., McGill University.

References: H. M. Mackay, E. Brown, C. Fergie, J. MacGregor, H. M. Lamb.

MACPHERSON—KENNETH P., of Montreal, Que. Born at Prescott, Ont., June 24th, 1892; Educ., B.Sc. (C.E.), Queen's Univ., 1914, Ass. Mem. A.I.E.E.; 1911 (summer), armature dept. C.G.E., Peterboro; 1914 (summer), test Dept., Can. Westinghouse; 1914-19, with Can. Engrs., Major 1918, awarded D.S.O.; 1919-20, instructor in Elec. Engr'g., Queen's Univ.; At present Sales Engr., Wire & Cable Sales Dept., Northern Electric Co., Montreal.

References: W. L. Malcolm, L. W. Gill, W. P. Wilgar, H. W. Tate, J. S. Cameron, W. F. McKnight, D. S. Ellis, J. L. H. Bogart.

McCAVOUR—SAMUEL THOMAS, of East Angus, Que. Born at St. John, N.B., Aug. 9th, 1899; Educ., B.Sc. (C.E.), Univ. of New Brunswick, 1920; 1917 (summer), rodman on constrn., St. John Valley Rly.; 1918 (summer), dftsman with Mil. Hospitals P.W.D. of Canada; 1919 (summer), dftsman with Union Foundry & Mach. Works, St. John; 1920 (May-Sept.), struct. dftsman, American Bridge Co., Pencoyd, Pa.; Oct. 1920 to date, struct. dftsman, Brompton Pulp & Paper Co. Ltd., East Angus.

References: F. O. White, J. A. Dickinson, J. O'Neil, J. A. Stiles, E. O. Turner, A. R. Crookshank.

McGAVIN—CHARLES JAMES, of Edmonton, Alta. Born at Tiree, Scotland, July 23rd 1883; 1899-1904, articled pupil with Messrs Babtie & Bonn, Glasgow, at same time attending West of Scotland Tech. Inst.; asst. to above firm for 4 mos.; 1905-06, with Messrs. Low & Thomas, Glasgow & London, in charge of constrn.; 1907-08, location engr., C.N.R.; 1909-11, private practice, Toronto; 1912, office engr., with Messrs. Harrison & Ponton, Calgary; 1913-14, asst. engr. with Hunt Engr'g. Co., Kansas, on constrn. of reinforced concrete cement plant; 1914-15, asst. engr., Medicine Hat; 1915 (Mar.-Dec.), field engr., Lethbridge Nor. Irrig. Project; 1916 to date, district hydrometric engr., Dept. of Interior, Edmonton.

References: J. L. Cote, C. C. Sutherland, R. H. Douglas, A. L. Cumming, P. M. Sauder.

McGORMAN—SAMUEL ERNEST, of Walkerville, Ont. Born at Township of Mornington, Ont., Sept. 23rd, 1880; Educ., Grad. S.P.S., University of Toronto, 1905; 1905 (summer), in charge of Contractors Gangs on foundation work in Winnipeg; 1906-14, dftsman bridges & struct. steel work; 1914 to date, with Can. Bridge Co., in charge of design, constructing and supervision of bridges and struct. steel work.; At present sales engr., with above firm.

References: F. C. McMath, G. F. Porter, C. M. Goodrich, S. Svenningson, F. A. Gaby, J. G. Legrand.

MEADER—JOSEPH CAVE, of Toronto, Ont. Born at Orillia, Ont., Feb. 20th, 1887; Educ., At present 4th year student, Faculty of App. Sc., University of Toronto; 4 mos. rodman, C.N.R.; 6 mos. in chg. of party D.L.S. with Beatty & Price, Pembroke, Ont.; Summers 1913, 1919 & 1920, in chg. of party O.L.S. for J. W. Fitzgerald.

References: C. R. Young, H. E. T. Haultain, J. Sinton, C. H. Fullerton, J. Hutcheon.

MURDEE—WILLIAM CAMPBELL, of Ottawa, Ont. Born at Winthrop, Ont., July 1st, 1891; Educ., B.A.Sc. (Honors), M.A.Sc., Univ. of Toronto, 1913, D.L.S.; 1903-09, (part time) rodman, munic'l drainage; 1911 (summer), topog'l. branch, Geol. Survey of Canada, Crow's Nest Pass; 1910 (summer), asst. to City Engr., Galt, Ont.; 1912 & 13 (summers asst. to W. W. Meadows on Sask. Govt. Roads; 1916-19, Lieut. & Capt. Can. Engrs., Awarded M.C.; 1919 to present time, on staff of Geodetic Survey of Canada, April 1920 to date in full charge of primary triangulation of Lr. St. Lawrence & Gulf.

References: P. Gillespie, N. J. Oglivie, J.J. McArthur, J. L. Rannie, W. M. Tobey, F. S. Jones, C. S. Walley.

NABLO—HAROLD WILLIAM, of Toronto, Ont. Born at Cayuga, Ont., Sept. 28th, 1899; Educ., At Present 2nd year student E.E., Univ. of Toronto; 1917-18, electn's. helper with H.E.P.C. of Ontario; 1919 (mar.-Sept.), with Ontario Power Co., Niagara Falls, Ont.; 1920 (Apr.-Sept.), sub-station operator, H.E.P.C. of Ontario.

References: C. H. Mitchell, P. Gillespie, C. R. Young, T. R. Loudon, J. R. Cockburn.

NASH—ABRAM LELAND STANLEY, of Brantford, Ont. Born at South Cayuga, Ont., July 6th, 1894; Educ., O.L.S. 1915, at present 3rd year student C.E., Univ. of Toronto; 1912-15, ap'tice and asst. to A. M. Jackson, O.L.S.; 1915-19, sgt., C.F.A.; 1919 (Apr.-Aug.), asst. to R. M. Lee, Township Engr., Brantford; Aug. 1919 to date, junior partner, Jackson, Lee & Nash, Surveyors & Engrs., Brantford, Ont., attending college during winter months.

References: J. R. Cockburn, A. M. Jackson, P. Gillespie, C. R. Young, C. H. Mitchell.

NICHOLSON—CHARLES JAMES, of Hamilton, Ont. Born at Hamilton, Aug. 13th, 1874; Educ., Grad. S.P.S., Univ. of Toronto, 1894; 1 yr. ap'ticed to J. W. Tyrrell as student for O.L.S.; 1894-97, rodman and dftsman on prelim. surveys; 1897-1910, ch. asst. to Thos. E. Hillman on constrn. of various rlys. etc.; 1910 to date, mtce. engr., Toronto Hamilton & Buffalo Rly.

References: R. L. Latham, W. Kennedy, Jr., C. H. Mitchell, A. E. Macallum, H. K. Wickstead, E. H. Darling, C. Carrol, F. W. Hubbard, E. R. Gray, W. B. Ford, F. W. Paulin, R. A. Black, W. A. Bucke, A. H. Harkness.

O'CONNOR-GARRETT Daunt, of Bridgeburg, Ont. Born at Niagara Falls, Ont., June 4th, 1895; Educ., 4th year student C.E., Queen's Univ.; one summer as rodman; 5 years overseas with Can. Engrs.

References: A. MacPhail, W. P. Wilgar, W. L. Malcolm, D. S. Ellis, T. S. Scott.

FOR TRANSFER FROM THE CLASS OF JUNIOR TO HIGHER GRADE

CARMAN—HENRY VICTOR, of Winnipeg, Man. Born at Halifax, N.S., March 24th, 1883; Educ., I.C.S. course in C.E. and at present taking course in Architecture; 1903, with res. engr., P.W.D., St. John, N.B.; 1904-05, rodman, C.P.R. Western lines; 1905-06, T.C. Rly. on location; 1906-09, G.T.P. Rly., as topog'r., leveller and transitman; 1909-10, dftsman with The Garson Quarrie Co. Ltd.; 1910-11, ch. dftsman, Thos. Kelly & Sons; 1915-17, ch. dftsman, Wallace Sandstone Quarries Co. Ltd.; 1917 (May-Jan.), dftsman, P. W. D., Man. Prov. Govt.; 1917-18, ch. dftsman, Gillis Tyndall Stone Co.; 1918 to date, office & field engr., J. McDiarmid & Co. Ltd., Winnipeg.

References: W. A. James, C. L. Bates, L. Pierard, F. W. B. Scholefield, S. S. Kennedy, W. R. Warren.

CLARK—ALBERT WILLIAM GARDNER, of Marlboro, Alta. Born at Valleyfield, Que., Dec. 11th, 1887; Educ., B.Sc. (Honors), McGill University, 1910; 1910-11, fuel & loco. inspr., C.P.R. Western lines; 1911-12, trainmaster, C.P.R. western lines, Field, B.C.; 1912-14, mech. foreman, Can. Car & Foundry Co., Montreal; 1914-15, mech. engr. and asst. supt., Canadian Cement Co., Winnipeg; 1915 to May 1918, and Feb. to Oct. 1919, supt. with above firm; 1918, Lieut. Can. Engrs.; 1919 to date, gen. mgr., Edmonton Cement Co., Marlboro, Alta.

References: W. G. Chace, N. M. Hall, D. L. McLean, H. W. McLeod, A. A. Young.

CROSSING—WILLIAM BERKLEY, of Nacmine, Alta. Born at Frome, Somerset, England; April 2nd 1893; Educ., Engr'g. Matric., Bristol University, England, 1910; 1910 (July-Oct.), dftsman, C. N. R.; 1910-14, with C.P.R. as rodman, pile inspr., field dftsman, asst. instr'man, and instr'man; 1914-19, overseas; 1919 to date, instr'man, C.P.R. constrn., Acme-Empress Branch.

References: J. A. Hesketh, W. A. James, C. Flint, H. W. Tye, T. C. Macnabb, J. G. Reid, W. D. Mackenzie.

FERGUSON—ANDREW WELSH, of Edmonton, Alta. Born at Bearsden, Scotland, Dec. 29th, 1892; Educ., Course in Geology, University of Alberta; transitman, T.C. Ry.; 1912-14, engr. & surveyor in charge of party locating etc., main highways, Alta.; 1914-19, overseas, engr'g. corps; 1919 (summer), engr. on roads, S. Alta.; At present engr. in charge, main highway surveys, S. Alta.

References: J. Adam, D. W. Ritchie, J. D. Robertson, J. V. Dillabough, F. S. Keith, A. G. Willson.

MACTAVISH—WILFRED IAN, of Toronto, Ont. Born at Toronto, Ont., Mar. 8th, 1892; Educ., 1910-12, S.P.S. University of Toronto; 1912-19, asst. engr. D.P.W., design, constrn., surveys, and estimates of wharves etc.; 1919, supt. in charge of Parry Sound Iron Works Co's. blast furnace & plant at Parry Sound; 1919 to date, asst. engr., D.P.W. of Canada.

References: J. M. Wilson, K. M. Cameron, W. P. Merrick, A. N. Molesworth, F. Moberly, C. L. Hays, W. H. Blanchet.

McLEOD—CLEMENT KIRKLAND, of Westmount, Que. Born at Montreal, Dec. 30th, 1889; Educ., B.Sc., McGill Univ., 1913; 1912 (June & July), chem. lab. work, Macdonald College; 1913-15, asst. chem., Canada Cement Co.; 1915 (June-Dec.), gen. engr'g. work, Norman McLeod Ltd., Toronto; 1916-18, with Imperia Munition Board & Imp. Ministry of Munitions; 1919-20, chem., Dom. Glass Co., Montreal; June 1920, asst. supt., Consumers Glass Co., Montreal, and Aug. 1920 to date supt. of same firm.

References: A. C. Tagge, C. M. McKergow, G. R. MacLeod, G. P. Cole, H. W. Racey, A. W. Sinnamon, A. F. Byers, F. S. Keith.

FOR TRANSFER FROM THE CLASS OF STUDENT TO HIGHER GRADE

MORTON—HAROLD ARTHUR, of Winnipeg, Man. Born at Munster, Ont., April 9th, 1893; Educ., 1 year Univ. of Manitoba; At present taking I.C.S. course Elec. Engr'g.; 1912 (summer), dftsman, city of Moose Jaw, Sask.; 1913 (summer), with J. A. Morton, Contractor, Winnipeg; 1916-18, overseas with 196th Western Univ. Batt., as cpl. signaller; 1913 to date, with city of Winnipeg Light & Power Dept., as junior & senior dftsman and from Oct. 1919 to date in charge of dfting office.

References: J. G. Glassco, E. V. Caton, C. A. Clendening, J. A. MacGillivray, E. A. Childerhose.

RICHARDSON—WILLIAM HENRY, of Minitonas, Man. Born at Stockton-on-Tees, England, May 2nd, 1883; Educ., B.Sc. (C.E.), University of Manitoba, 1914; 1912 (summer), dftsman & reporter. Man. Hydrographic Survey; 1913 (summer) dftsman, G.T.P. Winnipeg; 1914 (summer), asst. engr., Municipality of Rockwood; 1914-18, overseas; 1919 (Jan.-Aug.), topogr'r. & dftsman on location, C.P.R., Winnipeg; 1919 to date, municipal engr., Municipality of Minitonas, Man.

References: E. E. Brydone-Jack, M. A. Lyons, T. T. Wilson, E. W. M. James, E. Markham, C. N. Mitchell, Jr., J. A. H. O'Reilly, H. R. Urie.

TWINBERROW—JAMES OSWALD, of Montreal, Que. Born at Birmingham, England, Jan. 19th, 1892; Educ., B.Sc. (Mech. Engr.), McGill Univ. 1920; 1910-12, ap'tice, Gateshead Loco. Works, North Eastern Rly., England; 1912-13-14 (summers), with C.P.R. as fitter's helper, fireman and asst. to Master Mechanic; 1915-19, with B.E.F., France & Italy as workshops officer in charge of mtce., etc., also on staff of ch. insp'r. of mech. transport at Gen. Hqts., France; May 1920 to date, special engr., Canadian Branch, Babcock & Wilcox Ltd., Water Tube Steam Boiler Mfgrs. (A.M. Inst. of C.E., 1918).

References: H. H. Vaughan, F. A. Combe, A. R. Roberts, G. H. Dickson, R. E. Macafee, C. M. McKergow.

VON ABO—CECIL VIVIAN, of Montreal, Que. Born at Kroonstad, Orange Free State, S.A., Oct. 10th, 1895; Educ., B.A., 1913, B.Sc. (C.E.), 1917, M.A. (Pure Math.) 1918, M.A. (App. Math.), 1919, University of Capetown; 1918, lecturer in Graphics & Mech. Engr'g., University of Capetown; May 1920, asst. to field engr. on reconstrn. of Govt. Grain Elevator, Port Colborne, Ont., and field engr. for June & July, 1920; 1920 (Aug. & Sept.), dftsman, C. D. Howe & Co., Consulting Engrs., Port Arthur, Ont.

References: H. M. Mackay, C. Batho, E. Brown, R. de L. French, G. Blanchard.

Engineering Index

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Engineering Societies Library,

29 West Thirty-ninth Street, New York, N.Y.

ALCOHOL. Wood Alcohol—A New Industrial Monarch. Sci. Am., vol. 121, no. 19, Nov. 8, 1919, p. 462, 3 figs. Its production and utilization in United States during and since war.

ALLOYS ALUMINUM. Ternary Alloys of Aluminum with Magnesium and Copper (Ueber ternäre Legierungen des Aluminiums mit Maghesium and Kupfer), Rudolf Vogel. Zeitschrift fur anorganische und allgemeine Chemie, vol. 107, no. 1, July 29, 1919, pp. 265-307, 43 figs., partly on 4 supp. plates. Tests made with binary and a number of ternary alloys showed that tendency to binary combinations is very prevalent among metals but that combinations of three metals are less frequent.

Some Tests of Light Aluminum Casting Alloys—the Effect of Heat Treatment, P. D. Merica and C. P. Karr. Dept. Commerce, Technologic Papers Bur. of Standards, no. 139, Oct. 21, 1919, 31 pp., 16 figs., partly on supp. plates. Tensile properties and hardness of a number of different compositions of light aluminum casting alloys, comparison of their resistance to corrosion, and determination for a few commonly used compositions of resistance to action of alternating stresses.

Study Common Aluminum Alloys, Robert J. Anderson. Foundry, vol. 47, no. 19, Nov. 15, 1919, pp. 827-828. Discussion of relative merits of various aluminum alloys used for casting purposes.

Tempering of Various Aluminum Alloys (Contribution à l'étude de la trempe de certains alliages d'aluminium), Léon Guiller, Jean Durand and Jean Galibourg. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 11, Sept. 15, 1919, pp. 58-511. Experimental study of processes which were employed during war giving various degrees of hardness to duralumin.

COPPER. Copper Silicon Alloys -(Sur les alliages cuivre-silicium), A. Sanfourche. Revue de Métallurgie, vol. 16, no. 4, July-Aug., 1919, pp. 246-256, 1 fig. Formation, composition, methods of analysis and diagram of state.

See also Alloys, Aluminum.

IRON. The Electrical Properties of Iron Alloys, E. Gumlich. Elecn., vol. 83, no. 2163, Oct. 31, 1919, pp. 494-495. Report of committee appointed by Verband Deutscher Elekrotechniker to investigate magnetic properties of iron in so far as they depend on chemical constituents and thermal treatment. Translated from Elektrotechnische Zeitschrift.

MAGNESIUM. *See Alloys, Aluminum.*

SILICON. Limit of Combination of Silicon with some Metals of Iron Family (Sur la limite de combinaison du silicium avec quelques métaux de la famille du fer), A. Sanfourche. Revue de Métallurgie, vol. 16, no. 4, July-Aug. 1919, pp. 239-245. Experimental. It was found that richest combinations manifest tendency to partial dissociation until equilibrium was established according to general equation MxSiy=Mx Siy—z+Siz.

See also Alloys, Copper

TIN-ANTIMONY-ARSENIC. The Ternary Alloys of Tin-Antimony-Arsenic, J. E. Stand. Metal Indus., vol. 15, no. 14, Oct. 3, 1919, pp. 268-275, 19 figs. Most perfect structural arrangement of crystals is said to have been found in alloy containing 70 and 85 per cent tin, 25 and 18 per cent antimony, and 4 to 5 per cent arsenic.

TIN-THALLIUM. Thallium-Tin Alloys (Ueber Thallfum-Zinu-Legierungen), Paul Fuchs. Zeitschrift für anorganische und allegemeine Chemie, vol. 107, no. 4, July 29, 1919, pp. 308-312, 2 figs. Metallographic report of Institute of Physical Chemistry at Goettingen University. Crystallization curves.

ALTERNATORS

Characteristics of Alternators (Remarques sur les caractéristiques d'alternateurs), M. Doligez. Bulletin de la Société Française des Electriciens, vol. 9, no. 82, July, 1919, pp. 485-498, 6 figs.

ALUMINUM

Aluminum in Aeronautics (L'aluminum dans l'Aéronautique), M. Grard. Aéronautique, vol. 1, no. 5, Oct., 1919, pp. 183-187, 7 figs. Introductory statement giving statistics of world production of aluminum and its physical and chemical characteristics. (To be continued.)

Industrial Uses of Aluminum (Quelques applications industrielles de l'aluminium), Jean Escard. Revue d'Electrométallurgie, vol. 13, no. 3, May and June, 1919, pp. 63-72. Aluminum paper, aluminum powder, aluminum photo-powders, and uses of aluminum gas industry.

ALLOYS *See Alloys, Aluminum.*

AMMETERS

British Standard Specification for Recording (Graphic) Ammeters, Voltmeters and Wattmeters. British Eng. Standards Assn., no. 90, Oct. 1919, 14 pp., 1 fig. Limits of error varies from 1.5 to 2.5 per cent. of maximum scale value for voltmeter. Corresponding figures for ammeter and wattmeter are 3 to 3.5 per cent. respectively.

British Standard Specification for Indicating Ammeters, Voltmeters, Wattmeters, Frequency and Power-Factor Meters. British Eng. Standards Assn., no. 89, Oct. 1919, 24 pp., 3 figs. Specifications include both indicating and graphically recording instruments.

AMMONIA

ANALYSIS LIQUOR. The Estimation of Cyanogen Compounds in Concentrated Ammonia Liquor— 11. The Estimation of Thiocarbonate. Percy Edwin Spielmann and Henry Wood. J. Soc. Chem. Indus., vol. 38, no. 20, Oct. 31, 1919, pp. 369T-370T. Colorimetric method outlined in Jl. of Soc. of Chem. Indus., 1919, pp. 38T-43T, extended to include determination of thiocarbonate.

OXIDATION. The Oxidation of Ammonia, W. S. Landis, Thirty-fifth General Meeting of Am. Electro-chem. Soc., Apr. 3, 1919, pp. 283-303, 4 figs. Historical account of development of various process.

Catalytic Oxidation of Ammonia (Etude de L'oxydation catalytique de l'ammoniaque), Paul Pascal and Eugene Decarriere. Bulletin de la Société chimique de France, vol. 25 and 26, no. 9, Sept., 1919, pp. 489-507, 7 figs. Experimental study made by varying form of catalytic agent, temperature of reaction, duration of contact and composition of gaseous mixtures submitted to catalysis.

AMPLIFIERS

See Vacuum Tubes.

ASH HANDLING

See Coal Handling.

ASYNCHRONOUS MACHINES

Methods for Testing Asynchronous Machine (Perfectionnement aux méthodes d'essai des machines asynchrones), J. le Monier. Revue générale de l'Electricité, vol. 6, no. 10, Oct. 18, 1919, pp. 499-500, 2 figs. How to prevent errors resulting from difference of frequency used in tests as compared with normal frequency of machine.

ATOMIC STRUCTURE

The Structure of Atoms (La structure des atomes), A. Berthoud. Revue générale des Sciences, vol. 30, no. 20, Oct. 30, 1919, pp. 578-588, 2 figs. Scientific basis of electron theory of matter. Conference made before general assomoly of Swiss Soc. of Nat Sci.

The Nature of the Forces between Atoms in Solids, Ralph W. G. Wyckoff. Jl. Wash. Acad. Sci., vol. 9, no. 19, Nov. 19, 1919, pp. 565-592. It is emphasized that only arrangement of outside electrons has bearing on phenomena usually included under term chemistry. Several typical compounds are considered with reference to nature of forces producing them. Solid substances are classified, according to nature of forces of combination, into molecule-forming, polar and valency compounds.

Atoms and Molecules, Jean Becquerel. Sci. Am. Supp., vol. 88, no. 2,285, no. 8, 1919, pp. 260-263, 11 figs. An elementary explanation of modern methods of proving their existence.

AUDION

See Vacuum Tubes.

AUTOMOBILES

ENGINES. Varied-Duty Engines in Bude Series. Automotive Industries, vol. 41, no. 16, 1919, pp. 764-766, 5 figs. Construction details of series of eight models, of four cylinder L-head type.

Darracq 8-Cylinder, 20 hp. Engine Has American Features. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 756-758, 5 figs. Model exhibited at Paris show has increased accessibility of engine parts of integral manifolds and cross shaft for driving water pump and generator.

An Unusually Powerful Six-Cylinder Engine. Automotive Industries, vol. 41, no. 15, Oct. 9, 1919, pp. 728-731, 7 figs. Particulars of Fiar engine.

Suère Eight Cylinder Engine Only 1.77 by 3.54. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 760-761, 6 figs. Shown at Paris exhibit. V-type motor, of two castings, said to have smallest bore for number of cylinders ever built in France, and to have been designed for quantity production.

REAR AXLE DRIVE. Rear Axle Drive (Hinterachs-Antried), Franz Böhm. Motorwagen, vol. 22, no. 20, July 20, 1919, pp. 341-344, 9 figs. Details of spur bevel wheel with sector shaped bent teeth; advantages of Gleason design.

TYPES. The 10 h.p. Day-Leeds. Autocar, vol. 43, no. 1254, Nov. 1, 1919, pp. 731-733, 9 figs. Principal specifications are: 10 h.p., four cylinders, 64 x 100 mm.; two-bearing crankshaft, pumpfed trough lubrication; inverted leather cone clutch; three-speed and reverse gear box; semi-elliptic front and back springs.

FIAT. Fiat Has Six and Two Four Cylinder Models. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp 754-755 and 781, 5 figs. Changes from pre-war practice by Italian maker are said to include adoption of detachable head, semi-floating rear axle, lighting and starting system and detachable steel wheels.

The Eight-Cylinder 20 h.p. Guy. Autocar, Oct. 25, 1919, pp. 652-655, 11 figs. Specifications 20 h.p.; two blocks of four cylinders each, set at 90 deg.; four-speed and reverse gear; long semi-elliptic springs, rear underslung.

Overland-4 Design Has High Production Merit. Automotive Industries, vol. 41, no. 15, Oct. 9, 1919, pp. 704-708, 9 figs. Spring suspension, which by overhang extends distance between spring supports to 130 in. on 100-in. wheelbase, is noted as radical change made from usual practice.

The New 11 h.p. Riley. Autocar, vol. 43, no. 1254, Nov. 1, 1919, pp. 727-730, 11 figs. Principal specifications are: 11 h.p., four cylinders, 65-8 x 110 mm. bore and stroke; fabric-faced cone clutch; four-speed and reverse gear box; semi-floating bevel driven rear axle; half-elliptic springs.

The 15-9 h.p. Rouston Hornsby. Autocar, vol. 43, no. 1253, Oct. 25, 1919, pp. 646-648, 5 figs. Specifications: 15.9 h.p., four cylinders; three-speed and reverse gear box on rear axle; three-quarter elliptic rear, semi-elliptic front springs.

TRUCKS. *See Motor Trucks.*

AUTOMOBILE SHOW

Paris Show Indicates Trend toward American Practice, W. F. Bradley. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 751-753 and 773. Automobile exhibition shows among principal changes use of taper bearings, detachable cylinder heads, aluminum pistons, pressed steel axles, unit power plants, battery ignition and electric lighting and starting.

Overhead Valve Engine in the National, Automotive Industries, vol. 41, no. 14, Oct. 2, 1919, pp. 656-660, 8 figs. Peak is 71 B.hp. at 2,600 r.p.m.; speed range from 3 to 65 miles per hour is provided on high gear, ratio being 4 to 1.

Plant. Experimental Brick Plant of the Nova Scotia Steel & Coal Company, Ltd., A. Dawes. Iron & Steel of Canada, vol 2, no 10, Nov. 1919, pp. 269-271, 3 figs. Machinery consists of dry-pan clay mill, elevator, wire screens, pug mill, auger brick-machine, dies and wire brick-cutting machine.

Silica. Apparent vs True Specific Gravity of Silica Bricks, Leon R. Office. Jl. Am Ceramic Soc., vol. 2, no 10, Oct. 1919, pp. 833-835. Of 27 samples tested 22 showed slightly higher, 2 same, and 3 a lower true specific gravity. By taking average of differences, true specific gravity is found to be 0.011 higher than apparent specific gravity.

Slag-Lime. Manufacturing Slag-Lime Brick by a New Process at Illinois Plant. Brick & Clay Rec., vol. 55, no. 10, Nov. 4, 1919, pp. 858-859, 2 figs. Process is similar to that followed in manufacture of sand-lime brick.

BRIDGES

Hell Gate. Hell Gate Bridge, New York, Frank W Skinner. Engineering, vol. 108, no. 2804, Sept. 26, 1919, pp. 412 and 416-418, 6 figs., partly on 2 supp. plates. Specifications for rivets; yard assembling of trusses. (Continuation of serial.)

Portable, Military. Portable Military Bridges, C. E. Inglis. Engr., vol. 128, no. 3326, Sept. 26, 1919, pp. 310-312, 11 figs. Evolution of type which became in later stages of war standard bridge for rapid advance work. Paper read before British Assn. for advancement of Science. Also in Contract Rec., vol. 33, no. 46, Nov. 12, 1919, pp. 1044-1049, 6 figs.

Timber. Report on Methods and Equipment Used in Renewing Timber Bridges in Whole and in Part. Ry. Maintenance Engr., vol. 15, no. 11, Nov. 1919, pp. 398-399, 1 fig. Résumé of present practice. Committee report presented at Convention of Am. Ry. Bridge & Building Assn. Also in Ry. Rev., vol. 65, no. 18, Nov. 1, 1919, pp. 642-644.

BRITANNIA METAL

Some Notes on the Constitution and Metallurgy of Britannia Metal, F. C. Thompson and F. Orme. Metal Indus., vol. 15, no. 14, Oct. 3, 1919, pp. 276-278, 7 figs. Heat treatment. Brinell impressions and etchings showing structure of tin alloys with small quantities of antimony and copper known as Britannia metal.

BRONZES

High-Resistance. High-Resistance Bronzes (Bronzes à haute résistance). Fonderie Moderne, vol. 12, no. 5, May, 1919, pp. 113-116, 1 fig. Suggestions in regard to drying molds, utilizing waste and soldering. From Bulletin Technologique des Arts et Métiers.

Effect of Phosphorus. The Effect of Phosphorus on Bronze, William Owens. Metal Indus., vol. 15, Oct. 10, 1919, p. 293. Philip's specification that for bearings limiting values of copper and phosphorus be made 84.5 to 91 per cent. and 0.37 to 0.85 per cent., respectively, is recommended.

BRUSH HOLDERS

Defects to be Avoided on Yoke Supported Brush Holders, J. A. Horton. Elec. Traction, vol. 15, no. 11, Nov. 15, 1919, pp. 772-775, 18 figs. Defects and errors are illustrated by diagrams and it is suggested that when manufacturing wooden brush-yokes work should be done to correct drawings.

BUREAU OF MINES

Description and Activities of the Pittsburgh Station Bureau of Mines, E. E. Thum. Chem. & Metallurgical Eng., vol. 21, no. 7, Oct. 1, 1919, pp. 432-436, 7 figs. New laboratory building costing about $1,000,000 has been dedicated to service of public at Pittsburgh by Bur. of Mines. Its activities cover wide range of subjects of importance to chemical and metallurgical enterprise.

BURNERS, OIL

See Furnaces, Oil Burners.

CABLES

Electric High-Tension. High-Tension Electric Cables (Notes et remarques sur les cables électriques à haute tension), M. Lebaupin. Bulletin de la Société Française des Electriciens, vol. 9, no. 82, July, 1919, pp. 447-458 and (discussion) pp. 458-464, 1 fig. Concerning installation, testing and exploitation of network of cables transmitting energy at 15,000 and 5 000 volts.

High-Tension Cables for Gotthard Traction, (Hochspamungs Rabel für die Gotthard-Tracktion), Markus Dumermuth. Schweizerische Bauzeitung, vol. 74, no. 16, Oct. 18, 1919, pp. 193-196, 7 figs. It is noted that in order to judge electric strength of high-tension cable it is necessary to know the quality of insulating material and especially the stress of the inner-most layer of insulating material. Calculation of dependence of this stress on voltage, diameter of cable and thickness of layer of insulating material is discussed.

Hoisting. Selection and Care of Hoisting Cables. Contract Rec., vol. 33, no. 44, Oct. 29, 1919, pp. 998-1001, 1 fig. Defects to which ropes and chains are subjected and measures to be taken to prevent accidents in hoisting operations.

Submarine. Notes on the Localisation of Breaks or Faults in Submarine Cables, J. F. Lloyd. Elecn., vol. 83, no. 2163, Oct. 31, 1919, pp. 498-500, 1 fig. How to calculate combined apparent resistance due to polarization and earth current.

CABLEWAYS

Cableway Built in 1915 for Transportation of Supplies to Army in Alsace (Transporteur funiculaire de Retournemer), F. Mertz. Génie Civil, vol. 75, no. 18, Nov. 1, 1919, pp. 417-421, 13 figs. Cableway was nearly 4 miles long. It was operated electrically.

Spans Simplify Coal Storage, John Sinclair. Gas. Rec., vol. 16, no 9, Nov. 12, 1919, pp. 67-71, 6 figs. Instances where cableways are said to have proved extremely flexible in storing and reclaiming coal for public utilities.

CANALS

Construction Railroad. Construction Railroad Along the Queenstown-Chippawa Canal, Harry Gardner. Eng. World, vol. 15, no. 10, Nov. 15, 1919, pp. 11-14, 7 figs. Railway system consists of double track main line, single-track loading line and three yards on west side of canal and single-track pump line on east side.

Head Gates. Discharging Coefficients for Canal Head Gates, J. S. Longwell and Julian Hinds. Eng. & Contracting, vol. 52, no. 20, Nov. 12, 1919, pp. 552-555, 11 figs. Points out limitations to be observed in application of formula $Q = A\,C\,\sqrt{2gh}$ where Q is discharge, A is area of orifice, C is coefficient determined by experiment, and h is effective head. Also in Eng. World, vol. 15, no. 9, Nov. 1, 1919, pp. 31-35, 5 figs.

Wasteways. Electrically Operated Wasteways of the Tieton Canal, C. F. Gleason. Jl. Electricity, vol. 43, no. 10, Nov. 15, 1919, pp. 464-465, 2 figs. There are five waste ways located at about two miles intervals, each being of sufficient capacity to discharge total flow of canal.

CARBON ACTIVATION

The Activation of Carbon, N. K. Chaney. Can. Chemical Jl., vol. 3, no. 11, Nov. 1919, pp. 372-375. Nature of amorphous carbon as construed from study of defensive methods against toxic gases used in warfare.

CARBONIFEROUS DEPOSITS

Pre-Cambrian and Carboniferous Algal Deposits, W. H. Twenhofel. Am. Jl. Sci., vol. 48, no. 287, Nov. 1919, pp. 339-352, 5 figs. Suggested method of origin of deposits of laminated type occurring in Lower Huronian of Michigan and in Pennsylvania and Permian of Kansas and Oklahoma.

CARGO VESSELS

See Ships, Freight.

CARS

Accidents. Accidents Caused by Hand and Motor Cars, J. L. Walsh. Ry. Signal Engr., vol. 12, no. 11, Nov. 1919, pp. 391-393, 1 fig. Importance of proper inspection and repair is emphasized and it is suggested that rules governing this class of operation be more generally enforced. Paper read before Eighth Annual Safety Congress.

Dump. The Economic Disposal of Waste Material, Howard L. Beach. Off. Proc. Ry. Club Pittsburgh, vol. 18, no. 7, Sept. 25, 1919, pp. 183-197 and (discussion) pp. 198-204, 4 figs. Illustrating various types of dump cars.

Freight. Economics of Freight Car Maintenance, L. K. Sillcox. Ry. Rev., vol. 65, no. 19, Nov. 8, 1919, pp. 682-685. Value of retirement program, as drastic as conditions will permit, is emphasized particularly, as it may be instrumental in keeping weakly constructed cars out of heavy trains in main line service.

Lighting. *See Train Lighting.*

Safety Type. Electric Railway Service with the Safety Type Car, E. A. Palmer. Proc. Pacific Ry. Club, vol. 3, no. 5, Aug. 1919, pp. 7-11. Operating data of several electric companies in California.

Street Railway. *See Street Railways.*

Wheels. Car Wheels and Cause of Defects, W. F. Tidswell. Official Proc. Car Foremen's Assn., Chicago, no. 165, Oct. 1919, pp. 39-57, 6 figs. Failures discussed are sharp or worn flange, shelled out, burnt chill, either from sliding or from brake application, worn tread, worn through chill, chipped flange, chipped rim, etc.

CASE-HARDENING

Improvements in the Case-Hardening Process, D. Hanson and J. E. Hurst. Proc. Steel Treating Research Soc., vol. 2, no. 7, 1919, pp. 20-24 and 38-49, 6 figs. Experimental. It was found that ordinary methods of case hardening at or above 900 deg. cent. tend to lead to formation of hyper-eutectoid layer in the case, which is frequent source of flaking and grainding cracks.

CAST IRON

Contraction. Effects of the Contraction of Iron, Ernest Schwartz. Foundry, vol. 47, no. 19, Nov. 15, 1919, pp. 836-838, 2 figs. Cores which do not break up as casting sets and faulty designs are mentioned among principal causes of cracking of castings due to contraction.

Stresses. Study on Stresses in Cast Iron based on various Burdens (Beiträge zur Kenntnis der Spannungen im Grauguss unter Zugrundelegung verschiedener Gattierungen), Otto Banse. Stahl und Eisen, vol. 39, no. 22, May 29, 1919, pp. 596-600, 4 figs. Tests show that measurements of outer frame parts vary considerably in various burdens. Tests are said to show also that next to proper burden dry sand casting is one of means to avoid stresses.

Synthetic. Synthetic Cast Iron, Charles Albert Keller. Eng. & Indus. Management, vol. 2, no. 17, Oct. 23, 1919, pp. 515-520, 4 figs. Its origin and development.

CAST STEEL

Correct Heat Treatment of Cast Steel, Alvin N. Conarroe. Am. Drop Forger, vol. 5, no. 11, Nov. 1919, pp. 538-541. Discussion of changes which take place in steel testing during heat treatment and effect of cooling.

SAFETY. Dangerous and Safe Practices in Bituminous Coal Mines, Edward Steidle, Dept. Interior, Bur. Mines, miners' circular 22, 1919, 110 pp., 181 figs. Based on reports of State mine departments.

ELECTRICAL EQUIPMENT. Electricity Applied to Coal Mining, C. B. Reed. Coal Industry, vol. 2, no. 11, Nov. 1919, pp. 510-513. Discussion of development of mining machines to present types designed according to conditions in different seams. Reference is made to electric haulages, crushers and equipment

COKE

HEATING. Why and How Coke Should Be Used for Domestic Heating, Henry Henry Kreisinger and A. C. Fieldner. Dept. Interior, Bur. Mines, Technical Paper 242, 1919, 19 pp., 1 fig. Based on experiments conducted at Bur. of Mines on burning of coke and other fuels in house-heating furnaces.

OVENS. Making Coke for the Blast Furnace, W. F. Sutherland. Can. Machy., vol. 21, no. 19, Nov. 18, 1919, pp. 479-485, 16 figs. Operations of ovens installed at Hamilton plant steel company of Canada.

Coke Oven Plant at Hoyland Silkstone Collieries. Colliery Guardian, vol. 117, no. 3049. June 6, 1919, pp. 1343-1344, 4 figs. Plant comprises Luhrig coal washery and 37 Semet-Solvay ovens with power plant and other auxiliaries.

OVENS, BY-PRODUCT. The By-Product Coke Ovens at Anyox, B. C., and the Cassidy Colliery of the Granby Consolidated Mining and Smelting Co. Iron & Steel of Canada, vol. 2, no. 10, Nov. 1919, pp. 272-276, 6 figs. Following by-products are obtained: Benzol, toluol, solvent naptha, crude naptha and xylol. Operation of ovens is described.

The By-Product Coke Plant of the Algoma Steel Corporation at Sault Ste. Marie, Ontario, Wm. Seymour. Iron & Steel of Canada, vol. 2, no 10, Nov. 1919, pp. 262-268, 8 figs. Addition of 50 Wilputte ovens, increase of coal storage space and installation of additional primary cooler.

STEAM PRODUCTION. The Use of lump Coke for Steam Production (Die Verwendung von gestücktem Koks zur Dampferzeugung), Alfred Stober. Stahl und Eisen, vol. 39, no. 20, May 15, 1919, pp. 525-531, 4 figs. Article refers to publication on this subject by writer in Stahl und Eisen of Aug. 24, 1916, pp. 820-825 and relates his experiences after this period with coke fuel. Comparison of Steinmüller, Babcock and Siller types of furnace. (To be concluded.)

See also Refractories.

CODES, ELECTRIC

See High-Potential Systems.

COLLOIDAL FUEL

See Pulverized Coal.

COLLOIDS

Contribution to the Study of Non-Metallic Colloidal Particles (Contribucion al estudio de particulas coloidales no metalicas). Teofilo Isnardi, Contribucion al Estudio de las Ciencias fisicas y matematicas, Universidad de la Plata, no. 38, Dec. 1918, pp. 289-300, 2 figs. Application of absorption of solutions to determination of shape of particles.

COLUMNS

Stresses in Rods under Axial Pressure, Bent by Single Loads (Beanspruchung axial gedruckter, durch Einzellasten gebogener Stabe), Karl Arnstein. Eisenbau, vol. 10, no. 7, July 1919, pp. 151-156, 5 figs. Equations.

COMMUTATORS

The Trueing of Commutators, W. F. Sutherland. Power House, vol. 12, no. 18, Nov. 5, 1919, pp. 483-486, 9 figs. Illustrating methods used.

COMPASSES

The Electrical Gyro Compass, O. B. Whittaker. Eng. World, vol. 15, no. 10, Nov. 15, 1919, pp. 39-43, 7 figs. Principle of operation, manufacture and inspection. Abstract from lecture delivered before Am. Soc. of Mech. Inspectors.

New Gyroscopic Compass (Ein neuer Kreiselkompass), O. Martienssen. Zeitschrift für Instrumentenkunde, vol 39, no. 6, June 1919, pp. 165-180, 16 figs. Description and theory of new model, with reference to former study published in Zeitschrift f. Instrumentenkunde, vol. 32, p. 309, 1912.

COMPRESSORS

ECONOMY. Some Elements of Economy in Air Compression, Wm. Carter. Can. Min. Jl., vol. 40, no. 44, Nov. 5, 1919, pp. 825-829 and 831. Greatest value of water jacketing is seen in its effect on lubrication and resultant wearing qualities of machine. (Concluded.)

MOTOR PROTECTION. Electro-Pneumatic Device for Electrically Driven Air Compressors, Geo. J. Duckett. Elecn., vol. 83, no. 2163, Oct. 31, 1919, pp. 504-505, 3 figs. Suggested automatic arrangement in form of decompressor for releasing cylinder compression on starting up motor allowing normal current to flow and thus saving starter contacts.

ROTARY. A Perfected High-Pressure Rotary Compressor, Chester B. Lord. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 877-878 and 905. Excessive end pressure said to be overcome by floating plates at ends of cylinder held in intimate contact with rotor by pressure generated by machine itself. A volumetric efficiency of 92 per cent is claimed.

CONCRETE

DISTRIBUTION. Distribution of Concrete by inclined Chutes—III. Engineer, vol. 128, no. 3326, Sept. 26, 1919, pp. 300-301, 2 figs. Traveling plants.

Installations for Distributing Concrete by Gravitation (Instalaciones para distribuir el hormigon por gravitacion), R. Eiriz Sequeiros. Ingenieria, vol. 23, no. 7, Oct. 1, 1919, pp. 277-294, 11 figs. Considerations in regard to selection of slope and mechanical details.

MOTION-PICTURE STUDY. Better Concrete—I, II, Nathan C. Johnson. Sci. Am. Supp., vol. 88, nos. 2284 and 2285, Oct. 25 and Nov. 8, 1919, pp. 236-237 and 251, and 276-277, 15 figs. Oct. 25: Motion picture studies of existing conditions; suggested improvements. Nov. 8: Motion picture studies of air voids, effects of violent stirring, disintegration and softening.

REINFORCED. Notes on Reinforced-Concrete Construction, Geo. Allen. Mech. World, vol. 66, no. 1712, Oct. 24, 1919, p. 200. Waterproofing; properties of reinforcing bars. (Concluded.) Paper read before Junior Instn. of Engrs.

Transversal Shrinking of Reinforced-Concrete Structures (Sur les effets transversaux du retrait dans les ouvrages en béton armé), G. Guillaumin. Comptes rendus des séances de l'Academie des Sciences, vol. 169, no. 10, Sept. 8, 1919, pp. 465-467. Calculations based on empirical equations developed from experimental measurements. Reference is made to previous communications in Comptes rendus.

SEA WATER. Concrete in Sea Water, J. L. Harrison. Concrete, vol. 15, no. 5, Nov. 1919, pp. 198-200, 4 figs. Deductions from investigations made in Philippine Islands.

STEEL, BOND. Bond Between Steel and Concrete, M. O. Fuller. Concrete, vol. 15, no. 5, Nov. 1919, pp. 201-203, 5 figs. Tests made both with concrete tamped paralel to axis of steel and with concrete tamped normal to axis. Comparison of results presented show that concrete vertically tamped possesses much higher bond stress.

CONDUCTIVITY

Measurement of the Conductivity of Solutions, H. I. Schlesinger and F. H. Reed. Jl. Am. Chem. Soc., vol. 41, no. 11, Nov. 1919, pp. 1727-1732, 1 fig. It is pointed out that even though minima obtained in measurement of resistance of solution by usual method may be perfectly sharp, results may nevertheless be incorrect and criteria for determining reliability of measurements and methods for overcoming some of difficulties encountered are suggested.

CONDUCTORS

British Standard Specification for Dimentions of Insulated Annealed Copper Conductors for Electric Power and Light, Including Pressure Tests. British Eng. Standards Assn., no. 7, July 1919, 33 pp. Specification does not deal with composition, quality or durability of insulating material used as dielectric.

CONDUITS

The Economical Design of Water Conduits, W. T. Taylor. Engineer, vol. 128, no. 3326, Sept. 26, 1919, pp. 293-296, 3 figs. Graphs for determination of conduit cross section.

CONSTRUCTION STANDARDS

Is There Need for Further Standardization in American Construction Activities? Earnest T. Trigg. Jl. Engrs. Club Philadelphia, vol. 36, no. 180, Nov. 1919, pp. 418-423. Review of results obtained from use of construction standards already adopted. Possibilities for further development in engineering, commercial and business practice, legislation and city-planning standards.

CONTACTS

Contacts and Contact Material, H. von Fleischbein. Telephone Engr., vol. 22, no. 5, Nov. 1919, pp. 19-20, 3 figs. Devices developed with view of preventing welding of contact points and neutralizing effect of dust on contacts. Translated from "Elektrotechnische Zeitschrift."

CONTRACTS

Contracts—A Comparison of "Cost-Plus" with other Forms, Ernest Wilder Clarke. Eng. World, vol. 15, no. 1, Nov. 15, 1919, pp. 15-17. Based on writer's experience during past few years with "cost-plus" form of contract.

CONTROLLERS

Improvements in Contactor Types of Industrial Controllers, H. D. James. James. Elec. Jl., vol. 16, no. 11, Nov. 1919, pp. 489-493, 12 figs. Explaining action and operation.

CONVERTERS

Improvements in the Starting and Controlling of Rotary Converters. Elecn., vol. 83, no. 2163, Oct. 31, 1919, pp. 492-493, 5 figs. Scheme of connections of self-synchronizing converters of General Electric Co., Ltd. Essential features are specially designed synchronizing switch and choking coils.

CONVEYORS

Notes on the Uses of Spiral Conveyors. Coal Trade Jl., vol. 50, no. 35, Aug. 27, 1919, pp. 1048-1049. Tables of capacities based on tests and experience with screw conveyor installations.

DRILLING MACHINES

Recent Machine Tool Developments—VI, Joseph Horner. Engineering, vol. 108, no. 2804, Sept. 26, 1919, pp. 400-403, 18 figs. High-speed sensitive drilling [illegible].

DROP FORGING

The Anatomy of a Drop Forging, Leslie Aitchison. Am. Drop Forger, vol. 5, no. 11, Nov. 1919, pp. 531-538, 12 figs. Points out how drop forgings [illegible] steel ingot and explains different types of forgings.

DRYDOCKS

See [illegible].

DRYING

See [illegible].

DURALUMIN

The Micro-Mechanism of the Ageing of Duralumin, Zay Feffries. Metal Indus., vol. 15, no. 14, Oct. 3, 1919, pp. 278-280. Observations concerning heat treatment of duralumin.

DYNAMICAL SYSTEMS

On Hamilton's Principle and the Modified Function in Analytical Dynamics, G. H. Livens. Proc. Roy. Soc. of Edinburgh, vol. 39, no. 2, 1918-19, pp. 113-119. Concerning analytical questions involved in derivations of modified Lagrangian function for dynamical system.

EARTHQUAKES

The Propagation of Earthquake Waves Through the Earth and Connected Problems, C. G. Knott. Proc. Roy. Soc., of Edinburgh, vol. 39, no. 2, 1918-19, pp. 157-208, 9 figs. Determination of laws of propagation of seismic waves based upon method of calculation in which no assumptions are made between velocity of propagation and distance from earth center.

EARTH SLIDES

Earth Slides in Winnipeg Aqueduct Construction, Douglas L. McLean. Can. Engr., vol. 37, no. 21, Nov. 20, 1919, pp. 469-471, 7 figs. Bearing tests said to have demonstrated instability of soft, dark clay, analysis of which showed 15 per cent. of moisture and water of combination.

EDUCATION

The Education of the Workingman, W. L. Grant. Queen's Quarterly, vol. 27, no. 2, Oct. 1919, pp. 159-168. How in England and Scotland education of adult workman is being linked up with trained minds of universities. Paper read before College and High School Section of Ontario Educational Assn.

EJECTORS

Water Ejector—Theory and Design, E. J. Laschinger. Jl. South African Instn. Engrs., vol. 18, no. 3, Oct. 1919, pp. 54-58, 2 figs. Including equations which establish radius with regard to quantities, size of jet and throat efficiency expressed in terms of ratio of available head to lift.

ELECTRIC-CAR CONTROLLER

Electro-Magnetic, Walter S. Goll. Jl. Cleveland Eng. Soc., vol. 12, no. 1, July 1919, pp. 49-57, 2 figs. Construction and operation of electric-car controller.

See also Controllers.

ELECTRIC DRIVE

MACHINES. Electric Power in Engineering Works, G. W. Stubbings. Eng. & Indus. Management, vol. 2, no. 17, Oct. 23, 1919, pp. 526-528, 3 figs. Illustrating installations of motor driving gear running-in machines, drills, buttoning machines, presses, etc.

See also Rolling Mills and Mills, Auxiliary Drives.

ELECTRIC FURNACES

See Furnaces, Electric and Ferro-Alloys.

ELECTRIC POWER SUPPLY

Electric Power Supply During the Great War—II, Arnold B. Gridley and Arnold H. Human. Jl. Instn. Elec. Engrs., vol. 57, no. 285, Aug., 1919, pp. 541-546. Electrical plant manufactury.

LIMITS. Limits of Alternating Current Power Transmission (Ueber die Grenzen der Kraftübertragung durch Wechselströma), Elektrotechnischer Anzeiger, vol. 30, no. 75, July 22, 1919, pp. 349-350. Comparison of advantages and disadvantages of d. c. and a. c. for long distance transmission.

ELECTRIC POWER TRANSMISSION

BUSSES. California 220-Kv. Transmission Bus. Elec. World, vol. 74, no. 14, Oct. 4, 1919, pp. 743-745. Proposal to interconnect high-tension systems of that state, of which a 220-kw., 1100-mile, 1,500,000-kw. line shall form backbone.

CIRCUITS. Electrical Characteristics of Transmission Circuit—IV, Wm. Nesbitt. Elec. Jl., vol. 16, no. 11, Nov. 1919, pp. 485-489. Table showing approximate voltage limitation resulting from corona based on F. W. Peck's formulae.

HIGH-TENSION LINES. Cost of Building a 33,000 Volt Line. Elec. World, vol. 74, no. 15, Oct. 11, 1919, pp. 798-799, 4 figs. Steel pole line 32 miles in length equipped with no. 1 Copper wire is said to have been erected in middle west at price of $3.181 per mile in 1918 when labor cost was particularly high.

An Extension of the Step-by-Step Method of Transmission Line Computation. Frederick Eugene Pernot. University of Cal. Publications in Engineering, vol. 2, no. 4, July 10, 1919, pp. 131-138. Carying through analytical solution with receiving end voltage and current represented merely by symbols without assuming any values for them.

See also High-Potential Systems.

ELECTRIC RAILWAYS

FREIGHT. Trolley Freight in New England, R. E. Cosgrove. Elec. Traction, vol. 15, no. 11, Nov. 15, 1919, pp. 750-752. Growth of trolley freight in New England. There are now 175 scheduled daily freight cars operating in New England over 1750 miles of track, giving employment to 850 people. Paper read before meeting of New England Street Ry. Club.

NEW YORK STATE. Electric Railways of New York State. Elec. Ry. Jl., vol. 54, no. 14, Oct. 4, 1919, pp. 688-690. Report of conference of executives on condition of industry held at Syracuse on Sept. 18 under auspices of "Committee of Ten," New York Elec. Ry. Assn.

ELECTRICAL MACHINERY

Cooling Devices for Electric Machinery (Neuere Kühleinrichtungen für elektrische Maschinen). Elektrotechnischer Anzeiger, vol. 36, nos. 61 and 62, June 19 and 22, 1919, pp. 279-280 and 283-284, 11 figs. Description of types made by Brown,Boveri & Co., Siemens- Schuckert-Werke and Allegemeine Elektrizitats-Gesellschaft. (To be continued.)

ELECTRICITY

DISTRIBUTION. National Distribution of Electrical Energy (Une distribution nationale d'énergie électrique). F. Scoumanne. Revue générale de l'Electricité, vol. 6, no. 18, Nov. 1, 1919, pp. 594-608, 4 figs. Discussion of economical advantages and mechanical possibilities of establishing such a system. Question if treated in general without reference to conditions in any particular nation.

Electricity as an Industrial Power. Hastings Read. Indus. Australian & Min. Standard, vol. 62, no. 1610, Sept. 18, 1919, pp. 547-559, 19 figs. Western Censtralian government scheme of distribution from central station.

DOMESTIC USES. Domestic Uses of Electricity (l'Electricité au foyer), W. Vaillancourt. Revue trimestrielle Canadienne, vol. 5, no. 19, Nov. 1919, pp. 293-310. Comparative costs of heating, washing, etc., by electricity and coal. Figures in Canada, United States and Norway are given.

INERTIA. Inertia of Electricity (La Inercia de la Electricidad), Racardo Gans. Contribucion al estudio de las ciencias, fiscias y matematicas, Universidad acional de la Plata, no. 38, Dec. 1918, pp. 225-230, 4 figs. Criticism of claims made by P. de Heen in Mémoire de la Société Royale des Sciences de Liège, vol. 6, 1905, p. 24, where in article on matter, its origin, its evolution and its end he claims to have observed centrifugal forces developed by electric current flowing through spiral wire. Writer claims that forces observed by de Heen were well-known electromagnetic forces between mobile and fixed parts of circuits.

ELECTRIFICATION, RAILWAY

AUSTRALIA. Railway Electrification in Australia. Ry. Rev., vol. 65, no. 18, Nov. 1, 1919, pp. 631-638, 10 figs. Upwards of 200 miles of line have been electrified in carrying out scheme of ultimately intended to cover entire system of state-owned lines as well as to concentrate in one large project greater portion of power development needed by industries of common-wealth.

FRANCE. Results of Electrification of French Railways, Fred W. Scholz. Telephone Engr., vol. 22, no. 5, Nov. 1919, pp. 38-40, 3 figs. Troubles caused to telephone service through interference of railway lines. Translated from Annales des télégraphes et téléphones.

SOUTH AFRICA. The electrification of the South African Railways. Ry. Gaz., vol. 31, no. 18, Oct. 31, 1919, pp. 561-565, 7 figs. Report presented by Merz and McLellan, consulting engineers to South African government railways. Economic aspect of electrification is studied and from analysis of local conditions system of electrification is developed. Also in Elecn., vol. 83, no. 2164, Nov. 7, 1919, pp. 520-521.

SPAIN. Electrification of Spanish Railway (Electrification de los Ferrocarriles Espanoles), D. Luis Sanchez Cuervo. Revista de Obras Publicas, vol. 67, no. 2293, Sept. 4, 1919, pp. 437-440. Economical aspect of problems. (To be continued.)

SWITZERLAND. Electrification of Swiss Railways, F. Dossenbach. Jl. Electricity, vol. 43, no. 10, Nov. 15, 1919, pp. 469-470, 1 fig. Present development and plans for future electrification.

UNITED STATES. The Prospects of Railroad Electrification in American and Abroad. Street Ry. Bul., vol. 19, no. 11, Nov., 1919, pp. 427-429. High cost and inadequate supply of fuel in Europe make, in opinion of writer, railroad electrification there inevitable.

FIRE HAZARD

Dry Cell Batteries. Fire Hazard of Dry Cell Batteries, H. I. Miner. Quarterly of the Nat. Fire Protection Assn., vol. 13, no. 2, Oct. 1919, pp. 148-150, 1 fig. Due to their becoming short-circuited.

FIRE HYDRANTS

The Care of Fire Hydrants in Winter Weather in Montreal, T. W. Lesage. Quarterly of the Nat. Fire Protection Assn., vol. 13, no. 2, Oct. 1919, pp. 137-138 1 fig. Organization of staff of inspectors.

FIRE PROTECTION

Aeroplanes. *See Aeroplanes, Fire Protection.*

Building Construction. Building Construction and Fire Protection, J. Grove Smith. Contract Rec., vol. 33, no. 45, Nov. 5, 1919, pp. 1022-1025. From report on fire waste in Canada of Dominion Fire Commissioner.

Equipment. Railway Fire Protection Equipment, C. R. Knowles. Ry. Rev. vol. 65, no. 18, Nov. 1, 1919, pp. 645-648, 2 figs. Agents in use on railway are enumerated to be: Bicarbonate of soda, caustic soda and sulphuric acid, carbon-tetrachloride, dry sand and water. Paper read before Am. Ry. Bridge & Building Assn. Also in Ry. Maintenance Engr., vol. 15, no. 11, Nov. 1919, pp. 404-407, 5 figs.

See also Gas Masks and Sulphite.

FLAME VELOCITY

Flame Velocity in Inflammable Gases, J. D. Morgan. Engineering. vol. 108, no. 2808, Oct. 24, 1919, pp. 535-536, 7 figs. Derivation of expression establishing proportionality between flame velocity and gas pressure during combustion of inflammable gases.

FLUORESCENCE

Conditions of Excitation of Fluorescence (Sur les conditions d'excitation de la fluorescence), L. Bruninghaus. Comptes rendus des séances de l'Académie, vol 169, no. 12, Sept. 22, 1919, pp. 531-534. From experiments it is concluded that phenomena of phosphorescence and fluorescence are characterized by property that intensity of luminosity is maximum when solution is highly diluted and exciting radiation very feebly absorbed.

FORGING

American Practice. Making and Heat-Treating Heavy Forgings. Machy. (Lond.), vol. 15, no. 379, Oct. 30, 1919, pp. 129-135, 11 figs. Examples of American practice in production of heavy gun ingots and forgings.

Plant. Allis-Chalmers Heavy Forging Plant. Am. Drop Forger, vol. 5, no. 11 Nov. 1919, pp. 527-530, 7 figs. Equipped with 3000-ton hydraulic press, 1000-ton press and series of hammers. Attention is called to features of design which permit of future expansion of plant. Also in Blast Furnace & Steel Plant, vol. 7, no. 11, Nov. 1919, pp. 533-536, 7 figs.

Temperatures. Forging Temperatures and Rate of Heating and Cooling of Large Ingots, F. E. Bash. Blast Furnace and Steel Plant, vol. 7, no. 11, Nov. 1919, pp. 561-565 and 573, 3 figs. Results of tests claimed to show that an optical pyrometer can be used to determine when an ingot is ready to forge. Data offers suggestions for proper heating.

FOUNDRIES

Cast Steel. Examples of Practical Utilization in Founding Industry of Results of Physical and Chemical Tests (Exemples d'utilisation dans la pratique Industrielle de la fonderie de fonte des résultats d'essais physiques et chimiques, J. Seigle. Fonderie Moderne, vol. 12, no. 5, May 1919, pp. 107-111, 13 figs. Graphs indicating physical properties of cast steel of various composition, From Bulletin de la Société de l'Industrie Minérale.

Comparisons. Foundry Comparisons, H. G. Barrett. Foundry Trade Jl., vol. 21, no. 214, Oct. 1919, pp. 738-743, 11 figs. Concerning different types of runners, and various operations in founding brass and malleable cast iron. Paper read before Lond. Branch of Instn. of British Foundrymen.

See also Furnaces, Electric.

FREQUENCY

Standardization of Frequency in Italy (Della Unificazione delle Frequenze in Italia), U. del Buona. Elettrotecnica, vol. 6, no. 26, Sept. 15, 1919, pp. 550-552. Value of 50 periods proposed as standard for whole of Italy by Committee of Associazione Elettrotecnica Italiana.

FRICTION

Weighing of the relative Friction Between Two Solids (La pesée d'un frottement pendant le glissement relatif des deux solides en contact), Jules Andrade. Comptes rendus des séances de l'Académie des Sciences, vol. 169, no. 15, Oct. 13, 1919, pp. 638-639. Suggested experiment.

FUEL

Comparative Costs. Some Phases of the Fuel Problem, George A. Orrok. Elec. World, vol. 74, no. 15, Oct. 11, 1919, pp. 801-803, 3 figs. Comparative costs of coal and oil in heat equivalents and relation of prices of coal to price of oil in heat equivalent.

Economy. Fuel Economy. Chem. News, vol. 119, no. 310, Oct. 24, 1919, pp. 195-198. Committee report of British Assn. for advancement of science. (To be continued.)

See also Coal Conservation.

Supply. Present Fuel Supply from an Engineering Standpoint, H. M. Chance. Jl. Engrs. Club Philadelphia, vol. 36, no. 180, Nov. 1919, pp. 414-417. Calls attention to fact that while mines, equipment and coal resources are adequate to supply any possible demand, nevertheless ability of operator to mine is limited in part by labor shortage and principally by in adequate and irregular car service and by irregularity in purchases by consumers.

FURNACES

Combustion Control. Method and Apparatus for Controling Combustion in Automatically-Stoked Furnaces (Méthode rapide et appareils de contrôle des foyers à chargement automatique), Marcil Chopin. Génie Civil, vol. 75, no. 18, Nov. 1, 1919, pp. 421-425, 3 figs. Schematic arrangement of Chopin system.

Electric. Electric Furnaces, J. H. Stansble. Foundry Trade Jl., vol. 21, no. 214, Oct. 1919, pp. 703-707 and (discussion) pp. 707-708. Notes on Stassano, Rennerfelt, Heroult, Girod, Hering "Pinch" and Greaves-Etchells furnaces. Paper read before Birmingham Branch of Instn. British Foundrymen.

Large Electric Steel Melting Furnaces, Victor Stobie. Elecn., vol. 83, no. 2164, Nov. 7, 1919, pp. 526-528, 4 figs. Observations in regard to wiring diagram and shapes of furnaces transformers and automatic electrode regulators. Abstract of paper read before Instn. Elec. Engrs.

Modern Electric Furnace Practice in Foundries, W. E. Moore. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 874-876. Comparative operating costs are presented which bring out marked economy of electric furnace processes over converter process of producing liquid steel.

Production of industrial Metals in the Electric Furnace (Herstellung von industriell verwertbaren Metallen im Elektroofen), H. Baclesse. Elektrotechnischer Anzeiger, vol. 36, no. 13, 16, 18, Feb. 13, 23 and Mar. 2, 1919, pp. 61-62, 75-76 and 85-86. Tests made were mostly laboratory tests; metals tested were baryum, calcium, beryl, cobalt, nickel, titans, manganese, and chrome. (To be continued.)

Uses of Electric Furnace in Modern Chemical and Metallurgical industries (L'électrothermie à haute température dans les industries chimiques et métallurgiques modernes), Jean Escard. Industrie Electrique, vol. 28, no. 656, Oct. 25, 1919, pp. ??? Extraction of metals, notably aluminum copper; preparation of ferroalloys. (To be continued.)

Heat Treating. Heating Furnaces and Annealing Furnaces, W. Trinke. Blast Furnace & Steel Plant, vol. 7, no. 11, Nov. 1919, pp. 539-543, 9 figs. Selection of fuel for a given furnace in conjunction with selection of equipment for its economical combustion. Natural gas as a furnace fuel. Also in Am. Drop Forger, vol. 5, no. 11, Nov. 1919, pp. 541-545, 7 figs.

Oil Burners. The Function of Oil Burners in the Operation of Furnaces, Henry J. N. Voltmann. Jl. Am. Steel Treaters Soc., vol. 2, no. 2, Nov. 1919, pp. 110-115 and (discussion) pp. 115-116. Observed that application of burners to existing furnaces without making proper provision in furnace brickwork to maintain conditions necessary for properly heating product, is in long run a waste of time.

Open-Hearth. Improvement of Heat Economy in Furnaces, especially open-hearth Furnaces (Verbesserung der Wärmewirtschaft von Ofenfeuerungen, insbesondere von Martinöfen), W. Tafel. Stahl und Eisen, vol. 39, no. 43, Oct. 23, 1919, pp. 1280-1233, 1 fig. Showing various means for avoiding or utilizing heat losses; suggestions for preventing explosions in Siemens Martin furnaces when connected with boilers.

See also Hoists.

Reverberotory. Balance of Heat and Matter in a Foundry Laboratory Furnace (Stoff und Wärmebilans eines Giesvereiflammofens), R. Gnade. Stalh und Eisen, vol. 39, no. 22, May 29, 1919, pp. 590-595, 3 figs. Giving analysis of charge, of slag, of coal and flue gas; also temperatures of iron slag and furnace. Showing balance of matter of charge and of yield. (To be concluded.)

GAGES

Hole Limits. Limits for Gages for Holes. Machy. (Lond.), vol. 15, no. 370, Oct. 30, 1919, p. 145. Reasons advanced by Newal Eng. Co., Walthamstow, in support of plus and minus hole limits.

Summary of Reasons in Support of Plus and Minus Hole Limits. Engineering, vol. 108, no. 2808, Oct. 24, 1919, pp. 549-550. Presented in substantiation of contention that proposal of British Engineering Standards Assn. to make nominal size low limit for all holes will not be in best interest of all concerned.

Screw. Modern Methods of Screw Gage Production. Machy. (Lond.), vol. 15, no. 369, Oct. 23, 1919, pp. 121-124, 13 figs. Illustrating various specially designed single-purpose machines.

Screw Gage Making at Guildford. Engineer, vol. 128, no. 3329, Oct. 17, 1919, pp. 375-378, 14 figs. Machines and methods of testing.

Serration. The Inspection of Serration Gages and Serrated Components, R. B. Dyer. Machy. (Lond.), vol. 14, no. 359, Aug. 14, 1919, pp. 589-590, 8 figs. Formulae for checking broaches, cutters, tools, gages, etc. Form of serration considered is where spaces between teeth are sufficiently narrow in proportion to their depth to permit of measurement by means of wires.

GAS

Consuming Devices. Lack of Standard Performance Data Tends to Prevent Improvement in Efficiency of Gas Consuming Devices. Am. Gas Eng. Jl., vol. III, no. 18, Nov. 1, 1919, pp. 420-421 and 426. Report of Industrial Fuel Committee of Committee on Standard Performance Specifications for Gas Appliances of Am. Gas Assn.

HEATMETER

A New Compensated Heatmeter, Charles P. Frey. Proc. Steel Treating Research Soc., vol. 2, no. 7, 1919, pp. 27-33 and p. 51, 6 figs. Apparatus is essentially Brown pyrometer in which effect of line and thermocouple resistance has been eliminated.

HEAT TREATMENT

Steel. Notes on Heat Treatment of Steel, D. T. Lynch. Proc. Steel Treating Research Soc., vol. 2, no. 7, 1919, pp. 12-19 and 35-37, 11 figs. Comparison of physical properties of plain carbon steel with test result in 6-in. shell, presented with view to emphasize fact that problem of heat treating plain carbon steel is verification of old processes rather than any new development.

Tractor Parts. Heat Treating at the Holt Plant, J. W. Cook. Metal Trades, vol. 10, no. 11, Nov. 1919, pp. 479-481, 5 figs. Process used for heat treating tractor parts.

See also Alloys, Vanadium; Case Hardening; and Steel, Heat Treatment.

HIGH-POTENTIAL SYSTEMS

Discussion of Code Rules on High-Potential Systems, G. S. Lawler. Elec. Rev. (Chicago), vol. 75, no. 20, Nov. 15, 1919, pp. 822-824. Comments on relation of present rules to developments in field practice, with suggestions for proposed changes in rules given in paper presented to National Assn. of Elec. Inspectors.

Excess Voltage Produced by Means of Sustained Oscillation (Sovratensioni elettriche prodotte dalle oscillazioni persistenti), L. Lombardi. Elettrotecnica, vol. 6, no. 26, Sept. 15, 1919, pp. 556-561. Laboratory experiments performed in high-tension artificial line.

HOISTING MACHINERY

A New Development in Hoisting Machinery, Warren Travell. Freight Handling & Terminal Eng., vol. 5, no. 10, Oct. 1919, pp. 380-382, 3 figs. Apparatus in which single drum is used for both vertical hoisting and horisontal traversing.

HOISTS

Main Hoists for Open Hearth Ladle Cranes, W. W. Garrett, Jr. Assn. Iron & Steel Elec. Engrs., Oct. 1919, pp. 18-22 and (discussion) pp. 22-29. Tests and observations made on overhead electric traveling cranes, and suggestions in regard to their operation.

HOURS OF WORK

Revolutionizing the Wage and Industrial System in France, W. F. Bradley. Automotive Industries, vol. 41, no. 14, Oct. 2, 1919, pp. 670-674, 8 figs. Effect of introducing 48-hour week.

HOUSES

Concrete. Moulding Houses in Steel Forms for War Workers, Milton Dana Morrill. Cement & Eng. News, vol. 31, no. 11, Nov. 1919, pp. 36-38, 10 figs. Concrete houses built of cinder concrete mixed in proportion of one part cement, 2½ parts sand and 5 parts cinders.

Construction. British House Building Methods, Charles T. Ruthen. Building News, vol. 117, nos. 3380 and 3381, Oct. 17 and 24, 1919, pp. 331-332 and 337-338, 3 figs. Oct. 17: Economic aspect of housing problem in Great Britain. Oct. 24: Weatherproof houses that have been erected at Newton in a few weeks and were ready to be tenanted immediately. Also in Surveyor, vol. 56, no. 1449, Oct. 24, 1919, pp. 241-244, 4 figs.

Construction of Small Cottages (Kleine Wohnhäuser), Schweizerische Bauzeitung, vol. 74, no. 17, Oct. 25, 1919, pp. 209-211, 11 figs. Cheap type of workmen's houses constructed of wood and concrete, designed by Swiss architects. (Concluded.)

Residence Design. Large 8-Roomed Residence. Contract Rec., vol. 33, no. 44, Oct. 29, p. 1011, 3 figs. Rooms are designed to provide suites separate from rest of house.

HOUSING

The Work of the Toronto Housing Commission. Contract Rec., vol. 33, no. 46, Nov. 12, 1919, pp. 1041-1042, 2 figs. Types of houses being erected by the commission for use of workingmen. Two styles costing from $3,800 to $4,000.

See also Houses and Salvage Wall.

HYDROELECTRIC PLANTS

Canada. Hydro-Electric Power Development at High Falls. Can. Engr., vol. 37, no. 20, Nov. 13, 1919, pp. 451-454, 15 figs. Net head of 80 ft. utilized at power site on Miss. River by Hydro-Electric Power Commission of Ontario. Details of dam, intake, gate house, pipe line and power house. Surface area method of proportioning materials said to show excellent results in construction of concrete dam.

Niagara Falls. Queenston-Chippewa Development at Niagara Falls, Ontario, Harry Gardiner. Eng. World, vol. 15, no. 9, Nov. 1, 1919, pp. 17-21, 11 figs. Canal project, to cost about $25,000,000, consisting of one of possible group of several parallel canals near Niagara Falls, each intended to develop 300,000 hp.

The Relation of the Chemical Industry of Niagara Falls to the Water Works, John A. Kienle. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 496-513 and (discussion) pp. 514-517, 7 figs. Statistics of power development and of electrically made products, notably manufacture of liquid chlorine and bleaching powder by electrolytic method.

Norway. Hydroelectric Installations in Norway, Chas. H. Tallant. Jl. Electricity, vol. 43, no. 9, Nov. 1, 1919, pp. 417-418, 3 figs. Notably installation of electrolytic furnace plant where seven 4500-hp. Pelton impulse turbine, direct connected to 10,000-amperes, 300-volt direct-current generators.

Hydrolysis. Investigation of Hydrolysis of some Metal Acetates (Untersuchung über die Hydrolyse Metallacetate), N. Löfman. Zeitschrift für einiger anorganische und allgemeine Chemie, vol. 107, no. 4, July 29, 1919, pp. 241-246, 1 fig. Special tests of distribution coefficient and its dependency on temperature and concentration. Acetates examined were ammonia, aluminum, iron, mercury, silver, nickel, cobalt, zinc, lead, magnesium and natrium acetate.

INDUSTRIAL DEMOCRACY

Experiences in Industrial Democracy, F. L. Fluerbach. Contract Rec., vol. 33, nos. 45 and 46, Nov. 5, & 12, 1919, pp. 1032-1034, & 1051-1053. Successful application by William Demuth & Co. of a plan of internal government in its plant, aiming to solve labor difficulties.

Industrial Democracy—a remarkable experience, B. C. Forbes. Brick & Clay Rec., vol. 55, no. 11, Nov. 18, 1919, pp. 957-960. How Packer Piano Co. of Fort Wayne, Ind., established about six years ago "cordial, friendly, co-operative and mutually profitable relation" between employers and workers, which "have continued unruffled ever since."

INDUSTRIAL RELATIONS

Capital and Labor. Competition, Combination and Co-operation, S. P. Robins. Can. Ry. Club, vol. 18, no. 7, Oct. 1919, pp. 17-31. Observes that "Capitalists like workmen are at liberty to pursue their own interests in the way which they think best, provided always that way is not unethical" but "What is certainly wrong is that combinations of capitalists should disregard all considerations of justice, humanity and civilization in order to attain their own ends."

Human Factor. The Human Factor in the Operation of Industry, Henry R. Seager. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 886-887. Four ways of handling labor problems that are currently being tried are discussed: (1) Method of just and generous small employer who keeps in touch with needs of his employees and anticipates their needs; (2) method of large corporations, which tries by means of wellfare workers and profit-sharing to content employees and discourage them from going in labor organizations: (3) method of shop committee; and (4) plan of joint industrial councils.

Labor Organizations. How the Employer May Control the Changing Demands of Radical Labor, Harry Tipper. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 784-785. Advocates formation of labor organization within each factory which should permit collective bargaining and meet through needs of workers. Labor, writer says, is being influenced by men possessing no constractive ability who are drawing workers away from their old leaders by virtue of irresponsible promises and criticisms of deficiencies of union system.

Magazines for Employees. The Function of the Employees Magazine, E. B. Archley. Elec. Traction, vol. 15, no. 11, Nov. 15, 1919, pp. 759-761. Experience of railway company in securing contentment of employees by publishing in company organ notices warning men against activities of agitators.

Mining Industry. Industrial Relations in the Mining Industry, Chas. F. Willis. Arizona Min. Jl., vol. 3, no. 6, Nov. 1919, pp. 3-5. Their establishment is needed, writer observes, because psychology of miner is no different from that of any other worker, but he points out special conditions in industry which necessitate modification of systems followed in work-shops.

Profit Sharing. *See Profit Sharing.*

Unrest. Industrial Unrest. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 884-885. Historical survey of industrial unrest in United States.

INSULATORS

Causes of Breakage in High-Tension Insulators, E. O. Meyer. Elecn., vol. 83, no. 2162, Oct. 24, 1919, pp. 466-467. Examination of breakages occurring frequently in transmission line in Germany claimed to have discovered that cause of cracking lay in cementing process by which parts of insulators were joined together. Translated from Elektrotechnische Zeitschrift, nos. 16, 17, 18 and 24, 1919.

Phenomena Causing Rupture of High-Tension Insulators (Phénomènes provoquant la mise hors service des isolateurs à haute tension), E. O. Mayer. Revue générale de l'Electricité, vol. 6, no. 18, Nov. 1, 1919, pp. 608-609, 3 figs. Factors which influence formation of fissures. Translated from Elektrotechnische Zeitschrift.

Inyoite. Colemanite Pseudomorphous after Inyoite from Death Valley, California, Austin F. Rogers. Am. Mineralogist, vol. 4, no. 11, Nov. 1919, pp. 135-139, 2 figs. Including graphic method for determining geometrical constant of inyoite.

IRON AND STEEL MANUFACTURE

Fuel Economy and Consumption in the Manufacture of Iron and Steel, W. A. Bone, R. Hadfield and A. Hutchinson. Engineer, vol. 128, nos. 3326 and 3327, Sept. 26 and Oct. 3, 1919, pp. 316-317 and 341-343, 1 fig. Abstract of report presented to Iron and Steel Institute Autumns Meeting, on behalf of British Assn. Fuel Economy Committee.

IRON ORE

Developments. Recent Iron Ore Developments in the United Kingdom, F. H. Hatch. Colliery Guardian, vol. 118, no. 3055, July 18, 1919, pp. 157-158, 2 figs. Process of treating jurassic ironstones.

MAGNETIC MATERIALS

[illegible] for Electrical Purposes, Frank P. Fahy. Jl Am Steel [illegible], vol. 2, [illegible] 2, Nov., 1919, pp. 74-87, 4 figs. Points out fields of [illegible] magnetic material and source of common variations in [illegible] quality.

MAGNETOS

British Standard Specification for Magnetos for Aircraft-Purposes. British [illegible] Standards Assn., no. 86, July 1919, 27 pp., 23 figs. Only dimensions which [illegible] magnetos as a whole are dealt with.

MAIZE AS FUEL

Maize as Fuel for Steam Boilers. Ry. Gas, vol. 31, no. 17, Oct. 24, 1919, pp. 525. Use on locomotive engines in Argentine, with notes on calorific value and costs.

MALLEABLE IRON

Strive for Strength in Malleable, H. E. Diller. Foundry, vol. 47, no. 19, Nov. 15, 1919, pp. 803-807, 19 figs. Experience of company which formerly made railroad castings and has recently engaged in automobile work.

MANAGEMENT

See [illegible] Management and Shop Management.

MECHANICS

Solutions of the Problem of Three Bodies When the Lines Joining the Three Bodies Form an Isosceles Triangle (Sur les solutions du problème des trois corps où les trois corps forment un triangle isoscèle), Jean Chazy. Comptes rendus des séances de l'Académie des Sciences, vol. 169, no. 12, Sept. 22, 1919, pp. 526-529. Five movements pointed out—Lagrange's Euler's, movement admitting axis of symmetry, movement admitting plane of symmetry, and limit of two preceding movements.

MERCURY VAPOR PRESSURES

The Vapor Pressures of Mercury in the Range 120 deg. to 250 deg., Alan W. C. Menzies. Jl. Am. Chem. Soc., vol. 41, no. 11, Nov. 1919, pp. 1783-1787, 1 fig. Measurement by method involving use of two McLeod gages, hot and cold respectively.

METAL CONSTRUCTION

Esthetics of Metal Construction (Consideraciones sobre la estética de las construcciones metalicas), ... vol. 67, no. 2297, Oct. 2, 1919, pp. 488-494. Possibilities of ....as determined by mathematical calculations, to make them comply with accepted standards of artistic beauty.

METEOROLOGY

See Balloons.

METRIC SYSTEM

Standardization With .... Drury. Jl... Electricity, vol. 43, no. 9, Nov. 1, 1919, pp. 409-411, ... dealings with Allies during war "we were not at one" with them because we did not use the metric system while "30 nations fighting Germany were all using the metric units of weights and measures, and were thus capable of complete co-operation and united action."

MICARTA

See Aeroplanes Propellers.

MILLS

AUXILIARIES, DRIVES. Electric Versus Hydraulic Drive for Steel-Mill Auxiliaries, R. B. Gerhardt. Elec. Rev. (Chicago), vol. 75, no. 18, Nov. 1, 1919, pp. 736-738. From standpoint of control, adaptability, efficiency, and cost. Paper read before Iron & Steel Engrs.

POWER PIPING. Power Piping Requirements in Modern Mills, J. Roy Tanner and George J. Stuart. Blast Furnace & Steel Plant, vol. 7, no. 11, Nov. 1919, pp. 566-568. It is claimed that development of power generating machinery has stimulated progress in manufacture and mode of installation of power piping and placed heavier demands on specialists. Paper read before Engrs. Soc. of Western Pa.

SAFETY MOVEMENT IN. Safety Movement in Steel Mills, C. M. Brading and F. A. Wiley. Assn. Iron & Steel Elec. Engrs., Oct. 1919, pp. 3-17. Planning direction and supervision of safeguarding and education as elements in safety movement.

MILLING MACHINES

SPINDLE NOSES. Standard Spindle Noses for Milling Machines. Engineering, vol. 108, no. 2808, Oct. 24, 1919, pp. 548-549, 17 figs. Types in use by various members of Associated British Machine Tool Makers, Ltd., are presented and it is suggested in reference to previous article on subject published in Engineering that whole question of standardization be thrashed out with a view to securing interchangeability of arbors. Also in Engr., vol. 128, no. 3328, Oct. 10, 1919, p. 358, 4 figs.

THREAD MILLING. British Thread Milling Machines—III & IV. Engineer, vol. 128, no. 3326 & 3327, Sept. 26 and Oct. 3, 1919, pp. 302-304 and 324-326, 12 figs. Machine in which cutter and work are always driven at same speed, thread is not milled to full depth until after work has made 30 to 40 revolutions and work and cutter do not move longitudinally relatively to each other.

MINE ACCIDENTS

HAULAGE INCLINES. Accidents on Haulage Inclines—I, V. Eatteyne and L. Lebens. Colliery Guardian, vol. 118, no. 3070, Oct. 31, 1919, p. 1165, 7 figs. Recommendations based on investigation of cases of accidents in Belgium mines during period of 1889 to 1912. Translated from Annales des Mines de Belgioue.

Causes of Accidents on Incline Planes of Mines and Manner of Preventing Them (Les Causes d'Accidents sur les Plans Inclinés des Mines et l'étude des dispositions à prendre pour les prévenir). Génie Civil, vol. 75. no. 17, Oct. 25, 1919, pp. 395-398, 23 figs. Investigation and studies made by Belgium Department of Mines. Abstracted from Annales des Mines de Belgique, vol. 19 and 20.

EFFECT OF COMMON LANGUAGE. English Language and Mine Accidents, Albert H. Fay. Coal Industry, vol. 2, no. 11, Nov. 1919, pp. 489-492. Showing by comparison accidents increase as failure to speak a common language decreases.

FIRES. *See Breathing Apparatus.*

MINE WATER

NEUTRALIZATION. Neutralizing of Acid Mine Water on the Witwatersrand and Settlement and Treatment of Sludge formed thereby, F. Wartensweiler. Jl. South African Instn. Engrs., vol. 18, no. 3, Oct. 1919, pp. 46-53. Based on data obtained as result of experimental investigations.

MINES

PLANS. Isometric Mine Plans: Their Applications, Limitations and Method of Construction, H. Edward Clayton. Proc. Australasian Inst. Min. & Metallurgy, no. 34, June 30, 1919, pp. 9-18, 8 figs. Indicating cases in which method can be used to advantage.

RESCUE. Standardizing Mine Rescue. Salt Lake Min. Rev., vol. 21, no. 15, Nov. 15, 1919, pp. 29-30. Its desirability. Address delivered at Eighth Annual Safety Congress.

MINES

SALTING, DETECTION OF. The Detection of Salting, Morton Webber. Min. & Sci. Press, vol. 119, no. 19, Nov. 8, 1919, pp. 673-676. Suggested for detecting fraud.

STATE CONTROL. A National Mining Scheme, J. M. M. Munro. Iron & Coal Trades Rev., vol. 99, no. 2695, Oct. 24, 1919, p. 541. Underlying idea is that State should buy under compulsory powers controlling interest in industry and reconstruct it on safe lines.

VENTILATION. Ventilation in Shaft Sinking—I & II, H. Joosten. Colliery Guardian, vol. 118, nos. 3054-3055, July 11 & 18, 1919, pp. 91-92 and 159-160, 22 figs. Details of sinking derrick with ventilating appliances. Methods for coupling up lengths of pipe by means of flanges tightened with bo ts or clamps and sleeves. (Concluded.) Translated from Glückauf.

WORKING CAPACITY. The Working Capacity of Mines, A. Delmer. Colliery Guardian, vol. 118, no. 3059, Aug. 15, 1919, pp. 426-427. Study of nature of deposit, method of working and number of workmen as factors affecting productivity of each.

MINING PROFESSION

The Relation between Pure Science and the Mining Profession, J. S. Haldane. Sci. & Art of Min., vol. 30, no. 7, Nov. 1, 1919, pp. 97-100. Paper presented before the Past & Present Mining Students' Assn. at the Wigna Min. & Technical College, Oct. 18, 1919.

MINING INDUSTRY

See Industrial Relations, Mining Industry.

MOLDING SANDS

Molding Sands for Non-Ferrous Foundry Work, P. G. H. Boswell. Engineering, vol. 108, no. 2804, Sept. 26, 1919, pp. 418-420, 1 fig. Results of chemical and mechanical analyses. Paper read before Instn. of Metals. Also in Foundry Trade Jl., vol. 21, no. 214, Oct. 1919, pp. 712-716.

See also Foundries.

MOLDS

Leam Mold for Evaporator Steam Belt. Foundry, vol. 47, no. 19, Nov. 15, 1919, pp. 811-816, 9 figs. Example of loam-molding job recently completed in gray-iron foundry. Casting forms steam belt for evaporator and constitutes part of installation in sugar mill.

MOLYBDENITE

Some Optical and Photoelectric Properties of Molybdenite, W. W. Coblentz and H. Rakler. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 338, pp. 121-162, 22 figs. Data on change in electrical conductivity of molybdenite when exposed to thermal radiations of wave lengths extending from 0.36u in ultra-violet to beyond 9u in infra-red. Also in Jl. Wash. Acad. Sci., vol. 9, no. 18, Nov. 4, 1919, pp. 537-539.

PAINT-OIL SUBSTITUTE

Paint Oil Substitutes, A. H. F. Phillips. Ry. Rev., vol. 65, no. 18, Nov. 1, 1919, pp. 663-664. Linseed oil substitutes being employed in manufacture of paints for railway use

PAPER MILLS

History and Economics of Papermaking, Job Taylor. Paper, vol. 25, no. 4, Oct. 1, 1919, pp. 56 and 60-62. Early origin of the art and rise and development of wood fibers in paper-making.

Hydroelectric Plant and Paper Mill at Ocean Falls, B.C., W. A. Scott. Eng World, vol. 15, no. 10, Nov. 15, 1919, pp. 35-38, 7 figs. Plant has producing capacity of 200 tons of paper per day. Special attention is given to features of motor drive.

PARACHUTES

Airplane Parachutes (Notes sur les Parachutes d'avions), L.-P. Frantzen. Aérophile, vol. 27, nos. 17 and 18, Sept. 1-15, 1919, pp. 279-283, 4 figs. "Robert" type, developed in France, which is said to open entirely in 3 4/5 sec. (Continuation of serial.)

PARAFFIN

See Napthalene.

PATENTS

Patents and Progress, William E. Greenawalt. Min. & Sci. Press, vol. 119, no. 20, Nov. 15, 1919, pp. 708-712. Expressions given in technical press about use and abuse of patents are criticized because they make no attempt to conform with other laws pertaining to property or position. It is remarked that "special legislation is never a success," and "patented inventions are no different from other terms of property, and the general laws that govern one form of property should govern every other form."

PATTERNMAKING

The Segmental Method in Patternmaking, James Edgar. Mech. World, vol. 66, no. 1713, Oct. 31, 1919, pp. 210-211, 7 figs. Believed to be preferable for shapes that are irregular or that have to be recessed in places after work is turned. Examples of application are given.

PAVEMENTS

Permanent Pavements at Railway Stations and Freight Terminals, H. Colin Campbell. Eng. World, vol. 15, no. 10, Nov. 15, 1919, pp. 19-20, 6 figs. Their construction suggested as inviting field for contractors specializing in concrete street and highway paving.

PETROLEUM INDUSTRY

BAKU. The Petroleum Industry of Baku (L'Industria petrolifera di "Baku"), Rivista Marittima, vol. 52, nos. 8 and 9. Aug. and Sept. 1919, pp. 201-228, 2 figs. General statistics of production of region compared with figures indicating total production in Russia.

BORYSLAW. Geological Notes on the Boryslaw Petroleum Field in Galacia (Remarques géologiques sur le profil du champ pétrolifère de Boryslaw en Galicie), Arnold Heim. Archives des Sciences physiques et naturelles, vol. 1, no. 5, July and Aug. 1919, pp. 289-301, 2 figs., on two supp. plates. Stratigraphic study specially of zone which is believed to indicate permanently passage from Eocene and Olgocene in tetiary series.

PHOTOELECTRIC SENSITIVITY

Spectral Photoelectric Sensitivity of Silver Sulphide and Several Other Substances, W. W. Coblentz and H. Kahler. Dept. Commerce. Scientific Papers of Bur. of Standards, no. 344, Sept. 19, 1919, pp. 231-249, 17 figs. Data on change in electrical resistance of sulphides of silver and of bismuth, when exposed to radiations of wave lengths extending from 0.6 u invisible spectrum to about 3 u in infrared; also measurements upon galena cylindrite, pyrites, and jamesonite.

PHOTOMETERS

Suggestion in Regard to Manner of Using Weber Photometer (Contribution à l'emploi du Photomètre de Wéber). Société belge des Electriciens, vol. 33, July-Sept. 1919, pp. 185-187, 2 figs. Connecting in series the two incandescent lamps which are used as standards.

PHOTOPHONE

Bell's "Photophone" made practical. Telephone Engr., vol. 22, no. 5, Nov. 1919, pp. 13-15, 7 figs. Arrangement and action of Rankine's improvement. Apparatus in form given was used for British war signals.

PIEZO-ELECTRIC EFFECT

The Piezo-electric Effect in the Composite Rochelle Salt Crystal, A. McL. Nicolson. Proc. Am. Inst. Elec. Engrs., vol. 38, no. 11, Nov., 1919, pp. 1315-1335, 20 figs., partly on two supp. plates. Exposition of Piezo electricity and related optical and other properties belonging to these crystals. Special reference is made to comparatively large piezo electric effects produced by Rochelle salts crystals, prepared so as to develop natural composite structure.

PILING

Making Interlocking Steel Piling Watertight, W. T. Christine. Eng. World, vol. 15, no. 10, Nov. 15, 1919, pp. 27-28, 1 fig. By driving combination of sheet steel piling and heavy timbers along face of wall about 5 ft. outside the wall and in line with it.

PIPE

FLANGES. Investigation of Question of Flanges for Light Cast Iron Pipe, John Knickerbacker. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 457-472, 12 figs. Sketches showing in full size thickness of pipe and thickness of flanges for Am. Water Works Assn. classes A, B, and C pipe, flanges for these pipes being calculated by formula which established that thickness of flanges equals one and one-half times thickness of pipe plus one-eighth of an inch. Reference is made to report of Committee on Light Flanges of The American Society of Mechanical Engineers presented at annual meeting on Dec. 1919.

JOINTING. Recommend Deeper Bell and Elimination of Lead Groove for Cast Iron Pipe to be Jointed with Cement. Am. Gas Eng. Jl., vol. 111, no. 19, Nov. 8, 1919, pp. 444-446. Object sought is to take advantage of sheer resistance of cement being greater than strength of bond. Report of Cast Iron Pipe Joints Committee of Am. Gas Assn.

PIPE LINES

DESIGN. Factors in Design of Sluices and Pipe Lines for Hydraulicking, F. A. Goodale. Eng. & Contracting, vol. 52, no. 21, Nov. 19, 1919, pp. 590-591, 2 figs. Empirical formula for estimating amounts flume will carry and grade to use. From Colo. School of Mines Magazine.

OIL. Oil Pipe Lines, S. A. Sulentic. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 833 and 914. Writer compares cost of pipe-line transportation with that of rail and canal and shows advantages of oil engine and means of economically transporting oil for long distance through pipes. Derives formulae for calculating pressure, net horsepower and brake horsepower necessary for transmission of any quantity of oil per day through pipe of known diameter.

PIPING

See Mills, Power Piping.

PISTONS

The Manufacture of Pistons in a Medium Sized Factory, J. Edward Schipper. Automotive Industry, vol. 41, no. 16, Oct. 16, 1919, pp. 767-771, 6 figs. How it is possible in plant making 50 engines daily to use regular standard tools to advantage of production work.

PITOMETER SURVEY

See Water Waste, Prevention.

POISONING

Industrial Poisoning in British Works. Chem. Age, vol. 1, no. 17, Oct. 11, 1919, pp. 465-467. From annual report of Chief Inspector of Factories and Workshops for 1918.

POLE LINES

Wind and Ice Data, Stanley Rhoads. Telegraph & Telephone Age, vol. 37, no. 21, Nov. 1, 1919, pp. 526-527, 1 fig. For use in calculating class and number of poles required for telegraph and telephone pole lines.

POLES

Means for Increasing Life of Poles for Overhead Cables (Ueber Freileitungsmasten und Mittel zur Erhöhung dhrer Lebensdauer), J. Schmidt. Elektrotechnischer Anzeiger, vol. 36, nos. 63, 64 and 74, June 24 and 28, and July 20, 1919, pp. 289-290, 293-294, and 343-344. Details of Ruping system of impregnating wooden poles with creosote. Method is said to assure greatest safety regarding complete saturation of wood by mechanical means, to allow of easy handling of poles and to increase tensile and compressive strength of fiber by 15 per cent. (To be continued.)

POLYNOMIAL FUNCTIONS

Bernoulli Polynomials (Sur les polynomes de Bernoulli), N. E. Nörlund. Comptes rendus des séances de l'Académie des Sciences, vol. 169, no. 12, Sept. 22, 1919, pp. 521-524. Their extension by considering analogous polynomials which depend on two variables.

Symmetrical System of Polynomials (Un système symétrique de polynomes), L.-B. Robinson. Comptes rendus des séances de l'Académie des Sciences, vol. 169, no. 12, Sept. 22, 1919, pp. 524-526. Determination of conditions necessary and sufficient that a system composed of a number of integral equations and their polar equations may have solutions which do not cancel all determinants of matrix.

POLYPHASE CURRENTS

New Application of Polyphase Current (Ueber ein neues Anwendungsgebiet des Drehstroms), Gustav W. Meyer. Elektrotechnischer Anzeiger, vol. 36, nos. 42, 44 and 45, May 6, 11 and 13, 1919, pp. 197-198, 203-204, and 209-210, 10 figs. Short review of former attempts to use a. c. in magnetic dressing of ores. It is claimed that rotating field separator, invented by writer, makes possible a magnetic separation even of diamagnetic parts as long as they possess sufficient electric conductivity.

PORCELAINS

Relation Between the Composition and the Thermal Expansivity of Porcelains, F. H. Riddle. Jl. Am. Ceramic Soc., vol. 2, no. 10, Oct. 1919, pp. 804-811, 1 fig. Experimental. Bodies high in clay substance showed low thermal expansions. Variations in flint content within narrow limits possible in such bodies did not indicate decided lowering of expansivity. As clay content of porcelains was lowered and amount of quartz became larger, its quantitative effect as regards thermal expansion became more marked.

POWER GENERATION

POWER PLANTS

PROFIT SHARING

PULLEYS

QUARTZ CRYSTALS

RADIO CONSTRUCTION

RAILS

Fissures. Examination of Rails Long in Service for Relation Between Internal Stresses and Strains and Transverse Fissures, W. C. Cushing. Bul. Am. Ry. Eng. Assn., vol. 21, no. 218, Aug. 1919, pp. 95-124, 31 figs. Account of mechanical, chemical and microscopical examinations at Altoona Laboratory of Pa. Railroad.

Transverse Fissure Rails on Atchison, Topeka & Santa Fe Railroad—Heat 41177, M. H. Wickhorst. Bul. Am. Ry. Eng., Assn., vol. 21, no. 218, Aug. 1919, pp. 1-19, 16 figs. Investigation made of 52 rails of one heat, one of which failed due to transverse fissures and derailed train. Investigation disclosed that metal in interior of head of several rails was in badly shattered condition, containing numerous cracks, a few of these acting as nuclei from which transverse fissures developed in service.

Pressure. Intensity of Pressure on Rails, J. R. Onderdonk. Bul. Am. Ry. Eng. Assn., vol. 21, no. 218, Aug. 1919, pp. 49-87, 42 figs., partly on three supp. plates. Report of Sub-Committee on Rational Relation between intensity of pressure due to wheel loads and resistance of rail steel to crushing and deformation.

Relaying. Time Tests in Relaying 105-lb. Rail. Eng. & Contracting, vol. 52, no. 21, Nov. 19, 1919, p. 583. Tests were made to determine average amount of time used and lost during a day's work.

Rupture. On One Cause of Rupture of Rails and the Means of Preventing it (Sur une cause de rupture des rails et un moyen de la supprimer), Georges Charpy and Jean Durand. Génie Civil, vol. 75, no. 16, Oct. 18, 1919, pp. 377-379, 7 figs. Fissures developed in rails after certain time of service attributed to weakening of steel. Superficial reheating suggested as remedy. Paper read before Académie des Sciences.

TESTING MACHINES

British Standard Specification for Falling Weight Testing Machines for Rails. British Eng. Standards Assn., no. 103, June 1919, 1 p.

RAILWAYS

Construction. New Railways Planned in Foreign Countries. Ry. Rev., vol. 65, no. 19, Nov. 8, 1919, pp. 679-682. In Africa, Argentina, Australia, Bolivia, Brazil, Chile and China. (To be continued.)

Submergence of Culturable Land by Railway Embankments, R. Egerton Purves. Indian Eng., vol. 66, no. 15, Oct. 11, 1919, pp. 206-207, 1 fig., on supp. plate. Calculations of submergence due to embankment of Mallani-Dudwa Branch, Rohilkund-Kumaon Ry. across Sarda Valley in vicinity of Palia Kalan. Tehsil Nighasan, District Kheri, Oudh, presented typical of this class of works.

Electric. *See Street Railways.*

Freight Handling. Freight Handling on the Scioto Valley Railway. Elec. Traction, vol. 15, no. 11, Nov. 15, 1919, pp. 746-750, 14 figs. Methods employed in order to meet sudden rush of freight business due to establishment of war camp on line.

Operation. Co-operation with Farmers Gets Freight Business. Elec. Traction, vol. 15, no. 11, Nov. 15, 1919, pp. 743-746, 8 figs. How the Chicago, North Shore & Milwaukee Railroad Traffic Dept., gets acquainted with and co-operates with farmers and farmers' associations and gets freight business.

Repair Shops. Railroad Repair Shop Efficiency, Frank McManamy. Ry. Rev., vol. 65, no. 18, Nov. 1, 1919, pp. 638-642. Modernized and increased facilities for maintaining both cars and locomotives are held to be necessary in order to meet changed conditions as to wages that have transpired during period of war.

Signals. Busy Junction Protected by a Low Voltage Plant, A. M. Theiss. Ry. Signal Engr., vol. 12, no. 11, Nov. 1919, pp. 384-387, 10 figs. Train stops are eliminated at diverging point 4000 ft. from station by means of installation.

Spain. The Three Principal Aspects of Railroads (Los tres principales aspectos que presentan los ferrocarriles), Francisco Cambo. Revista de Obras Públicas, vol. 67, no. 2301, Oct. 30, 1919, pp. 534-539. Technical, economical and financial. Article discusses question of extending and improving railway service in Spain.

Spikes. Recent Tests on the Holding Power of Railroad Spikes. Eng. & Contracting, vol. 52, no. 21, Nov. 19, 1919, pp. 593-595, 3 figs. Behavior of various spikes was investigated at laboratory of Columbia University for resistance to direct pull and also resistance to direct pull as affected by redriving.

Track Material. Life, Renewal and Depreciation of Railroad Track Material (Note sur la durée, le renouvellement et la dépréciation du matériel de voie ferrée), A. Perey. Bulletin Technique de la Suisse Romande, vol. 49, nos. 21 and 22, Oct. 18 and Nov. 1, 1919, pp. 219-221 and 235-237. Oct. 18: Statistical figures of service given by ties in branch of Swiss railway. Nov. 1: Empirical formulae for determining depreciation.

See also Canal Construction and Fire Protection Equipment.

Yards. The New Feltham Concentration Yard, London & South Western Railway. Ry. Gaz., vol. 31, no. 16, Oct. 17, 1919, pp. 482-488, 11 figs., partly on supp. plate. Capacity is 3500 freight cars. Tracks circuiting in up and down marshalling sidings is indicated by diagrams.

RAIN GUARDS

Centrifugal Rain and Spray Guard. Eng., vol. 128, no. 3326, Sept. 26, 1919, pp. 319, 3 figs. Device for keeping window or screen free from water, rain or snow.

RANGE FINDER

The Works and Products of Messrs. Barr and Stroud, Limited. Engineering, vol. 108, no. 2808, Oct. 24, 1919, pp. 536-540, 29 figs., partly on two supp plates. Range finders and fire-control gear. (Continuation of serial.)

RECTIFIERS

Electric Current Rectifiers. Post Office Elec. Engrs. Jl., vol. 12, no. 3, Oct. 1919, pp. 137-143, 1 fig. Concerning life and efficiency of glass bulb rectifier, with special reference to electrolytic and vibrating-tongue types.

REFLECTIVITY

Reflecting Power of Stellite and Lacquered Silver, W. W. Coblentz and H. Kabler. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 342, Sept. 11, 1919, pp. 215-217. Data presented show that reflectivity of stellite varies somewhat in visible spectrum, depending upon homogeneity and upon exact composition of alloy. Data on reflecting power of lacquered silver mirrors show that owing to photochemical action in lacquer, silver is turned brown in color, thus reducing its reflecting power.

REFRACTION

Immersion Method for Measuring Indices of Refraction of Solid Bodies (Méthode par immersion pour la mesure des indices de réfraction des corps solides), Ch. Fabry. Jl. de Physique Théorique et Appliquée, vol. 8, Jan. 1919, pp. 11-25. Principle of method consists in immersing solid in liquid the composition of which is varied until its index of refraction for a certain radiation is the same as that of solid, equality of indices being determined by fact that passage of radiation through solid is accomplished without any deviation taking place.

REFRACTORIES

Alumina. Refractory Properties of Alumina Products (Propriétés réfractaires des produits alumineux), H. Le Chatelier and B. Bogitch. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 11, Sept. 15, 1919, pp. 495-499, 1 fig. Comparison of experimental results obtained with bauxite brick, cornidite and products having carborundum base.

Coke Ovens. Investigation into the Properties of Refractory Materials Used in Coke Oven Construction. Gas World, vol. 71, no. 1837, Oct. 4, 1919, pp. 21-24. Results of research at Imperial College of Science and Technology, England. Experiments are claimed to have shown that presence of water favors actual incorporation of alkali into refractory. Investigation also covers action of "salty" coals and experiments of washing.

REFRIGERATING PLANTS

How Can Our Plant Be Improved? Charles H. Herter. Refrig. World, vol. 54, no. 11, Nov. 1919, pp. 29-30. Advises taking advantage of approaching winter to effect improvements in equipment of refrigerating plant.

REFRIGERATOR CARS

Canadian Pacific Railway Steel Underframe Refrigerator Cars. Can. Ry. & Mar. World, no. 261, Nov. 1919, pp. 585-586, 1 fig. Particulars of 41-ft. cars.

REFUSE DISPOSAL

Refuse Disposal, Thomas L. Willes. Proc. Louisiana Eng. Soc., vol. 5, no. 4, Aug. 1919, pp. 253-268 and (discussion), pp. 268-273. Tests conducted for period of one year to determine character and amount of waste in City of New Orleans are said to have shown that this refuse contained enough grease and other valuable materials to insure profitable operation of reduction and utilization plant.

RELATIVITY

Michelson's Experiment and his Interpretation (L'esperienza di Michelson e la sua interpretazione). Il Nuovo Cimento, vol. 18, no. 6, Sept. 1919, pp. 91-106, 3 figs. In the light of modern theory of relativity.

Some Functional Equations in the Theory of Relativity, Arthur C. Lunn. Bul. Am. Math. Soc., vol. 26, no. 1, Oct. 1919, pp. 26-34. Attempt to transcribe more completely by means of functional equations and their solutions without appeal to differentiation of relations connecting space-time co-ordinates in two systems of reference, which Einstein obtains in transcribing process of light signal.

RESCUE APPARATUS

See Breathing Apparatus.

RESEARCH

Industrial Research in Small Establishments. Science, vol. 50, no. 1298, Nov. 14, 1919, pp. 445-448, 1 fig. Opposes making distinction between research and testing laboratory and that industrial research be defined for any given establishment "all that class of work which enlarges the technical horizon of the established beyond what is necessary for routing production and test of its products."

See also Bureau of Mines; Cotton Industry and Shipbuilding, Research.

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ROLLER BEARINGS

[illegible]

SEWERS

Building the Augusta Street Concrete Intercepting Sewer, W. T. Christine. Eng. World, vol. 15, no. 9, Nov. 1, 1919, pp. 37-39, 4 figs. Notes on excavation work, which was done in large part by Marion Model 60 shovel equipped with 35-ft. boom and 42-ft. dipper arm with 1¾-yd. bucket.

SHAFTING, LINE

See Bearings.

SHELL-BED GEOLOGY

On a Shell-bed Underlying Volcanic Tuff Near Warrnambool; with Notes on the Age of the Deposit, Fredk. Chapman and Chas. J. Gabriel. Proc. Roy. Soc. Victoria, vol. 30, no. 1, Sept. 1917, pp. 4-14. Bed is believed to belong to same episode as older dune-rock accumulations of that locality.

SHIPBUILDING

AUSTRALIA. Shipbuilding in Australia. Shipbuilder, vol. 21, no. 111, No. 1919, pp. 258-260, 2 figs. Particulars of Dromana, built under scheme of Ship Construction service, are: Length overall, 341 ft. 6 in.; length between perpendicular, 331 ft.; breadth extreme, 48 ft.; depth moulded, 26 ft. 6 in.;load deadweight, 5600 tons. Propelling machinery consists of set of triple-expansion reciprocating engines.

NEW ORLEANS. Great Shipbuilding Plant and Drydock in New Orleans. Manufacturers Rec., vol. 76, no. 19, Nov. 6, 1919, pp. 182-183, 4 figs. Notes on equipment. Plant is able to do any work on the ship and lift vessels up to 11,000 tons. It was constructed at cost of $2,000,000.

RESEARCH. Scientific Research in Connection with Marine Engineering and Shipbuilding, Frank Heath. Trans. North-East Coast Instn. of Engers. & Shipbuilders, vol. 35, no. 2, Mar. 1919, pp. 69-81 and (discussion) 81-85. Possible field for investigation are indicated and reasons are given to prove that organization of research should be in hands of government.

SHIPS

CASTINGS. Castings for Ship Construction, Ben Shaw and James Edgar. Foundry, vol. 47, no. 19, Nov. 15, 1919, pp. 832-835, 15 figs. Method of preparing bearings for pit molding propeller shaft bracket. Also in Foundry Trade Jl., vol. 21, no. 214, Oct. 1919, pp. 717-728, 29 figs.

CONSTRUCTION COSTS. How to Determine Shipyard Costs, Creighton Churchill. Mar. Rev., vol. 49, no. 12, Dec. 1919, pp. 586-589, 10 figs. Study of factors entering into ship construction costs with outline of method for adapting findings to different yards. Paper presented befofe Soc. of Naval Architects & Mar. Engrs.

ELECTRIC PROPULSION. The Electric Propulsion of Ships (La propulsione turboelettrica delle navi), Ing. Filiberto Dondona. Rivista Marittima, vol. 52, nos. 8 and 9, Aug. and Sept. 1919, pp. 167-200, 3 figs. Developments in England and United States, with general statement of characteristics of installation in U. S. S. New Mexico.

FREIGHT. American Standard 8800 Ton D. W. Cargo Steamships. Shipbuilding and Shipping Rev., vol. 14, no. 19, Nov. 6, 1919, pp. 517-521, 7 figs., partly on supp. plate. Built by Newburgh Shipyards, Inc., Newburgh, N. Y., for U. S. Shipping Board. Principal dimensions are: Length overall, 417 ft. 10 in.; breadth moulded, 54 ft.; depth moulded to upper deck, 32 ft. 10 in.; draught, Lloyds summer freeboard, 25 ft 6 in.

The Economic Efficiency of Merchant Ships, Alexander Urwin. Trans. North-East Coast Instn. Engrs. & Shipbuilders, vol. 35, part 3, May 1919, pp. 86-96 and (discussion), pp. 96-108, 2 figs., partly on supp. plate. Proposes scheme whereby efficiency of merchant ship can be measured and contribution to final efficiency of each factor shown in such manner as to give definite figure to its importance and indicate its value relative to other items.

MODELS. Experiments on Full Cargo-Ship Models. Shipbuilding & Shipping Rec., vol. 14, no. 17, Oct. 23, 1919, pp. 465-467, 3 figs. Comparison of various models. (To be continued.)

PAINTING. How Modern Ships Are Painted—I, Fred B. Jacobs. Mar. Rev., vol. 49, no. 12, Dec. 1919, pp. 571-573, 2 figs. Importance of selecting and preparing materials. Reasons why special attention should be given to pigments, solvente and driers.

STABILITY. "Shape Stability" of Ships ("Formstabile Schiffskörper"), Ernst Foerster. Zeitschrift des Vereins Deutscher Ingemeure, vol. 63, no. 29, July 19, 1919, pp. 669-676, 24 figs. Tests were made on ships plying beetween Lissabon and Rio de Janeiro, having speed of 15 knots. Stability losses between points of departure and port of arrival are calculated. Effect of stabilizing additions to body of ship. (To be concluded.)

SHOP EFFICIENCY

Shop Efficiency, Frank McManamy. New England RR. Club, Oct. 14, 1919, pp. 129-146. Warns against overlooking, while making time studies of shop operations, conditions where time is lost greatly in excess of amount that time studies are intended to save.

SHOP MANAGEMENT

Graphic Representation Reduces Travel in Meter Repair Shop Hundreds of Miles with Consequent Saving in Costs, H. M. Riley. Am. Gas Eng. Jl., vol. III, no. 20, Nov. 15, 1919, pp. 461-468, 7 figs. Diagram studies made preliminary to changing layout of shop.

SIGNAL INDICATORS

Visual and Audible Signal Indicator at Blairhall Colliery. Colliery Guardian, vol. 118, no. 3070, Oct. 31, 1919, p. 1163, 5 figs. Instrument is of aluminous type and comprises polished wood case hinged in two parts and so made as to be placed on floor immediately in front of engine keeper when operating engines.

SILK

The Silkworm's Formidable Competitor, R. G. Skerrett. Sci. Am., vol. 121, no. 19, Nov. 8, 1919, pp. 460 and 470, 3 figs. Outline of methods and results.

SILOS

40,000-Ton Grain Silo at the King George Dock, Hull. Eng., vol. 128, no. 3328, Oct. 10, 1919, pp. 360, 364-366, 16 figs., partly on two supp. plates. It is made of reinforced concrete and comprises two blocks each 96 feet wide and 241 feet long, in which are placed elevating, weighing, cleaning and other machinery.

SILVER

The Properties of Standard or Sterling Silver, with Notes on its Manufacture, Ernest A. Smith and Harold Turner. Metal Indus., vol. 15, no. 15, Oct. 10, 1919, pp. 303-316, 24 figs. and (discussion) 316-317. It is concluded from microscopic examinations and tests that alloys of silver and copper from simple series with eutectic containing 72 per cent silver and 28 per cent copper, which is said to be most uniform in composition of alloys of series.

SLUICEWAYS

Removal of Sand from Irrigation Canal by Sluicing. Eng. & Contracting, vol. 52, no. 20, Nov. 12, 1919, pp. 559-560, 1 fig. Sluiceways have been built at intervals of several miles and sand is removed by aid of water. From Sept. Reclamation Rec.

SLUICES

DESIGN. *See Pipe Lines, Design.*

SOIL

PERMEABILITY. *See Irrigation.*

VIBRATION. Vibration of Elastic Soil (Sulle vibrazioni di un suolo elastico), Pietro Alibrandi. Il Nuovo Cimento, vol. 17, nos. 4, 5 and 6, Apr., May June 1919, pp. 159-181. Technical study. Circumstances of perturbation at points at various distances from source of motion.

SOLIDIFICATION OF METALS

Second Report to the Beilby Prize Committee of the Institute of Metals on the Solidification of Metals from the Liquid State, Cecil H. Desch. Metal Indus., vol. 15, no. 16, Oct. 17, 1919, pp. 325-331 and (discussion)pp. 331-332, 9 figs. Deals with form of crystal grains and their relation to foam structures, and solidification of liquids exhibiting cellular convection structure.

SOLUTIONS

CONDUCTIVITY. *See Solutions.*

SOUTH AMERICA

See Latin America.

SPRINGS

Design of Multiple Helical Springs (Calcolo delle molle ad elica eilindrica multiple), Nicola Fabiano. Rivista Tecnica delle Ferrovia Italiane, vol. 16, nos. 1 and 2, July and Aug. 1919, pp. 1-12, 8 figs. Formulae for computing dimensions for types used for locomotive support.

SPECTROPHOTOMETRY

Photoelectric Spectrophotometry by the Null Method, K. S. Gibson. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 349, Oct. 11, 1919, pp. 325-352, 10 figs. It is believed in consequence of experimentation by Null method that between ware lengths 410 and 550 mm. inclusive, on certainty of measurements is not greater than 0.01 for values of transmission between zero and 1, and not greater than 0.003 for values between zero and 0.1; and beyond this range as far as 390 and 600 mm. on certainty is slightly greater, being at these wave lengths about twice as great as throughout better range.

STANDARDIZATION

See Construction Standards; Transformers, Instruments.

STACKS

Why Concrete Stacks Are Successful, A. C. Irwin. Power Plant Eng., vol. 23, no. 22, Nov. 15, 1919, pp. 1012-1013, 1 fig. Properties of concrete which is said to render material capable of withstanding exacting service.

STANDPIPES

The Standpipe in Action, Edward R. Hardy. Quarterly of the Nat. Fire Protection Assn., vol. 13, no. 2, Oct. 1919, pp. 155-159. Records of its use at fires.

MULTIPLEX. The Different Systems of Rapid Telegraphy (Les différent systèmes de télégraphie rapide), E. Montoriol. Annales des Postes, Télégraphes et Téléphones, vol. 8, no. 3, Sept. 1919, pp. 324-381, 24 figs. Instrument used and operation of automatic and multiplex systems. Paper read before Société française des Electriciens.

PRINTING SYSTEMS. The Morkrum Printing Telegraph System. Telegraph & Telephone Age, vol. 57, nos. 21 and 22, Nov. 1 and 16, 1919, pp. 528-533 and 557-534, 21 figs. Nov. 1: Description of operation. Nov. 16: Description of automatic transmitter.

The Baudot. Telegraph & Telephone Jl., vol. 5, no. 55, Oct. 1919, pp. 1-3, 7 figs. Description of Baudot multiplex type printing telegraph system. (To be continued.)

TELEPHONY

ITALY. Telephone Industry in Italy (L'industria telefonica in Italia); L. A. Zanni. Elettrotecnica, vol. 6, no. 29, Oct. 15, 1919, pp. 622-626. Statistical figures of existing installations.

ANTI-INDUCTION LINES. Anti-Inductionof Telephonie Circuits (Anti-induction des circuits téléphoniques), M. Cahen. Annales des Postes, Télégraphes et Téléphones, vol. 8, no. 3, Sept. 1919, pp. 430-445, 8 figs. Comparative study of systems used in different countries.

INTERFERENCE. European Telephone Practice. Fred. W. Scholz Telephone Engr., vol. 22, no. 5, Nov. 1919, pp. 38-40, 3 figs. Troubles caused to telephone service through interference of railway lines.

REPEATERS. Telephone Repeaters, Hancroft Gherardi and Frank B Jewett. Proc. Am. Inst. Elec. Engrs., vol. 38, no. 11, Nov. 1919, pp. 1255-1313. 48 figs., partly on 8 supp. plates. History of research and development work which has led up to final production of successful telephone repeaters. Various forms of amplifiers are described and their possibilities and limitations pointed out.

The Telephone Repeater. Post Office Elec. Engrs., Jl. vol. 12, no. 3, Oct. 1919, pp. 129-133. 4 figs. Patented repeater circuit, known as "scilesTee," each wire of which is used for telegraph working.

TEMPERATURE MEASUREMENTS

ELECTRIC INDICATOR. Designing an Electric Temperature Indicator, V. H. Todd. Power Plant Eng., vol. 23, no. 22, Nov. 15, 1919, pp. 1018-1019, 4 figs. Principle of operation and method of making required calculatiens.

STEEL FURNACES. Steel Furnace Temperature Measurements, George K. Burgess. Blast Furnace & Steel Plant, vol. 7, no. 11, Nov. 1919, pp. 550-551. Role played by research laboratory in problem .... steel temperatures. Work of Bur. of Standards and National Research Council. Paper read before Am. Iron & Steel Inst.

TEXTILE INDUSTRY

Safety Education in Textile Industry, William S. Ide. Textile World Jl., vol. 56, no. 15, Nov. 15, 1919, pp. 91-92. Records of accomplishments at mills of one company.

THALLIUM AMALGAMS

Concentrated Thallium Amalgams: Their electrochemical and thermochemical Behavior, Densities and Freezing Points. Theodore W. Richard and Farrington Daniels. Jl. Am. Chem. Soc., vol. 41, no. 11, Nov. 1919, pp. 1732-1768, 12 figs. Experimental measurements of electromotive forces between amalgams ranging from 0.33 per cent to saturation (over 40 per cent.) These potentials were found to be greater than those demanded by simple concentration law.

THEATRES

A Community Amusement Building, Donald J. Baker. Coal Age, vol. 16, no. 15, Oct. 9, 1919, pp. 602-604, 2 figs. Built at Pennylvania Mine. Building is of stucco-tile construction with fiber roofing.

Some Features of Danforth Theatre, Toronto. Contract Rec., vol. 33, no. 46, Nov. 12, 1919, pp. 1037-1038, 3 figs. Notably concrete balcony and pre-cast roof.

THERMAL ANALYSIS

A Simplification of the Inverse-Rate Method for Thermal Analysis, P. D. Merica. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 336, June 11, 1919, pp. 101-104, 1 figs. Suggested method of recording successive time intervals without use of chronograph.

THERMIONIC VALVE

See Vacuum Tubes, Thermionic Valves.

THREADS

FORMS. Threads Forms for Worms and Hobs, D. P. Waterman. Mech. Eng., vol. 41, no. 11, Nov. 1919, pp. 872-873, 5 figs. Mechanical problems involved in construction and operation of worm gears. Writer believes it is desirable to establish and follow standard line of procedure in manufacture of worm gears as their use is increasing rapidly and suggests adoption of straight-sided cutters with change in pressure handle at same sided angle of helix and change of axial to normal depth at same point.

STANDARDS. Historical Synopsis of Work Undertaken by the Société d'Encouragement pour l'Industrie Nationale with a view to standardizing Systems of Threads Employed in Mechanical Constructions by Introducing in These Systems the Metric and Decimal Systems (Résumé historique des travaux entrepris par la Société d'Encouragement pour vue d'assurer l'unification des systèmes de filetage employés dans les constructions mécaniques par application à ces filetages du système métrique et du système décimal). Bulletin de la Société d'Encouragement pour l'Industrie Nationale, vol. 131, no. 5, Sept. and Oct. 1919, pp. 177-216, 6 figs. A bibliographic list of documents on screw threads published by the Société is appended and also a report of the Union des Syndicats de l'Electricité in which a comparison is made of the dimensions of bolt, screws and notes adopted by the Congress of Zurich and Société d'Encouragement, the Schneider works, the French Railways and the Chambre Syndicale des Constructeurs d'Automobiles.

See also Screw Threads.

TIMBER PRODUCTION

Timber Production and Growth Curves in the Mountain Ash. Eucalytus, regnans, R. T. Patton. Proc. Roy. Soc. Victoria, vol. 30, no. 1, Sept. 1917, pp. 1-3, 4 figs., partly on two supp. plates. From study of annual rings, it is concluded that Mountain ash reaches its maturity between fortieth and fiftieth years, but it is not then fit for milling.

TIME STUDY

Research on Rapid Evaluation of Elementary times Needed for Mechanical Operations (Recherches sur l'évolution rapide des temps élémentaires des travaux mécaniques), J. Androuin. Bulletin de la Société d'Encouragement pour l'Industrie Nationale, vol. 131, no. 5, Sept. and Oct. 1919, pp. 145-154, 2 figs. Proposes decimal geometric series for rapid calculation of number of lathes, times of operation, etc.

TINNING

Equipment and Methods of Tinning, E. P. Later. Foundry, vol. 47, no. 19, Nov. 15, 1919. pp. 817-820. Pickling processes with details for handling various classes of work.

TOW BOATS

Tow Boats and Barges for American Inland Waterways. Pac. Mar. Rev., vol. 16, no. 11, Nov. 1919, pp. 93-95, 8 figs. Construction is practically all of steel, assembled in sizes and shapes to meet requirements of Am. Bur. of Shipping.

TOWN PLANNING

See Cities, Planning.

TRACK-CIRCUIT LAYOUTS. A. C. Track-Circuiting Lay-Outs—II, A. E. Tattersall. Ry. Engr., vol. 40, no. 478, Nov. 1919, pp. 239-243, 20 figs. Siemens' system. (Continuation of serial.)

TRACTORS

PERFORMANCE. Calculating Performance of Industrial Tractors. Elec. World, vol. 47, no. 15, Oct. 11, 1919, pp. 795-797, 2 figs. Performance graphs with various motor and battery equipment.

SAMSON. Mechanical Details of the $650 Samson Tractor. Automotive Industries, vol. 41, no. 16, Oct. 16, 1919, pp. 772-773. 1 fig. Tractor is of backbone type, transmission and rear axle housing being in one and bolted and fly wheel housing.

SCHNEIDER. Schneider Automobile Tractors Used for Towing Canal Barges (Tracteur automobile, système Scheneider, pour le galage des bateaux), Génie Civil, vol. 75, no. 18, Nov. 1, 1919, pp. 432-434, 4 figs. Tractor is fitted with 12 hp. engine. Wheels have metallic tires. Machine is said to tow barge of 225 tons with speed of about 2½ miles an hr.

TRAIN LIGHTING

Illumination of Cars is Becoming an Exact Science. Ry. Elec. Engr., vol. 10, no. 10, Oct. 1919, pp. 360-368, 24 figs. Data in regard to efficiency and uniformity of distribution, effect of coloring of head lining, installation, maintenance cost and methods of testing intensity required. Committee report of Assn. Ry. Elec. Engrs.

Specifications for Electric Train Lighting Equipment. Ry. Elec. Engr., vol. 10, no. 10, Oct. 1919, pp. 380-383. Suggesting reductions in present practices, which are believed not to impair qualities of service. Committee report of Assn. Ry. Elec. Engrs.

TRANSFORMERS

DESIGN. Designing Transformers (Het ontwerpen van transformatoren), A. M. A. Wijans. Ingenieur, vol. 34, no. 43, Oct. 25, 1919, pp. 787-795, 8 figs. With special reference to Pohl's and Feldman's method of calculation. Designing core transformers with rectangular or with elliptic core sections. Factors influencing costs. Berry transformers.

EQUATIONS. Alternating Current dynamic Transformer (Un transformatore dinamico per correnti alternate), A. G. Rossi. Il Nuovo Cimento, vol. 17, nos. 4, 5 and 6, Apr., May, June 1919, pp. 95-132, 9 figs. Expressions determining conditions of operations under various system of connections. (Concluded.)

HEATING. The Heating of Transformers, M. Vidmar. Elecn., vol. 83, no. 2164, Nov. 7, 1919, pp. 525-526. Formulae for computing internal temperature fall both in non-impregnated and impregnated copper coils. Translated from Elektrotechnische Zeitschrift.

VOLTAGE REGULATORS

Automatic Voltage Regulators, Terrell Croft. Natl. vol. 23, no. 2, Nov. 1919, pp. 576-580, 12 figs Illustrating principle of automatic voltage regulator as applied to small generators, both of a c and of d c. types.

VOLTAGE SYSTEMS

Constant and Variable Voltage Systems, A. M. Bennett. Am Drop Forger, vol. 5, no. 11, Nov. 1919, pp. 548-550, 2 figs. It is pointed out that any number of workers can operate in multiple from same machine up to its capacity when constant voltage system is used. Paper read before Am. Iron & Steel Elec. Engrs.

WAGES

See Bonus Systems.

WASTE MATERIALS

See Cars, Dump.

WATER HAMMER

Water Hammer in Conduits Consisting of Two or Three Sections of Different Diameters (Calcul du coup de bélier maximum dans les conduites formées de deux de trois tronçons de diamètres différents), Ed. Carey. Revue générale de l'Electricité, vol. 6, no. 17, Oct. 25, 1919, pp. 539-551, 8 figs. Simplification by means of graphs of formulae developed by M. de Sparre. (To be continued.)

WATER POWER

British Columbia. Report on Water Powers of British Columbia. Can. Engr., vol. 37, no. 20, Nov. 13, 1919, pp. 461-465, 3 figs. Concerning water legislation, meteorological and topographical data, surveys and maps, stream flow data, bench marks, power sites, present and proposed developments, electrical inspection and bibliography. From report published under Commission of Conservation. Also in Contract Rec., vol. 33, no. 46, Nov. 12, 1919, pp. 1053-1059.

Plants. Reconstruction of Small Water Power, Plants, Ray K. Holland. Contrac Rec., vol. 33, no. 45, Nov. 5, 1919, pp. 1029-1031. Conditions to be considered by engineer when making improvements to old or insufficient developments.

WATER PURIFICATION

Motor-Truck-Mounted Water Purification Units, Wm. J. Orchard. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 532-571, 7 figs. Arrangement and operation.

WATER RATES

The Control of Water Rates, Edward S. Walsh. Freight Handling & Terminal Eng., vol. 5, no. 10, Oct. 1919, pp. 383-388. Statement of Superintendent of Public Works, State of New York, in opposition to bill empowering Interstate Commerce Commission to control water front.

WATER SUPPLY

Army Camps. Notes on the Water Supplies of Army Camps, Cantonments and Posts in the United States, with Particular Reference to Problems of Quality, Charles Gilman Hyde and Charles A. Haskins. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 532-561. After reviewing circumstances and conditions which were obtained with respect to control of quality of water supplied to army camps, it appears to writers that variability in bacteriological quality observed with respect to considerable number of ground water supplies is shown that frequent examinations should be made of samples collected from different points in water-supply system.

Army of Occupation. Water Supply Service in the Army of Occupation in Germany, Lucius A. Gritze. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 422-426. Scheme of organization.

Catskill Aqueduct. History of Water Supply, J. C. Beardsler. Jl. Cleveland Eng. Soc., vol. 12, no. 1, July 1919, pp. 25-42, 11 figs. Olden works contracted with such modern undertakings as Catskill aqueduct.

Schoharie Development, Catskill Water Supply System for New York City, J. Waldo Smith. Jl. New England Water Works Assn., vol. 33, no. 3, Sept. 1919, pp. 257-272, 4 figs. Project involves impounding water of Schoharie Creek in reservoir of 20 billion gal. capacity to be formed by construction of dam in Schoharie County, flow line of reservoir being at level of 1130 ft. above sea level.

Collecting Galleries. The Gallery Collecting System of the Des Moines Water Company, Des Moines, Iowa, A. T. Luce. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 475-485, 4 figs. Structural details of galleries.

Old Hickory Works. The Water Supply of the Old Hickory Works, Oscar E. Bulkeley. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 427-438. System consists of two intake pumping stations, three large parallel wood-stave pipe lines about 1½ miles long, booster pump house, filtration plant, power house flume and twelve service pumps, and distribution systems. Approximately 1000,000,000 gal. of raw water are required daily, of which 65,000,000 are filtered.

Scouring. Index Numbers and Scoring of Water Supplies, Abel Wolman. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 444-456, 5 figs. Principles of water supply scoring, comparison of these methods with similar ones in index number making discussion of their points of analogy and difference, and development of data as guides in problems of water-supply standardization.

WATER WASTE

Prevention. Philadelphia Fights Water Waste. Fire and Water Eng., vol. 66, nos. 15-18, Oct. 1919, pp. 837-841, 8 figs. Charts showing Pitot records obtained (To be continued.)

Some Details of Water-Waste Prevention Surveys, Paul Lanham. Jl. New England Water Works Assn., vol. 33, no. 3, Sept. 1919, pp. 287-300 and (discussion) pp. 300-305, 7 figs., partly on supp. plate. Concerning proper division of mains into permanent districts, making and studying flow charts taken upon various districts, and organizing properly balanced force for handling water-waste problem.

Reduction of Water Consumption by Means of Pitometer Survey and Constant Inspection, George C. Andrews. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 355-370, 8 figs. Experience of Buffalo Bur. of Water.

WATER WORKS

Practical Checks upon Water-Works Depreciation Estimates, Leonard Metcalf. Jl. Am. Water Works Assn., vol. 6, no. 3, Sept. 1919, pp. 371-393. Records of actual depreciation developed in practical administration of water works in different parts of United States. Necessity for keeping better records of plant abandoned as evidence of actual in contra-distinction to theoretical depreciation.

WATT-HOUR METERS

Calibrating Standard Watt-Hour Meters, F. A. Kartak. Elec. World, vol. 74, no. 14, Oct. 4, 1919, pp. 740-742, 6 figs. Extreme accuracy in testing portable standard watt-hour meters by taking revolutions of meter during a definite time interval fixed by an electric clock; details of electrical apparatus which starts and stops meter.

WATERSHED LEAKAGE

Watershed Leakage in Relation to Gravity Water Supplies, Robert E. Horton. Jl. New England Water Works Assn., vol. 33, no. 3, Sept. 1919, pp. 306-332 and (discussion) pp. 333-336, 11 figs. Based on examination of conditions in various plains in New York State.

WAVE MOTION

Absolute Mechanics of Wave Motion and the Newtonian Relativity of Energie (Mécanique absolue des ondulations et Relativité newtonienne de l'Energie), G. Sagnac. Comptes rendus des séances de l'Académie des Sciences, vol. 169, no. 15, Oct. 13, 1919, pp. 643-646. Their correlation in view of accepted theories of radiation and movement.

Ether and the Absolute Mechanics of Wave Motion (Æther et mécanique absolue des endulations), G. Sagnac. Comptes rendus des séances de l'Académie des Sciences, vol. 169, nos. 10 and 12, Sept. 8 and 22, 1919, pp. 469-471 and 529-531, Sept. 8: Concerning absolute origin of velocities measured in universal system of reference. Sept. 22: Establishment of relation between internal absolute waves and total Newtonian energy.

WEIGHTS AND MEASURES

Weights and Measures of the Far East Trans-Pacific, vol. 1, no. 3, Nov. 1919, pp. 67-68. Units used in the various countries and their equivalents in English system.

See also Metric Systems.

WEIRS AND DAMS

Ferro-Concrete Weirs and Dams. Ferro-Concrete, vol. 11, no. 3, Sept. 1919, pp. 89-91, 8 figs. Particulars of various structures.

WELDERS

Training Arc Welders—II, O. H. Eschholz. Elec. World, vol. 74, no. 14, Oct. 4, 1919, pp. 750-752. Discussion of principles necessary for production of satisfactory welds. Definition of welding terms and bibliography of articles on welding in technical magazines.

WELDING

Acetylene. Oxy-Acetylene Industry in France, Paul Pleiss and C. V. Price. Welding Eng., vol. 4, no. 11, Nov. 1919, pp. 21-25. Practices of various companies in regard to charging acetylene generators, pressures used, etc. Comparing conditions with industry in United States writer says that outstanding difference is degree of co-operation that exists between manufacturers, users, and the French Welding Soc., who are all "united in their efforts to further the use of the process through the offices of the Welding Soc., and this spirit has been of tremendous import to the growth of the Industry in France."

Oxy-Acetylene Welding Methods, Automotive Manufacturer, vol. 61, no. 6, Sept. 1919, pp. 25-26, 2 figs. Filling blow-holes and other cavities.

Oxy-Acetylene Welding of heavy Sheets, F. H. Sweet. Am. Drop Forger, vol. 5, no. 11, Nov. 1919, pp. 553-554. Material to use and bow to handle it.

Use of Acetylene in Navy Yards during the War, H. G. Know. Acetylene Jl., vol. 21, no. 5, Nov. 1919, pp. 325-334, 17 figs. New York yard used about 110,000 cu. ft. per month; Charleston 15,000 cu. ft.; Norfolk, 60,000 cu. ft.; Boston 75,000 cu. ft. Applications are illustrated. Paper read before International Acetylene Assn.

Technical Engineer's Judgment of the Oxy-Acetylene Process, Alfred S. Kinsey. Acetylene Jl., vol. 21, no. 5, Nov. 1919, pp. 346-350. Fundamental principles involved in oxyacetylene welding, which were not used in shop practice before introduction of this process. Paper read before International Acetylene Assn.

WELFARE WORK

WIND MOTORS

WIND PRESSURE

WINDING DRUMS

WIRE

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1919, pp. 298-300, 8 figs. [illegible]

Metal Construction of Aircraft, A. P. Thurston. Aeronautical Jl., vol. 23, no. 105, Sept. 1919, pp. 473-512, 41 figs. Methods of design, kinds of materials used and method of testing specimens at various works in England.

D. F. W. German. The German D. F. W. Commercial Four Engined Biplane. Aerial Age, vol. 10, no. 9, Dec. 8 and 15, 1919, pp. 326-328, 4 figs. Machine is fitted with four 220-hp. Mercedes engines placed in fuselage and driving airscrews on wings by means of bevel gears and shafts.

Dopes. Aeroplane Dopes and Doping, W. H. Smith. Aerial Age, vol. 10, no. 6, Oct. 27 and Nov. 3, 1919, pp. 208 and 213. Report no. 38 of National Advisory Committee of Aeronautics.

Eagle. The Curtiss Eagle Transport Airplane. Aviation, vol. 7, no. 7, Nov. 1, 1919, p. 309, 1 fig. Tractor fuselage biplane fitted with additional wing engines and propellers.

Hangars. *See Hangars.*

Hild-Marshonet. The Hild-Marshonet Sportplane. Aerial Age, vol. 10, no. 11, Dec. 29, 1919, pp. 400-401, 9 figs. General characteristics are: spread overall 24 ft.; length 19 ft.; weight, loaded with pilot and fuel for three hours 700 lb., speed range 35-65 m.p.h.

Lawson. Air Liner is Designed for Commerce. Automotive Industries, vol. 41, no. 20, Nov. 13, 1919, pp. 964-967, 4 figs. Details of construction of twin-motor Lawson C-2.

The Lawson Airplane C-2. Aviation, vol. 7, no. 7, Nov. 1, 1919, pp. 315-316, 1 fig. Structural characteristics are: overall length, 48 ft.; overall height, 15 ft.; span of upper and lower wings, 91 ft.; total weight, loaded, 13,929 lb.

Limitations. The Large Aeroplane and Its Limitations, A. Ryan. Aeronautical Jl., vol. 23, no. 106, Oct. 1919, pp. 530-537. Effects of increasing size under following conditions: (1) all sizes to have same speed, (2) loss per sq. ft. of surface same for all sizes and (3) density of atmosphere constant.

Linke-Hoffman. The Linke-Hoffman Central Power Plant Giant Biplanes, Eric Hildesheim. Aviation, vol. 7, no. 9, Dec. 1, 1919, pp. 391-393, 10 figs.

Nieuport. The Nieuport "Nighthawk." Flight, vol. 11, no. 48, Nov. 27, 1919, pp. 1524-1532, 21 figs. Single-seater fitted with 320 hp. ABC Dragonfly engine. Main characteristics are: total weight, 2100 lb.; speed at 5000 ft., 150 m.p.h.; climb, 29,000 ft. in 20 min.; ceiling, 29,000 ft.

Performance Estimation. Estimating Performance of an Airplane, V. E. Clark. Aviation, vol. 7, no. 8, Nov. 15, 1919, pp. 349-350, 1 fig. Given engine, flight duration and military or commercial load.

Radiators. Preliminary Report on Resistance due to Nose Radiator. Flight, vol. 11, no. 47, Nov. 20, 1919, pp. 1509-1510, 8 figs. Based on experiments carried out by Am. Bur. of Standards.

Stresses. The Loads and Stresses on Aeroplanes, John Case. Aeronautics, vol. 17, nos. 309, 310, 315, 317 and 318, Sept. 18, 25, Oct. 30, Nov. 13 and 20, 1919, pp. 289-292, 314-315, 406-407, 450-452 and 471-472, 37 figs. Systems of bracing employed in triplanes. Design of spar sections. Examples of investigating mechanical stresses in stiff-jointed frame-works. Mechanical study of stresses produced in various members during steep dives. Calculation of loads in front and rear trusses due to lift reactions. (Continuation of serial.)

Struts. Resistance of Navy No. 1 Struts, A. F. Zahm. Aerial Age, vol. 10, no. 11, Dec. 29, 1919, p.p. 407-408, 4 figs. Aviation, vol. 7, no. 6, Oct. 15, 1919, pp. 256-257, 4 figs. Results of tests. Experimental investigation Bureau of Construction and Repair is said to have established that Navy No. 1 strut has smaller coefficient of resistance than any hitherto reported.

Technical Orders. Eng. Division, Air Service, Dayton, Ohio, no. 7, Apr. 1919, 91 pp., 12 figs. Including non-injurious tests for determining ultimate strength of interplane struts for airplanes.

The Strength of Tubular Struts, Andrew Robertson. Aeronautics, vol. 17, no. 309, Sept. 18, 1919, p. 281. Formula for collapsing load per sq. in.

Turn Indicators. The Static Head Turn Indicator for Aeroplanes, Horace Darwin. Sci. Am. Supp., vol. 88, no. 2288, Nov. 29, 1919, pp. 322-323. See also Aeronautics, vol. 17, no. 315, Oct. 30, 1919, pp. 419-412. Instrument designed to indicate whether under all conditions path of aeroplane is straight line or whether machine is turning to right or left.

Undercarriages. Aircraft Undercarriages, John D. North. Flight, vol. 11, no. 50, Dec. 11, 1919, pp. 1596-1599, 7 figs. Account of development. (To be continued.) Paper read before Royal Aeronautical Soc.

Wing Coverings. Modern Wing Coverings—Materials Used and Their Application, R. G. Dort. Aerial Age, vol. 10, nos. 9 and 11, Dec. 8, 15 and 29, 1919, pp. 329-330 and 335, 403-406 and 418. Types of pigmented protective coverings; application of wing covering materials. (To be concluded.)

Wing Rib. Development of a 15-Foot Airplane Wing Rib, Raymond M. Wirka. Aviation, vol. 7, no. 9, Dec. 1, 1919, pp. 386-388, 12 figs. Load-travel curves, plywood web, twisted veneer strap, and Pratt truss types at Forest Service, Madison, Wis., showed that ribs of these types were not quite so stiff as those of other types, ribs of Warren truss type, design no 11, were superior in strength per unit weight to all oth er ribs tested.

See also Flying Boats; Seaplanes.

AEROPLANE ENGINES

Altitude Operation. Report on Variation of Horse-Power with Temperature. Aeronautics, vol. 17, no. 310, Sept. 25, 1919, pp. 308-313, 11 figs. Tests covering altitudes from 2000 ft. to 30,000, with engine being fitted successively with Clandel, Stromberg and Tice carburetors. U. S. Bur. of Standards Aeronautic Power Plants. Report No. 8.

Fuel. Qualities of Gasoline for Aviation Motors (Les qualités de l'essence pour moteurs d'aviation), A. Grebel. Génie Civil, vol. 75, no. 21, Nov. 22, 1919, pp. 517-519, 3 figs. Characteristics of fuel fixed in September 1917, by Service d'Aeronautique militaire.

Napier. Aircraft Practice in the 1920 Napier, M. W. Bourdon. Automotive Industries, vol. 41, no. 22, Nov. 27, 1919, pp. 1056-1060, 9 figs. Overhead valves are fitted in detachable aluminum cylinder head and are operated by overhead camshaft; cylinder jackets and upper half of crank case are cased as unit in aluminum with pressed in steel liners for pistons.

Napier Lion. Aero Engine with New Arrangement of Cylinders, M. W. Bourdon. Automotive Industries, vol. 41, no. 21, Nov. 20, 1919, pp. 1006-1012 and 1015, 13 figs. Napier Lion 450-hp., 12-cylinder engine designed and built for British air service. Attention is called to short stroke, roller-bearing crankshaft and special details of cylinder and head construction.

Siddeley Puma. The Siddeley Puma Aircraft Engine. Automobile Engr., vol. 9, no. 132, Nov. 1919, pp. 369-376, 26 figs., partly on supp. plate. Engine has six cylinders in line and is of vertical water-cooled type. Valves are actuated by overhead camshaft which operates exhaust valves directly from cams and inlet valves by means of rockers. Cylinders are of aluminum, with steel liners ranged in special manner.

Starting. The Starting of Aeroplane Engines—I, T. L. Sherman. Automobile Engr., vol. 9, no. 132, Nov. 1919, pp. 366-368, 3 figs. Classification of systems of starting and suggestions in regard to effecting improvements. (To be continued.)

Testing. Altitude Laboratory for the Testing of Aero Engines, H. C. Dickinson and H. G. Boutell. Aerial Age, vol. 10, no. 4, Oct. 6, 1919, pp. 122-123 and 134, 3 figs. Description of laboratory constructed at Bur. of Standards for National Advisory Committee for Aeronautics. (Concluded.)

Viking. The Viking Aircraft Motor. Aerial Age, vol. 10, no. 9, Dec. 8 and 15, 1919, p. 325, 1 fig. Sixteen-cylinder, air-cooled, X type, having four rows of cylinders of four cylinders each, set at 90 deg. angle.

See also Internal-Combustion Engines.

AIR ANALYSIS

The Rapid Determination of Carbon Monoxide in Air, Arthur B. Lamb and Alfred T. Larson. Jl. Am. Chem. Soc., vol. 41, no. 12, Dec. 1919, pp. 1908-1921, 5 figs. Two thermometric methods are described.

AIR CONDITIONING

Humidification and Cooling of Work Shops (L'Humidification et le rafraîchissement des ateliers), Emile Masson. Revue Universelle des Mines, vol. 2, no. 2, June 1919, pp. 285-323, 10 figs. Comparative study of value of vaporizers, saturators, atomizers and super-saturators. Regulations adopted at Rouen congress are quoted. These established that hygrometric state of work shop should be maintained between 61 to 70 per cent, that the air of factory should be renewed twice each hour and that the inside temperature should be maintained above 15 deg. cent. in winter and below 25 deg. cent. in summer.

AIRCRAFT

See Aeronautics; Aeroplanes; Airships; Aviation; Baloons; Flying Boats; Seaplanes.

AIR PUMPS

See Pumps, Air ; Blowers ; Compressors.

AIRSHIPS

Airships, T. R. Cave-Browne. Cave. Aeronautics, vol. 17, no. 309, Sept. 18, 1919, pp. 277-280. Table showing strength of various fabrics, method of using steam engine for airship propulsion. Paper read before Eng. Section of "G" British Assn.

The Transverse Frame of the Rigid Airship, E. H. Lewitt. Aeronautics, vol. 17, no. 309, Sept. 18, 1919, pp. 287-288, 3 figs. Calculation of stress developed in frame.

French Practice in Airship Construction, John Jay Ide. Aviation, vol. 7, no. 9, Dec. 1, 1919, pp. 400-402, 3 figs. Specifications for seams of envelopes; precaution taken against explosions when filing dirigibles, and against sparks from atmospheric electricity and radio.

See also Balloons.

ALCOHOL

Symposium on Industrial Alcohols. Chem. & Metallurgical Eng., vol. 21, no. 11, Oct. 29 and Nov. 5, 1919, pp. 557-559, 1 fig. Presented at meeting in N. Y. Section of Am. Chem. Soc. Attention is focussed upon production and industrial uses of more important alcohols. Chart showing several uses of alcohol is given.

Alcohol as Motor Fuel. Times Eng. Supp., no. 537, July 1919, p. 223. Conditions of use.

ALLOYS

Aluminum. Heat Treating of Aluminum Alloys (Traitements thermiques d'alliages d'aluminum), M. Girard. Comptes Rendus des séances de l'Académie des Sciences, vol. 169, no. 13, Sept. 29, 1919, pp. 571-574, 1 fig. Study of variations of mechanical characteristics in terms of heat-treating temperature after rolling and of velocity of cooling after treatment.

Increasing the Scope of Aluminum Alloys, Ferdinand Jehle. Automotive Industries, vol. 41, no. 21, Nov. 20, 1919, pp. 1025-1027, 5 figs. Properties of aluminum alloys developed during war, specially Lynite alloys.

G. N. Air-Cooled. The Air-cooled G. N. Autocar, vol. 43, no. 1260, Dec. 13, 1919, pp. 1122-1123, 4 figs. Principal specifications are: 90 deg. V twin air-cooled engine, 84 x 98 mm bore and stroke; disc clutch; three speed and reverse gear.

Lancia. Lancia Produces a Novel Twelve Cylinder Model. Automotive Industries, vol. 41, no. 18, Oct. 30, 1919, pp. 862-864, 5 figs. Cylinders are block casting with angle of only 22 deg. between two rows, one row being offset in relation to other so that connecting rods are side by side.

Lighting and Starting. British Adaptation of Starting and Lighting Equipment, F. H. Hutton. Automotive Industries, vol. 41, no. 21, Nov. 20, 1919, pp. 1002-1004, 5 figs. Analysis of equipment in 1920 cars exhibited at Olympia show.

Lorraine Dietrich. Lorraine Dietrich Builds Low-priced Six Cylinder. Automotive Industries, vol. 41, no. 18, Oct. 30, 1919, pp. 860-861, 5 figs. Car designed for quantity production.

Military Transport. Military Transport Chassis—XVII. Automobile Engr., vol. 9, no. 132, Nov. 1919, pp. 391-394, 6 figs. Performance of Hallford chassis type E. I. F. 100 under war conditions.

Delage Offers the Only Car Built for Military Service. Automotive Industries, vol. 41, no. 20, Nov. 13, 1919, pp. 960-963, 8 figs. Unit construction with 6-cylinder engine and gear-box. Noted feature is great accessibility there being no obstructions to reaching valve steams.

Radiators. Manufacturers Producing Major Part of Automobile and Aeroplane Radiators Use Gas for Every Operation Requiring Heat, Charles A. Drum. Am. Gas Eng. Jl., vol. 111, no. 22, Nov. 29, 1919, pp. 505-508, 8 figs. Notes on manufacture of radiator.

Rear-Axle Housing. A Rear-Axle Housing That Is Different, Fred. H. Colvin. Am. Mach., vol. 51, no. 21, Nov. 27, and Dec. 4, 1919, pp. 919-921, 5 figs. Jigs and fixtures are so designed that each one checks work of previous operation.

Show. The Motor Car Show at Olympia. Engineering, vol. 108, no. 2811, Nov. 14, 1919, pp. 658-661, 14 figs. Trend of design.

Sigma. The 10 hp. Sigma. Autocar, vol. 43, no. 1260, Dec. 13, 1919, pp. 1117-1119, 6 figs. Principal specifications are : 10 hp., four cylinders, 65 x 120 mm; Hele-Shaw clutch; four-speed gear box; semi-elliptic springs.

Sizaire-Berwick. The New 25-50 hp. Sizaire-Berwick. Autocar, vol. 43, no. 1258, Nov. 29, 1919, pp. 1026-1030, 10 figs. Principal specifications are: 25-50 hp., four-cylinder, 95 by 160 mm. engine; four-speed and reverse gear box; full floating helical bevel-driven rear axle; semi-elliptic springs.

Steam. The Scott-Newcomb Steam System. Automobile Engr., vol. 9, no. 132, Nov. 1919, pp. 381-383, 4 figs. Advantages of this system for automobile use, as compared with internal combustion power plant.

Tires. Pneumatic Tire and Wheel Equipment for Motor Trucks, J. E. Hale. Automotive Industries, vol. 41, no. 19, Nov. 6, 1919, pp. 918-921, 2 figs. Discussion of probable change coming in motor truck equipment.

Turcat-Mery. The 15-25 hp. Turcat-Méry. Autocar, vol. 43, no. 1259, Dec. 6, 1919, pp. 1075-1077, 6 figs. Principal specifications are: 15-25 hp., four cylinders, 80 x 150 mm.; leather cone clutch; four-speed and reverse gear box, unit with engine.

Voisin. The 25-35 hp. Voisin. Autocar, vol. 43, no. 1259, Dec. 6, 1919, pp. 1067-1069, 6 figs. Principal specifications are: 25-35 hp., four cylinders, 95 x 140 mm. bore and stroke; Knight sleeve valves, aluminum pistons; dioc clutch ;semi-elliptic front, cantilever rear springs.

Wolseley. Wolseley Cars at Olympia. Engineering, vol. 108, no. 2810, Nov. 7, 1919, pp. 606-609, 21 figs., partly on supp. plate. Three models: 10-hp. 4-cylinder; 15-hp. 4-cylinder and 20 hp. 6-cylinder.

Motor Car Show at Olympia—I. Engineer, vol. 128, no. 3332, Nov. 7, 1919, pp. 460-462, 8 figs. Particulars of Wolseley cars.

AUTOMOBILE ENGINES

Air Cooling. A Test of Air Cooling, B. H. Davies. Autocar, vol. 43, no. 1259, Dec. 6, 1919, pp. 1064-1065, 3 figs. Road trial of air-cooled engine.

Clayden. The Clayden Engine. Autocar, vol. 43, no. 1259, Dec. 6, 1919, pp. 1073-1074, 4 figs. Principal specifications are: 20 hp. four cylinders, 90 x 135 mm; multi-disk Ferodo-lined clutch; four-speed gear box; three-quarter floating, bevel-driven rear axle.

Farman, Six. Aviation Practice Features Farman Six Cylinder. Automotive Industries, vol. 41, no. 18, Oct. 30, 1919, pp. 866-867 and 870, 4 figs. Engine of aviation type, developing 85 hp., fitted to automobile.

Stroke-Bore Ratio. Analyzing the Question of the Stroke-Bore Ratio, Edward G. Ingram. Automotive Industries, vol. 41, no. 21, Nov. 20, 1919, pp. 1016-1019, 2 figs. Analysis of long- versus short-stroke engines taking into consideration all forces acting on bearings. Writer concludes that bearing loads will be lower in short-stoke type at high speeds.

Temperature Control. Reducing the Cold Engine Troubles, J. Edward Schipper. Automotive Industries, vol. 41, no. 21, Nov. 20, 1919, pp. 1014-1015, 2 figs. Device which puts water circulation under control of driver by means of butterfly valve, controlled by Bowden wire from dash, in one of pipes.

See also Internet Combustion Engines.

AVIATION

Civil. An Analysis of the Need for Civil Aviation, W. F. Durand. Automotive Industries, vol. 41, no. 18, Oct. 30, 1919, pp. 872-875. Report to Executive Committee of Nat. Advisory Committee for Aeronautics.

Civil Aviation. Flight, vol. 11, no. 47, Nov. 20, 1919, pp. 1506-1508. Summary of work carried out during last six months by Department of Civil Aviation of Air Ministry.

Racing Statistics. Aeroplanes Safer Than Automobiles, Glenn L. Martin. Aeronautics, vol. 17, no. 318, Nov. 20, 1919, pp. 476-477. Statistics of recent aeroplane races compared with similar statistics for automobile races. Figure of 4,000 machine-miles per death for automobile contrasted with 17,940 machine-miles per death for aeroplane.

Transportation. Possibilities of Aerial Transport in Peru, G. M. Dyott. Aeronautical Jl., vol. 23, no. 106, Oct. 1919, pp. 521-529, 3 figs. Commercial possibilities offered by reasons of climate, natural resources, geographical position and peculiar topographical configuration.

The Need for Civil Aerial Transport—II, III, W. F. Durand. Automotive Industries, vol. 41, nos. 19 and 20, Nov. 6 and 13, 1919, pp. 922-924 and 968-971. Nov. 6: Estimated cost of transportation of express matter by airplane. Nov. 13: Problems of personnel, production and operation.

BALLOONS

Some Kite-Balloon Experiments, Griffith Brewer. Flight, vol. 11, no. 48, Nov. 27, 1919, pp. 1533-1538, 16 figs. For the purpose of devising method of descending in event of cable breaking. Paper read before Roy. Aeronautical Soc.

BATHING PAVILIONS

Chicago Municipal Improvements—I and II. Am. Architect, vol. 116, nos. 2284 and 2285, Oct. 1 and 8, 1919, pp. 461-465 and 483-490, 17 figs. Constructional details of bathing pavilion at Jackson Park.

BATTLESHIPS

H.M.S. "Hood," the Latest Capital Ship. Engineer, vol. 128, no. 3332, Nov. 7, 1919, pp. 468-470, 3 figs. Outline of salient features, and comparison with powerful units of other navies.

BEAMS

Charts for Designing T Beams, Ernest Owen. Concrete, vol. 15, no. 6, Dec. 1919, pp. 230-233, 5 figs. Developed from design formulæ.

Criticism of the Ordinary Methods of Designing Reinforced Concrete Beams, James W. Pearl. Eng. & Contracting, vol. 52, no. 22, Nov. 26, 1919, pp. 616-617, 1 fig. Following proportionality of table proposed for diameter for reinforced bars in preliminary designing: In straight cantilever beams, 0.010 arm; in straight simple beams, 0.005 span; in straight continuous beams at center, 0.003 span and at support, 0.005 span.

Concrete Arched Beams and Open Girder Carry Roof of Theater. Eng. World, vol. 15, no. 12, Dec. 15, 1919, pp. 27-28, 4 figs. Reinforced concrete roof and balcony designed on Hennebique system.

BEARING METALS

Conservation of Tin in Bearing Metals, Bronzes and Solders, G. K. Burgess and R. W. Woodward. Am. Mach., vol. 51, no. 20, Nov. 13 and 20, 1919, pp. 883-885. Reference is made to experiments carried out to determine whether lowering tin content in alloys by substitution or addition of other metals would render alloy less fit for its intended use. Formulæ are suggested for modification of alloys so as to reduce their tin content.

BEARING

Aluminum. Aluminum Bearings (Coussinets en aluminum), M. Legrand. Industrie des Tramways et Chemins de Fer, vol. 13, nos. 148-149 and 150. Apr.-May-June 1919, pp. 30-34, 4 figs. Tests performed with cargo machine said to have given promising results. It is therefore suggested that tests be made of aluminum bearings in actual work with a view to determine advisability of substituting them for bronze bushings.

Automobile. Putting Quality First in Bearing Production, J. Edward Schipper. Automotive Industries, vol. 41, no. 19, Nov. 6, 1919, pp. 909-913, 13 figs. Method of manufacturing bearing supporting unusually heavy and rigid crank-shaft in Marmon cars.

Kingsbury Thrust. Slow-Speed Tests of Kingsbury Thrust Bearings, H. A. S. Howarth. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 915-917 and 968. Operating and experimental data which show wide range of application of Kingsbury thrust bearings are presented, together with particulars of typical installations which have been in successful operation since 1911. Results of tests made on bearing having total area of 76 sq. in. on its four shoes and load of 10,000 lb. are said to have indicated that the lower the speed at which bearing is run continuously, the better are the conditions of the bearing surfaces.

Mitchell. The Mitchell Bearing, Eric W. Walford. Automobile Engr., vol. 9, no. 132, Nov. 1919, p. 384, 3 figs. Patented form of thrust bearing in which place where pressure is smaller than maximum is provided for continuously introducing oil.

BELT CONVEYORS

Elevating and Conveying Equipment—II. Coal Trade Jl., vol. 50, no. 49, Dec. 3, 1919, pp. 1396-1397, 2 figs. Illustrating uses of belt conveyors.

BELTING

Leather Substitutes. The Question of Substitutes for Leather Belting, G. Steinmetz. Eng. & Indus. Management, vol. 2, no. 20, Nov. 13, 1919, pp. 611-613, 6 figs. Substitutes are divided into two classes, (1) manufactured on principle of textile belting from woven flat wedding, strapping or rope of hemp, paper, etc., with or without interwoven wire, and (2) of leather link type manufactured from individual links of wire, wood, compressed paper or sheet metal. Results are given of textile breaking tests. Translated from Der Betreib-

CONCRETE ARCH. Through Concrete Arch Bridge to Give Large Waterway, F. W. Epps. Eng. News-Rec., vol. 82, no. 21, Dec. 11 and 18, 1919, pp. 994-99,5 4 figs. Roadway suspended by light hangers and each floor-beam hinged to allow bending under arch expansion.

DESIGN. The Comparative Economies of Cantilever and Suspension Bridges, J. A. L. Waddell. Jl. Western Soc. Engrs., vol. 24, no. 4, Apr. 1919, pp. 187-214, 11 figs. Concluded that for exclusively railroad bridges economic limit for cantilever type of structure is that length which requires $4\frac{1}{2}$ lb. of metal to carry one lb. of live load. For modern highway structure carrying also incidentally electric railway tracks this limit is set at 1000 ft., and for combined railway and highway structures limit is placed intermediate between limit for railway structures and that for highway structures.

Increasing the Permissible Stresses for Iron Bridge Structures (Ueber die Erhohung der zulassigen Materialinanspruchnahme eiserner Brücken), Friedrich Hartmann. Zeitschrift des oesterr. Ingenieur-u. Architekten-Vereines, vol. 71, no. 37, Sept. 12, 1919, pp. 339-341, 2 figs. Comparison of values obtained by writer with those given by Patton. Calculation of influence of method of load on the secondary stresses of chords. (To be continued.)

Economic Span Lengths for Simple-Truss Bridges on Various Types of Foundation, J. A. L. Waddell. Jl. Western Soc. Engrs., vol. 24, no. 4, Apr. 1919, pp. 215-260, 36 figs. Computations and diagrams. Conclusions are in part, that for all types of bridges ecoonomic span length increases with dept of foundation though not in same proportion; that the leghter the superstructure and the live load it carries, the greater is the economic span length and the greater the variation of the latter with depth of foundation; that using nickel steel instead of carbon steel in the superstructure increases materially economic span length.

Unusual Design and Joint Details of 430-Foot Bridge. Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 656-657, 3 figs. Heat-treated steel eyebars and high-carbon steel built-up members used in Warren-type truss for economy is material.

DRIP FLOOR. Steel-Plate Drip Floor for Niagara Railway Arch Bridge. Can. Ry. & Mar. World, no. 262, Dec. 1919, pp. 645-646, 3 figs. Floor consists of plates of copper-steel 3/16 in. thick resting on maple raising strips bolted to top flanges every 3 ft. by countersunk bolts.

HELL GATE. Hell Gate Bridge, New York, Frank W. Skinner. Engineering, vol. 108, no. 2812, Nov. 21, 1919, pp. 674-678, 28 figs., partly on three supp. plates. Design of viaducts.(Concluded.)

MISSOURI RIVER. An Unusual Design for a Missouri River Bridge. Ry. Age, vol. 67, no. 25, Dec. 19, 1919, pp. 1177-1179, 5 figs. Pile piers are used as supports for 300-foot steel truss span.

OHIO RIVER. The Metropolis Bridge Over the Ohio River at Metropolis, Ill., Ralph Modjeski. Jl. Western Soc. Engrs., vol. 24, no. 2, Feb. 1919, pp. 59-81 and (discussion) pp. 81-87, 36 figs., partly on fourteen supp. plates. Main bridge consists of one 300-ft. through span, four 551-ft. 3-in. thorough spans, one 720-ft. through span, and one 246-ft. deck span. General problems of design and construction are discussed.

BROACHING

Broaching as an Aid to Greater Production, Frank H. Mayo. Can. Machy., vol. 22, nos. 22 and 24, Nov. 27 and Dec. 11, 1919, pp. 518-572, 29 figs. Combinations used in production of broaching work, together with description of various types of broaching machines.

BUILDING LAWS

"The Law of Ancient Lights" and "London Building Act" George R. Mackenzie. Jl. Engrs. Club Philadelphia, vol. 36, no. 181, Dec. 1919, pp. 466-469. Review of early English building laws and London building act of 1894, with particular reference to their value in zoning.

Revision of Toronto's Building By-Law. Contract Rec., vol. 33, no. 47, Nov. 19, 1919, pp. 1063-1066. Regulations for flat slabs.

BUILDINGS

CONCRETE. Factory at Montreal for Crane Co., Ltd. Contract Rec., vol. 33, no. 51, Dec. 17, 1919, pp. 1164-1166, 6 figs. Layout of flat slab reinforced concrete building.

The Protection of Concrete Buildings Against Damp and Water. Concrete & Constructional Eng., vol. 14, no. 10, Oct. 1919, pp. 579-582, 5 figs. Following proportions are suggested where dampness of water is to be combated: (1) for 4 parts of crushed stone ¼ to ½ in diameter, mixture of one part of cement and 2 parts of sand containing rather more fine grade than are needed to obtain concrete of maximum strength: (2) for smaller stones ½ in and less 1: 2: 2 mixture. From La Revue des Matériaux de Construction et de Travaux Publics.

A Reinforced Concrete Canteen. Concrete & Constructional Eng., vol. 14, no. 11, Nov. 1919, pp. 631-637, 7 figs. Building measuring about 242 ft. by 50 ft. wide, wing portion being about 70 ft. by 50 ft. is provided by English works for comfort of workers.

FIRE HAZARDS. Miscellaneous Hazards in Building Operations. Contract Rec., vol. 33, no. 51, Dec. 17, 1919, pp. 1166-1167. Danger of fire during construction due to lack of care in properly storing materials.

HEAT LOSSES. Air Interchange and Heat Loss from Buildings, W. W. Nobbs. Domestic Eng. & Estate Engr., vol. 39, no. 11, Nov. 1919, pp. 155-162. Formulæ. Paper read before Instn. of Heating & Ventilating Engrs.

SPECIFICATIONS. Standard Specification for Cottages. Concrete & Constructional Eng., vol. 14, nos. 10 and 11, Oct. and Nov. 1919, pp. 565-570 and 664-669. Approved by Ministry of Health. (To be continued.)

STANDARDIZATION. Need for Standardization in Construction, Ernest T. Trigg. Contract Rec., vol. 33, no. 47, Nov. 19, 1919, pp. 1073-1076. Necessitated, it is pointed out, by reason of advance in price of all building materials.

STEELWORK. Common Errors in Detailing Steelwork for Buildings, Edward Godfrey. Eng. News-Rec., vol. 83, no. 16, Oct. 16, 1919, pp. 730-733, 8 figs. Specially those occurring in eccentric loads, cantilever beams and curved beams.

BULKHEADS

A Test of Watertight Bulkheads for Ship Subdivision, Archibald Hogg. Engineering, vol. 108, no. 2814, Dec. 5, 1919, pp. 762-763, 3 figs. Committee report presented before Northeast Coast Instn. of Engrs. and Shipbuilders.

An Analysis of Stresses in Bulkhead Stiffeners (Bracketed End Connections). Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 729-234, 5 figs. Data figured on assumption that brackets fix ends of stiffeners absolutely.

BUSHINGS

Interchangeable Bushings for High Voltage Apparatus, Eugene D. Eby. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 865-875, 20 figs. Standard types manufactured by Gen. Elec. Co. Curves showing variation in flashover point with change in altitude and correction factor for different altitudes, as well as other technical data obtained by Company's High Voltage Bushing Eng. Dept., are given.

BUYING

Specializing in Efficient Buying, Robert N. Ladd. Iron Trade Rev., vol. 65, no. 25, Dec. 18, 1919, pp. 1650-1651. Separate department with trained men in charge considered just as necessary to successful conduct of business as sales, auditing or other departments. Requisites of an able executive.

CANAL LOCKS

Manufacture and Testing of Large Chains for the Fenders in the Panama Canal Locks, Henry Goldmark. Jl. Western Soc. Engrs., vol. 24, no. 2, Feb. 1919, pp. 88-101, 9 figs. Average breaking strength of four test chains was found to be 541, 250 lb. Summary of specification for chains as developed from results obtained in tests is presented.

CAMS

Rational Study of Mechanisms Operated by Cams (Etude rationelle des mécanismes commandés par cames), Octave Lepersonne. Revue Universelle des Mines, vol. 2, no. 2, June 1919, pp. 193-284, 32 figs. Profiles composed of straight lines and arcs of circle.

CAMSHAFTS

The Problems in Designing an Engine Camshaft—I, Don T. Hastings. Automotive Industries, vol. 41, no. 22, Nov. 27, 1919, pp. 1072-1080. Valve timing and operating mechanism; tangential and mushroom cams; constant acceleration cam. (To be continued.)

CARBON MONOXIDE

See Air Analysis.

CARBURETORS

The Beemac Carburetter. Motor Traction, vol. 29, no. 768, Nov. 19, 1919, p. 465. Constructed with throttle barril, jet chamber, and float chamber in one unit. It is governed by sliding valve which is operated by suction of engine.

CARS

AXLES. The Car Axle. Ry. & Locomotive Eng., vol. 32, no. 11, Nov. 1919, pp. 330-332. Its early history and development.

CABOOSES. Approved Standard Design for Caboose Cars. Ry. Age, vol. 67, no. 25, Dec. 19, 1919, pp. 1187-1189, 6 figs. Design is 24-ft. caboose of composite type having steel underframe and super structure with wood outside sheeting and interior finish.

U. S. R. A. Standard Caboose Car. Ry. Mech. Engr., vol. 93, no. 11, Nov. 1919, pp. 654-656, 6 figs. Design recommended by Railroad Administration; strong underframe for heavy pusher service.

CHINESE. General Characteristics of Chinese Bolling Stock, Frank Rhea. Ry. Mech. Engr., vol. 93, no. 10, Oct. 1919, pp. 585-586, 3 figs. From report no. 80 of Bureau of Foreign and Domestic Commerce, Department of Commerce.

DINING. New Steel Dining Cars for the North British Railway. Ry. Gaz., vol. 31, no. 19, Nov. 7, 1919, pp. 592-595, 8 figs. Principal dimensions are: Length over body 66 ft.; width, outside body, 9 ft.; height to top of roof from rail, 12 ft. 4 in.; approximate total weight loaded, 45 tons.

ELECTRIC. Transference of Load in Cars while Braking, T. F. Burke. Elec. Ry. Jl., vol. 54, no. 16, Oct. 18, 1919, pp. 750-752, 3 figs. Methods used in calculating "fly-wheel" of rotating parts of electric car equipment and explanation of how load is transferred throughout train during retardation period.

FREIGHT. Diagonal Frame Bracing of Freight Cars, Ry. & Locomotive Eng., vol. 32, no. 10, Oct. 1919, pp. 306-308, 7 figs. Arguments in behalf of each of two methods—(1) running braces from junction of end and center sills out to end of bolster and (2) running braces from corner of car into junction of center sills with bolster.

Freight Car Utilization, Warren C. Kendall. Official Proc. N. Y. Railroad Club, vol. 29, no. 9, Oct. 17, 1919, pp. 5721-5736 and (discussion) pp. 5736-5750. How railroad, shipper and consignee may co-operate to increase capacity and proper working of a freight car.

CITY PLANNING

INDUSTRIAL DEVELOPMENT. Town Planning in Relation to Industrial Development, C. W. Kirkpatrick. Can. Engr., vol. 37, no. 24, Dec. 11, 1919, pp. 524-525 and 531-532. Because, it is noted, it is not possible to get "the most or the best out of a man unless he be happy and contented."

ONTARIO. Planning and Development of Cities in Ontario. Thomas Adams. Can. Engr., vol. 37, no. 23, Dec. 4, 1919, pp. 509-510. Planning and development act of Ontario, which deals largely with planning as a matter of fixing location and dealing with widening, extnsion and relocation of highways and parkways is not considered satisfactory because it does not deal with town planning, i.e. "with the regulations for the use of land and character of building developed in cities, towns and rural areas."

PRINCIPLES. Principles of City Planning, Noulan Cauchon. Eng. & Contracting vol. 52, no. 23, Dec. 3, 1919, pp. 653-654. From viewpoint of ethics, economics and art. Paper read before Joint Conference of Am. City Planning Inst. and Town Planning Inst. of Can.

WINNETKA, ILL. The Proposed City Plan of Winnetka, Illinois, E. H. Bennett. Am. City, City Edition, vol. 21, no. 4, Oct. 1919, pp. 305-307, 3 figs. Previsions for establishing motor highways.

ZONING. Zoning Cities for To-morrow, W. J. Donald. Can. Engr., vol. 37, no. 23, Dec. 4, 1919, pp. 510-512. Plan projected for Niagara Falls, which provides for six classes of zones or districts for which different conditions for use height and area of buildings are specified.

The Legality of Zoning Regulations, Herbert S. Swan. Am. City, City Edition, vol. 21, no. 5, Nov. 1919, pp. 458-459. Court decisions quoted as having withheld that city's expansion and growth are superior to individual caprice of land owners.

CLAY

The China Clay Industry of The West of England, Henry F. Collins. Min. Mag., vol. 21, no. 5, Nov. 1919, pp. 269-275, 5 figs. Geological occurrence and mineralogical characteristics of china clay, method of mining and preparation for market, and economic questions involved in its disposal. (To be continued.)

CLIMATE CONTROL

Factors of Climatic Control, W. J. Humphreys. Jl. Franklin Inst., vol. 188, no. 6, Dec. 1919, pp. 775-810, 3 figs. Discussion of principal factors and effects of their possible changes, that determine various averages and extremes of weather of any given place. Question is studied from viewpoint of physics and not of geographic distribution. (To be continued.)

COAL

BUNKERS. Cement Clinker and Coal Bunkers at Newmains, N.B. Ferro-Concrete, vol. 11, no. 4, Oct. 1919, pp. 108-110, 2 figs. Bunkers for storage capacity of 1000 tons of clinker and were constructed on Mouchel-Hennebique system of ferro-concrete.

DEPOSITS. Coal in French Indo-China, Min. Mag., vol. 21, no. 5, Nov. 1919, pp. 307-309, 1 fig. Account of coal deposits in Tonkin. Vrom Far Eastern Rev., Shanghai.

HANDLING PLANT. Efficient Handling Plant at Alicia Mines No. 1. Coal Trade Jl., vol. 50, no. 52, Dec. 24, 1919, pp. 1483-1484, 1 fig. Plant has storage capacity of 100,000 tons.

LABOR SAVING MACHINERY. Improving the American Coal Situation, L. W. Alwyn-Schmidt. Power Plant Eng., vol. 23, no. 24, Dec. 15, 1919, pp. 1100-1102, 1 fig. Possible ways to increase the coal production by the introduction of labor-saving machinery, and use of coal at mines.

METERS. The Lea Coal Meter, J. H. Blakey. Power Plant Eng., vol. 23, no. 23, Dec. 1, 1919, pp. 1060-1061, 4 figs. Illustrating application of meter to Babcock & Wilcox boiler and also to boiler fed intermittently.

SULPHUR COMPOUNDS. A Study of the Forms in Which Sulphur Occurs in Coal, A. R. Powell and S. W. Parr. University of Illinois Bul., vol. 16, no. 34, Apr. 21, 1919, 66 pp., 3 figs. Investigation to determine relationship between amounts of various sulphur forms in coal and residual sulphur left in coke and also nature of sulphur retained in coal.

Occurrence and Origin of Finely Disseminated Sulphur Compounds in Coal, Reinhardt Thiessen. Coal Age, vol. 16, no. 17, Oct. 23, 1919, pp. 668-673, 10 figs. Presence of sulphur in coal, either as sulphur balls or lenses or as minute particles scattered throughout mass, attributed to sulphur originally contained in plant matter from which coal has been evolved.

STRUCTURE. Constitution of Coal through a Microscope, Reinhart Thiessen. Coal Indus., vol. 2, no. 12, Dec. 1919, pp. 558-563, 10 figs. Microphotographs of Illinois, Indiana, Pittsburgh and Alabama coals.

WASHING. Modern Practice in the Washing of Coal, Horatio C. Ray. Coal Industry, vol. 2, no. 12, Dec. 1919, pp. 535-543, 9 figs. It is said that coal which contains mechanically mixed impurities can be successfully washed after being crushed sufficiently to free these impurities.

Purification of Coal, B. J. Roberts. Cement, Mill & Quarry, vol. 15, no. 10, Nov. 20, 1919, pp. 11-13. Also Eng. World, vol. 15, no. 12, Dec. 15, 1919, pp. 49-51. Data in regard to uses of concentrating table and accessory equipment, compiled from results of experimental work conducted by corporation of Fort Wayne, Ind.

COAL MINES

No. 1 Plant of the Mather Collieries, Donald J. Baker. Coal Age, vol. 16, no. 20, Nov. 13 and 20, 1919, pp. 783-786, 11 figs. Plant was designed for capacity of 5000 tons in 8 hr.

New Pit at Swanwick Collieries. Iron & Coal Trades Rev., vol. 99 no. 2697, Nov. 7, 1919, pp. 593-594, 8 figs., partly on supp. plate. Concerning coal pit which is 16 ft. in diameter and has been sunk to depth of 400 yd.

COAL MINING

ELECTRICAL APPLIANCES. Electricity Applied to the Mechanical Mining of Coal, C. B. Reed. Popular Engr., vol. 12, no. 6, Dec. 1919, pp. 10-13. Survey of applications of electricity in collieries.

FIRE PREVENTION. Fire Prevention in Anthracite Coal Mines, M. W. Price. Coal Age, vol. 16, no. 16, Oct. 1919, pp. 651-652. Necessary equipment for extinguishment of mine fires. Paper read before National Safety Congress.

GERMAN REGULATION. State Participation in German Coal Mining—I & II, E. Jüngst. Colliery Guardian, vol. 118, no. 3071 and 3072, Nov. 7 and 14, 1919, pp. 1230-1231 and 1297-1298, 3 figs. Tables showing records of yearly mining operations in various districts from 1880 to time of war. Statistics of recovery of by-products in various districts. Translated from "Glückauf."

PROBLEMS. Present Problems of Mining Industry, Van H. Manning. Min. & Sci. Press, vol. 119, no. 23, Dec. 6, 1919, pp. 816-818. Such as frequent periods in which the bituminous mines, especially in spring and summer months, are not worked from cause not under the control of either operator or miner. Address delivered before Am. Min. Congress.

PILLAR DRAWING. Different Methods of Pillar Drawing, A. W. Hesse. Coal Indus., vol. 2, no. 12, Dec. 1919, pp. 543-551, 7 figs. Also Coal Age, vol. 16, no. 21, Nov. 27 and Dec. 4, 1919, pp. 845-849, 7 figs. Fairmount, Keighley, Gay and Block systems; half advance and half retreat, concentrated and two other methods. Factors which affect pillar drawing.

ROOF CONTROL. Roof Control in Coal Mines, James Ashworth. Can. Min. Jl., vol. 40, nos. 48 and 49, Dec. 3 and 10, 1919, pp. 901-904, 933-935, 8 figs. It is concluded from analysis of conditions at various mines that "bumps" are not related to outbursts of explosive gases, but are caused by subsidence of roof under rigidity rocks.

SHAFT SINKING. Colliery Shaft Sinking, Edmund L. Hann. Times Eng. Supp., no. 536, June 1919, p. 188. Novel methods in Kent.

COAL TIPPLES

New Coal Tipple of the Consolidation Coal Company. William Brasack. Coal Age, vol. 16, no. 17, Oct. 23, 1919, pp. 678-682, 9 figs. Prepares coal form three drift mines and ultimate capacity will be 5000 tons per day. Tipple is built of steel and has been designed with a view to secure safety and simplicity of operation.

COALING

See Ships Coaling.

COBALT

Passivity of Cobalt, Horace G. Byers and Curtis W. Thing. Jl. Am. Chem. Soc., vol. 41, no. 12, Dec. 1919, pp. 1902-1908, 1 fig. Series of measurements of anodic potentials of iron, nickel and cobalt are given. Results show that at low current densities cobalt when used as anode readily goes into solution.

COKE

Handling of Coke. Times Eng. Supp., no. 536, June 1919, p. 189; Mechanical Systems.

COKE OVENS

Coking of Illinois Coal in Koppers Type Oven, R. S. McBridge and W. A. Selvig. Dept. Commerce Technical Papers of Bur. Standards, no. 137, Nov. 17, 1919, 51 pp. Operating test at St. Paul plant of Minnesota By-Product Coke Co. conducted jointly by Nat. Bur. Standards and Bur. Mines.

Eighty-Oven By-Product Coke Plant of the Steel Co. of Canada at Hamilton. Contract Rec., vol. 34, no. 48, Nov. 26, 1919, pp. 1085-1090, 6 figs. Details of making coke for blast furnace use.

The Dominion Iron and Steel Company's Koppers By-Product Coke Plant at Sydney, N.S., C. E. Wallin. Iron & Steel Co. of Can., vol. 11, no. 11, Dec. 1919, pp. 291-298, 7 figs. Ovens are of standard regenerative type, 37 ft. 6 in. in length, 15¾ in. in width, and 8 ft. 7 in. in height from floor to top of coal.

COKE-OVEN GAS

Coke Oven Gas Reheater Improvement, George B. Cramp. Blast Furnace & Steel Plant, vol. 7, no. 12, Dec. 1919, pp. 606 and 616, 2 figs. Increasing utility of reheater by application of radiator plates of corrugated sheets.

Heating Furnaces and Annealing Furnaces—XI and XII, W. Trinks. Blast Furnace & Steel Plant, vol. 7, no. 12, Dec. 1919, pp. 583-585, 9 figs. Also Am. Drop Forger, vol. 5, no. 12, Dec. 1919, pp. 577-579, 9 figs. Economical use of by-product coke oven gas for heating and annealing furnaces.

Moisture in Blast Furnace Coke, Wm. H. George. Jl. Soc. Chem. Indus., vol. 38, no. 22, Nov. 29, 1919, pp. 394T-396T. Method of determining it.

COLLOIDAL FUEL

A Solid Fuel in Liquid Form, Robert G. Skerrett. Sci. Am., vol. 121, no. 25, Dec. 20, 1919, pp. 604-605, 4 figs. Advantages of combining solid and liquid fuels in colloidal form.

METHODS. Cost Accounting, George L. Bennett. Ice & Refrigeration, vol. 57, no. 5, Nov. 1919, pp. 194-197. Advises systematizing cost data in ice-making industry. Paper read before Natural Ice Assn. of Am.

COTTON MILLS

Electric Service at Naumkeag Cotton Mills. Elec. World, vol. 74, no. 18, Nov. 15 and 22, 1919, pp. 933-936, 8 figs. Methods of inspecting and maintaining installation of 3247 motors.

CRANES

CARGO. Mechanical Method for Handling Cargo, Warren Travell. Shipping, vol. 9, no. 11, Dec. 17, 1919, pp. 23-24 and 68, 2 figs. Illustrating types of cranes. (To be continued.)

INSTALLATION. Consider the Crane, Chester C. Rausch. Wisconsin Engr., vol. 24, no. 2, Nov. 1919, pp. 53-62. Suggestions in regard to installation of cranes with a view to avoid accidents and also locating lights in such a position as never to cause a glaring light confusing vision of crane operator. Paper read before National Safety Congress.

OPEN-HEARTH LADLE. Main Hoists for Open Hearth Ladle Cranes. W.W. Garrett, Jr. Blast Furnace & Steel Plant, vol. 7, no. 12, Dec. 1919, pp. 593-594. Tests and observations made on main hoists of two overhead electric travelling open hearth ladle cranes. Paper read before Assn. of Iron & Steel Elec. Engrs.

SHIPBUILDING. Heavy Double Trestle for Shipbuilding Cranes over Newport News Battle-Cruiser Berths, R. W. Burpee. Eng. News-Rec., vol. 83, no. 10, Oct. 16, 1919, pp. 723-728, 9 figs. Long runway without expansion joints. 75-ton and 15-ton cranes on same rails. Truss loads divided between tower columns. Transverse framing statistically indeterminate.

Modern Lifting Machinery. Steamship, vol. 31, no. 366, Dec. 1919, pp. 131-135, 7 figs. Cranes built by Herbert Morris, Ltd., Loughborough, England.

CRANKSHAFTS

Torsional Oscillations of a Crankshaft, J. Morris. Aeronautics, vol. 17, no. 317, Nov. 13, 1919, pp. 454, 3 figs. Effect on crankshaft of relation between frequencies of torsional oscillations and firing strokes.

CRYSTALLIZATION

Rhythmic Crystallization, Raphael Ed. Liesegang. Sci. Am. Supp., vol. 88, p. no. 2287, Nov. 22, 1919, pp. 299. Examples of intermittent precipitation. Translated from Die Naturwissenchaffen.

CUPOLAS

Ancient and Modern Cupolas (Les cubilots anciens et modernes), T. Levoz. Fonderie Moderne, vol. 12, no. 6, June 1919, pp. 125-132, 10 figs. Practice at Milan plant. (Continuation of serial.)

Ancient and Modern Cupolas (Les cubilots anciens et modernes), T. Levoz. Fonderie Moderne, vol. 12, no. 7, July 1919, pp. 153-160, 6 figs. Significance of positions of tuyere. (Concluded.)

Fuel Economy in Cupola Practice, H. James Yates. Engineering, vol. 108, no. 2803, Sept. 19, 1919, pp. 396. Methods of reducing heat losses due to (1) radiation, (2) sensible heat in waste gases, (3) undeveloped heat in unburned carbonic oxide. Paper read before Iron and Steel Inst.

See also Electric Furnaces, Iron Foundry.

CUTTING METALS

Supplement to Frederick W. Taylor's "On the Art of Cutting Metals"—III, Carl G. Barth. Indus. Management, vol. 58, no. 5, Nov. 1919, pp. 369-374, 11 figs. Formulæ for cutting metals and general formula for plotting slide rules; also method used in laying out machine tool slide rule to embody all of variables in general formula.

See also Abrasive Wheels.

DAMS

CONCRETE. Concrete in Water Works Construction, A. O. Irwin. Mn. & County Eng., vol. 57 no. 5, Nov. 1919, pp. 225-234, 8 figs. Constructional details of dams, reservoirs, pipe lines, tanks, standpipes, power houses, etc., made of concrete.

EARTH. Hydraulic Fill Dams of the Miami Conservancy District, Harry Gardner. Eng. World, vol. 15, no. 12, Dec. 15, 1919, pp. 11-17, 7 figs. Concerning construction of large earth dams.

FLOOD CONTROL. Concerning Procedure on Miami Flood-Control Dams. Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 740-743, 7 figs. How standard products were secured by test control of varying aggregates.

JACKSON LAKE. Jackson Lake Dam the Savior of the Sharpe River Valley. Eng. News-Rec., vol. 83, no. 21, Dec. 11, and 18, 1919, pp. 992-994, 6 figs. How flush method of delivery was discarded for regulated continuous-flow method.

PRESSURE MEASUREMENTS. Study of Pressures in Hydraulic Dam Cores. Eng. News'Rec., vol. 83, no. 22, Dec. 25, 1919, pp. 1040-1044, 7 figs. Methods of Miami conservancy engineers to obtain data on core consistency and action. Ball soundings. Measurements of lateral and vertical pressure. Results to date on Germantown Dam.

DETERIORATION

Specific Depreciation as Applied to Mechanical Deterioration, W. W. Pollack. Am. Mach., vol. 51, no. 17, Oct. 23, 1919, pp. 761-762, 1 fig. Suggested form for recording deterioration factors.

DIES

Details of Shaving Dies, Frank A. Stanley. Am. Mach., vol. 51, no. 21, Nov. 27 and Dec. 4, 1919, pp. 929-931, 10 figs. Advantages of shaving dies is said to make possible to attain desired results with less attention to quality of blanking dies.

DIESEL ENGINES

CONSTRUCTION. Merchant Marine Diesel-Engine Construction in Switzerland. Motorship, vol. 4, no. 11, Nov. 1919, pp. 44-49, 16 figs. Shop tests of new model 1250 shaft hp. Sulzer two-type motor. Preliminary details of 4200 shaft hp. (5550 i.hp.) cargo—and passenger-ship model. 40 ft. engine-room for 3000 hp.

MARINE. Nearly Half-a-Million Horse-Power in Marine Heavy-Oil Engines. Motorship, vol. 4, no. 11, Nov. 1919, pp. 33-44, 13 figs. Notes on constructional features of machines built by Vickers Ltd., with remarks on question of solid-injection of fuel.

WERKSPOOR. The New Werkspoor Engine. Motorship, vol. 4, no. 11, Nov. 1919, pp. 54-60, 8 figs. Details of recent changes, particularly in reversing mechanism.

WINTON. Winton Diesel Oil Engines. Gas Engine, vol. 21, no. 12, Dec. 1919, pp. 387-388, 3 figs. Features of stationary type.

DIFFERENTIAL EQUATIONS

Transformations of Linear Equations with Partial Derivatives Involving Two Independent Variables (Sur les transformations des équations linéaires aux dérivées partiels à deux variables indépendantes), G. Cerf. Comptes Rendus des seances de l'Academie des Sciences, vol. 169, no. 14, Oct. 6, 1919, pp. 613-615.

DIRECTION FINDERS

How Aeroplanes are Navigated by Wireless, R. Keen. Wireless World, vol. 7, no. 79, Oct. 1919, pp. 389-393, 3 figs. Operation of wireless direction-finder.

DRAINAGE

Reclamation by Drainage of Land in the Mississippi Valley, Edmund T. Perkins. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 215-217, 4 figs. Possibilities of developing natural resources of region.

DRIFTS

Making and Using Drifts, H. F. Pusep. Am. Mach., vol. 51, no. 17, Oct. 23, 1919, pp. 757-760, 10 figs. Illustrating possible applications of drifts.

DRINKING FOUNTAINS

The Relative Sanitary Values of Different Types of Drinking Fountains—1 and 2, Louis V. Dieter. Am. City, City Edition, vol. 21, no. 5 and 6, Nov. and Dec. 1919, pp. 452-457 and 549-554, 4 figs. Results of tests of vertical nozzle types and of sloping stream types.

DRYDOCKS

The Morse Dry Dock and Repair Plant. Int. Mar. Eng., vol. 24, no. 12, Dec. 1919, pp. 781-792, 20 figs. Notes on organization methods, welding equipment used for repair work and employes' association established for looking after welfare of men while at their work in shops.

DRYING

Some Factors Involved in Drying Operations, Eustace A. Elliott. Chem. & Metallurgical Eng., vol. 21, no. 12, Nov. 12 and 19, 1919, pp. 620-623, 8 figs. Graphs showing influence of both initial and final moisture on length of drying and other factors. Constructed from experiments carried out in small jacketed pan 4 ft. in diameter.

See also Kiln Drying.

DUST

Further Studies in Methods of Dust Determination, E. V. Hill and Otto W. Armspach. Trans. Am. Soc. Heating & Ventilating Engrs., vol. 25, no. 4, Oct. 1919, pp. 391-404 and (discussion), pp. 404-406, 7 figs. Experimental. It was found that all dust is not retained in process of sampling in passing air through water or water spray.

Removing Solid and Liquid Particles from Gases by Means of Electricity (Elektrische Ausscheidung von festen und flüssigen Teilchen aus Gasen), R. Dürrer. Stahl und Eisen, vol. 39, no. 46, Nov. 13, 1919, pp. 1377-1385, 8 figs. Historical review and description of various types of apparatus used. (To be continued.)

Electric Precipitation of Solid and Liquid Particles in Gases (Elektrische Ausscheidung von festen und flüssigen Teilchen aus Gasen), D. Durrer. Stahl und Eisen, vol. 39, no. 47, Nov. 20, 1919, pp. 1423-1430, 17 figs. Details of Cottrell and Möller processes. Application of Cottrell system in various plants.

ELECTRIC CABLES

SINGLE-PHASE. Electric B+B+B -Freight Locomotives on Silesian Mountain Railway (Elektrische B+B+B -Lokomotiven fur die Guterzugbeforderung auf den schlesischen Gebirgsbahnen), Winkler, Elektrische Kraftbetriebe u. Bahnen, vol. 17, no. 20, July 14, 1919, pp. 153-156, 3 figs. These single-phase a. c. engines have a wheelbase of 13,660 mm.; their entire length, between buffers, is 17,200 mm.

TESTS. St. Paul Locomotive Tested at Erie. Elec. Ry. Jl., vol. 54, no. 18, Nov. 1, 1919, pp. 827-831, 16 figs. Also Ry. Age, vol. 67, no. 15, Oct. 10, 1919, pp. 749-750, 2 figs. Regenerating tests and "tug-of-war" test of giant 3000-volt, direct-current locomotive built by General Elec. Co. for Chicago. Milwaukee & St. Paul Ry. Locomotive is equipped with bi-polar motors of gearless type with motor armatures mounted directly upon driving axles. Locomotive weighs 265 tons of which 229 tons are on drivers.

THREE-PHASE. New "Baltic" Three-Phase High-Speed Locomotives used in the Italian Railways (Nouvelles locomotives triphasées à grande vitesse type "Baltic" des Chemins de Fer de l'Etat Italien). Industrie Electrique, vol. 28, no. 658, Nov. 25, 1919, pp. 423-436, 15 figs. Principal characteristics are: Two traction motors coupled by rank and connecting rods to three 1630-mm. driving wheels; total weight 92 tons; operated at 330 volts.

ELECTRIC MOTORS

MAINTENANCE. The Care of Shop Motors, C. E. Clewell. Am. Mach., vol. 51, no. 20, Nov. 13 and 20, 1919, pp. 877-880, 6 figs. Notes on general instructions to be followed in setting up motors for first time. together with cautions on manipulation of electric machinery.

INSTALLATION. The Installation of Electric Motors, E. Austin. Eng. & Indus. Management, vol. 2, no. 21, Nov. 20, 1919, pp. 645-647, 6 figs. Special work for which each of types of winding is suitable.

OPERATION. Operation of Shop Motor Brushes and Contract Devices, C. E. Clewell. Am. Mach., vol. 51, no. 21, Nov. 27 and Dec. 4, 1919, pp. 939-941, 6 figs. Notes on common adjustment of brushes and brush holder of motor and on care of commutator and brushes.

ELECTRIC MOTORS, A. C.

COMMUTATORS. Uses of Commutators for Polyphase Currents (Sur certains modes d'emploi du collecteur en courants polyphasés), L. Gratzmüller. Revue Générale de l'Electricité, vol. 6, no. 20, Nov. 15, 1919, pp. 659-665, 7 figs. How to regulate speed of asynchronous ring motor by relative displacement of two sets of brushes upon commutator of transformer field of which rotates in synchronism with rotor.

STARTING. The Starting of Asynchronous Motors with Squirrel-Cage Rotors (Der Anlaufvorgang bei Asynchronomotoren mit Kurschlussanker), Reinhold Rudenberg. Elektrotechnik und Maschinenbau, vol. 37, no. 44, Nov. 2, 1919, pp. 497-504, 13 figs. Calculation of starting activities based on assumption that torsional moment corresponds to curve indicated by writer. (To be concluded.)

Manual Starters for Small Squirrel-Cage Induction Motors, C. K. Applegarth and H. D. James. Elec. Jl., vol. 16, no. 12, Dec. 1919, pp. 532-536, 12 figs. Features of design, together with auxiliograph record of test made in 3-phase, 60-cycle, 750-volt line having 55 per cent power factor.

VENTILATION. Ventilation of Induction Motors, Fraser Jeffrey. Elec. World, vol. 74, no. 19, Nov. 29 and Dec. 6, 1919, pp. 988-990, 10 figs. Diagram showing flow of air through ducts and discussion of effect of various shapes of ventilating passages.

ELECTRIC POTENTIAL MEASUREMENT

Measuring Small Differences of Potential by Means of Lamp-Amplifiers (Emploi des amplificateurs pour la mesure des différences de potentiel faibles), R. Depriester. Revue Générale de l'Electricité, vol. 6, no. 19, Nov. 8, 1919, pp. 619-620, 1 fig. Method of thermionic balance in open circuit and without differential galvanometer.

ELECTRIC POWER PLANTS

DRYING OUT. Putting a Flooded Power Station Back into Commission. Elec. Rec., vol. 26, no. 4, Oct. 1919, pp. 197-199, 6 figs. Methods used in drying out and testing electric equipment of 4000-kw. generating station which was flooded by bursting of hydraulic turbine.

INDUCTION-GENERATOR. Induction Generator Plants, C. M. Ripley. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 963-969, 3 figs. It is said that in few instances and under specially favorable circumstances induction generator plant with little or no attendance has been able to justify its installation. Description of such of these is given and it is pointed out that if prices of coal and labor continue to soar at their present rates small induction generator plants will soon be economically more feasible than they are at present.

JAPAN. On the Power Station of Kyushyu Electric Railway Company, Y. Kusakari (In Japanese.) Denki Gakkwai Zasshi, no. 375, Oct. 10, 1919.

LAYOUT. The Electrical Layout of Large Power Systems, Robert Treat. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 918-926, 6 figs. (Discussion of means for insuring continuity of service, with comments on investment in protective apparatus and spare equipment which may be justified under varying conditions. Typical transmission network is described and application to this system of principles of selective relaying is taken up.

NEW ENGLAND. Development in New Hampshire and Vermont. Elec. World, vol. 74, no. 16, Oct. 18, 1919, pp. 833-835, 1 fig. Locations of electric generating stations, substations and transmission lines. Possible connections with Connecticut systems.

The New England Power Company, E. A. Dillard and H. R. Wilson. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 974-979, 5 figs. Developments of system. Energy is transmitted about 300 miles at 66,000 volts and normal week-day output averages 1,100,000 kw-hr. and normal week-day peak averages 80,000 kw.

Centralization and Conservation in Power Supply of Central Massachusetts, F. L. Hunt. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919. pp. 947-959, 19 figs How by closing down 121 isolated and using central stations supply nearly 400,00 tons of coal were saved in one year.

NITRATE PLANT. Electrical Energy Supply for Nitrate Plant, C. D. Gray and E. Hagenlocher. Elec. World, vol. 74, no. 20, Dec. 13, 1919, pp. 1052-1055, 3 figs. Electrical machines are arranged to facilitate straight copper runs; storage battery is to carry vital loads in case of complete generator shut-down.

PROTECTION. Relay Protection for Large Power Stations, O. C. Traver. Gen. Elec. Rev., vol. 22, no. 11, No. 1919, pp. 885-899, 29 figs. Describes recent developments and importance in design and construction of relays and indicates variety of results which can be accomplished by their combinations.

SHORT-CIRCUITING. Effects of Short-Circuits on Power House Equipment, E. G. Merrick. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 935-941, 9 figs. Attention is called to problems created in properly handling vast amounts of energy which interconnection of power systems has created. In dealing with this class of problems writer analysizes troubles which are likely to occur in power house equipment due to electro-magnetic stresses and abnormal temperatures resulting from short circuit.

Calculating Short Circuits on Power Systems I and II, R. F. Gooding. Elec. World, vol. 74, nos. 16 and 18, Oct. 18 and Nov. 15 and 22, 1919, pp. 827-830 and 938-941, 7 figs. Oct. 18: Scheme for investigating 3-face symmetrical short circuits is worked out. Nov. 15 and 22: Case of three large stations to be operated in parallel.

ELECTRIC POWER TRANSMISSION

GAS VS. ELECTRICITY. Power Transmission by Gas Times Eng. Supp., no. 541, Nov. 1919, pp. 331. Comparison with electricity.

HEATING OF CONDUCTORS. Electrical Characteristics of Transmission Circuits—V. Wm. Nesbit. Elec. Jl., vol. 16, no. 12, Dec. 1919, pp. 515-519. With table indicating heating capacity of 40 deg. rise of bare copper conductors suspended out of doors.

HIGH-VOLTAGE LIMITATIONS. The Limitations of High-Voltage Transmission, T. A. Worcester. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 880-884. Visualizes use of 220,000 volts as next step in transmission of energy. This is concluded from examination of past developments, which have involved a systematic increase in maximum voltage from 11,400 in 1894 to 150,000 in 1912. Difficulties to be met in installing transmission system at 220,000 volts and ways in which they may be solved are discussed.

High Voltage Power Transmission Problems, W. W. Lewis. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 927-934. Examples of application of formulæ developed by Steinmetz (See Gen. Elec. Rev., June 1913). It is visualized that voltages and length of line will soon be reached where it will be necessary to employ rigid hyperbolic formulæ.

INDUSTRIAL DEVELOPMENT. Power Transmission and Industrial Development, Ross J. McClelland. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 825-832, 1 fig. Functions of transmission and power sources sighted from viewpoint of possibility of effecting economies. Writer discusses relationship between power supply and transportation, interconnection of power systems and influence that comprehensive scheme of power supply would have upon national industrial and economic development.

INTERCONNECTION. The Seattle-Spokane Transmission Line, G. E. Guinan. Stone & Webster Jl., vol. 25, no. 5, Nov. 1919, pp. 350-357, 10 figs. on 4 supp. plates. Interconnection in one electrical system of various generating plants having total capacity of 298,100 hp.

National Distribution of Electric Energy (Une distribution nationale d'énergie électrique), F. Scoumanne. Revue Générale de l'Electricité, vol. 6, nos. 19 and 20, Nov. 8 and 15, 1919, pp. 638-643, and 667-675. Study of economy resulting from interconnection of central stations. Suggested method of organizing progressive development of general distribution of energy. Question is considered in general without reference to any nation in particular. (Concluded.)

Power and Transmission, H. H. Dewey. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 876-880. Writer calls attention to fact that while demand for power increased enormously during war, normal supply of generating equipment to meet that need was not immediately forthcoming. To supply this deficiency, tendency already in evidence toward inter-connection of power systems was greatly enhanced. He concludes that co-operation between manufacturers of electrical apparatus and operators who use them is essential to avoid serious difficulties of handling of future power networks.

PHILADELPHIA. Distributing System of Philadelpnia Electric Company (Système distributeur d'énergie de la Philadelphia Electric Company), George P. Roux. Revue Générale de l'Electricité, vol. 6, no. 20, Nov. 15, 1919, pp. 675-681, 6 figs. Insists particularly on duties of load dispatcher and describes apparatus by means of which control is affected.

PROTECTING APPARATUS. Automatic Protecting Apparatus for Alternating Current Net Works (Appareillage automatique de protection pour les réseaux à courants alternatifs), M. Rosebourne. Revue Générale de l'Electricité, vol. 6, no. 22, Nov. 29, 1919, pp. 774-780, 14 figs. Comparative value of apparatus employed.

ELECTRIC OSCILLATIONS

Absolute Value of Periods of High-Frequency Electric Oscillations (Mesure en valeur absolue des périodes des oscillations électriques de haute fréquence), Henri Abraham and Eugene Bloch. Annales de Physique, vol. 12, no. 9, Sept.-Oct. 1919, pp. 237-302, 11 figs. Period is determined by rendering it identical to that of harmonic of electric oscillator, fundamental frequency of which can itself be made identical to that of a standard tuning fork.

EMULSIFICATION

Emulsification by Absorption at an Oil-Water Interface, S. E. Sheppard. Jl. Phys. Chem., vol. 23, no. 9, Dec. 1919, pp. 634-639, 3 figs. Experiments are said to have agreed with Bancroft's general theory of peptization that absorption at a liquid, liquid interface is capable of procuring emulsification.

END STANDARDS

Types of End Standards, R. L. Rankin. Iron Age, vol. 104, no. 26, Dec. 25, 1919, pp. 1331-1332, 5 figs. Relative value of flat, cylindrical, spherical and other end standards.

ENGINES

See Aeroplane Engines; Automobile Engine, Diesel Engines, etc.

EVAPORATORS

Modern Commercial Evaporators, W. L. Badger. Michigan Technic, vol. 32, no. 3, Oct. 1919, pp. 186-200, 7 figs. Design calculations.

Efficiency Determination of Evaporator Heating Surfaces (Ueber Verdämpher und die Bestimmung der Leistung ihrer Heizflächen), H. Claassen. Zeischrift für angewandte Chemie, vol. 32, no. 62, Aug. 5, 1919, pp. 241-246, 3 figs. Purpose of article is to establish basis for determination and calculation of practical coefficient of heat flow and certain rules for carrying our efficiency tests in evaporation systems.

EXCAVATING MACHINERY

Electrically Operated Excavating Machines (Machines d'extraction à commande électrique), G. Hacault. Revue Générale de l'Electricité, vol. 6, no. 19, Nov. 8, 1919, pp. 623-637, 22 figs. Alternating-current controllers: comparison of various systems of controlling. (Concluded.)

The Queenstown-Chippewa Hydro-Electric Power Project, Harry Gardner. Eng. World, vol. 15, no. 11, Dec. 1, 1919, pp. 15-19, 14 figs. Operation of electric shovels used for excavation of canal.

Electrically Operated Excavating Machinery in French Mines (Sur l'avenir des installations d'extraction à commande électrique dans les mines françaises), A. Barjon. Revue Générale de l'Electricité, vol. 6, no. 22, Nov. 29, 1919, pp. 768-773, 6 figs. Comparative study of machinery used in collieries. Operation of Leonard coupling with Koepe pulley is particularly noted and advantages of systems are exposed.

EXHAUST HOODS

See Grinding Machines.

EXPLOSIONS

Apparatus for Preventing Explosions. Acetylene & Welding Jl., vol. 16, no. 191, Aug. 1919, pp. 156-157, 2 figs. Flame in gas conduit is arrested by utilizing heat of flame to melt quantity of fusible material in path of gas flow and thereby seal passage.

The Temperature of Explosion for Endothermic Substances, Rasik Lal Datta and Nihar Ranjan Chatterjee. Jl. Chem. Soc., vols. 115 and 116, no. 683, Sept. 1919, pp. 1006-1010. Results obtained experimentally for nitocompounds, picrates azo-compounds, haloid compounds, and organic perchlorates.

EXPLOSIVES

MANUFACTURE. Filling Containers with TNT and Amatol—I, Chem. Age, vol. 1, no. 14, Sept. 20, 1919, pp. 385-386. Methods of filling.

MILITARY TESTS. Experiments with Blast and Pressure Meters and Tests of Explosives, E. H. Schultz. Professional Memoirs, Corps Engrs, U. S. Army and Engr. Dept. at large, vol. 11, no. 57, May-June 1919, pp. 325-346, 9 figs. Tests made at Aberdeen proving grounds, Maryland.

USES. Report of Tests to Demonstrate the Adaptability of Grade III TNT for Clearing Land or Similar Uses, W. J. Montgomery. Professional Memoirs, Corps Engrs. U. S. Army and Engr. Dept. at large, vol. 11, no. 57, May-June 1919, pp. 260-262 and 270-276, 10 figs. Research of Bureau of Mines.

Safety Factors in the Use of Explosives in Cement Rock Quarrying, Walter O. Snelling. Cement & Eng. News, vol. 31, no. 12, Dec. 1919, pp. 31-34, 1 fig. Recommendations as to manner of loading and unloading, thawing, etc.

Proper Use of Explosives in Mines, H. Y. Russel. Cement, Mill & Quarry, vol. 15, no. 11, Dec. 5, 1919, pp. 37-40. Explosives discussed are those in which explosive base consists of nitroglycerine, nitroglycerine in combinationwith guncotton, or nitroglycerine in combination with ammonium nitrate. Paper read before Can. Min. Inst.

EXPORT MARKETS

The Electrical Market in Italy, O. M. Smart. Elec. World, vol. 74, no. 16, Oct. 18, 1919, pp. 831-833, 1 fig. Writer sees great outlet for exports to Italy, where electrical energy is very generally used in industrial plant. Geographic charts show frequencies and other data is given.

FABRICS

Theory of Elastic Fabrics and Its Application to the Calculation of Elastic Plates (Die Theorie elastischer Gewebe und ihre Anwendung auf die Berechnung elastscher Platten), H. Mercus. Armierter Beton, vol. 12, no. 8, Aug. 1919, pp. 181-190, 11 figs. Discussion of plate having uniform loading. (To be continued.)

FACTORY LAYOUT

New Plant of National Acme Company. Iron Age, vol. 104, no. 23, Dec. 4, 1919, pp. 1111-1119, 16 figs. Details of shop built for large production of screw machine products, noting features designed for convenience of employees.

FEEDWATER

Hot-Water Feeding for Boilers (Kesselspeisung mit heissem Wasser), A. Bruser. Kraft und Betrieb, vol. 3, nos. 9 and 10, Aug. 1 and 15, pp. 114-115 and 121-122, 4 figs. Treatise on principles and application of injectors for feedwater of 30 deg.without addition of cold water and for feedwater of maximum heat of 100 deg. cent. with addition of cold water. Description of "hot-water" injector.

Lime-Barium Softener for Treatment of Boiler Feed Water, C. A. Mehring. Chem. & Metallurgical Eñg., vol. 21, no. 12, Nov. 12 and 19, 1919, pp. 629-632, 2 figs. Operating procedure, specially methods of charging softeners and washing filters, sampling and analyzing, and gaging flow with weir.

FERROALLOYS

Complex Ferro-Alloys (Les ferro-alliages complexes). Journal du Four Electrique, vol. 28, no. 22, Nov. 15, 1919, pp. 149-151. Manufacture, properties and uses of ferro-silico-aluminum, ferro-siloco-manganese; ferro-silico-nickel; ferro-mangano-nickel and ferro-chromos-aluminum.

FERTILIZERS

Tetraphosphate—A Special Italian Fertilizer. Am. Fertilizer, vol. 51, no. 11, Nov. 22, 1919, pp. 58-59. Phosphorite is ground finely and mixed with 6 per cent of powder made up principally of oblomite, sulphate of sodium and carbonate of sodium, and is then heated in furnace to about 700 deg. cent; finally, while still hot, mass is hydrated with fine spray of water so as to add about 8 kg. of water per quintal.

Value of Minnesota Peat, Henry H. Hindwhaw. Jl. Am. Peat Soc., vol. 12, no. 4, Oct. 1919, pp. 194-198. As fertilizer element.

FIELD COILS

A Direct Method of Calculating Shunt Field Coils Having Two Bages of Wire, R. G. Jakeman. Elecn., vol. 83, no. 2166, Nov. 21, 1919, pp. 557-578, 1 fig. Fornulæ expressing ratio between winding depths of two standard gages, both in case larger gage is wound first and one smaller gage is wound first.

FILING SYSTEMS

Some Thoughts on Filing Systems, Donald J. Baker. Coal Age, vol. 16, no. 19, Nov. 6, 1919, pp. 736-740, 7 figs. System employed at Bur. of Mines Station in Pittsburgh.

FIRE PROTECTION

CHEMICAL. Chemical Fire Protection for the Car-Storage Yard. Elec. Ry. Jl., vol. 54, no. 16, Oct. 18, 1919, pp. 753-754. Installation of Chicago Elevated which comprises ten cars with chemical apparatus including two 100-gal. operating tanks and a 500-gal. auxiliary supply tank particularly for use to extinguish fires where water mains are not available.

PRIVATE SERVICE. Report of Committee on Private Fire Protection Service. Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 679-770 and (discussion) pp. 770-784, 12 figs. Concerning manner of controlling fire service pipes where they enter buildings of private property, limit to be placed upon size of fire-service connections, means to prevent pollution of public water supply through private fire-protection service, and advisability of making charge for private fire-protection service and manner of determining this charge.

SAFETY. Industrial Safety—V. Sidney J. Williams. Power Plant Eng., vol. 23, no. 23, Dec. 1, 1919, pp. 1070-1071. Fire protection in relation to safety. Paper read before Schools for Safety Engrs.

See also Buildings, Fire Hazards; Coal Mines, Fire Prevention.

FIRE PUMPS

See Pumps, Fire.

FLAME COLORATION

Flame Reaction of Selenium and Tellurium, Harry B. Wieser and Allen Garrison. Chem. News, vol. 100, no. 3108, Nov. 7, 1919, pp. 214-217. Probabel causes of colorations produced in flames. (Concluded.)

FLOODS

Propagation of Floods and Their Forecast (Note sur la Propagation des Crues et leur prévision journalière), M. Pigeaud. Annales des Ponts et Chaussées, vol. 51, no. 4, July-Aug. 1919, pp. 29-57, 6 figs. Determining propagation in water course by Graeff sysstem, which is based on gaging graphs establishing at various points definite relation between amount of water passing per second and level to which it rises.

FLOTATION

OIL ACTION. Mechanical Treatment of Ores (Préparation mécanique des minerais), F. Bronckart. Revue Universelle des Mines, vol. 2, no. 2, June 1919, pp. 325-366, 5 figs. Description of flotation and of Murex method, which also outlines selective action of oil but is not a method of flotation.

OIL. Oil Furnaces in Manufacture of Steel (Emploi des fours à l'huile pour la fusion de l'acier), J. Lambot. Fonderie Moderne, vol. 12, no. 7, July 1919, pp. 146-148. Construction and operation of furnaces.
Safety Rules for Tar-Oil Furnaces (Sicherheitsvorschriften für Teeröfeurrungen). Zeitschrift des Bayerischen Revisions-Vereins, vol. 23, no. 17, Sept. 15, 1919, p. 139. Fourteen rules to avoid explosions.

ROSENHAIN. Use of a Modified Rosenhain Furnace for Thermal Analysis, H. Scott and J. R. Freeman, Jr. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 348, 1919, pp. 317-323, 5 figs. Description is given of thermal analysis furnace constructed on principle of Rosenhain's furnace, chief departures from his design being, (1) use of gravity-drive rate control and (2) introduction of sample through bottom and cold end of furnace. Advantages and faults of these modifications are mentioned.

TEMPERATURE MEASUREMENTS. Measuring Furnace Temperature, George K. Burgess. Iron Trade Rev., vol. 65, no. 19, Nov. 6, 1919, pp. 1248-1249. Solution of pyrometer problems is said to depend upon co-operation of steelmaker scientific man in research laboratory and instrument maker.

WASTE-HEAT UTILIZATION. Using Waste Heat from Industrial Furnaces—I. Metal Worker, Plumber and Steam Fitter, vol. 92, no. 15, Oct. 10, 1919, pp. 427-428, 2 figs. It is said that waste of heat can be stopped, expense of waste saved and increased service enjoyed everywhere if local heating engineer makes non-competitive business for himself by examining plants in his vicinity. (To be continued.)

GAGES

BRASS GOODS. Gauges and Standards for Manufacturing Brass Goods, P. W. Blair. Metal Indus., vol. 17, no. 10, Oct. 1919, pp. 460-462, 7 figs. Comparison of standards proposed by various scientific organizations.

HOLE LIMITS. Limits for Gauges for Holes. Engineer, vol. 128, no. 3331, Oct. 31, 1919, pp. 444-445. Summary of reasons in support of plus and minus hole limits.

INSPECTION. Use of Precision Balls for Accurate Measurements, R. L. Rankin. Machy. (Lond.), vol. 15, no. 374, Nov. 27, 1919, pp. 272-274, 7 figs. Attachments for machines and for taking direct measurements in inspection of gages. Practice of Gauge Section of Bur. of Standards.

MANUFACTURE. Elements of Gage Making—VII, C. A. Macready. Am. Mach., vol. 51, no. 23, Dec. 18, 1919, pp. 1035-1036, 7 figs. Points out errors caused by attaching gages temporarily to auxiliary pieces used to hold them while being machined.

SYSTEMS. The Use of Gauges in the Mechanical Field, E. C. Peck. Can. Machy., vol. 21, no. 23, Dec. 4, 1919, pp. 549-551. Origin of gages and description of principal systems in use.

GARBAGE DISPOSAL

Recovery of Valuable Constituents of Garbage, Samuel A. Greeley. Can. Engr., vol. 37, no. 22, Nov. 27, 1919, pp. 495-498. Summary of various methods of disposal of municipal wastes, including hog-feeding, incineration, sorting, reduction, alcohol production, etc. Paper read before Am. Soc. for Municipal Improvement.
Recent Practice in Garbage Disposal by Feeding to Pigs. Eng. & Contracting, vol. 52, no. 24, Dec. 10, 1919, pp. 672-673. Committee report submitted at convention of Am. Public Health Assn.
Pig Feeding for Disposal of Garbage, F. S. Besson. Mun. Jl. & Public Works, vol. 47, no. 21, Nov. 22, 1919, pp. 306-309, 4 figs. Results obtained at experimental farm operated by District of Columbia, and conclusions therefrom.

GAS ANALYSIS

An Improved Orsat Apparatus for Gas Analysis, G. W. Jones and F. R. Neumeister. Chem. & Metallurgical Eng., vol. 21, no. 14, Dec. 10-17, 1919, pp. 734-736, 4 figs. Apparatus used by Bureau of Mines.

GAS APPLIANCES

Industrial Fuel Committee Report of Sub-Committee on Standard Performance Specifications for Gas Appliances, I. Lundgaard. Am. Gas Assn. Monthly, vol. 1, nos. 11-12, Nov.-Dec. 1919, pp. 627-633, 6 figs. Tentative proposal for standard specifications for oven furnaces and instruments for testing furnaces.

GAS ENGINES

DEVELOPMENT. The Development and Use of High-Power Gas Engines, Walter Crooke and John Lyon Ewan. Iron & Coal Trades Rev., vol. 99 and 100, nos. 2697 2698 and 2899, Nov. 7, 14 and 21, 1919, pp. 590-598, 623-625, and 659-661, 14 figs. Design features of four-stroke, horizontal, double-acting tandem arrangement. Tests with non-recovery producer gas on 2-cycle single-acting engines; curves showing variation of consumption of heat units, mechanical efficiency and overall efficiency load for gas engines running on Mond recovery producer plant.

KNOCKING. Knocking in Gas Engines, Mark Meredith. Gas Engine, vol. 21, no. 12, Dec. 1919, pp. 385-386. Causes which develop knocking. Instances quoted where, after numerous investigations, knocking was found to be due to slackness in flywheel.

HEAT CONSUMPTION. Gas Machines (Gasmaschinen), Rudolph Schick. Kraft und Betrieb, vol. 3, no. 11, Sept. 1, 1919, pp. 129-131. Comparative calculations of heat consumption of steam engine and gas engine. Utilization of furnace and coke oven gases is discussed and gasification of fuels is described.

GAS FLOW

Three-dimensional Flow of Gases (Mehrdimensionale Strömung von Gasen), Gustav Flugel. Zeitschrift für das gesamte Turbinenwesen, vol. 16, no. 18, June 30, 1919, pp. 178-180, 2 figs. Stationary axial flow in a diaphragm and stationary rotating axial flow in a rotor are described. (Concluded.)

GAS MAINS

Regulation for High and Low Pressure Mains, Geo. T. Macbeth. Gas Age, vol. 44, no. 10, Nov. 15, 1919, pp. 443-445, 3 figs. Experience in regulating pressures from transmission or pumping mains into distribution mains.

GAS MANUFACTURE

Determination of the Amounts of Tar and Gas and the Heat Value of Gas in Gasification (Ueber die Ermittlung der Teerund Gasmenge, sowle des Gasheizwertes dei Vergasungen), Deinlein. Zeitschrift des Bayerischen Revisions-Vereins, vol. 23, no. 16, Aug. 31, 1919, pp. 128-130. Discussing amount of tar, composition of coal and tar, amount of gas and heat value.
Inert Products in Coal Gas. Times Eng. Supp., no. 537, July 1919, p. 224. Origin and methods of avoiding.
Rational Use of Coal for Power and Heat, John Blizard. Can. Min. Inst. Bul., no. 92, Dec. 1919, pp. 1214-1221. Possibilities of carbonizing or complete gasifying coal, supplying consumers with gas and coke instead of raw coal.
Process in Coal Carbonization since 1916, J. A. Brown. Gas Age, vol. 44, no. 11, Dec. 1, 1919, pp. 475-477. General report of Carbonization of Am. Gas Assn. and special reports on installations.

GAS PRODUCERS

Home-Made Gas Producers Increase Lime Burned Per Unit of Fuel 50 per cent. Rock Products, vol. 22, no. 23, Nov. 8, 1919, pp. 37-40, 12 figs. Experience of company after replacing coal-fired furnaces with semi-gas producers.
Operation of a Gas Producer, J. S. McClimon. Chem. & Metallurgical Eng., vol. 21, no. 12, Nov. 12 and 19, 1919, pp. 632-635, 1 fig. Suggestions in regard to various details of operation.

GAS RETORTS

Heavy Duty Through Retort Operation in St. Louis, J. L. Eigenbrot. Gas Age, vol. 44, no. 9, Nov. 1, 1919, pp. 395-396, 2 figs. Handling horizontal through retorts with heavy duty Debrouwer chargers and dischargers.
Practical Hints on Retort House Operation, Carl B. Wyckoff. Gas Age, vol. 44, no. 9, Nov. 1, 1919, pp. 389-392, 1 fig. Concerning introduction of primary air into bench, arrangement of secondary air ports, form of steam super-heater, temperature to maintain in retort and making Orsat test. (Concluded.)
Steaming Horizontals, R. J. Rew. Gas World, vol. 71, no. 1834, Sept. 13, 1919, pp. 201-202, 1 fig. Manner of proceeding. Advantages of short period steaming.

GAS WAREFARE

Gas In Defense, Amos A. Fries. Nat. Service & Internat. Millitary Digest, vol. 6, no. 5, Nov. 1919, pp. 273-277, 5 figs. Development of gas mash, specially in America, and comparison of principal types constructed by various belligerants.

GASES

BSORPTION. The Absorption of Gases at Low and Moderate concentrations, I, II & III, A. M. Williams. Proc. Roy. Soc., vol. 96, no. A-677, Nov. 1, 1919, pp. 287-311, 6 figs. Theoretical form of absorption isostere is found to be $\log a/c = B + A/T$ where B and A are functions of a only. Part III—Relationship among constants was found to be in good agreement with theory based on existence of thing surface layer.

HEAT-VALUE INDICATOR. A New Heat Value Indicator for Gasworks Use, Edward J. Brady. Gas World, vol. 71, no. 1844, Nov. 22, 1919, pp. 410-412, 8 figs. Apparatus designed for study of flame characteristics.

IGNITION BY HOT WIRE. The Igition of Gases by Hot Wires, W. M. Thornton. Lond. Edinburgh, and Dublin Phil. Mag., vol. 38, no. 227, Nov. 1919, pp. 613-633, 9 figs. Article deals with problem of ignition by hot wires, such as may occurr in coal mines, battery rooms or in manufacturing processes where combustible gas is set free.

OCCLUDED. The Influence of Hydrogen Sulphide on the Occlusion of Hydrogen by Palladium, Edward Bradford Maxted. Jl. Chem. Soc., vols. 115 and 116, no. 683, Sept. 1919, pp. 1050-1055, 1 fig. Hydrogen-occluding power of oxygen-free palladium-black was measured before and after treatment with hydrogen of sulphide. Data are presented relating to absorption of hydrogen sulphide by palladium and stability of absorption compound.

GEARS

LUBRICATION. The Lubrication of Worm Gear, Motor Traction, vol. 29, no. 770, Dec. 3, 1919, pp. 543-545. Also Autocar, vol. 43, no. 1258, Nov. 29, 1919, pp. 1016-1018, 2 figs. Tests made at National Physical Laboratory for determining lubricating qualities of various classes of oil.

MANUFACTURE. Gear Makers Adopt Standard Contract. Automobile Industries, vol. 41, no. 17, Oct. 23, 1919, pp. 830-831 and 833. Form drawn by Committee of Am. Gear Manufacturers' Assn.
Gear Manufacture—Types and Materials—II, Raw Material, vol. 1, no. 8, Nov. 1919, pp. 377-384, 18 figs. Materials for noiseless operation of gears.

[illegible]

GOVERNORS

[illegible]

GRAVITATION EXPERIMENTS

[illegible]

[illegible] in toolrooms with a view to have them interfere as little as possible with operation of [illegible]

[illegible]

Scandinavia. Heating and Ventilating of Workshops in Scandinavia (Litt om opvarmning av verksteden), O. Gruner Loken and Henrik Ovenberg. Teknisk Ukelblad, vol. 66, no. 44, Oct. 3, 1919, pp. 514-515 and 516, 1 fig. Air heating nd ventilating arrangement of building 690 ft. long by 59 ft. wide, containing four stories each 13 ft. high. It is said that ventilation and heating of workshops by warm air is more effective than heating by radiators or stoves and that it results in increased production from workman.

St. Paul Public Library. St. Paul Public Library Heating and Ventilating, C. S. Tompkins. Power Plant Eng., vol. 23, no. 24, Dec. 15, 1919, pp. 1093-1097, 7 figs. Fans are designed to make six changes of air per hour.

HIGHWAYS

See Roads; Pavements.

HOUSING, INDUSTRIAL

Houses by the Bucketful, Floyd Hamilton Hazard. Sci. Am., vol. 121, no. 23, Dec. 6, 1919, p. 553, 1 fig. One-piece concrete house that is said to be built in ten days.

Industrial Housing at Walkerville, Ont., Norman C. McEachren and Wm. H. Martin. Contract Rec., vol. 33, no. 51, Dec. 17, 1919, pp. 1154-1158, 7 figs. Constructional details of houses built.

Industrial Housing Development, Harold R. Watson. Can. Manufacturer, vol. 39, no. 12, Dec. 1919, pp. 53-57, 7 figs. Illustrating recent work under Housing Act.

Some Sidelights on Construction Work, N. L. Rea. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 913-917, 9 figs. Concerning specially living conditions for men engaged in transportation of materials and questions of assembly and erection as influenced by local conditions.

The Workman's Home—I, Leslie H. Allen. Sci. Am. Supp., vol. 88, no. 2289, Dec. 6, 1919, pp. 330-331. Its influence upon production in the factory and labor turnover. Paper read before Am. Soc. Mech. Engrs.

HYDRAULIC COMPUTATIONS

Another Diagram for Solving the Manning Hydraulic Formula, R. D. Goodrich. Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 648-649, 1 fig. Prepared to facilitate hydraulic computations involved in investigation of river and flood channels preliminary to design of regulation of river system.

HYDRAULIC TURBINES

A New Type of Hydraulic-Turbine Runner, Forrest Nagler. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 921-925, 7 figs. Design is based on straight radial blade, which is said to offer abslute minimum of wetted surface and of bending moment on root of blade. From direction of flow it is characterized as pure Jonval type. Writer expects that this water-wheel runner, because of its simplicity and inexpensiveness, will supersede mixed-flow or Francis type.

Features of Design in Large Hydraulic Turbines, F. H. Rogers. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 849-852, 5 figs. Relative importance of losses occurring in penstock runner and draft tube at various heads and specific speeds is discussed and attention is called to conditions under which certain of these losses become sufficiently important to warrant exercising considerable effort to minimize them.

HYDROLYSIS

Diastatic Inversion of Saccharose; Influence of Products of Reaction on Velocity of Hydrolysis (Sur l'inversion diastasique du saccharose; Influence des produits de la réaction sur la vitesse d'hydrolyse), H. Collin and A. Chaudun. Comptes Rendus des séances de l'Académie des Sciences, vol. 169, no. 19, Nov. 10, 1919, pp. 849-852. Experiments are said to have established that velocity of hydrolysis is function of first degree of fluidity of solutions and retardation of diastatic inversion of saccharose, due to presence of glucose, is attributed to increase of viscosity of solution.

HYDRODYNAMICS

Movement of a Solid in an Indefinite Liquid (Sur le mouvement d'un solide dans un liquide indéfini), G. Kolessoff. Comptes rendus des séances de l'Académie des Sciences, vol. 160, no. 16, Oct. 20, 1919, pp. 685-687. Cases of integration of general equations of movement.

HYDROELECTRIC PLANTS

Chile. New Hydroelectric Power Plant at Rio Pangal, Chile, Hugh L. Cooper. Elec. Rev. (Chicago), vol. 75, no. 21, Nov. 22, 1919, pp. 853-856, 6 figs.; also in Eng. World, vol. 15, no. 12, Dec. 15, 1919, pp. 29-32, 6 figs. Construction feature of diversion dam, seven-mile pipe line, penstocks and waterwheels for new plant built by Braden Copper Co. to supply power to its works at Sewell, Chile. Plant capacity will be 20,000 kv. a. available at low-tension busbars of generating station.

Industrial Use. Hydro-Electric Power and Its Use for Industrial Purposes, Eric A. Lof. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 942-946, 4 figs. It is urged that development of our water power resources be encouraged by enactment of just laws governing their use and construction of large economical supplementary steam plants at "strategic" points.

Keokuk. The Hydro-Electric Plant at Keokuk, Ia. Power House, vol. 12, no. 19, Nov. 20, 1919, pp. 509-510, 4 figs. Capacity is 150,000 hp. Dam, power house, lock, dry dock, sea-wall and ice fender are all one concrete monolith, with total linear measurement of 13,185 ft.

Niagara Falls. New Hydroelectric Developments at Niagara—1. Engineer, vol. 128, no. 3331 and 3332, Oct. 31 and Nov. 7, 1919, pp. 427-429 and 454-455, 7 figs. Concerning plant operating under head of 305 ft. and developing 300,000 hp. with provision for eventual increase to nearly 1,000,000 hp.

Construction Progress on Canadian Niagara Power Project. Eng. News-Rec., vol. 83, no. 21, Dec. 11, and 18, 1919, pp. 1010-1012, 7 figs. Excavation under way on Queenston-Chippewa Canal which will develop most of head between two great lakes.

See also Water Power.

HYDROGEN OVERVOLTAGE

Hydrogen Overvoltage, II. Applications of Its Variation with Pressure to Reduction, Metal Solution and Deposition, D. A. McInnes and A. W. Contieri. Jl. Am. Chem. Soc., vol. 41, no. 12, Dec. 1919, pp. 2013-2019, 3 figs. Increase of hydrogen over voltage with a diminished pressure is shown to follow, in nearly quantitative manner, from theory advanced by MacInnes and Adler.

ICE

Plants. Electrically Driven Raw Water Ice Plants, A. M. Jones. Ice and Refrigeration, vol. 57, no. 6, Dec. 1919, pp. 260-261. Reasons for tendency to introduce electric drive.

Low-Pressure Absorption Ice Plant, C. M. Vaden. Ice and Refrigeration, vol. 57, no. 6, Dec. 1919, pp. 290-291. Discussion of conditions which effect economy of plant.

Saving Labor Costs, Van R. H. Greene. Ice and Refrigeration, vol. 57, no. 6, Dec. 1919, pp. 251-252. Examples of labor saving in ice tank room, daily ice storage room and engine and boiler rooms of refrigerating plant.

Storage. Interior Finishes of Ice Storages, Junius H. Stone. Ice and Refrigeration, vol. 57, no. 6, Dec. 1919, pp. 254-256. Relative values of wood, cement and asphalt as storage house finishes.

Transportation. Transportation of Ice, Nat Duke. Ice & Refrigeration, vol. 57, no. 5, Nov. 1919, pp. 200-201. Difficulties encountered last summer by railroad administration in transporting ice for conservation of food particularly into New York City. Paper read before Natural Ice Assn. of Am.

IGNITION

Coil Energization. Energization of the Ignition Coil, Harry F. Geist. Automotive Industries, vol. 41, no. 17, Oct. 23, 1919, pp. 824-828, 5 figs. Calculation of time required for ignition coil to build up to different fractions of its maximum strength. Discussion of energy involved in spark and efficiency of sparking systems under different conditions.

Practice. Recent Ignition Practice in Great Britain, F. H. Hutton. Automotive Industries, vol. 41, no. 22, Nov. 27, 1919, pp. 1052-1055, 8 figs. Development of magneto industry under war necessity.

Spark Plug. The B-G Spark Plug. Aerial Age, vol. 10, no. 7, Nov. 10 and 17, 1919, p. 247, 2 figs. Design possesses self-cleaning feature which is obtained by high pressure air blast directed over sparking points on all four strokes of engine cycle.

Subsidiary Gap. The Subsidiary Gap as a Means for Improving Ignition, W. S. Gorton. Gas Engine, vol. 21, no. 12, Dec. 1919, pp. 400-406, 1 fig. Report prepared at Bureau of Standards for National Advisory Committee for Aeronautics. It is concluded that series gap may be used as remedy for considerable part of trouble due to fouling of blocks which is met with in practice.

Tests. The Relation of Time of Ignition to the Economy of the Gasoline Engine, J. P. Calderwood and A. J. Mack. Gas Engine, vol. 21, no. 12, Dec. 1919, pp. 390-391, 2 figs. Results of tests made at Engineering Experiment Station of Kansas State Agricultural College. It was concluded that (1) with other conditions constant, economical spark advance to be carried depends on fuel mixture and (2) with richer mixture and higher spark advance, maximum delivered hp. will be greater than can be secured with leaner mixtures and smaller spark advance.

IMPACT

Remarks on the Problem of Impact, N. W. Akinoff. Jl. Am. Soc. Naval Engrs., vol. 31, no. 4, Nov. 1919, pp. 849-856, 4 figs. Popular exposition of difference in concepts of force, work and power.

INCLINOMETER

Determination of Inclination by Means of Induction Inclinometer (Ueber die Bestimmung der Inklination mit dem Induktions—Inklinator), W. Uljanin. Terrestrial Magnetism and Atmospheric Electricity, vol. 24, no. 3, Sept. 1919, pp. 113-117, 1 fig. New method for determining angle of inclination said to be superior to Wild's method, which is most frequently used at present.

INDICATOR DIAGRAMS

The Steam Engine Indicator Diagram—II. Power Plant Eng., vol. 23, no. 24, Dec. 15, 1919, pp. 1104-1106, 18 figs. Analysis of expension, release, exhaust and compression lines.

INDUCTANCE COILS

Simplified Inductance Calculations, with Special Reference to Thick Coils, Philip R. Coursey. Wireless World, vol. 7, no. 79. Oct. 1919, pp. 380-385, 3 figs. Plots for determining values of various coefficients and formulæ and thus simplify cal ulations. Abstract of paper read before Phys. Soc. of Lond.

High-Tension Lines. Changing Insulators on Live Lines. Elec. World, vol. 74, no. 19, Nov. 29 and Dec. 6, 1919, pp. 992-994, 12 figs. Insulating frame used to raise and hold high-tension line conductors above top of pole so that insulators and cross arms can be replaced with ease. Lifting tools and other devices aid in tying wires to insulators.

Elimination of Insulator Failures, E. J. Kallevang. Elec. World, vol. 74, no. 20, Dec. 13, 1919, pp. 1063-1064. Results of tests and experience with insulators on transmission lines in Wisconsin.

Testing. Apparatus for Testing Insulation (Insolationsprüfer). Elektrotechnischer Anzeiger, vol. 36, no. 77, July 27, 1919, pp. 357-358, 4 figs. Illustrating various types of testing apparatus.

IRRIGATION

See Tunnels.

JAPANNING

Electric Japanning Gives Extreme Satisfaction. Elec. World, vol. 74, no. 17, Oct. 25, Nov. 1 and 8, 1919, pp. 876-879, 5 figs. Method of operating and comparison with gas kiln for baking japan.

JUTE

The Preparation and Dyeing of Jute. Textile World Jl., vol. 56, no. 18, Dec. 6, 1919, pp. 70, 75 and 107. Treatment of material. Classes of colors employed.

KILN DRYING

Inadequacy of Visual Inspection in Kiln-Drying, H. D. Tiemann. Aviation, vol. 7, no. 8, Nov. 15, 1919, pp. 352-354. Experimental work at Forest Products Laboratory of U. S. Forest Service, Madison, Wis.

See also Drying.

KILNS

How a Ceramic Kiln May be Insulated, P. A. Bocek. Brick and Clay Rec., vol. 55, no. 12, Dec.2, 1919,pp. 1044-1047, 5 figs. Illustrating round down-draft kiln which was insulated by covering crown partly with platting and partly with insulation bricks.

LABOR

Employer's Duty. The Employer's Duty in Dealing with Labor, Harry Tipper. Automotive Industries, vol. 41, no. 17, Oct. 23, 1919, pp. 832-833. Writer points out futility of general settlements of labor difficulties. He observes that employes and employers of individual factories must work, one with the other, to oviate broken contracts and excessive demands from labor and to assure justice from organization head.

Federal Incorporation of Organizations. Industrial Stability by Federal Incorporation of Trade and Labor Associations, John Stephen Sewell. Manufacturers Rec., vol. 76, no. 22, Nov. 27, 1919, pp. 113-117. Suggests plan which involves enactment of legislation to stabilize relations between capital and labor in interest of general good. Representations of capital and labor in consultation with legislators are to establish scale of wages and prices, which having been fixed makes strikes, boycotts, etc., punishable as conspiracies "without depriving the individual workman of his right to quit or change his employment, nor the individual employer of his right to discharge or employ individual workmen."

Hours of Work. Recent Application of the 8-Hour Day and the 44-Hour Week. Monthly Labor Review, vol. 9, no. 5, Nov. 1919, pp. 194-199. Statsitical figures give number of establishments reported as adopting 8-hour day in 1915, 1916, 1917, 1918, and first 6 months of 1919.

See also Industrial Relations; Women Workers.

LADLE HANGERS

The Breaking of Ladle Hangers (Ueber den Bruch von Giesspfannengehängen). Stahl u. Eisen, vol. 39, no. 44, Oct. 30, 1919, pp. 1309-1315 and (discussion), pp. 1315-1318, 8 figs. Discussion of causes and suggested remedies. Writer attributes breaking to variation in temperature and lack of elasticity in hanger material. (Concluded.)

LATHES

Turret Lathe Practice—I, II, and III. Machy. (Lond.), vol. 15, no. 371, 373 and 374, Nov. 6, 20 and 27, 1919, pp. 174-180, 228-231 and 261-269, 60 figs. Illustrating practice at English work shops. Tooling equipment for auto truck wheels. Tractor axle housings, wheel hubs and motor frames.

LEAD MEATLLURGY

Losses in Dry Lead and Zinc Processes, K. Friedrich. Metal Industry, vol. 15, no. 20, Nov. 14, 1919, pp. 405-407. Points out possible fields of scientific investigation. Translated from Metall und Erz.

LIBERTY MOTORS

How Ford Built Liberty Motors, Fred H. Colvin. Am. Mach., vol. 51, no. 23, Dec. 18, 1919, pp. 1037-1041, 24 figs. Notes specially assembling operations.

LIGHT

Absorption. Absorption of Light by Gases (Contribution à l'étude de l'absorption de la lumière par les gaz), G. Ribaud. Annales de Physique, vol. 12, no. 9, Sept.-Oct. 1919, pp. 107-226, 22 figs. Study of continuous absorption of brome vapor in ultraviolet under various conditions of vapor and at temperatures up to 620 deg. C.

Diffusion. Diffusion of Light by Rain, Cloud or Fog, A. Mallock. Proc. Roy. Soc., vol. 96, no. A-677, Nov. 1, 1919, pp. 267-272. Data showing effect of shower or cloud in obscuring direct light of distant source.

Diffused Reflexion and Transmission of Light, A. P. Trotter. Illuminating Engr., vol. 12, no. 9, Sept. 1919, pp. 243-267, 54 figs. It is shown how specular reflexion can be separated from diffused reflexion by drawing internal osculating circle, instead of circumscribing circle of Bouguer and Blondel.

Refraction. The Scattering of Light in the Refractive Media of the Eye, C. V. Raman. Lond., Edinburgh, and Dublin Phil. Mag., vol. 38, no. 227, Nov. 1919, pp 568-572. Examination of Helmholtz explanation of luminous streamers observed when small and intensely luminous source of light is viewed directly by eye against dark ground.

On Terrestrial Refraction, A. B. McLeod. Lond., Edinburgh, and Dublin Phil. Mag., vol. 38, no. 227, Nov. 1919, pp. 546-568, 7 figs. Refraction of light rays of various length and sinus distances by atmosphere is dealt with and errors in Chauvenet dip range formulæ are considered. Report communicated to Advisory Committee for Aeronautics, England.

LIGHTHOUSES

Repairing a Lighthouse, James H. Deppeler. Jl. Am. Welding Soc., vol. 1, no. 1, Oct. 1919, pp. 15-17, 3 figs. Bulk of ice piling on one side caused cast iron columns, which supported lighthouse superstructure, to bend through an angle of about 20 deg. and break. Column were welded with thermit steel.

LIGHTING

Shops. Good Lighting Aids Production, Ward Morrison. Iron Trade Rev., vol. 65, no. 25, Dec. 18, 1919, pp. 1637-1641, 5 figs. Tests conducted to find relation of lighting and production are said to have shown that substitution of proper lamps and reflectors for antiquated equipment increased output by from 2 to 35 per cent. Paper read before Soc. of Indus. Engrs.

Shop Protective Lighting, C. E. Clewell. Am. Mach., vol. 51, no. 18, Oct. 30,1919, pp. 785-788, 7 figs. Discusses question of lighting yards and building fronts as protective measure, and advantages of night lighting for yard areas, loading platforms and similar places.

Lighting Fixtures for Shop Illumination, C. E. Clewell. Am. Mach., vol. 51, no. 16, Oct. 16, 1919, pp. 727-731, 14 figs. Features for minimizing glare of Mazda gas-filled lamps.

Street. Development of the Chicago Street-Lighting System, William G. Keith. Eng. World, vol. 15, no. 12, Dec. 15, 1919, pp. 39-41. Installation and operation of series group systems. Paper read before Internat. Assn. of Mun. Elecns.

LIGHTNING

Lightning—II. The Effect of Lightning Voltages on Arrester Gaps, Insulators and Bushings on Transmission Lines, F. W. Peek. Jr. Gen Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 900-906, 14 figs. Writer calls attention to necessity to produce lightning arresters of very high speed if steep wave front impulses are to be removed before damage is done to apparatus, bushings and other equipment. He then proceeds with analysis of relative speeds of different forms of gaps and shows variation in discharge value for and gaps under 60-cycle and lightning voltages and under wet and dry conditions.

LIGNITE

See Fuels.

LIME

The Hydrated Lime Plant at Genoa, Ohio, of the U. S. Gypsum Company, Curtis F. Columbia. Rock Products, vol. 22, no. 24, Nov. 22, 1919, pp. 30-32, 5 figs. Capacity of plant is 200 tons. Operation of Schaffer hydrator is illustrated.

LIMESTONE

Limestone for Newcastle Steel Works, Commonwealth Engr., vol. 6, no. 9, Apr. 1, 1919, pp. 274-280, 8 figs. Description of quarrying, crushing, handling and storage in Australian works. Face worked is 300 ft. long with average height of 30 ft. and maximum height of 50 ft.

LIQUID FILMS

See Soap Bubbles.

LOAD DISPATCHING

See Central Stations; Load Dispatching.

LOCKS

The Cylinder Lock—III, Ellsworth Sheldon. Am. Mach., vol. 51, no. 22, Dec. 11, 1919, pp. 979-983, 5 figs. Master keying system.

LOCOMOTIVES

Boilers. Boilers for 2-8-0 Goods Engines, Great Central R. Ry. Engr., vol. 40, no. 479, Dec. 1919, pp. 258-262, 5 figs. Boilers are fitted with superheaters of 28 elements and made for working pressure of 180 lbs. per sq. inch.

DEOXIDIZERS. Magnesium as a Scavenger of Metals, J. T. Rooney. Metal Industry, vol. 17, no. 12, Dec. 1919, p. 511. Advantage of magnesium over other deoxidizers.

EXPANSION. Stretched Wire Apparatus for Measuring Thermal Expansions, Arthur W. Gray. Chem. & Metallurgical Eng., vol. 21, no. 13, Nov. 26-Dec. 3, 1919, pp. 667-671, 6 figs. Equipment used at Bureau of Standards for determining expansivity of material in form of bars.

Influence of Length of Bar on Elongation (Einfluss der Stablänge auf die Dehnung), M. Rudeloff. Forschungsarbeiten auf dem Gebiete des Ingenieurwesens, no. 215, 1919, 80 pp., 27 figs. Treatise on proportion between extensions of tensile strength tests having length of 1 = 5d and 1 = 10d, respectively, but otherwise with same dimensions and of same material.

MELTING. Waste in Melting of Alloys, E. H. Schulz and H. Winkler. Metal Industry (Lond.), vol. 15, no. 13, Sept. 26, 1919, pp. 241-242. Also Metal Industry (N. Y.), vol. 7, no. 12, Dec. 1919, pp. 521-522. Experimental meltings carried out (1) with 33 per cent of new metal and 67 per cent of old brass scraps and turnings and (2) 80 per cent scraps and 20 per cent of new copper and zinc. It was concluded that melting in hearth furnace with addition of 60 to 67 per cent of scrap of somewhat poor quality will result in loss of 7.5 per cent of charge. Translated from Metall. und Ers.

MOULDS. The Practical Use of Denseners and Permanent Moulds, E. H. Broughall. Foundry Trade Jl., vol. 21, no. 213, Sept. 1919, pp. 624-629, 7 figs. Concerning use of ordinary denseners for equalizing rate of cooling between thick and thin portion of casting and use of permanent moulds for production of sound castings. Paper read before Birmingham Branch of Inst. of British Foundrymen.

POURING. Pouring Lead, Zinc and White Metal Alloys. Metal Industry, vol. 15, no. 12, Sept. 19, 1919, pp. 221-222, 7 figs. Device in which plug is mounted outside pot but close up against it is considered better arrangement to mounting tapping plug inside pot. Machine for rapid casting metal bars is illustrated.

SEASON CRACKING. Season Cracking. W. H. Hatfield. Engineering, vol. 108, no. 2805, Oct. 3, 1919, pp. 456-460, 20 figs. Results of investigations in which writers endeavored particularly to determine effect of cold work and internal stresses introduced thereby into metals, whether non-ferrous or ferrous. Photomicrographs are presented. Paper read before Inst. of Metals.

SOLIDIFICATION. The Solidification of Metals from the Liquid State, Cecil H. Desch. Engineering, vol. 108, no. 2810, Nov. 7, 1919, pp. 612-615, 9 figs. Concerning form of crystal grains and their relation to form structures and solidification of liquids exhibiting cellular convection and crystal grains.

STRAINS IN ROLLING. Investigation of Strains in Rolling of Metal. Alfred Musso. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 937-938, 3 figs. Experimental investigation to determine most convenient length and width of piece of metal to be rolled in order to produce finished article of certain definite dimensions so that waste of material may be reduced to minimum.

METEOROLOGY

The Supply of Meteorological Information, H. G. Lyons. Aviation, vol. 7, no. 8, Nov. 15, 1919, pp. 346-348, 2 figs. Methods of keeping meteorological data at French Meteorological Office.

Normal Temperatures (Daily): Are Irregularities in the Annual March of Temperature Persistent? Charles F. Marvin. Monthly Weather Rev., vol. 47, no. 8, Aug. 1919, pp. 544-555, 5 figs. Based on records from widely scattered weather bureau stations, covering period 1871-1916.

See also Aeronautics, Weather Conditions in Flight.

MICA

On the Colors of the Striæ in Mica, and the Radiation from Laminar Diffracting Boundaries, Phanindra Nath Ghosh. Proc. Roy. Soc., vol. 96, no. A-677, Nov. 1, 1919, pp. 257-266. Striæ are said to have been shown by examination of Haidinger's rings in mica to be boundaries bewteen parts having slightly different thicknesses.

MICRO-ORGANISMS

The Employment of Micro-Organisms in the Service of Industrial Chemistry, A. Chaston Chapman. Chem. News, vol. 119, no. 3109, Nov. 14, 1919, pp. 223-226. Plea for National Institute of Industrial Micro Biology. Paper read before Gen. Meeting of Soc. of Chem. Indus., Lond.

MICROPHONES

Multiple-Contact Microphone (Sur un microphone à alvéoles multiples). A. Soret and R. Conespel. Comptes Rendus des Séances de l'Académie des Sciences, vol. 169, no. 9, Sept. 1, 1919, pp. 431-432. Microphone with 21-mm. carbon paste having 220 interstics each contining one granule of carbon is reported to have shown high sensibility and to have transmitted sound with extreme purity.

MICROPHOTOMETERS

Construction and Operation of New Microphotometer (Description et emploi d'un nouveau microphotomètre), Ch. Fabry and H. Buisson. Journal de Physique théorique et appliquée, vol. 9, no. 5, Feb. 1919, pp. 37-46, 3 figs. Designed with a view to securing uniformity of photometric plates.

MILLING CUTTERS

The Milling of Side Relief on Side and Face Milling Cutters. Machy. (Lond.), vol. 15, no. 373, Nov. 20, 1919, pp. 235-236, 6 figs. Describing method of setting and relieving cutter; diagram illustrating construction to obtain correct relieving.

Milling Cutter for Splined Transmission Shaft, W. Richards. Machy. (Lond.), vol. 15, no. 372, Nov. 13, 1919, pp. 218-221, 9 figs. How to make milling cutter to cut within close limits 4 splines in transmission shaft.

MILLING MACHINES

The Cincinnati M-Type Milling Machine, John H. Van Deventer. Am. Mach., vol. 51, no. 17, Oct. 23, 1919, pp. 749-753, 12 figs. Made in two sizes and in three forms—plain. universal and vertical—all of constant-speed type.

Ingersoll Circular Table Continuous Milling Machine. J. V. Hunter. Am. Mach., vol. 51, no. 21, Nov. 27 and Dec. 4, 1919, pp. 915-918, 6 figs. Types of continuous milling machines designed for maximum production with minimum labor.

MINES

ACCIDENTS. Mine Accidents, Albert H. Fay. Eng. & Min. Jl., vol. 108, no. 18, Nov. 1, 1919, pp. 726-729. Statistics of accidents due to employes not understanding English.

Mine Accidents: English Speaking vs. Non-English Speaking Employes, Albert H. Fay. Coal Age. vol. 16, no. 20, Nov. 13 and 20, 1919, pp. 777-782. Statistical figures. Paper presented before Eighth Annual Safety Congress.

EXPLOSIONS. Report of Some of the Most Interesting Explosions in Prussian Anthracite Mines During 1918 (Mittellungen über einige der bemerkenswertesten Explosionen beim preussischen Steinkonlen bergbau im jahre 1918). Zeitschrift fur das Berg- Hütten-u. Salinenwesen im preusischen Staate, vol. 67, no. 2, 1919, pp. 100-131, 18 figs. Report on causes and damages resulting from ten different explosions, based on official figures.

HOISTS. Progress in the Electrification of Mine Hoists, R. S. Sage. Coal Age, vol. 16, no. 20, Nov. 13 and 20, 1919, pp. 770-776, 11 figs. It is noted that electrification of mine hoists proceeded slowly for many years, chiefly because of their intermittent operation and high peak loads to which they were subject. Difficulties have been so successfully overcome, however, that at present over 85 per cent of new installations are electrically driven.

LOCOMOTIVES. *See Locomotives, Storage Battery.*

RESCUE APPARATUS. Effective Means of Using Rescue Apparatus in the Fighting of Mine Fires, J. T. Ryan. Coal Age, vol. 16, no. 19, Nov. 6, 1919, pp. 741-743. Organization and equipment of recue crews. Paper read before Min. Section of National Safety Congress.

See also Breathing Apparatus.

RESCUE TRAINING. Desirability of Standardizing Mine Rescue Training and a Plan Therefor, D. J. Parker. Coal Age, vol. 16, no. 17, Oct. 23, 1919, pp. 686-687. Principally because "thorough and systematic training are essential to insure safe and economic use of apparatus" and "such training can best be secured through standardization of training methods."

SURVEYING. Short Cuts in Mine Surveying—I and II, Douglas Waterman. Min. & Sci. Press, vol. 119, nos. 21 and 22, Nov. 22 and 29, 1919, pp. 749-752 and 773-779, 5 figs. Illustrating use of protractor and parallel-ruler in plotting survey made with Brunton compass, and manner of massing stadia measurements. (To be continued.)

MINERALS

Eighth List of New Mineral Names, L. J. Spencer. Mineralogical Mag., vol. 18, no. 87, Nov. 1919, pp. 373-390. Compiled from reports of scientific publications throughout the world; principal particulars of 106 minerals are given.

A New Mineral, Isomorphous with Trechmannite, from the Binn Valley, Switzerland, R. H. Solly. Mineralogical Mag., vol. 18, no. 87, Nov. 1919, pp. 363-365. Description of specimen in which were three small round-shaped crystals, about the size of small shot, grown upon a prismatic crystal of sartorite.

MINERAL DEPOSITS

Tungsten, Cinnabar, Manganese, Molybdenum, and Tin Deposits of Idaho, D. C. Livingston and Francis A. Thomson. Bul. University of Idaho School of Mines, vol. 14, no. 2, Jan. 1919, 72 pp., 11 figs. With notes on the antimony deposits.

MINIMA SURFACES

Surfaces of Translation and Minima Surfaces in Curved Spaces (Surfaces de translation et surfaces minima dans les espaces courbes), E. Bompiam. Comptes Rendus des Seances de l'Académie des Sciences, vol. 169, no. 19, Nov. 10, 1919, pp. 840-843. Theorem concerning characteristic property of minima surfaces having isothermic network of asymptomic orthogonal lines.

MINING INDUSTRY

The Duty of the Mining Industry, George Otis Smith. Min. & Sci. Press, vol. 119, no. 22, Nov. 29, 1919, pp. 782-784. Emphasizes importance of increasing production of raw materials. Address delivered before Min. Congress.

MOLDING METHODS

Speed Marks Auto Parts Molding, D. M. Avey. Foundry, vol. 47, no. 20, Dec. 1, 1919, pp. 852-857, 13 figs. Methods of molding cylinder and crankcase bleok, transmission housings and cylinder heads, developed by Am. Foundry Co., Indianapolis.

ORE CONCENTRATION

A New Machine for Concentrating Minnesota Wash Ores, Edward W. Davis. Bul. University of Minnesota, vol. 22, no. 56, Dec. 16, 1919, 32 pp., 5 figs. It is concluded from tests that Dorr classifier equipped with submerged trommel will produce practically same results as are secured in standard log-washing plants

ORE DEPOSITS

Ore Deposits of Utah—I, II, B. S. Butler. Eng. & Min. Jl., vol. 108, nos. 15 and 16, Oct. 11 and 18, 1919, pp. 605-611 and 641-645, 11 figs. Oct. 11: Principal mining districts of State are described as being associated with occurrences of intrusive rocks, ore bodies occurring as replacement deposits in fissures. Oct. 18: Evidences presented to show that formation of large ore bodies were influenced by relation existing between interior and surface at period of solidification.

ORE UNLOADERS

Unique Ore Unloader for Lake Steamers. Mar. Eng. and Can. Merchant Service Guild Rev., vol. 9, no. 11, Nov. 1919, pp. 369-371, 4 figs.; also Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 735-737, 5 figs. W. S. M. automatic ore unloader. It consists of main frame work mounted on trucks which along runway rails. Two operators control unloading, weighing and delivery of ore.

ORGANIC COMPOUNDS

Commercial Possibilities in the Electrochemical Production of Organic Compounds, C. J. Tthatcher. Chem. & Metallurgical Eng., vol. 21, no. 13, Nov. 26-Dec. 3, 1919, pp. 663-666. Particularly study of conditions favoring economy in operation catalytic effect, diaphragms and suggestions in regard to effecting organic electrosyntheses.

OZONE

Electrical Production of Ozone and Its Industrial Applications. Elec. Rec., vol. 26, no. 5, Nov. 1919, pp. 268-270, 9 figs. Description of equipment used in generation of ozone. Uses of ozone.

OXY-ACETYLENE WELDING

Equipment. Autogenous Welding of Metals (La soudure autogène des métaux). Métallurgie, vol. 51, no. 48, Nov. 26, 1919, pp. 3254-3255, 1 fig. Connections of equipment for securing constant flow of acetylene at low pressure. (To be continued.)

Fireboxes. Boiler Repairs by Oxy-Acetylene Welding. Acetylene & Welding Jl., vol. 16, no. 193, Oct. 1919, pp. 190-192, 6 figs. Illustrating welding back and front plates of fireboxes and cracks in side sheets of fireboxes. (Continuation of serial.)

Heavy Forgings. Oxy-Acetylene's Possibilities in Heavy Welding, J. G. Hill. Can. Machy., vol. 21, no. 23, Dec. 4, 1919, pp. 560-561. Cases are cited such as welding section 18 in. by 40 in. of 70-ton frame of bull-dozer for piercing shelf forging. Paper read before Convention International Soc. Assn.

Pumping Station Equipment. Oxy-Acetylene Welding, J. H. Stoliker. Natural Gas & Gasoline Jl., vol. 13, no. 11, Nov. 1919, pp. 389-391. Experience with welding equipment at large pumping station located 25 miles from nearest repair shop.

Ship Construction. Oxy-Acetylene Welding in Hull Construction, Charles C. Phelps. Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 727-729, 6 figs. Parts of vessel which may be welded with the approval of principal ship classification societies in United States and Great Britain.

Ship Repair. The Use of Acetylene in Navy Yards, H. G. Knox. Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 720-727, 25 figs. Oxy-acetylene apparatus for welding and cutting is said to have proved indispensable in building and repairing of ships. Uses are illustrated and typical plan of an oxygen, hydrogen and acetylene generating plant for navy yard is given. Paper read before Int. Acetylene Assn.

Training Welders. Value of Oxy-Acetylene Welding Process, Alfred S. Kinsey. Metal Worker, Plumber and Steam Fitter, vol. 92, no. 19, Nov. 7, 1919, pp. 555-557. Points out training necessary to insure wider use and better services. Paper read before Internat. Acetylene Assn.

Tubing. Tube Welding by the Oxy-Acetylene Process, F. W. Smith. Am. Mach., vol. 51, no. 20, Nov. 13 and 20, 1919, pp. 845-848, 6 figs. Writer believes that reasons for rmarkably rapid growth of industry of tube welding are high quality and low cost of welded tubing.

PAPER

Composition. Graphic Analytical Method for Paper, Ignatius L. Gartland. Paper, vol. 25, no. 10, Nov. 12, 1919, pp. 15-19, 5 figs. Chart system of presenting analytical data concerning the composition of paper.

Estimating Percentages of Fibers in Papers, Roger C. Griffin. Paper, vol. 25, no. 9, Nov. 5, 1919, pp. 23-24. Count and estimation methods contrasted to advantage of latter.

The Estimation of Starch in Paper—II, Oliver Kamm and Frank H. Tendick. Paper, vol. 25, no. 9, Nov. 5, 1919, pp. 20-21. Analysis for dextrins in presence of beater starch.

Manufacture. How Paper is Formed on the Fourdrinier Wire. Paper, vol. 25, no. 11, Nov. 19, 1919, pp. 19-21, 2 figs. Influence of certain conditions as degree of upward or downward inclination of wire, height of damming behind slices, etc., on formation of sheet.

Paravane. The Paravane, Robert F. McKay. Engineering, vol. 108, no. 2803, Sept. 19, 1919, pp. 389-392, 8 figs. Paravane installations are illustrated and their utility emphasized.

PARAFFIN

Paraffin Wax and Its Manufacture, A. Campbell and W. J. Wilson. Jl. Inst. Petroleum Technologists, vol. 5, no. 18, Feb. 1919, pp. 106-130 and (discussion) pp. 130-136, 1 fig. Experimental investigation, (1) to observe effect of variation of time and rate of temperature-increase of sweating, and (2) to ascertain advantage or disadvantage of obtaining scales obtained by separate filtrations at different temperatures, as compared with separate sweating of crude products.

PATENTS

Restraint of Trade in Patent Agreements, Chesla C. Sherlock. Am. Mach., vol. 51, no. 17, Oct. 23, 1919, pp. 763-765. Exposition of rights and privileges conferred on patentee or owner of patent by statutes and by judicial influence of courts.

PATTERNS

The Economical Control and Handling of Patterns in a Large Foundry. Walter D. Jones. Am. Mach., vol. 51, no. 23, Dec. 18, 1919, pp. 1043-1044. Describes pattern system adopted by large steel foundry, in which patterns go in turn from pattern storage to sketch and checking room, to active floor, and to foundry, and finally are returned to storage section. Movement of pattern through this cycle is governed by five cards, function of which are explained in article. Paper read before Am. Foundrymen's Assn.

Making Column Patterns, Joseph Horner. Foundry Trade Jl., vol. 21, no. 215, Nov. 1919, pp. 795-800, 16 figs. Illustrating sequence of operations.

Iron Foundry Assists Pattern Shop, H. E. Diller. Foundry, vol. 47, no. 21, Dec. 15, 1919, pp. 887-891, 11 figs. Experience of foundry with gray-iron foundry established as adjunct to pattern department for testing and trying all patterns before delivery to customer.

PAVEMENTS

Asphalt. Hot-Mix Asphalt Pavements—III, Francis P. Smith. Am. City, City Ed., vol. 21, no. 4 and 6, Oct. and Dec. 1919, pp. 341-347; 545-548, 6 figs. Standard sheet asphalt construction.

Bitulithic. Bituminous Pavement Investigations in Certain Texas Cities—Part I, Bitulithic, Roy M. Green. Bul. Agricultural and Mech. College of Texas, bul. 22, vol. 5, no. 9, May 1, 1919, 62 pp., 12 figs. It is concluded that seal coat of appreciable thickness is necessary in order to keep pavement in such a condition that it will be able to withstand action of traffic for long period of years.

Brick Asphaltic Filler for Brick Pavements, Allen D. Dimmick. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 201-203, 3 figs. Practice of application is reviewed. It is said that maximum results are procured when filler is heated to temperature of from 350 to 400 deg. Fahr.

Vertical Fiber Brick Pavement. Mun. Jl. and Public Works, vol. 47, no. 18, Nov. 1, 1919, pp. 266-267. Advantages of this type of pavement and account of its latest developments.

New Paving Standards. Brick and Clay Rec., vol. 55, no. 12, Dec. 2, 1919, pp. 1041-1042. Recently revised specifications for standard vitrified paving brick of Nat. Paving Brick Manufacturing Assn.

Success of Asphalt Joint-Filler in Vertical Fiber Brick Pavements, Clark R. Mandigo. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 211-212. As dependent on (1) method of application, (2) shape and texture of brick, (3) quality of filler, and (4) character of traffic.

Concrete. Cement Concrete Pavements in New Zealand and the United States and Canada, Walter E. Bush. Engineering, vol. 108, no. 2813, Nov. 28, 1919, pp. 735-737. Practices of construction and records of service. Paper read before County Councils Assn. at Roads and Transport Congress.

Labor Cost of Paving Alleys with Concrete. Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, p. 638. Data obtained in paving four alleys at University City, Mo., in 1917 and 1919.

Wood-Block. New Joint Spacer for Wood-Block Pavements, John Stanley Crandell. Good Roads, vol. 18, no. 22, Nov. 26, 1919, p. 227, 2 figs. Corrugated cardboard spacer placed between each two rows.

See also Roads.

Peat. Evaporation Tests with Peat and Peat Coke (Verdampfungsversuche mit Torf und Torfkoks), H. Winkelman. Kraft und Betrieb, vol. 3, no. 12, Sept. 15, 1919, pp. 138-139. Showing construction of boiler in which tests were made, also measurements taken during tests, analysis of fuel and results of tests.

PETROLEUM

See Oil.

PHOTOGRAPHY

The Photography of Bomb Trajectories, A. Wm. Duff. Jl. Worcester Polytechnic Inst., vol. 23, no. 1, Nov. 1919, pp. 24-33, 3 figs. Procedure in taking photographs.

The Polar, Multi-Exposure, High Speed Camera, J. W. Legg. Elec. Jl., vol. 16, no. 12, Dec. 1919, pp. 509-512, 5 figs. Examples of stereoscopic photographs of arc.

PHOTOMETRY

Heterochromous Photometry Permitting Physical Measurement of Luminous Intensity (Sur une solution de la photométrie hétérochrome permettant une mesure physique de l'intensité lumineuse), A. Blondel. Comptes Rendus des Séances de l'Académie des Sciences, vol. 169, no. 19, Nov. 10, 1919, pp. 830-835. Luminous source of bolometer or thermo element received inversely on spectroscope.

PILOT TUBES

POLES

EUROPEAN. European Power Plant Practice—II, Stephen Q. Hayes. Elec. World, vol. 74, no. 18, Nov. 15 and 22, 1919, pp. 924-928, 13 figs. Protective devices, switchboards and transformer practice. It is noted that use of draw-out and sheet-metal- inclosed switchboards has become more general abroad than in U. S., and that in matter of power transformers core type is commonly used to facilitate repairs.

GENERAL ELECTRIC COMPANY. Features of the New Steam Power Plant at the Erie Works of the General Electric Company, A. R. Smith. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 907-913, 4 figs. Coal and ash handling facilities, lighting and ventilation, steam distribution, cable distribution and power distribution.

RECORDS. Daily Records of Plant Costs and Efficiencies, J. N. Strike. Elec. World, vol. 74, no. 17, Oct. 25, Nov. 1, and 8, 1919, pp. 870-874, 4 figs. System of records followed in 20,000 kw. power plant, which is said to reveal operating conditions daily, thereby permitting immediate action to stop losses.

See also Electric Power Plants; Electric Power Transmission.

PROFITS

On What Should Profits Be Based? W. L. Churchill. Indus. Management, vol. 58, no. 5, Nov. 1919, pp. 375-380. Writer lays down general principle that profit charge should be just for quality of service rendered. With this in mind he analyzes common methods of "profiting" and finds that they are inconsistent and even dangerous under certain conditions of labor and material costs.

PROJECTILES

See Photography.

PROPELLERS

STRESSES. Some Notes on Propeller Stresses—I & II, Mech. World, vol. 66, no. 1714 and 1716, Nov. 7 and 21, 1919, pp. 220-221 and 247-248, 10 figs. Formulæ for finding modulus of blade section and for calculating stress in boss of propeller.

TANDEM Note on the Efficiency of Tandem Propellers, J. G. Coffin. Aviation, vol. 7, no. 8, Nov. 15, 1919, p. 350. Formula showing that it is always detrimental to run propeller in slip stream of another unless other attendant gains more than compensate for necessary loss in efficiency thereby incurred.

TESTING. The Propeller Testing Laboratory of the Army Air Service at McCook Field, F. W. Caldwell. Aerical Age, vol. 10, no. 10, Dec. 22, 1919, pp. 365-370, 15 figs. Description of laboratory equipment and of scope of tests that are carried out.

THEORY. A Complete Theory of the Screw Propeller Working in Air, M. A. S. Riach. Engineering, vol. 108, no. 2803 and 2810, Sept. 29 and Nov. 7, 1919, pp. 361-363 and 601-603, 3 figs. Example of application of method for designing air screw outlined in preceding installments. Taking into account both ship and inflow velocity and notation set up in race column. (Continuation of serial.)

THRUST. Thrust and Power of Rotating Blades that are Unevenly Twisted (Poussées et puissances de pales tournantes inégalement tordues), M. Amans. Comptes rendus des séances de l'Académie des Sciences, vol. 169, no. 18, Nov. 3, 1919, pp. 779-781. Table giving experimentally measured thrust for various incidences of blade to equator plane.

VARIABLE-PITCH. Variable Pitch Propellers (Verstellbare Luftschrauben), C. Eberhardt. Motorwagen, vol. 22, no. 21, July 31, 1919, pp. 365-368, 6 figs. Adaptation of propellers to height of flight. (Concluded.)

PUBLIC WORKS DEPARTMENT

A National Department of Public Works, M. O. Leighton. Jl. Engrs. Club, Philadelphia, vol. 36, no. 181, Dec. 1919, pp. 472-476. Outline of existing conditions and conflicts of authority in Federal management of Public Works which have led National Engineering Societies to undertake movement for co-ordination of all such work under Cabinet officer in charge of Dept. of Public Works. Digest of bill now before Congress designed to accomplish this co-ordination.

PULVERIZED COAL

Pulverized Coal in the Brass Foundry, L. C. Hervey. Metal Industry, vol. 15, no. 12, Sept. 19, pp. 224-227, 4 figs. Suggested type of furnace for powdered coal firing.

Pulverized Coal in Open-Hearth Practice, W. H. Fitch. Iron Age, vol. 104, no. 26, Dec. 25, 1919, pp. 1323-1328. Review of experience of eighteen American steel plants.

Burning Pulverized Coal in a Sheet Mill, Iron Age, vol. 104, no. 24, Dec. 11, 1919, pp. 1167-1172, 14 figs. Details of installation at rolling mills.

PUMPS

AIR. Air Pumps for Condensing Equipment, Frank R. Wheeler. Mech. Eng., vol. 41, no. 12, Dec. 1919, pp. 926-930, 6 figs. After presenting classification of air pumps writer takes up features of each type and makes comparative study of their respective advantages and limitations, giving special attention to steam-jet ejector type of pump, for which extreme simplicity, reliability and flexibility, stability, low-steam consumption and high efficiency are claimed.

CENTRIFUGAL. The Principles of a New Centrifugal Pump, J. H. Moore. Power House, vol. 12, no. 19, Nov. 20, 1919, pp. 513-518, 10 figs. Rees-Ro-Turbo type, which comprises single or series of pressure drums—number depending on nature of work—rotating inside cast-iron casing at moderately high speed. When running water gravitates or is drawn into eye of revolving pressure drum where its speed, being slow relative thereto, water is carried round by revolving partitions.

FIRE. Fire Pumps, Charles L. Hubbard. Power Plant Eng., vol. 23, no. 23, Dec. 1, 1919, pp. 1047-1051, 12 figs. Various types, their construction and methods of driving.

SALVAGE. Turbine-Driven Salvage and Bilge Pump. Shipbuilding & Shipping Rec., vol. 14, no. 20, Nov. 13, 1919, pp. 553-555, 6 figs. Also Steamship, vol. 31, no. 366, Dec. 1919, pp. 143-146, 7 figs. Pump is direct-driven and of centrifugal type. It is mounted on tank top or inner bottom of vessel, drawing direct from bilge through removable strainer and delivering thourgh connection passing through bottom to under side of vessel.

SQUEEGEE ROTARY. The Squeegee Rotary Pump. Engineering, vol. 108, no. 2905, Oct. 3, 1919, pp. 455, 4 figs. Pump consists of six main parts—casing, two covers, shaft and two rotors, which, in standard design, are covered with india rubber.

RADIO-ELEMENTS

The Radio-Elements and Their Classification, P. Curie. Chem. News, vol. 119, no. 3108, Nov. 7, 1919, pp. 211-212. Table showing classification of radio elements in groups of same chemical properties. Translated from Le Radium.

RADIOMETALLOGRAPHY

Radiometallography, T. Thorne Baker. Elecn., vol. 83, no. 2167, Nov. 28, 1919, pp. 611-612, 1 fig. Apparatus used for testing of metals.

X-Ray Applied to Examination of Metals, W. E. Ruder. Blast Furnace & Steel Plant, vol. 7, no. 12, Dec. 1919, pp. 589-593, 15 figs. Technique, possibilities and limitations of examination of physical condition of ordinarily invisible portion of metallurgical products. Paper read before N. Y. meeting of Am. Iron & Steel Inst.

See also Steel, Radiographic Investigation.

RADIOTELEGRAPHY

AERONAUTICAL SETS. Radio Equipment for Commercial Aircraft, Edgar H. Felix. Aerial Age, vol. 10, no. 6, Oct. 27 and Nov. 3, 1919, pp. 205-207, 4 figs. Description of National Wireless Telegraph Transmitter unit, Simon aircraft transmitter and Simon compact receiving equipment.

ANTENNAE. Harmonic Oscillations in Directly Excited Antennas used in Radio Telegraphy, Luigi Lombardi. Proc. Inst. Radio Engrs., vol. 7, no. 6, Dec. 1919, pp. 636-647 and (discussion) pp. 648-651, 3 figs. Using symmetrically excited artificial antenna consisting of two long coils with spark gap between them, writer measures frequencies, decrements, and relative amplitudes of fundemental current and of each of harmonics.

Theoretical Research on Radiation of Antenna Systems (Theoretische Untersuchungen über die Strahlung von Antennensystemen), Max Abraham. Achiv für Elektrotechnik, vol. 8, nos. 2 and 3, July 24, 1919, pp. 92-116, 2 figs. Basic formulæ, radiation of two synchronous antennae, radiation resistances, etc. are discussed.

FIELD SETS. "W/F. T. R. E.," B. F. J. Schoenland. Wireless World, vol. 7, nos. 79 and 80, Oct. and Nov. 1919, pp. 394-397, 452-455, 4 figs. Account of work and development of field wireless sets used by allied armies during war.

NAVAL. The United States Naval Communication Service, S. W. Bryant. Jl. Franklin Inst., vol. 188, no. 6, Dec. 1919, pp. 751-770. Establishment of Navy Radio Service for developing continuous communication with fleets and among various subdivisions of fleets and for co-ordinating all naval communication facilities so as to provide rapid and reliable interchange of information between all naval organizations afloat and ashore.

RECEIVING CIRCUITS. A Non-Radiating Wireless Receiving Circuit for the Reception of Damped and Undamped Waves John Scott-Taggart. Elec. Rev. (Lond.), vol. 85, no. 2190, Nov. 14, 1919, pp. 614-615, 1 fig. Radiations from aerial of steady stream of feeble continuous waves receiving stations with a few miles radius.

An Oscillation Source for Radio Receiver Investigations, Julius Weinberger and Carl Dreher. Proc. Inst. Radio Engrs., vol. 7, no. 6. Dec. 1919, pp. 584-602, 13 figs. By special construction stray fields are reduced and instead of measuring current in dummy receiving antenna e.m.f. of known amplitudes is introduced.

Long Wave Reception and the Elimination of Strays on Ground Wires (Subterranean and Submarine), A. Hoyt Taylor. Proc. Inst. Radio Engrs., vol. 7, no. 6, Dec. 1919, pp. 559-583, 11 figs. Question of Optimum length of ground wires for reception at given wave length is discussed and experimental data are given.

On a New Circuit for the Reception of Electric Waves, G. Leithauser. Wireless World, vol. 7, no. 79, Oct. 1919, pp. 386-388, 3 figs. Oscillatory circuit is symmeterically placed with respect to two high resistances which are wound on bobbins of small diameter; variations of potential across condenser are transferred to grid and filament by means of additional blocking condensers. Translated from Jahrbuch der drahtlosen Telegraphie und Telephonie, July 1919.

SUBMARINE. Submarine Radio-Telegraphy. H. D. Forest Stevers. Armour Engr., vol. 11, no. 1, Nov. 1919, pp. 12-16. Description of single turn loop antenna receiving coils.

TIME RECORDING. Recording of Eiffel Tower Time Signals for Determination of Clock Error, L. B. Turner. Elecn., vol. 83, no. 2165, Nov. 14, 1919, pp. 554-557, 8 figs. Wireless recording apparatus intended for use in determinations of longitude for survey work in East Africa.

RADIOTELEPHONY

Wireless Telephony (Ueber die drahtlose Telephonie), A. Meissner. Tele-Telegraphen-u. Fernsprech-Technik, vol. 8, no. 4, July 1919, pp. 45-48, 11 figs. Review showing how three basic problems of wireless telephony—generation of constant, undamped oscillations, production of strong-current microphone and development of duplex transmission—have been solved.

RAILWAY ARTILLERY

RAILWAY CONSTRUCTION

RAILWAY ELECTRIFICATION

RAILWAYS

REFRIGERATION

See Cars Refrigeration; Ice Plants; Tanks, Freezing.

REFRIGERATOR CARS

See Cars, Refrigerator

RESERVOIRS

Concrete Fuel Oil Reservoirs, H. B. Andrews. Oil News, vol. 7, no. 23, Nov. 20, 1919, pp. 15-17, 2 figs. Considerations in regard to location, size, shape, proportions and protection. Paper read before Am. Concrete Inst.

RETAINING WALLS

Concrete I-Beams Used to Make Crib Retaining Wall. Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 651-652, 4 figs. Experience of railroad is said to have shown that concrete structure combines flexbility of wood crib with permanence of concrete.

REVETMENTS

See Concrete Blocks.

ROADS

Bituminous Macadam. Asphalt Macadam (Bituminous) Roads, and Their Extended Use, H. T. Wakelam. Engineering, vol. 108, no. 2813, Nov. 28, 1919, pp. 737-738. Experiments to determine wearing qualities of various road metals.
Why Bituminous Macadam Is Successful in Rhode Island, Irving W. Patterson. Eng. News-Rec., vol. 83, no. 21, Dec. 11 and 18, 1919, pp. 976-984, 4 figs. Writer is of opinion that bituminous macadam properly laid is economical pavement under certain conditions. He claims that good results have been obtained in Rhode Island with bituminous concrete of mineral aggregate, consisting of local sand or gravel laid over base of local rock crushed to large sizes.

Brick. The Economy of Brick Street and Road Construction, Will P. Blair. Clay-Worker, vol. 72, no. 5, Nov. 1919, pp. 440-441. Advises against building curve in brick-paved country roads. Paper read before Am. Soc. for Mun. Improvements.

Classification. Classification and Uses of Highways and the Influence of Federal-Aid Acts, Thomas H. MacDonald. Eng. News-Rec., vol. 83, no. 21, Dec. 11 and 18, 1919, pp. 985-988. An address before Louisville Convention of American Association of State Highway Officials, Dec. 10, 1919.
Classification of Highways, H. G. Shirley. Better Roads & Streets, vol. 9, no. 10, Oct. 1919, pp. 339-340. Proposes plan of national, state and county highways at expenditure of seventeen billion dollars during next ten to twenty years.

Concrete. A Reinforced Concrete Highway in Essex. Concrete and Constructional Eng., vol. 14, no. 12, Dec. 1919, pp. 708-710, 1 fig. Road is reinforced with fabric which is pressed 1½ inch from bottom.
Details of Inspection and Construction in Concrete Highway Work, H. Eltinge Breed. Am. City, Town & County Ed., vol. 21, no. 4, Oct. 1919, pp. 305-309, 1 fig. Concerning manner of testing fine aggregate for organic impurities, gradation, mortar strength, and volume of silt or loam.
New Features in Indiana's Concrete Road Specifications, Eng. News-Rec., vol. 83, no. 15, Sept. 25, 1919, pp. 614-615. Specifications of Ind. State Highway Commission include both one and two-course construction, with and without reinforcement, but conditions determining use of these alternative designs are not stated.
Reinforced Concrete Roads, Their Construction, Maintenance and Life, W. Matthews Jones. Engineering, vol. 108, no. 2813, Nov. 28, 1919, pp. 733-735. Recommendations to surveyors. Paper read before County Councils Assn. at Roads and Transport Congress.
Recent Developments in Concrete Highway Construction, A. N. Johnson. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 204-206. Concerning grading of aggregate, determining amount of water to use, methods of finishing, and uses of machinery and reinforcement.
The Advent of Concrete Roads in the Metropolitan Area. Concrete & Constructional Eng., vol. 14, no. 11, Nov. 1919, pp. 638-643, 4 figs. Account of construction of various concrete roads in London district.

Economic Value. Good Roads Are a Factor in Production, W. A. McLean. Contract Rec., vol. 33, no. 47, Nov. 19, 1919, pp. 1061-1062. Emphasizes service rendered by improved highways. Paper read before Elec. Club of Toronto.

Grades. Capacity Load and Ruling Grade in Highway Transportation, R. C. Barnett. Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, pp. 637-638, 3 figs. Graphs indicating effect of grades in reduction of trailer loads.

Gravel. The Construction and Maintenance of Gravel Roads, Frederick H. Colburn Good Roads, vol. 18, no. 20, Nov. 12, 1919, pp. 211-213, 2 figs. Paper presented before New Hampshire Good Roads Assn.

Hard-Surfaced. Hard-Surfaced Roads—II, E. J. Wulff. Good Roads, vol. 18, no. 18, Oct. 29, 1919, pp. 195-196, 2 figs. Discussion of different types of hard-surfaced roads with special reference to conditions in North Carolina. Paper read before North Carolina Good Roads Assn.

Impact Test. Impact Tests on Highway Surfaces, A. T. Goldbeck. Eng. World, vol. 15, no. 11, Dec. 1, 1919, pp. 37-43, 13 figs. Also Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, pp. 651-652. Made by Bur. of Public Roads for the purpose of determining (1) amount of impact delivered to road surfaces, and (2) effect of this impact on different types or surfaces.

Installment Construction. Paved Roads Built in Installments From Dirt Roads. Eng. News-Rec., vol. 83, no. 21, Dec. 11 and 18, 1919, pp. 1008-1009. Plan followed at Iowa.

Macadam. Method of Constructing Macadam in Province of Quebec, A. Paradis. Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, pp. 648-649. Method necessitated by reason of special conditions found, such as heavy winter frost which penetrate several feet into earth and cause heaving, and nature of local materials. Paper read before Can. Good Roads Assn.
Resurfacing of Old Macadam Streets in Milwaukee, C. J. Van Etta. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 195-196, 4 figs. Surface of old road after being cleaned, is spiked or scarrified. Road surface is reshaped, made smooth conforming with grade, but 2½ in. below finished grade, and rolled until firm and hard.

Maintenance. Heavy Motor Transport and Road Construction. Engineering, vol. 108, no. 2814, Dec. 5, 1919, pp. 768-772. Symposium of weight, construction and speed of mechanically-propelled vehicles in relation to construction and maintenance of roads at Road and Transport Congress of County Councils Assn.
Maintenance of Indiana Highways, George E. Martin. Purdue University, Pub. Eng. Dept., Highway Bul. no. 1, vol. 1, Apr. 1919, 24 pp., 10 figs. Concerning building and placing of new culverts, reflooring of bridges, cutting down hills and raising fills. It is particularly emphasized that "the public must be educated to the fact that there is no perfect road surface," and that "all of them, no matter how built and of what material, require maintenance."

Patrol Maintenance. Patrol Maintenance on Hard Surface Roads, J. S. Crandell. Can. Eng., vol. 37, no. 25, Dec. 18, 1919, pp. 542-543, 4 figs. Design of patrol house for storing road materials and inexpensive municipal storage tank.
Motor Truck Patrol Maintenance on Gravel Roads, Charles E. Moore. Am. City, Town & Country Ed., vol. 21, no. 5, Nov. 1919, pp. 419-420. Practice in Rock County, Wis.

Reconstruction. Reconstruction of Narrow Trunk Highways. Good Roads, vol. 18, no. 21, Nov. 19, 1919, pp. 219-220. Progress report of Committee of Am. Road Builders' Assn.

Snow Removal. Solving Snow Problem on Highways, A. H. Hinkle. Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, pp. 642-644, 3 figs. From bulletin offering suggestions for keeping roads open for motor traffic during winter months; prepared by Dept. Highway Commissioner of Ohio, and shaped snow plow designed by Ohio State Highway Dept. is described.

See also Street Cleaning.

Surfacing. Types of Surfacing for Light and Medium Traffic Roads, C. L. Moth. Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, p. 650. Used in Minnesota where subgrade materials are principally either heavy clay or black loam.

See also Pavements.

ROAD MACHINERY

Large Paving Mixer Puts in 180-Yard Slab Every Hour. Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 658-659, 5 figs. Bulk cement is clamshelled from gondola cars to bins; boxes carrying proportioned batches crane-charged into mixer.
Machines Take the Place of Men on 20-Mile Concrete Road. Cement & Eng. News, vol. 31, no. 12, Dec. 1919, pp. 24-26, 4 figs. Also Eng. News-Rec., vol. 83, no. 14, Oct. 2, 1919, pp. 664-666, 4 figs. Methods of grading, subgrading and slab construction in Illinois section of Lincoln Highway.
Recent Developments in Concrete Highway Construction, A. N. Johnson. Eng. & Contracting, vol. 52, no. 23, Dec. 3, 1919, pp. 644-674, 5 figs. Special machinery for finishing concrete roads. Paper read before Am. Soc. for Mun. Improvements.

ROCK CRUSHERS

Design of Large Rock-Crushing Plant—II, Brownell McCraw. Rock Products, vol. 22, no. 23, Nov. 8, 1919, pp. 24-25. Location of rejection crushers and storage bins.

ROCK DRILLS

Development of the Rock Drill in America, Charles Austin Hirschberg. Eng. & Min. Jl., vol. 108, no. 17, Oct. 25, 1919, pp. 677-681, 26 figs. General types of power rock drills and parts.

ROLLING MILLS

New Rolling-Mill Plant at the Works of Messrs. Steel, Peech and Tozer, Ltd. Iron & Coal Trades Rev., vol. 99, no. 2702, Dec. 12, 1919, pp. 763-765. 18 figs., partly on four supp. plates. Details of plant for rolling billets and slabs.
Electrically Driven Reversing Rolling Mills, Wilfred Sykes. Iron Age, vol. 104, no. 26, Dec. 25, 1919, pp. 1332-1333. With notes on comparative values of electric and steam drives. Discussion before Am. Iron & Steel Inst.
Rolls Strip Steel in Long Lengths, G. H. Manlove. Iron Trade Rev., vol. 65, no. 20, Nov. 13, 1919, pp. 1317-1320, 6 figs. Vertical guides near last finishing stand impart oscillating motion to product as it slides on edge to coilers.

RUBBER

Synthetic. An Examination of German Synthetic Rubber, Lothar E. Weber. India Rubber World, vol. 61, no. 2, Nov. 1, 1919, pp. 71-72, 4 figs. Results of chemical analyses of four samples of synthetic rubber obtained from Germany and tests for determining their aging properties cause writer to call this synthetic product an astounding chemical accomplishment.
The Future of Artifical Rubber, E. K. Rideal. Chem. Engr., vol. 27, no. 10, Oct. 1919, pp. 249-251. After reviewing various methods of preparing butadienes writer concludes that possible competition of synthetic process rubber with natural product does not rest entirely with successful economic development of one of these processes because "natural rubber by no means consists entirely of condensed isoprene." From Chem. Age.

SEPARATORS

Centrifugal Machines Recover and Purify Oil. Automotive Industries, vol. 41, no. 20, Nov. 13, 1919, pp. 972-973, 4 figs. De Laval separators.

The Steam Separator, A. J. Dixon. Southern Engr., vol. 32, no. 4, Dec. 1919, pp. 38-41, 13 figs. Explanation of benefits obtained by separating moisture from steam, together with description of mechanical principles of various devices so employed.

SERIES

New Observations on Ultra-Spherical Series (Nouvelles observations sur les séries ultrasphériques), Erwand Kobetliantz. Comptes Rendus des Séances de l'Académie des Sciences, vol. 169, nos. 9 and 18, Sept. 1 and Nov. 3, 1919, pp. 423-426 and 769-770. Concerning summation of ultraspherical development of $f(x)$ in interval $(-1,+1)$. Reference is made to theorems given in C. R. vol. 169, 1919 p. 322.

SEWAGE

Army Camps. Sewerage, Sanitation and Reclamation at U. S. Army Camps, Leonard J. Doten. Jl. Western Soc. Engrs., vol. 24, no. 5, May 1919, pp. 263-275 and (discussion), pp. 275-281, 11 figs., partly on three supp. plates. Scheme adopted for cantonments consisted of classification and separation of waste materials in such manner as to secure greatest amount of revenue from sale of material; all wastes were collected by means of duplicate can system. Garbage and other wastes were disposed of by sale to contractors.

Disposal. Sewage-Disposal Difficulties at Madison, Wisconsin. Contract Rec., vol. 33, no. 47, Nov. 19, 1919, pp. 1079-1080. How sludge handling was improved by hoppers and new pipe connections.

Present Status ofthe Sewage Disposal Problem, George G. Nasmith. Can. Engr., vol. 37, no. 24, Dec. 11, 1919, pp. 519-522. It is noted that efforts to recover nitrogenous contents of sewage are made difficult by colloidal nature of activated sludge. In opinion of writer cities may have to dissolve and oxidize as much of organic material as possible, turning out smaller quantity of stable residue and making no attempt at conservation.

The Present Situation in Regard to Sewage Disposal Problems and Methods, George G. Nasmith. Contract Rec., vol. 33, no. 50, Dec. 10, 1919, pp. 1137-1140. Combination of activated sludge or trickling filters with sludge digestion regarded as best solution.

Screens. Results of 1918 Operations of Testing Station of Milwaukee Sewerage Commissions. Eng. & Contracting, vol. 52, no. 24, Dec. 10, 1919, pp. 669-671. 1 fig. Experiments demonstrated that revolving screen with slots 2 in. by ¼ in. working under 2-in. loss of head handled 3,000,000 gal. of sewage upon 27 sq. ft. of wet screen area per day and removed 156 lb. of dry solids per 1,000,000 gal., and that activated sludge tanks 15 ft. deep treated affluent from such screen at rate of 16.5 million gal. per acre per day.

Sludge Handling. Sewage Sludge Economic Value, Raymond Wells. Eng. World, vol. 15, no. 11, Dec. 1, 1919, pp. 27-31. How Cobwell process, which is usually applied to handling of municipal garbage, dead animals, slaughter-house offal and other wet organic waste materials, has been applied to sewage sludge. Paper read before Am. Soc. for Municipal Improvements.

Tanks. "Dortmund" Sewage Tank. Ferro-Concrete, vol. 11, no. 4, Oct. 1919, pp. 104-107, 7 figs. Sewage is discharged from carrier into cast-iron supply pipe serving 24-in. down pipe at center of tank, this pipe terminating 14 ft. below top so that sewage may be deposited within conical portion.

Treatment. Sewage Treatment Plant at Montezuma, Iowa, J. H. Dunlap. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 218-222, 6 figs. Plant consists of sedimentation tank of Imhoff type, siphon chamber, two intermittent sand filters and sludge bed.

SEWERS

Earth Slips Prove Disastrous to Open-Cut Sewers. Eng. News-Rec., vol. 83, no. 21, Dec. 11 and 18, 1919, pp. 989-991, 5 figs. Experience in conducting Detroit sewers.

Multiple Outlet Provides for Variable Sewage Flow, S. T. Smetters. Eng. News-Rec., vol. 83, no. 16, Oct. 16, 1919, pp. 728-730, 4 figs. Regulation and distribution of sewage discharge through seven outlets into Calumet-Sag Canal.

Sewer Ventilation and Health, William Brown. Soc. Engrs., Jl. and Trans., vol. 10, no. 9, 1919, pp. 247-261 and (discussion), 261-278, 2 figs. Writer contends that "constant, efficient ventilation of each whole system of sewerage is the dominant desideratum in the solution of public health problems" and offers arguments in substantiation of this proposition by studying conditions in London sewers noting how formation of sewer gas is prevented by sewer ventilation.

SHAFTS

High-Speed Shafts (Schnellaufende Wellen), D. Dresden. Zeitschrift für das gesamte Turbinewesen, vol. 16, no. 20, July 20, 1919, pp. 197-202, 9 figs. Critical discussion of de Laval, Stobola, Dunkerley, Chree, Kerr and Leblanc theories. (To be continued.)

Formula of Dunkerley for the Critical Velocity of Rotating Shafts: Demonstrations and Applications (La formule de Dunkerley pour la vitesses critique des arbres tournante; démonstration et applications), M. Goupil. Annales des Ponts et Chaussées, vol. 51, no. 4, July-Aug. 1919, pp. 66-74. Review of applications which have appeared in technical press, notably Phil. Transactions of London, Pro. Roy. Soc. and Zeitschrift des Vereins Deutcher Ingenieure.

SHELLAC

Pure Gum Shellac, Chester H. Jones. Chem. & Metallurgical Eng., vol. 21, no. 14, Dec. 10-17, 1919, pp. 715-721, 11 figs. Account of manufacture and suggested specifications for pure shellac varnishes.

SHIPS

Cargo. Economical Cargo Ships, Alfred J. C. Robertson. Int. Mar. Eng., vol. 24, no. 12, Dec. 1919, pp. 799-805, 3 figs. Cost of operation at four different speeds of four standard vessels of different sizes. Paper read before Soc. Naval Architects and Mar. Engrs.

Coaling. Coaling Ships at Sea, H. Hubert. Coal Trade Jl., vol. 50, no. 49, Dec. 3, 1919, pp. 1393-1395, 3 figs. British floating coal depot used for storing large quantities of coal afloat.

The Michener System of Coaling Vessels, George Frederick Zimmer. Eng. & Indus. Management, vol. 2, no. 23, Dec. 4, 1919, pp. 729-732, 4 figs. Noted feature is that driving and delivery terminals are in permanent position relative to spot where coal is to be delivered into vessel.

Construction. Internal Bossing for Cargo Vessels, E. de Brinja. Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 752-754, 2 figs. Structural changes proposed where strength and savings in space and cost are of vital importance.

Castings Used in Ship Construction—II and III, Ben Shaw and James Edgar. Foundry Trade Jl., vol. 21, no. 213 and 215, Sept. and Nov. 1919, pp. 635-639 and 815-823, 59 figs. Also Foundry, vol. 47, nos. 20 and 21, Dec. 1 and 15, 1919, pp. 870-873, 902-905, 33 figs. Patternmaking of propeller-shaft bracket moulding propeller brackets.

Electric Propulsion. Electric Propelling Machinery of the U. S. S. Tennessee, William H. Easton. Power Plant Eng., vol. 23, no. 24, Dec. 15, 1919, pp. 1118-1119, 3 figs. Maximum power will be 33,500 hp. and maximum speed is expected to be over 21 knots.

Electric Propulsion of Merchant Ships, W. L. R. Emmett. Int. Mar. Eng., vol. 24, no. 12, Dec. 1919, pp. 814-817, 5 figs. Results obtained with electrically propelled ships; advantages claimed and comparison with geared turbine and reciprocating engine drive.

Ex-German. Electrical Repairs on Ex-German Ships, Joseph Stansbury Jones. Int. Mar. Eng., vol. 24, no. 12. Dec. 1919, pp. 818-822, 11 figs. Nature of damage to electrical equipment by sabotage; alterations and replacements; generators and motors lighting and communication systems.

Freight. Designing Economical Freighters, Alfred J. C. Robertson. Mar. Rev., vol. 50, no. 1, Jan. 1920, pp. 13-15. Data obtained on ship operating costs, compiled from vessels of varying capacities.

Launchings. Observations on Side Launchings, John A. McAleer. Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 746-749. Arrangement of blocking. Progressive loss of support as vessel goes down the ways. Lifting and tipping pressures.

Machinery. Designing Marine Machinery for Economy, H. C. Dinger. Int. Mar. Eng., vol. 24, no. 11, Nov. 1919, pp. 743-744. Features of machinery design that affect fuel consumption of ship. Reduction and simplification of pipnig. Furnace and condenser losses.

Models. Experiments on Full Cargo-Ship Models. Shipbuilding & Shipping Rec. vol. 14, no. 20, Nov. 13, 1919, pp. 556-558. 2 figs. Curves of propeller characteristics. (Concluded.) Paper read before Instn. of Naval Architects.

Molds. Sequence of Mold Work in the Loft, J. A. Ridley. Int. Mar. Eng., vol. 24 no. 11, Nov. 1919, pp. 754-756. System adopted at McDougall-Duluth Shipyard for getting out material for standard lake type cargo steamers.

Painting. How Modern Vessels Are Painted—II, Fred R. Jacobs. Mar. Rev., vol. 50, no. 1, Jan. 1920, pp. 30-32, 4 figs. Uses of paint gun.

Power Circulation. Power and Speed of Steamers, Arthur R. Liddell. Engineer, vol. 128, no. 3331, Oct. 31, 1919, pp. 430-431. Methods for calculating power required to overcome different resistances experienced by ship.

Propulsion. Development of Geared Turbines for the Propulsion of Ships, R. J. Walker. Engineering, vol. 108, no. 2803, Sept. 19, 1919, pp. 386-387, 1 fig. With table of comparative results obtained with Parsons single-reduction gear turbines and reciprocating engines. Paper read before Engineering Section of British Assn.

The Propulsive Efficiency of Single-Screw Cargo Ships, Wm. McEntee. Int. Mar. Eng., vol. 24, no. 12, Dec. 1919, pp. 796-799, 6 figs. Effect of varying amount of parallel middle body and longitudinal coefficient simultaneously with constant over-all dimensions. Paper read before Soc. Naval Architects and Mar. Engrs.

Reinforced-Concrete. Construction of Reinforced Concrete Barges and Seagoing Ships (La Construction des Chalands et des Navires de Mer en Ciment armé), M. Fourniols. Revue Générale des Sciences, vol. 30, no. 21, Nov. 15, 1919, pp. 617-623, 7 figs. Development of industry, noting constructional features of important recent types.

Sweden's First Wood and Reinforced-Concrete Ship (Das erste Holz-Eisenbetonschiff Schwedens), K. W. Ljungdell. Beton u. Eisen, vol. 18, nos. 12 and 13, Aug. 4, 1919, pp. 132-136, 17 figs. It has displacement of about 1000 tons and carrying capacity of 700 tons. Length over all is 42 m.; draft unloaded, 2.05, loaded in 4 m.; and makes eight knots when loaded.

Ventilation. Employing the Nozzle Effect for the Ventilation of Ships (Die Ausnützung der Düsenwirkung für die Lüftung auf Schiffen), Freudenthal. Schiffbau, vol. 20, no. 20, July 23, 1919, pp. 551-560, 26 figs. Sanitary significance of enlarged nozzle. Increasing nozzle effect by means of suction nozzle. (To be concluded.)

SHOPS

See Factories.

SIDEWALKS

City Sidewalks (Les Trottoirs de ville), Ch. Dubasch. Annales des Travaux Publics de Belgique, vol. 20, no. 3, Sept. 1919, pp. 390-391, 10 figs. Their construction, practices in various countries for determining their width in proportion to the total width of street, their height, etc.

SNOW REMOVAL

RUSSIA. Iron and Steel Resources of Russia, P. Kovaloff. Iron Age, vol. 104, no. 25, Dec. 18, 1919, pp. 1247-1251, 2 figs. Data on estimated large future requirements of Russia for Iron and steel products and country's facilities for supplying demand. Paper read before Assn. of Russian Engrs. for Relief of Russia.

SULPHUR EFFECTS. The Effect of Sulphur on Steel Castings, A. E. White. Blast Burnace & Steel Plant, vol. 7, no. 12, Dec. 1919, pp. 586-587. Minute scrutiny of sulphur held to be not as essential in making steel castings as design, composition, molding, steel-making and annealing practice. It is suggested that basis of accepting steel casting should be broader. Paper read before Am. Foundrymen's Assn.

TOOL. Tool Steel's Influence on Progress and Prosperity. Raw Material, vol. 1, no. 8, Nov. 1919, pp. 368-376, 8 figs. Survey of developments in manufacture of tool steel. (To be continued.)

VISCOSITY. Viscosity of Steels at High Temperatures (Sur la viscosité des aciers aux températures élevées), P. Chevenard. Comptes Rendus des Séances de l'Académie des Sciences, vol. 169, no. 17, Oct. 27, 1919, pp. 712-715, 2 figs. Experiments are said to have established that all steels, excepting extra rapid steels, by being exposed for certain hours to temperature between 700 and 600 deg. cent. are relieved of internal stresses developed by any previous heat or mechanical treatments.

STEEL MANUFACTURE

The Use of Spiegeleisen in Steel Manufacture, Henry D. Hibbard. Dept. Interior, Bur. Mines, Monthly Reports of Investigations, Nov. 1919, 8 pp. Possibilities of utilizing greater quantity of spiegel and interimmediate grades of ferro-manganese.

STEEL PLANTS

Welsh Steel Plant Self-Contained, Joseph Horton. Iron Trade Rev., vol. 65, no. 22, Nov. 27, 1919, pp. 1441-1445, 6 figs. How raw materials are controlled by company which makes diversified line of products.

STOCK ROOMS

Caring for the Stock. Jl. Electricity, vol. 43, no. 11, Dec. 1, 1919, pp. 503-505, 4 figs. Stock room devices used by Pac. State Elec. Co.

STONEWARE

Manufacture of Stoneware Used in Chemical Industry (La fabrication des produits en grès pour l'industrie chimique), Paul Razous. Génie Civil, vol. 75, no. 20, Nov. 15, 1919, pp. 481-485, 3 figs. Suggested methods for determining thickness of walls of stoneware apparatus.

STOKERS

A New Overfeed Automatic Stoker. Power Plant Engr., vol. 23, no. 23, Ded. 1, 1919, p. 1088, 2 figs. Machine is of incline moving grate overfeed type. It is claimed that use of overfeed principle results in ash being kept in zone of low temperature.

STORAGE

BUNKERS. Stone Storage Bunkers. Ferro-Concrete, vol. 11, no. 4, Oct. 1919, pp. 112-114, 3 figs. Capacity is 4000 tons. Structure is supported upon three rows of reinforced concrete pillars.

SYSTEMS. The Organization of a Steel Stores, E. A. Allcut. Eng. and Indus. Management, vol. 2, no. 23, Dec. 4, 1919, pp. 707-708, 2 figs. Classification and discussion of systems of steel storage.

A Group Tool Storage System, Peter F. O'Shea. Am. Mach., vol. 51, no. 20, Nov. 13, and 20, 1919, pp. 893-895. Acts enacted in various states.

STORAGE BATTERIES

Cadmium Electrode for Storage-Battery Testing, H. D. Holler and J. M. Braham. Dept. Commerce, Technologic Papers of Bur. of Standards, no. 146, 1919, 15 pp., 3 figs. It is concluded that cadmium electrode is accurate to about 0.02 volt provided proper precautions are taken. It was found to be constant within 0.01 volt during several hours, but from day to day it varied as much as 0.02 volt. Greatest error in use of cadmium electrode was determined to be due to polarization caused by voltmeter of low resistance.

STONES

See Electric Stones.

STREET CLEANING

Street Cleaning, Refuse Disposal and Snow Removal, George H. Norton. Eng. World, vol. 15, no. 11, Dec. 1, 1919, pp. 33-34. Report of Bur. of Eng. of Buffalo. Paper read before Am. Soc. for Municipal Improvements.

See also Roads, Snow Removal.

STREET RAILWAYS

BRAKING. Against the Purely Electric Braking of Street Cars (Gegen die rein elektrische Bremsung der Strassenbahnwagen), H. Sauveur. Elektrische Kraftbetriebe und Bahnen, vol. 17, no. 21, July 24, 1919, pp. 161-164, 1 fig. It is noted that air brake insures greater safety of operation than the electric brake because the energy necessary for braking is actually there ready for use, and its volume noticeable to motorman.

CAR OPERATION. Economies in Car Operation, F. R. Phillips. Elec. Traction, vol. 15, no. 12, Dec. 15, 1919, pp. 815-821 and (discussion), 821-829, 2 figs. Concerning number of stops and slow-downs, density and regulation of traffic, speed of boarding and alighting from cars, etc.

CARS. Construction Features of New Cars Now Building at Detroit. Elec. Ry. Jl., vol. 54, no. 19, Nov. 8, 1919, pp. 863-864. 10 figs. Special members are used in floor and side frame, and there are no bulkheads. Arch roof is in three units without headlining.

Safety Cars for Brooklyn. Elec. Ry. Jl., vol. 54, no. 17, Oct. 25, 1919, pp. 784-789, 16 figs. Overall length is 3 in. greater than standard safety car previously constructed. Other modifications are: Water table is pressed as integral part of letterboard; side posts are extended downover side sill: crown pieces are substituted for dasher angles and furring: and belt rails, ¼ in. by 1¾ in., are used instead of dropper bars.

Italian Car Design Experience. Elec. Ry. Jl., vol. 54, no. 20, Nov. 15, 22, 29 and Dec. 6 and 13, 1919, pp. 909-910, 4 figs. Car with standing room only is said to have proven very unpopular in Rome.

CORPORATE STRUCTURE. Simplification of Corporate Structures, Charles B. Cooke, Jr. Elec. Ry. Jl., vol. 54, no. 19, Nov. 8, 1919, pp. 858-861, 1 fig. Co-operative plan is outlined for relief of large street railway systems through reconstruction of underlying corporate and financial structure. By special increase in fare sinking fund is provided by which underlying securities are retired, equity therefrom being taken by city.

EXPRESS SERVICE. Electric Railway Express Service, C. J. Munton. Elec. Traction, vol. 15, no. 12, Dec. 15, 1919, pp. 808-810 and (discussion) 810-815. Replies to questionnaire sent to various companies in which they were asked to outline method by which they provide express service. Paper read before Central El. Ry. Assn.

FARES. Fares in Chicago, Cleveland and Philadelphia Compared, L. A. Busby. Elec. Ry. Jl., vol. 54, no. 17, Oct. 25, 1919, pp. 795-796. Average fare per passenger, that is, amount determined by dividing total passenger rates by total passengers carried—cash, transfer and free, computed for each of these cities. Although there is 7-cent fare in Chicago and 5-cent fare in other two cities, it developes that average fare per passenger in Chicago is 3.92 cents 3.98 cents in Philadelphia and 3.7 cents in Cleveland.

London's Tubes and Ruses—II, WalterJ ackson. Elec. Ry. Jl., vol. 54, no. 18, Nov. 1, 1919, pp. 816-823, 24 figs. Methods of zone fare auditing; training, welfare work and other features relative to employees.

FREIGHT SERVICE. Heavy Freight Service on a Single-Track, High-Speed Passenger Line, A. B. Cole. Elec. Ry. Jl., vol. 54, no. 19, Nov. 8, 1919, pp. 866-868, 7 figs. Dispatch merchandise and steam road interchange freight service interspersed with frequent multiple-unit passenger trains.

INTERURBAN. Cutting Down Operating Expenses on a Small Interurban Road, C. T. Dehore. Elec. Ry. Jl., vol. 54, no. 20, Nov. 15, 22, 29 and Dec. 6 and 13, 1919, pp. 915-918, 6 figs. Examples of eliminating useless material, reducing labor cost and speeding up cars.

PHILADELPHIA. Philadelphia Conditions Analyzed. Elec. Ry. Jl., vol. 54, no. 21, Dec. 20, 1919, pp. 999-1002, 2 figs. City director of transit Twining criticises recent Phila. Rapid Transit- proposals and discusses five-cent fare situation in that city. Comparative figures are given with previous years and other cities.

PUBLIC REGULATION. Service at Cost Agreements, Harlow C. Clark. Aera, vol. 8, no. 4, Nov. 1919, pp. 504-509. Analysis of various laws and ordinances which are now in effect in American cities.

STANDARDIZATION. Standardization Rules for Tramways and Vignoles Rail Lines (Matériel standard pour voies de tramways et voies vignoles). Industrie des Tramways et Chemins de Fer, vol. 13, nos. 148-149 and 150, Apr.-May-June 1919, pp. 26-30, 19 figs. Types adopted by standardization committees of French Ministry of Public Works and of Commerce.

ZONE PLAN. The Connecticut Company Goes to Zone Plan. Elec. Ry. Jl., vol. 54, no. 19, Nov. 8, 1919, pp. 852-857, 10 figs. One of features is that in business center of each city "neutral" areas are provided to permit passengers to ride beyond geographical center in order to reach stores in central business region without paying extra fare.

See also Cars; Locomotives; Railways.

STREAM-LINE FLOW

Stream-Line Flow from a Disturbed Area, A. R. Richardson. Lond., Edinburgh and Dublin Phil. Mag., vol. 38, no. 226, Oct. 1919, pp. 433-452, 5 figs. Study of vortices caused by viscosity and of effect of alteration in shape on resistance of body moving at given speed.

STUCCO CONSTRUCTION

Successful Building in Stucco—II. Am. Architect, vol. 116, no. 2200, No. 12, 1919, pp. 615-621, 13 figs. Illustrating hollow wall tile construction.

SUBMARINE MINES

Stray Mines in the North Atlantic (Les mines errantes sur l'Atlantique nord), Albert, Prince of Monaco. Comptes Rendus des Séances de l'Académie des Sciences, vol. 169, no. 13, Sept. 29, 1919, pp. 562-566, 1 fig. Communications of Weather Bureau and Hydrographic Office at Washington to meteorologic service of Azores, advising of finding of 33 stray mines at various points along course of Gulf Stream are quoted, and possible courses followed by other mines, particularly along coast of U. S. A. are traced.

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SURVEYING

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SWIMMING POOLS

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SWITCHBOARDS

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SWITCHES

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TALC

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TANKS

[illegible] arrangement of cylindrical tank.

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TAR

[illegible] Harold Moore. Power Plant Eng. [illegible] properties and required characteristics.

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See also Coal [illegible]

TELEPHONES

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TELEPHONY

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TELEGRAPHY

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TEMPERATURE INDICATORS

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TERMINALS

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See also Piers.

TESTING MACHINES

[illegible]

TEXTILE INDUSTRY

[illegible]

TEXTILE MILLS

[illegible]

Electrical Operation of a Small Textile Mill, H. C. N. Ripley. Elec. World, vol. 74, no. 17, Oct. 25, Nov 1 and 8, 1919, pp. 868-869, 4 figs. Details of motor installations, motor-control equipment and lighting layout, together with cost of lighting and power service.

THERMIT WELDING

Repairs Made with Thermit. Ry. Jl., vol. 25, no. 8, Aug. 1919, pp. 21-23, 6 figs. Welds made on locomotive parts in railway shops.

Safety Practices in Thermit and Electric Welding. Marine News, vol. 6, no. 8, Jan. 1920, pp. 156-160. Recommendations of Nat. Safety Council.

THERMO-ELECTRICITY

Thermo-Electricity of Liquid Mercury Demonstrated by Means of Galvanometer (Thermo-électricité du mercure liquide démontrée au moyen du galvanomètre). Calr Benedicks. Comptes Rendus des Séances de l'Académie des Sciences, vol. 169, no. 13, Sept. 29, 1919, pp. 578-581, 1 fig. Negative effect reported to have been obtained by subjecting special glass container of mercury to differences in temperature amounting to 150 deg. Cent.

TIDAL POWER

Tidal Power and Some of Its Aspects, William T. Taylor. Elec. Times, vol. 56, no. 1464, Nov. 6, 1919, pp. 356-358, 3 figs. Comparative study of various schemes proposed.

TILE CONSTRUCTION

See Stucco Construction.

TIMBER PERFORATING

Timber Perforating Patent Released. Ry. Age, vol. 67, no. 25, Dec. 19, 1919, pp. 1203-1204, 2 figs. Method consists of perforating surface of wood to be treated by holes systematically located at uniform distances apart, both transversely and longitudinally.

TIME MEASUREMENTS

Measurement of Absolute Value of Time Based on Newton's Law (Sur la mesure absolue du temps fondée sur les lois de Newton), Gabriel Lippmann. Annales de Physique, vol. 12, no. 9, Sept.-Oct. 1919, pp. 226-237. Suggested concept of absolute unit of time.

TIN

Bibliography of Recent Articles on Tin, R. R. Horner. Dept. Interior, Bur. Mines. Monthly Reports of Investigations, Nov. 1919, 8 pp. Articles indexed have appeared in technical literature of England and United States during years 192 to Nov 1919

The Electrolytic Extraction of Tin from Tinplate Scrap. Metal Industry, vol. 15, no. 18, Oct. 31, 1919, p. 372. Precautions to observe while applying Keihl process of submitting tinplate scrap to electrolytic action in alkaline solution. Translated from Bul. de la société des Ingenieurs Civils.

TITANIUM

Rapid Method for the Estimation of Titanium in Titaniferous Iron Ores, John Waddell. Analyst, vol 44, no. 522, Sept. 1919, pp. 307-309. Method in use at Queens' University, Kingston, Canada.

TOLUENE

The Critical Solution Temperature of a Ternary Mixture as a Criterion of Purity of Toluene, Kennedy Joseph Previte Orton and David Charles Jones. Jl Chem. Soc., vols. 115 and 116, no. 683, Sept. 1919, pp. 1055-1070, 6 figs. Method said to be particularly applicable to detecting and estimating petroleum in toluene.

TOOLS

Heat Treatment of Alternate Contact Tools, John J. Jones. Jl. Am. Steel Treaters Soc., vol. 2, no. 3, Dec. 1919, pp. 171-176. Concerning use of pyrometers, economical management of heat-treating plant and manner of treating such tools as punches, dies and pneumatic hammer pistons.

Reclaiming High Speed Precision Cutting Tools from Scrap Heap, W. H. Lloyd. Iron Trade Rev., vol. 65, no. 21, Nov. 20, 1919, pp. 1379-1383, 12 figs. Practice of large plant.

TOOL ROOMS

Making the Toolroom Efficient, F. B. Jacobs. Iron Trade Rev., vol. 65, no. 20, Nov. 13, 1919, pp. 1326-1327. It is held that economical tool room practice depends on two principal factors; installing up-to-date equipment and routing work so that lower priced workmen perform simle operations.

TOWN PLANNING

See City Planning.

TRACK BONDING

Soldered Bonds for Track Bonding, G. H. McKelway. Elec. Ry Jl., vol. 54, no. 20, Nov. 15, 22, 29 and Dec. 6 and 13, 1919, pp. 899-901, 8 figs. Types of soldered bonds.

TRACTORS

British. Description and Features of the British Tractors, M. W. Bourdon. Automotive Industries, vol. 41, no. 18, Oct. 30, 1919, pp. 852-859, 11 figs. Based on examination of types exhibited at Lincoln trials.

Design. Constructive Comment on Tractor Design, M. W. Bourdon. Automotive Industries, vol. 41, no. 18, Oct. 30, 1919, pp. 849-851. Account of English tractor trials at Lincoln. (Concluded.)

Transformation of Automobile Vehicles into Tractors on Rails by Army in the Orient (La transformation de voitures automobiles en tracteurs sur rails à l'armée d'Orient), Génie Civil, vol. 75, no. 22, Nov. 29, 1919, pp. 529-531, 5 figs. Experience is discussed in light of requirements which must be satisfied by automobile designed for operation on rails.

Fiat Lorry. The Fiat Lorry Tractor. Motor Traction, vol. 29, no. 770, Dec. 3, 1919, pp. 523-524, 3 figs. For hauling loads up to 100 tons.

TRACTOR ENGINES

Accessibility is Featured in Tractor Engine. Automotive Industries, vol. 41, no. 22, Nov. 27, 1919, pp. 1064-1066, 2 figs. Stearns engine designed for tractor work.

TRANSFORMERS

Construction and Application of Potential and Current Transformers. Elec. Rec., vol. 26, no. 4, Oct. 1919, pp. 217-221, 34 figs. Including dry insulated, oil-insulated and busbar pipes built by General Elec. Co., at Schenectady.

Some Recent Developments in Power Transformers, W. S. Moody. Gen. Elec. Rev., vol. 22, no. 11, Nov. 1919, pp. 853-864, 16 figs. Writer observes that importance in self-cooled transformer brought about by development of radiator tank, have made it possible to use self-cooled units in many places where water-cooling would formerly have been considered essential. He describes how special problems involved in design of transformers for electric furnaces were met successively, and reference to use of conservators.

Testing Transformers by the Alternating Potentionmeter, Douglas C. Gall. Elecn., vol. 83, no. 2167, Nov. 28, 1919, pp. 603-604, 4 figs. Description of test made upon current transformer of nominal ratio 1 to 10, secondary full-load 5 amperes.

TRAWLERS

Diesel-Electric Drive for Trawlers. Motorship, vol. 4, no. 12, Dec. 1919, pp. 32-34, 6 figs. Account of trials of 500-ton fishing vessel with heavy-oil engine and electric transmission for propelling and auxiliary power.

TRENCH DIGGING

Steam Shovel Digs Sewer Trench in Narrow Space, George C. D. Lenth. Eng. News-Rec., vol. 83, no. 22, Dec. 25, 1919, pp. 1064-1066, 5 figs. Illustrating method of excavating trench between footings and under floor of bridge over street.

TRUCKS

Use of Electric Industrial Trucks. Textile World Jl., vol. 56, no. 17, Nov. 29, 1919, pp. 111-113, 6 figs. Illustrating uses of tractors provided with safety devices, which permit employment of women workers.

Electric Trucks and Tractors in Printing Plants, Bernard K. Dillon. Elec. Rev., vol. 75, no. 22, Nov. 29, 1919, pp. 895-897, 3 figs. Illustrating methods of applying electric apparatus to handling problems of such plants.

Using Basements and Subways for Factory Trucking, Peter F. O'Shea. Factory, vol. 23, no. 6, Dec. 1919, pp 1285-1289, 6 figs. System of Fisk Rubber Co. for fast trucking between departments and between buildings.

TUNGSTEN

Political and Commercial Geology Series No. I—The Tungsten Resources of the World, Frank L. Hess. Eng. & Min. Jl., vol. 108, no. 18, Nov. 1, 1919, pp. 715-722, 1 fig. Geographical distribution, indicating control exerted by principal nations.

TUNNELS

Cost of Driving 8,700 Ft. of Tunnel by Station Men. Eng. & Contracting, vol. 52, no. 25, Dec. 17, 1919, pp. 689-690. Figures obtained in reconstruction of canal system of irrigation district in Yakima Valley, Wash.

The Scranton Tunnel. Ry. Engr., vol. 40, no. 179, Dec. 1919, pp. 270-273, 7 figs. Total length is 4747 ft. width 17 ft. clear inside and height 20 ft. above and 2 ft. below rail level. Account of construction.

TURBINES

The Possibilities of an Aeronautical Gas Turbine, C. A. Norman. Automotive Industries, vo. 41, no. 19, Nov. 6, 1919, pp. 914-917, 8 figs. Discussing report that German engineers have developed aeronautic gasoline turbine engine, writer concludes that such an engine is a possibility but that is advantages would not be of consequence.

See also Hydraulic Turbines.

TURBO-ALTERNATORS

See Electric Generators, A. C.

UNIVERSAL JOINTS

The Universal Joint. Automobile Engr., vol. 9, no. 132, Nov. 1919, pp. 411-412, 12 figs. Concerning calculations involved in designing of various types.

VACUUM TUBES

VALUATION

VALVE GEARS

VALVES

VAPOR PRESSURES

VENTILATION

VENTURI METERS

VIBRATION MEASUREMENT

VISCOSITY

WATER FLOW MEASUREMENTS

WATER POWER

New Horsepower Formulæ, P. M. Heldt. Automotive Industries, vol. 41, no. 20, Nov. 13, 1919, p. 959. Proposes that for passenger car engines rule be adopted of one houre-power per 10.5 cu. in. piston displacement at 1000 r.p.m. and proportionately more at higher speeds.

Water Power Resources of British Columbia. Elec. News, vol. 28, no. 22, Nov. 15, 1919, pp. 32-36, 5 figs. Abstracts of report issued by Commission of Conservation of Can. Resources are estimated at 3,000,000 hp.

WATERPROOFING

Suggested Improvements in Waterproofing Railroad Structures. Eng. & Contracting, vol. 52, no. 25, Dec. 17, 1919, pp. 701-702. Such as having membrane come in ready-made sheets on work.

WATER PURIFICATION

Chlorination. Field Methods for the Chlorination of Small Amounts of Water, F. R. Georgia. Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 654-663, 1 fig. Chlorination was carried out in Lyster bags. Details of system used for effecting continous purification of water as it was pumped.

The Chloramine Process as Applied to the Catskill (Esopus) Water, Frank E. Hale. Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 804-817 and (discussion) pp. 818-822, 3 figs. Concerning reported discovery of dead trout and other fish in Esopus Creek after treatment of water was started with with 0.4 p.p.m. chlorine.

The Effect of Chlorine on Periodic Precipitation, A. W. Foster. Jl. Phys. Chem., vol. 23, no. 9, Dec. 1919, pp. 645-655, 9 figs. Results obtained by using chlorinated tap water instead of distilled water in experiments on absorption of ions by colloids.

Filter Nozzles. Testing Discharge of Sprinkling Filter Nozzles, W. Earle Weller. Mun. & County Eng., vol. 57, no. 5, Nov. 1919, pp. 203-204, 3 figs. Tests made by Bur. of Eng. of City of Binghamton, N.Y.

Filter Plant. Water Filtration Plant built on Gravity Supply at Dundas, Ont., built at low Figure. Contract Rec., vol. 34, no. 48, Nov. 26, 1919, pp. 1092-1096, 8 figs. Capacity of plant is 700,000 gallons per day. It is said to have been erected at cost of $30,000.

WATER SUPPLY

Army. Keeping the First Army Supplied with Water, F. W. Scheidenhelm. Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 623-638, 8 figs. Work of Water Supply Service. Its responsibility covered water for men, for animals, for railways, both standard and narrow gages, and for hospitals including field and evacuation hospitals.

Aviation Fields. Water Supply and Sewage Disposal at the Military Aviation Fields, Posts, Depots, etc., in the United States, Robert H. Craig. Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 664-678. Experiences are quoted, such as for instance that Imhoff tanks with longitudinal flow, one flowing-through compartment over each sludge digestion chamber, settling compartment with steep sloping sides in less than 1:1 and with gas vent area from 20 to 25 per cent of total tank area gave best results.

Catskill. Schobarie Development of the Catskill Water Supply System for New York City, J. Waldo Smith. Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 639-653, 5 figs. Project involves extending system 36 miles north from Ashokan dam making overall distance for system of 156 miles from new dam to terminal reservoir on Staten Isd.

Metering. Effect of Metering on Water Consumption, H. P. Matte. Jl. Western Soc. Engrs., vol. 24, no. 3, March 1919, pp. 133-148 and (discussion) pp. 148-152, 9 figs. Based on records taken at various cities both before and after instaling meters.

What Metering of Water has Done for a New England City. Contract Rec., vol. 34, no. 48, Nov. 26, 1919, pp. 1103-1104. By installing meters city of Middletown, Conn., is said to have reduced its water consumption from 133 gal. per capita to 78 gal. per capita.

Waste Prevention. Water Waste Prevention Surveys in Washington, Paul Lanham. Mun. Jl. & Public Works, vol. 47, no. 17, Oct. 25, 1919, pp. 250-254, 11 figs. Plan and organization by which 45,000,000 gal. have been saved daily.

WATER WORKS

The Effect of the War Period 1914-1918, and Public Control Upon the Water of the United States, Leonard Metcalf. Jl. Am. Water Works Assn., vol. 6, no. 4, Nov. 1919, pp. 785-803, 5 figs. Review of 500 decisions, more or less effecting water works, handed down by courts and commissions during four and one-half period from Jan. 1915 to May 1919.

Present Conditions in the Waterworks Field. Eng. & Contracting, vol. 52, no. 24, Dec. 10, 1919, pp. 668-669. Committee report submitted at convention of Am. Soc. Municipal Improvements.

WEIRS

See Water-Flow Measurements Weirs.

WELDING

Burners. Improvements in Spray Burners for Welding and Cutting Metals. Acetylene & Welding Jl., vol. 16, no. 191, Aug. 1919, pp. 157-158, 1 fig. Apparatus is arranged so as to permit soaking and spraying liquid fuel with burner tube by oxygen introduced by pressure.

Disk-Depression Method. Disk-Depression Method of Welding, Chas. H. Kicklighter. Southern Eng., vol. 32, no. 4, Dec. 1919, pp. 66-68, 12 figs. It is claimed for this method that joint effected by it has greater strength than riveted joint and that greater economy in production is secured with it.

Engine Cylinders. The Making and Welding of Engine Cylinders. Practical Engr., vol. 60, no. 1707, Nov. 13, 1919, pp. 233-234, 8 figs. American patent relating to welding elbow-like members of gas passages leading to or from inlet or exhaust ports to cylinder.

Welding Large Mill Engine Cylinders, L. M. Malcher. Foundry, vol. 47, no. 21, Dec. 15, 1919, pp. 908-909, 5 figs. Repairing 70-in. cylinder of Allis-Chalmers twin tandem-compounds engine. Also in Iron Trade Rev., vol. 65, no. 26, Dec. 25, 1919, pp. 1710-1711, 5 figs.

Welding Locomotive Cylinders. Am. Mach., vol. 51, no. 21, Nov. 27 and Dec. 4, 1919, pp. 932-933. Symposium presented at convention of Int. Ry. Gen. Foremen's Assn.

Forgings. Fusion Welding Applied to Drop Forgings, S. W. Miller. Acetylene Jl., vol. 21, no. 6, Dec. 1919, pp. 402-406 and 420-424. Oxy-acetylene and electric welds and their applicability to defective forgings. Effect of high temperatures on physical structure. Paper presented before Am. Drop Forge Assn.

Foundry Work. The Welder in the Iron Foundry, David Baxter. Acetylene Jl., vol. 21, no. 6, Dec. 1919, pp. 410-416, 2 figs. Applications of welding in foundry, with instructions for doing various classes of work.

Steel. Welding of Bessemer and Open Hearth Steel, E. Wanamaker and H. R. Pennington. Ry. Elec. Engr., vol. 10, no. 11, Nov. 1919, pp. 406-408, 3 figs. Study of effect of impurities and result of electric arc on various compositions.

Tanks. Welded Water Tank Constructed from Surplus War Material. Acetylene Jl., vol. 21, no. 6, Dec. 1919, pp. 400-401, 4 figs. How iron sheets originally made for shrapnel protection in trenches are being used in construction of 9700-gal. water tanks.

Tests. Tests of Welded Materials Maurice Y. Kapetansky. Michigan Technic, vol. 32, no. 3, Oct. 1919, pp. 201-213, 16 figs. Results of chemical, physical and microscopical tests are presented and their relative importance in determining value of welds is discussed. Use of microscope alone, it is noted, saves a great deal of preparation as cost of preparing specimens of microscopical examination is only one-forth or one-fifth that of preparing samples for physical test.

Training Welders. Training Welders and Cutters. Acetylene & Welding Jl., vol. 16, no. 193, Oct. 1919, pp. 102-103. Ability required by prospective welder. (Concluded.)

Truck Frames. Welding Truck Side Frames, Bolsters Side Bars. Ry. Jl., vol. 25, no. 8, Aug. 1919, pp. 23-26. Committee report presented at joint convention of Master Car Builders and Master Mechanics.

See also Electric Welding, Oxy-Acetylene Welding; Thermit Welding.

WELFARE WORK

Strong Background for Community Work Is Formed by Bathhouses and Laundries, Donald J. Paker. Coal Age, vol. 16, no. 16, Oct. 16, 1919, pp. 634-637, 3 figs. Results obtained by coal and coke company in Pa. which has established installation of bathhouses and laundries in mining camp.

WIND MOTORS

Wind Motors, Faville C. Poulton. Sci. Am. Supp., vol. 88, no. 2268, Nov. 15, 1919, pp. 286-287. Their possibilities and limitations. From Roy. Soc. Arts.

WIRELESS COMMUNICATION

See Radiotelegraphy; Radiotelephony.

WOMEN WORKERS

The Works and Products of Messrs. Barr and Stroud Limited. Engineering, vol. 108, no. 2803. Sept. 19, 1919, pp. 363-365, 4 figs. Employment of female labor at these works is said to have shown that "women, with suitable training could prove as efficient as men in some ordinary instrument making work." (Continuation of serial.)

WOOD

Average Weights of Various Species of Wood. Eng. & Contracting, vol. 52, no. 22, Nov. 26, 1919, p. 610. Table giving figures computed by U. S. Forest Products Laboratory.

WOOD WASTE

The Economy of Using Waste Wood for Heat and Power Generation in Woodworking Establishments (Die Wirtschaftlichkeit der Abfallholzverwendung zu Heiz, und Kraftdampf für Holzbearbeitungsbetriebe), M. A. Nüscheler. Zeitschrift des Bayerischen Revisions-Vereins, vol. 23, nos. 16 and 17, Aug. 31, and Sept. 15, 1919, pp. 125-128 and 135-138, 4 figs. Experience with boilers of Cornwall type of comparatively long construction and having only one large flue in order to provide large heating surface. (To be concluded.)

ZINC BRONZE

Five Foundry Tests of Zinc Bronzes, C. P. Karr. Brass World, vol. 15. no. 10, Oct. 1919, pp. 320-322. Proportional limit, tensile strength, elongation and reduction in area of specimens of two compositions, 88 copper, 10 tin, and 2 zincs, and 88 copper, 8 tin, and 4 zinc.

Engineering Index

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ACCIDENT PREVENTION

[illegible]

ACCOUNTING

Billing by Machinery. Billing Machinery. [illegible]

Woodworking Shops. [illegible]

AEROPLANE ENGINES

Altitude vs. Power. Engine Power and Height. H. T. Tizard. Engineering, [illegible]

Carburetors. [illegible]

Fiat. The Fiat 700 hp. Aircraft Engine. [illegible]

Fuels. [illegible]

Inspection. [illegible]

Radiators. General Analysis of Aeroplane Radiator Problems. [illegible]

Requirements. [illegible]

Starting. The Starting of Aeroplane Engines. [illegible]

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Maintenance in Construction. See Aircraft Construction [illegible]

[illegible]

AIRSHIPS

[illegible]

AIRCRAFT CONSTRUCTION MATERIALS

AIRPLANE DOPES. Airplane Dopes and Doping. W. H. Smith. Sci. Am. Supp., vol. 88, no 2292 Dec. 27, 1919, pp 387 and 399. Method of shrinking and waterproofing fabric of aeroplane wings. From fourth annual report of Nat. Advisory Committee for Aeronautics.

AIRPLANE WING COVERINGS. Airplane Wing Coverings, Charles J. Cleary Aviation, vol 7, no. 11, Jan 1, 1920, pp. 487-490, 5 figs. Methods of covering aerofoils and methods of testing fabric

Modern Wing Coverings—Materials Used and Their Application, R. G. Dort Aerial Age, vol. 10, no. 12, Jan 5, 1919, pp. 455-457 Manner of applying dope and pigmented protective coverings. (Concluded.)

RUBBERIZED BALLOON CLOTHS. Permeability of Rubberized Balloon Materials (Die Gasdurchlässigkeit von gummierten Ballonstoffen), Walter Frenzel. Chemiker Zeitung, vol 43, no 100, Aug. 19, 1919, pp. 530-532, 6 figs. Account of testing various balloon materials as to their permeability and its dependence of pressure and temperature by means of an interferometer.

AIRSHIPS

COMMERCIAL. Airships for Civilian Purposes, W. T. Blake. Aeronautics, vol. 17, no, 321, Dec. 11, 1919, pp 530-531. Performances of types of 2,000,000-cu. ft. and 70,000-cu. ft. capacities are studied and possibilities of using these types for commercial purposes are deduced.

ALCOHOL

ETHYLENE FROM COKE-OVEN GAS. Ethylene as Alcohol from Coke-Oven Gases, Ernest Bury and O Ollander. Iron and Coal Trades Rev., vol. 99, nos. 2703 and 2704, Dec. 19 and 26, 1919, pp. 801-805 and 831-832. Possibilities of producing absolute alcohol from coke-oven gas are pointed out and chart is given illustrating derivation of alcohol and its derivatives from coke-oven gas. Ethylene is said to be absorbed by coke-oven gas at temperature of 60 to 80 deg. cent. Paper before Cleveland Instn. of Engrs.

FUEL. Three New Sources of Fuel Alcohol. Automotive Industries, vol. 42, no. 2, Jan. 8, 1920, pp. 80-83. Processes for production of alcohol from molasses, wood waste and acetylene described in technical appendices to German war-time law creating an alcohol monopoly. Commercial prospects of processes are discussed.

ALUMINUM

CASTINGS. Casts Large Tonnage of Aluminum. Foundry, vol. 48, no. 1, Jan. 1, 1920, pp. 17-23, 13 figs. Attention is called to system in Detroit foundry, which permits continuous pouring and automatic removing of castings from moulding floor.

ALUMINUM ALLOYS

ALUMINUM-MAGNESIUM-COPPER Mechanical Properties and Resistance to Corrosion of Rolled Light Alloys of Aluminum and Magnesium with Copper with Nickel and with Manganese, F. D. Merica, R G. Waltenberg and A N Finn. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 132, Oct. 25, 1719, 13 pp., 3 figs. Alloys of aluminum-magnesium-copper were found to be superior in all conditions to those of other series in respect to tensile properties.

IRON, NICKEL, MANGANESE AND ANTIMONY. Transformations Experienced by Certain Aluminum Alloys (Sur les transformations subies par certains alliages d'aluminium), Leon Guillet. Comptes rendus des séances de l'Académie des Sciences, vol. 169, no. 22, Dec. 1, 1719, pp. 1042-1043. Alloys experimented on were: Aluminum-iron with 77.55 per cent iron; aluminum-nickel with 62 52 per cent nickel; aluminum-manganese with 85.4 per cent manganese and aluminum-antimony with 79.86 per cent antimony.

AMMONIA

OXIDATION OF. The Catalyst for the Oxidation of Ammonia, G. A. Perley. Chem. & Metallurgical Eng., vol, 22, no. 3, Jan, 21, 1920, pp. 125-129. Use of suitably preheated air-ammonia mixture is pointed out as most important for production of sufficiently high temperature for rapid reaction velocity of desired reaction. It is believed that use of platinum gauze of 0 0025 in, diameter wire and 120 to 150 mesh is more convenient than one of 80 mesh because it decreases free gas space between wires.

The Commercial Oxidation of Ammonia, George Arthur Perley. Jl. Indus, & Eng. Chem., vol. 12, no. 1, Jan. 1920, pp, 5-16. 2 figs. Survey of work done by various investigators, specially at Bur. of Mines. (To be concluded)

NORMAL VALUE IN. "Normal" Value in Appraisals, Cecil F, Elmes. Eng. & Contracting, vol 53 no. 3, Jan 21, 1920, pp, 65-70, 4 figs. Charts representing average cost of various basic commodities for a number of years are presented and question of determining from them average value of each commodity is discussed. Paper read before Ill. Gas Assn.

APPRENTICES, TRAINING OF

FOUNDRY. Training Men for Foundry Duties, C. C. Schoen. Foundry, vol. 48, no. 2, Jan. 15, 1920, pp 50-51. Claims that existing conditions in foundry labor demand more general use of short time training systems for apprentice labor and unskilled help now available.

ARCHES

DESIGN. Influence Lines Applied to Arch Design, G. R. Magnel. Engineering, vol. 108, no. 2817, Dec. 26, 1919, pp. 843-845, 6 figs. Exemplifies methods of plotting influence lines for designing arch to withstand rolling loads.

REINFORCED-CONCRETE. Study of a Reinforced-Concrete Arch (Estudo de um arco de concreto armado), Machado de Costa. Boletin do Instituto de Engenharia, vol. 2, nos 6 and 7, April and Aug. 1919, pp 355-369 and 391-420, 8 figs. General theory of stresses is first presented and its application is subsequently illustrated by working out design of arch of 150-ft. span.

ASPHALT

SOFTENING POINT. Determination of the Softening Point of Asphaltum and other Plastic Substances, D. F. Twiss and E. A. Murphy. Jl. Soc. Chem. Indus., vol. 38, no. 23, Dec. 15 1919, pp. 405T-406T, 2 figs. Arrangements to simplify introduction of bituminous material into tube in Krämer-Sarrow method.

AUDIONS

See *Radiotelegraphy, Audions.*

AUTOMOBILE ENGINES

CAMERON AIR-COOLED. The Cameron Air Cooled in a "Comeback." Automotive Industries, vol. 41, no 24, Dec. 11, 1919, pp. 1164-1166. 6 figs. Valves are operated by groove cams mounted on crankshaft in bottom of crank case.

CAMSHAFTS. The Problems in Designing an Engine Camshaft—II, Don T. Hastings. Automotive Industries, vol. 41, no. 23, Dec. 4, 1919, pp. 1116-1124, 4 figs. Comparaison of action obtained from tangential and mushroom cams.

CRANKSHAFT VIBRATION. How to Prevent Torsional Vibration in the Camshaft, P. M. Heldt. Automotive Industries, vol. 42, no. 1, Jan. 1, 1920, pp 26-28, 3 figs. Damper with very thick web in which holes were drilled for coiled springs that press together friction plates at both sides of web is said to have proven entirely satisfactory.

CYLINDER MACHINING. Automobile Cylinder Blocks. Automobile Engrs., vol. 9, no. 133. Dec. 1919, pp. 424-425, 5 figs. Notes on special machines for mass production.

FUEL PUMP. An Intersting Invention. Autocar, vol. 43, no. 1261, Dec. 20, 1919, p. 1152, 2 figs. Fuel pump having no loose valves.

IGNITION. A Flexible Closed Circuit Type of Ignition, Automotive Industries, vol 41, no. 25, Dec. 25. 1919, pp 1253-1255, 5 figs. System which may be changed from four-cylinder ignition set to one adapted to six-cylinder machine.

LUBRICATING OILS. Engine Oils, W. R. G. Atkins. Automobile Engr., vol. 9, no. 133, Dec. 1919. pp. 425-429 Outline of chemical and physical tests usually applied to oils, and discussion of serviceableness of each.

PREMIER VALVE MECHANISM. Details of Valve Mechanism on New Premier. Motor Age, vol. 37, no. 2, Jan. 8, 1920, p 30, 2 figs. Rocker arms are lubricated by wick system and end of rocker arm has rolling action.

RECENT PATENTS. Inventions, B. H. Davies. Autocar, vol. 43, no. 1262, Dec. 27, 1919, pp. 1177-1179, 13 figs. Review of and comments upon recent automobile and aero engine patent specifications.

ROTARY VALVE FOR. A Rotary Valve not Moved by Pressure in Cylinder. Automotive Industries, vol. 41, no. 25, Dec. 18, 1919, p. 1217, 4 figs. Valve receives its motion from cam disc and begins to move only after spent gases have been eliminated.

VALVES. Valve Failures and Valve Steels in Internal-Combustion Engines, Leslie Aitchison. Engineering, vol. 108, no. 2816, Dec. 19, 1919, pp 834-836 3 figs. Properties of valve steels, especially hardness after cooling in air from different high temperatures. (Concluded.) Paper read before Instn. Automobile Engrs.

AUTOMOBILES

DESIGN. Current Tendencies in Automobile Design, E. de Normanville. Engineer, vol. 128, no. 3330, Oct. 24, 1919, pp. 406-409, 7 figs. Remarks on designs exhibited at Olympia, England. Tyler and Napier engines are particularly considered as exemplifying recent progress.

HEADLIGHTS. Anti-Dazzle Device. Autocar, vol. 44, no. 1263, Jan. 3, 1920, pp. 16-17, 4 figs. Various devices are illustrated. Preventing any of beams of lamp to shine into person's eyes is mentioned as principle of practically all anti-dazzling devices.

RADIATORS. A New Style Winter Radiator. Automotive Industries, vol 42, no. 1, Jan. 1, 1920, p. 17, 1 fig. Device consists of drawn steel shell fitting over core of radiator and is attached by four bolts which pass through it.

STARTING AND LIGHTING. A Single Unit Starting and Lighting System Developed in France. Automotive Industries, vol. 41, no. 26, Dec. 25, 1919, pp. 1257 and 1259, 4 figs. Essentials of Dynastart which is combined generator and starter having both shunt and series field winding.

TIRE MANUFACTURE. The Mechanical Building of Pneumatic Tyre Casings. India-Rubber Jl., vol. 58, no. 22, Nov. 29. 1919, pp. 9-10, 2 figs. By Thropp patent tire building machine. Distinct feature of machine is two guide plates which are operated through right and left-hand screws geared so that turning of one handle brings guide plates closer together or further apart.

VALVES. Valve Failures and Valve Steels. Leslie Aitchison. Automotive Industries, vol. 41, no. 25. Dec. 25, 1919, pp. 1254-1258, 2 figs. Gives account of experiments that have been made to obtain knowledge of properties which should be possessed by valve and indicates best methods of selecting suitable valve steel. Paper read before Inst. of Automobile Engrs.

FUTURE OF. The Future of Aviation. [illegible] Mech. Eng., vol. [illegible] no. 1, Jan. 1920, pp. [illegible], [illegible] figs. [illegible]

MARKING AIR ROUTES. Marking Overland Lines for Guidance of Airplanes. [illegible] Dec. [illegible] 1919 [illegible] figs. [illegible] suggestions made to this [illegible]

See also Zeppelins.

BALLISTICS

GERMAN LONG-RANGE GUNS. Some Considerations on the Ballistics of a Gun of Seventy-Five Mile Range. Arthur Gordon Webster. [illegible] Nat. Acad. [illegible] vol. [illegible] 1919, pp. [illegible] figs. Technical considerations showing how Germans [illegible] Paris from distance of seventy miles was made possible by taking advantage of decrease in resistance due to decreasing density of air at high altitudes.

BAROMETERS

TYPES. Barometers and Vacuum Measuring Instruments. Power Plant Eng., vol. 24, no. 1, Jan. 1, 1920, pp. [illegible], [illegible] figs. Descriptions of various types, their construction and principles of operation.

BATTERIES, PRIMARY

DRY CELLS AND THEIR TESTING. Electrical Characteristics and Testing of Dry Cells. [illegible] Elec. Rev., vol. [illegible], no. [illegible], Dec. [illegible] 1919, pp. [illegible], [illegible] figs. Describes various kinds of cells that are obtainable, indicates kinds of service for which they are adapted, and outlines methods of testing them. Abstract of Circular 79 of U. S. Bur. of Standards.

BEAMS

CONTINUOUS, BENDING MOMENT IN. Calculation of Bending Moment in Continuous Beams having Three Supports. [illegible] Schweiz. Bauzeitung, vol. [illegible], nos. [illegible] 1919, pp. [illegible], 34 figs. Equations. (Concluded.)

See also Concrete Construction, Reinforced; Vibration, Effect on Beams.

BEARINGS

BALL, SWIVELLING. The Principles and Practice of Swivelling Ball Bearings. W. H. [illegible] Engineering, vol. [illegible], no. [illegible] 1919, pp. [illegible], [illegible] figs. [illegible] bearings which [illegible] should only be used where [illegible] shaft [illegible] as in textile machines found in leather, paper-making and [illegible] and in [illegible]

BALL, NEW TYPE. A New Design of Ball Bearing. L. H. Little. Elec., vol. 83, no. [illegible], Dec. [illegible], 1919, pp. [illegible], [illegible] figs. Special feature is patented cage which is said to give [illegible] advantages of both ball and roller types.

BELTING

COMPARISON OF TYPES. The Economy of Various Types of Power Transmission. [illegible] Zeitschrift des Vereines Deutscher Ingenieure, vol. [illegible], no. [illegible], Sept. [illegible] 1919, pp. [illegible], 1 fig. Discussion of advantages and disadvantages of [illegible] and [illegible] belting, of rope and steel bands and suggestions for improving rope drives.

HAIR. Unusual and Severe Applications of Hair Belting. Belting, vol. 15, no. 12, Dec. [illegible] 1919, pp. [illegible], [illegible] figs. Service in [illegible] foundry, machine shop, power plant and sugar refinery described in detail and illustrated.

BENZOL

MARKETING OF. British Plans for Marketing Benzol. [illegible] vol. [illegible], no. [illegible], Jan. [illegible], 1920, pp. [illegible], [illegible] figs. Organization and work of [illegible] formed in England to advertise and introduce benzol as motor-car fuel.

BLAST-FURNACE GAS

CLEANING. Blast Furnace Plants Install Electrical Precipitation for Cleaning Gas. N. H. Gellert. Blast Furnace & Steel Plant, vol. [illegible], no. 1, Jan. 1920, pp. [illegible], 5 figs. [illegible] for gas cleaning, and [illegible] to wet cleaning [illegible] advantages of electrical precipitation.

Cleaning Blast Furnace Gas by Electrical Precipitation. [illegible] Eng. Jl., vol. 112, no. [illegible], Jan. [illegible], 1920, pp. [illegible] and [illegible] [illegible] measurements are said to have shown that [illegible] gas to less than [illegible] grain of dust per cubic foot of gas at standard conditions.

The Cleaning of Blast Furnace Gases. Iron & Coal Trades Rev., vol. [illegible], no. [illegible], Dec. [illegible], 1919, pp. [illegible], [illegible] figs. [illegible] Halberg-Beth dry plant for cleaning gas [illegible] without [illegible] water.

BOILER OPERATION

COMBUSTION CONTROL. Hagan Combustion-Control Regulator. Power, vol. 50, no. 17, Oct. 21, 1919, pp. [illegible], [illegible] figs. System which regulates fuel and air supply in accordance with flow of steam.

BOILERS

COKE PLANT. See Coke, Coking and Fuels.

CORROSION OF. Pitting and Corrosion in Boilers and Economizers. F. J. [illegible] [illegible] vol. [illegible], no. [illegible], Jan. [illegible], 1920, pp. [illegible] Survey of theories [illegible] and suggested [illegible] of prevention.

EXPLOSIONS OF. Boiler Explosions Reports. [illegible] Eng. & [illegible] vol. [illegible], no. [illegible], Dec. 1919, pp. [illegible], [illegible] figs. [illegible]

FLUE. See Marine Boilers.

PREVENTION OF. [illegible] Boilers. [illegible] Eng., vol. [illegible], no. 1, Jan. 1920, pp. [illegible], [illegible] figs. [illegible]

PERFORMANCE. [illegible] Study of Boiler Performance. Power, vol. 50, no. [illegible], [illegible] 1919, pp. [illegible], [illegible] figs. [illegible]

BONUS SYSTEMS

[illegible] Wages with Bonus Systems. [illegible] Eng. & Indus. Management, vol. [illegible], no. [illegible], Jan. [illegible], 1920, pp. [illegible], [illegible] figs. [illegible]

BRAKES

AUTOMATIC [illegible]. The Automatic [illegible] Brake on [illegible] vol. [illegible], no. [illegible], Dec. [illegible], 1919, p. [illegible], 1 fig. [illegible]

BRASS

[illegible] See Press Work; [illegible]

BRASS FURNACES

[illegible] Furnaces for Brass [illegible] vol. [illegible], no. [illegible], Jan. [illegible], 1920, p. [illegible] Comparative value of [illegible] furnaces with [illegible] fired with [illegible] fuel or gas.

BRIDGES

CONSTRUCTION [illegible]. [illegible] of Good Bridge Construction [illegible] [illegible] vol. [illegible], no. [illegible], 1919, pp. [illegible], 18 figs. [illegible]

SPAN [illegible]. A [illegible] of Recent [illegible] in the Length of Spans of Different Classes of Bridges. [illegible] Civil Eng., vol. [illegible], no. [illegible], 1919, pp. [illegible] [illegible] for different classes of bridges.

BRIDGES, CONCRETE

DIAGRAMS FOR ESTIMATING QUANTITIES. Highway Bridges of Steel and Concrete. [illegible] Eng. & Contracting, vol. [illegible], no. [illegible], Dec. 1919, pp. [illegible], [illegible] figs. Diagrams [illegible] estimating quantities of reinforced concrete highway spans, and [illegible] amounts of steel reinforcement [illegible] spans with [illegible]

BRIDGES, LIFT

STRAUSS BASCULE. Bascule Bridges [illegible] W. [illegible] Eng. World, vol. 16, no. 1, Jan. 1, 1920, pp. [illegible], [illegible] figs. [illegible]

[illegible] Ft. Span [illegible] and Bascule Bridge [illegible] Eng. & Contracting, vol. [illegible], no. [illegible], Dec. [illegible], 1919, pp. [illegible], [illegible] figs. [illegible]

BRIQUETTING

FOR CONCRETE. [illegible] for Concrete [illegible] Frank H. Mayoh. Can. [illegible] vol. [illegible], no. 1, Jan. [illegible], 1920, pp. [illegible], [illegible] figs. [illegible]

BUILDINGS

CONCRETE, [illegible]. The [illegible] of Concrete Buildings [illegible] Eng. & Contracting, vol. [illegible], no. [illegible], Dec. [illegible], 1919, pp. [illegible], [illegible] figs. [illegible]

BUNKERS

CONCRETE. A [illegible] Bunker. [illegible] Eng. & Contracting, vol. [illegible], no. [illegible], Dec. [illegible], 1919, p. [illegible], [illegible] figs. [illegible]

BUREAU OF MINES

[illegible]. The Bureau of Mines. [illegible] Eng., vol. [illegible], no. [illegible], Jan. 1920, pp. [illegible], [illegible] figs. [illegible]

CONICAL, CALCULATION. Study on the Calculation of Conical Bushings (Beitrag zur Berechnung von kegeligen Hülsen), H. Bonte. Zeitschrift des Vereins deutscher Ingenieure, vol. 63, no. 38, Sept. 20, 1919, pp 823-926, 11 figs. Used in connecting piston and piston rod, crosshead and piston rod, etc.

ARMORED, DEFECTS IN. Defects in Armored Cables (Recherche des défauts dans les cables armés), G. Lebaupin. Electricien, vol. 49, no. 1242, Dec. 15, 1919, pp. 250-252. Based on writer's experience with line of 350 km. carrying energy at 15,000 volts.

CALORIMETERS

CONSTRUCTION. Calorimeters. Power Plant Eng., vol. 24, no. 1, Jan. 1, 1920, pp. 95 97, 3 figs. How constructed and used.
Testing Heat Values of Fuels. Power Plant Eng., vol. 24, no. 1, Jan. 1, 1920, pp. 97-99, 3 figs. Calorimeters, their construction and use.

CAMS

DESIGN. Cam Operation of Valves, T. L. Sherman. Automobile Engr., vol. 10, no. 134, Jan. 1920, pp. 2-5, 12, figs. Analytical design of cams of predetermined performance.

CANALS

IRRIGATION, CONCRETE-LINED. Method of Lining-Irrigation Canal with Reinforced Concrete. Eng. & Contracting, vol. 53, no. 2, Jan. 14, 1920, p. 35, 1 fig. concrete lining is 3 in thick, of 1:2:4 mix, and is reinforced with No. 11 electric welded 12 in. by 12 in. mesh wire.

CARS

ADJUSTABLE-GAGE. Design Developed by Swiss Industrial Society of Neuhausen for Adapting Wheels of Railway Cars to Different Track Gages (Dispositif de la Société industrielle suisse de Neuhausen, pour faire varier l'écartement des roues de wagons). Génie Civil, vol. 75, no. 23. Dec. 6, 1919, pp. 578-579, 1 figs. In order to separate wheels or bring them closer together car is run over special length of track rails of which are inclined to direction of travel and in center of which rack engages with small gear operating mechanism separating wheels or bringing them together.

FLEXIBLE AXLES, CURVE RESISTANCE. Behavior of Free Flexible Axles in Railway Cars on Curves (Das Verhalten der freien Lenkachsen bei der Bewegung der Eisenbahnwagen in Gleisbogen), Chr Boedecker. Zentralblatt der Bauverwaltung, vol. 39, no. 62, July 30, 1919, pp. 361-366, 9 figs. Calculation of resistance values.

INSPECTION. Inspecting Cars in Interchange. Ry. Mech. Engr., vol. 93, no. 12, Dec. 1919, pp. 722-724. Suggested manner of procedure.

CARS, FREIGHT

MAINTENANCE. Economics of Freight Car Maintenance and Operation, L. K. Sillcox. Ry. Age, vol. 67, no. 26, Dec. 26, 1919, pp. 1227-1231, 1 fig. Discusses relative saving effected by rebuilding or retirement.

NUMBER NEEDED BEFORE 1923. Production Is Limited by Lack of Freight Cars. Ry. Age, vol. 68, no. 1, Jan. 2, 1920, pp. 27-32, 3 figs. Writer notes that equipment has not kept pace with growth of traffic. He believes that 800,000 cars will be needed in next three years.

CARS, PASSENGER

LONDON SUBWAY. New Passenger Car on the Metropolitan Railway. Ry. Gaz., vol. 32, no. 1, Jan. 2, 1920, pp. 21-24, 5 figs. Provided with five swing doors on each side and accommodation of 58 seats.

NUMBER NEEDED BEFORE 1923. 24,500 Passenger Cars Needed in Next Three Years. Ry. Age, vol. 68, no. 1, Jan. 2, 1920, pp. 37-40, 2 figs. Is based on past record in 10 years up to June 30, 1915 in which time it is said passenger traffic increased 48 per cent and number of passenger cars increased 35 per cent

CARS, REFRIGERATOR

C. P. RY. Refrigerator Cars for the C. P. R. Ry. Mech. Engr., vol. 93, no. 12, Dec. 1919, pp. 713-716, 4 figs. Steel underframe construction, 41 ft. long, fitted with tank bunkers, meat racks and ventilators.

CARS, TANK

MAINTENANCE. Tank Car Maintenance. Ry. & Locomotive Eng., vol. 32, no. 12 Dec. 1919, pp. 361-362. Importance of proper repairs of friction draft gears.

CASE HARDENING

CALCIUM CYANIDE. Heat Treating Methods Improved in 1919, B. F. Weston. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 113-114. Notably by use of calcium cyanamide in case hardening.

STEEL. Case Hardening of Steel, Walter Rosenbain. Automotive Industries, vol. 42, no. 2, Jan. 8, 1920, pp. 74-76, 2 figs. Outline of principles underlying process and discussion of recent improvements in it which overcome tendency for case to crack and fleck off.

CAST IRON. The Casehardening of Steel—II, J. F. Springer. Ry. Mech. Engr., vol. 93, no. 12, Dec. 1919. pp. 731-735, 1 fig. Chart showing relation of time and temperature to depth of impregnation.

CAST IRON

SYNTHETIC. Synthetic Cast Iron, Charles Albert Keller. Chem. & Metallurgical Eng., vol. 22, no. 2, Jan. 14, 1920, pp 83-88. 2 figs. Outlines continuous process of rapid carburization during melting of steel turnings, said to produce cast iron and semi-steel of exceptional purity and exact chemical analysis for manufacture of heavy shells and high-grade castings. From paper presented to Iron & Steel Inst.

CEMENT

EFFECT OF CALCIUM SULPHATE. Effect of Sulphate on Cement, J. C. Witt. Eng. World, vol. 16, no. 2, Jan. 15, 1920, pp. 83-87, 2 figs. Experiments at Chemical Laboratory, Bur. of Sci., Manila. It was found that cement ground in regular way at plant must have sulphuric anhydride content of 1.8 per cent to insure normal set. Effects of exposure to air and of additions of hydrated lime were found to be independent of sulphuric anhydride content.

SOLUBILITY. The Solubility of Portland Cement.—Its Relation to Theories of Hydration, J. C. Witt and F. D. Reyes. Concrete, Cement Mill Section, vol. 16, no 1, Jan. 1920, pp. 13-17, 1 fig. Factors that effect solubility were found to be (1) absence of carbon dioxide, (2) method of agitation, (3) fitness of grain, (4) volume of water and (5) time. Of these, volume of water is said to be most important. Investigations at laboratory of General, Inorganic and Physical Chem., Bur. of Sci., Manila, P. I.

CEMENT MANUFACTURE

ROTARY KILNS. Preheating Air for Rotary Kilns, S. H. Harrison. Concrete, Cement Mill Section, vol. 16, no. 1, Jan. 1920, pp 9-11, 2 figs. Method of calculating theoretical maximum temperature of preheated air under ideal conditions.

WET PROCESS. New Wet Process Plant of the Indiana Portland Cement Co. Concrete, Cement Mill Section, vol. 16, no. 1 Jan 1920, pp. 1-9, 9 figs. Capacity for plant is 1500 bbl. Storage and mixing tanks, slurry and clinker elevators, hoppers, platforms and machinery supports are of reinforced concrete; piers for kilns and heavy machinery are of massive concrete.

CENTRAL STATIONS

ECONOMICAL OPERATION. Central-Station Operation and District Heating Service, I. L. Kentish-Rankin. Elec. Rev., vol. 7, no. 1, Jan. 3, 1920, pp. 19-21. Points out opportunities for increasing revenue and conserving fuel.

RATE MAKING. Central-Station Rates in Theory and Practice, H. E. Eisenmenger. Elec. Rev., Chicago, vol. 75, no. 26, Dec 27, 1919, pp. 1048-1053. Questions involving valuation of physical and intangible property of utility.

CERIUM

CASTINGS FROM. Cerium and Its Alloys, Charles Vickers. Brass World, vol. 5, no. 11, Nov. 1919, pp. 330-332, 3 figs. Specifications contained in United States patent for "process of making castings of rare-earth metals and their alloys."

CHAINS

ROLLER STANDARDIZATION OF. The Standardization of Roller Chains. Automotive Industries, vol. 42, no. 1, Jan. 1, 1920, p. 33, 1 fig. Standard adopted by Assn. of British Chain Manufacturers.

CHEMICAL CONSTANTS

DETERMINATION. Note on the Determination of Chemical Constants, Alfred C. Egerton. Lond., Edinburg & Dublin Phil Mag., ol. 39, no. 229, Jan. 1920, pp. 1-20. Methods of calculating chemical constants and conditions necessary for obtaining accurate results are discussed. It is claimed that the older formula by which most of constants were calculated leads to result without physical significance. Formula which should be used, writer contends, requires knowledge of specific heat of substance.

CHIMNEYS

HEAT LOSSES IN. Reading Chimney Losses Direct from CO_2 Charts, C. C. Phelps. Power Plant Eng., vol. 24, no 2, Jan. 15, 1920, pp. 133-136, 6 figs. Illustrates why average CO_2 does not indicate chimney loss.

CHUCKS

MAGNETIC. Relative Characteristics of Magnetic Chucks, O. A. Kenyon. Mech. World, vol. 66, no. 1719, Dec. 12, 1919, pp 279-280, 5 figs. Outline of principles embodied in construction of magnetic chucks.

CLUTCHES

See Couplings, Flexible-Clutch.

COAL

ASH, FUSIBILITY OF. Fusibility of Coal Ash from Eastern Coals, W. A. Selvig, D. C. Brown and A. C. Fieldner. Chem. & Metallurgical Eng., vol. 22, no. 2, Jan. 14, 1920, pp 80-81. Table giving results of tests of standard mine samples collected by representatives of Bureau of Mines, U. S. Geol. Suevey, or by various State. Geol. Surveys, according to methods used by Bureau of Mines.

COPPER METALLURGY

Production from Secondary Material. Production of Copper from Secondary Material, Lawrence Addicks. Chem. & Metallurgical Eng., vol. 22, no. 3, Jan. 21, 1920, pp. 119-122, 1 fig. Methods of sampling miscellaneous products entering refinery, their treatment in regular or special furnaces with discussion of commercial possibility of recovering some of impurities as metallic by-products.

COST ACCOUNTING

Economic Requirements. Cost Accounting in the "New Industrial Day," G. Charter Harrison. Indus. Management, vol. 58, no. 6, Dec. 1919, pp' 441-444; also vol. 59, no. 1, Jan. 1920, pp. 13-17, 1 fig. Opinion is expressed that accounting profession faces crisis and great responsibility in its relation to industrial production. Also that cost accounting must fulfill its duty in industrial economics and should parallel actual costs and established standards, showing why first varies from latter if such is the case.

Laboratories. The Value of Cost Accounting in Commercial Laboratories, William W. Caswell. Jl. Indus. & Eng. Chem., vol. 12, no. 1, Jan. 1920, pp. 79-81. Economical aspect of installing system of cost accounting.

See also Steam Power Plants.

COSTS

Analysis of. A Graphic Method of Cost Analysis, G. I. Vincent. Am. Gas Assn. Monthly, vol. 1, no. 8, Aug. 1919, pp. 431-434, 2 figs. Suggested graphic method is illustrated with graphic studies of boiler fuel cost and boiler house labor cost.

Factory, Checking. Checking the Factory Costs, Wm. A. Smith. Eng. & Indus. Management, vol. 2, no. 25, Dec. 18, 1919, pp. 786-787. Indicates how cost records can be interlocked and checked with financial books.

Foundry. Production Cost and Profit Control in Non-Ferrous Foundries, Walter Glenn Scott. Metal Indus., vol. 15, no. 21, Nov. 21, 1919, pp. 429-431, 1 fig. Suggested method of keeping in touch with cost of a product at any stage of its manufacture.

COUPLINGS

Flexible-Clutch. Flexible Clutch Couplings, Charles L. Hubbard. Nat. Engr., vol. 24, no. 1, Jan. 1920, pp. 13-16, 13 figs. To compensate for shafting out of alignment and overcome difficulties in installation and operation. Various types and applications

CRANES

Cargo. Mechanical Method for Handling Cargo, Warren Travell. Shipping, vol. 9, no. 12, Dec. 24, 1919, pp. 23-24, 2 figs. General design of cargo cranes of types C and D. (Concluded.)

Safety Practice for. Cranes, Chester C. Rausch. Power Plant Eng., vol. 24, no. 2, Jan. 15, 1920, pp. 150-151. Recommendations in regard to safe practice and safety devices in connection with overhead and locomotive cranes.

Wharf. Cargo Handling at Ports, Brysson Cunningham. Elec., vol. 83 no. 2169, Dec. 12, 1919, pp. 652-657, 3 figs. Early appliances are alluded to, inception of hydraulic crane is described, and features and requirements of electric quay crane are enumerated.

CREOSOTE OIL

See Pavements, Wood-Block.

CUTTING METALS

Barth Slide Rules. Supplement to Frederick W. Taylor's "On the Art of Cutting Metals"—IV and V, Carl G. Barth. Indus. Management, vol. 58, no. 6, Dec. 1919, pp. 483-487, 6 figs., and vol. 59, no. 1, Jan. 1920, pp. 49-53, 7 figs. Describes logarithmic slide rule for formula embodying variables of tool pressure, feed and depth of cut, and modifications of this leading up to construction of compound planer slide rule and lathe slide rule for cutting steel.

Lathe Tools, Cutting Power of. Cutting Power of Lathe Turning Tools—II, George W. Burley. Engineering, vol. 108, no. 2817, Dec. 26, 1919, pp. 867-875, 25 figs. It is concluded from experiments that there is no practical cutting speed in which it is impossible to obtain satisfactory surface on plain carbon steels by means of ordinary lathe finishing tools, whether these be made of plain carbon tool steel, ordinary non-vanadium high-speed steel or vanadium high-speed steel. It is added that there is a maximum limiting speed at or above which satisfactory finish cannot be obtained on account of tendency of tool to plug at and tear surface, this tendency being related to phenomenon of building up on cutting edge of tool. Paper read before Inst. Mech. Engrs.

Rivet Removal. Process for Removing Rivets and Cutting Metals. Acetylene & Welding Jl., vol. 16, no. 194, Nov. 1919, p. 224. Recent invention by Société Anonyme L'Acetylène Dissous. Process consists essentially in fusing head of rivet by electric arc of suitable intensity enabling metal of rivet head to combine with substances adapted to form therewith compounds which are sufficiently fusible and liquid at working temperature to flow readily or be blown away by wind of arc.

See Electric Welding, Arc, Carbon Arc, also Oxy-Acetylene Welding.

CYLINDERS

Engine, Machining Fins on. Machining Fins on Radial Engine Cylinders, S. A. Inscoe. Machy. (Lond.), vol. 15, no. 379, Jan. 1, 1920, pp. 427-428, 5 figs. Methods of cutting grooves over bosses.

Molding Methods. Efficient Rig for Making Cylinders, J. R Anderson. Foundry vol. 48, no. 11, Jan. 1, 1920,pp. 15-16, 4 figs. Suggested design of rig.

DIES

Design of. The Design of Upsetting Machine Dies—I. Mech. World, vol. 67, no. 1722, Jan. 2, 1920, pp. 2-3, 1 fig. Illustrates set of heading tools and dies for production of mild-steel collars.

DIESEL ENGINES

Augsburg. World's Highest-Powered Naval-Type Diesel Engine. Motorship, vol. 5, no. 1, Jan. 1920, pp. 25-28, 6 figs. Augsburg 3000-shaft-horse-power heavy-oil engine for German submarine-cruisers. Engine is of 10-cylinder, 4-cycle, reversable high-speed type and runs at 385 r.p.m.

Cards from. Some Cards from a Diesel Engine, G. Ure-Reid. Engineer, vol. 128, no. 3333, Nov. 14, 1919, p. 497, 9 figs. Attention is called to difference in results obtained from engine when (1) each cylinder had separate pump discharging through accumalator to its spray valve and (2), where separate pumps discharged through their accumulators to common pipe and then to spray valves.

Design. Some Notes on the Design and Construction of Diesel Engines. Motorship, vol. 5, no. 1, Jan. 1920, pp. 40-41, 4 figs. Table giving piston speeds in various makes of 4-stroke engines and diagram showing piston effort curve for 4-stroke engine are studied and conclusions drawn in regard to most suitable stroke-bore ratio. (To be continued.)

German Submarine. German Submarine Diesel Engines, Philip H. Smith. Petroleum World, vol. 17, no. 232, Jan. 1920, pp. 35-38, 4 figs. Discussed their adaptability for industrial purposes.

Testing. Testing High-Powered Marine Oil-Engines. Motorship, vol. 5, no. 1, Jan. 1920, pp. 31-33, 4 figs. Dynamometer commonly sued by engine builders.

Valve Gear. Notes on the Valve-gear of Diesel Engines. Mech. World, vol. 67, no. 1772, Jan. 2, 1920, 6 figs. Study of valve diagrams.

See also Heavy-Oil Engines.

DIRECTION FINDERS

Zero Method, Application of. On the Goniometric Functions Applicable to Directive Aerials, A. Blondel. Radio Rev., vol. 1, nos. 1, 2 and 3, Oct., Nov. and Dec. 1919, pp. 1-10, 8 figs., 58-66, 1 fig., and 100-123, 4 figs. Indicates manner in which phase differences of electromotive forces induced in two vertical parts of measuring aerial necessitate corrections, when dimensions of loop or frame are not very small compared with wave length employed. Application of "zero method" to direction finding; effect of wave decrement; errors due to neglecting damping.

DREDGING

Suction Dredge. A Dredging Pump of Novel Construction, Walter J. White. Mech. Eng., vol. 42, no. 1, Jan. 1920, pp. 1-7 and 80, 13 figs. Modification of dredges employed in construction in canal connecting Mississippi River with Lake Pontchartrain was necessitated by reason of large number of stumps of trees and roots which it was desired to pump through dredge. Accordingly pump casings and impellers of 20-in. dredge were modified by changing shape of throat ring, and fitting new piece of suction pipe and cutting out two-thirds of each alternate vane.

DUST

Explosions. Dust Explosions, Ralph B. Chandler. Can. Engr., vol. 38, no. 1, Jan. 1, 1920, pp. 107-108, 1 fig. Account of accident and suggested theory of dust explosions.

Health Hazards. Health Hazards of Non-Poisonous Dusts. A Résumé of Some Recent Investigations. Emery R. Hayhurst. Am. Jl. of Public Health, vol. 10, no. 1, Jan. 1920, pp. 60-65. Includes also bibliography of articles in current literature on health hazards of dusts in industry.

Notes on the Final Report of the South African Miners' Phthisis-Prevention Committee, E. M. Weston. Eng. & Min. Jl., vol. 108, no. 23, Dec. 27, 1919, pp. 944-947. Comparative study of various methods of testing samples of air and discussion of effects of different types of drills on dust production and diffusion.

DYE INDUSTRY

Hygienic Control. Hygienic Control of the Anilin Dye Industry in Europe, Alice Hamilton. Monthly Labor Rev., vol. 9, no. 6, Dec. 1919, pp. 1-21. Notes complied by writer while sent on special mission to examine conditions in European factories in which anilin dyes and dye intermediates are manufactured, particularly measures taken to protect workers against danger of industrial poisoning.

DYES

Bibliography. General Review and Bibliography of Dyeing—II, P. E. King. Color Trade Jl., vol. 6, no. 1, Jan. 1920, pp 18-23. Articles on substantive dyes, colloid solutions and absorption phenomena, which have appeared in technical press, especially in German periodicals. From British Assn. Reports.

Dangers in Dyestuff Industry. Dangers in the Dyestuff Industry, L. C. Cone. Chem. & Metallurgical Eng., vol. 22, no. 1, Jan. 7, 1920, pp. 33-35. Review of incidental accidents due to inexperience in new industries. Explosion risks of dyes and intermediates of high-pressure apparatus and of inflammable vapor mixtures. Paper read before the Eighth Annual Safety Congress.

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DYNAMOMETERS

[illegible]

EDUCATION, ENGINEERING

[illegible]

ELECTRIC CIRCUITS, A. C.

[illegible]

ELECTRIC DRIVE

[illegible]

ELECTRIC GENERATORS, A. C.

[illegible]

ELECTRIC LAMPS, MERCURY ARC

[illegible]

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ELECTRIC LOCOMOTIVES

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ELECTRIC MOTORS, A. C.

[illegible]

ELECTRIC PLANTS

[illegible]

ELECTRIC RAILWAYS

[illegible]

[illegible]

[illegible]

ELECTRIC WELDING

RATES FOR. Making Proper Rates for Electric Welding, S. I. Oetreicher. Elec. World, vol. 75, no. 2, Jan. 10, 1920, pp. 70-72, 2 figs. Points out that question of central station rates is of vast importance to welding industry and advises that all factors be considered fairly and far-reaching co-operative policy be adopted.

ELECTRIC WELDING, ARC

APPLICATIONS. Arc Welding Apparatus and Its Applications, A. M. Candy. Welding. Engr., vol. 5, no. 1, Jan. 1920, pp. 28-32 and 36, 23 figs. Suggestions in regard to installation of equipment and selection of electrodes. (To be continued.)

Some Applications of Electric-Arc Welding. Metal Trades, vol. 11, no. 1, Jan. 1920, pp. 38-41, 9 figs. Illustrates filling blow-hole in steel casting by carbon-electro process, welding hatch-cover on steel vessel, repairing of brake fulcrum, and similar operations.

CARBON-ARC. Carbon-Electrode Arc Welding and Cutting, O. H. Eschholz. Elec. World, vol. 74, no. 22, Dec. 27, 1919, pp. 1158-1162, 9 figs. Enumerates advantageous applications of welding and cutting by means of carbon arc.

FACTORS IN. Arc Welding F. A. Anderson. Jl. Electricity, vol. 44, no. 2, Jan. 15, 1920, pp. 70-72, 5 figs. Discusses properties of various metals in their relation to welding, efficiency of welds, and various factors which contribute to successful work.

LOCOMOTIVE BOILER REPAIRS. Locomotive Boiler and Fire Box Arc Welding, E. Wanamaker and H. R. Pennington. Ry. Elec. Engr., vol. 10, no. 12, Dec. 1919, pp. 431-439, 33 figs. Illustrates practice followed at repair shops of Rock Island Lines.

PLASTIC-ARC, SHIP WORK. Plastic-Arc Welding Applied to Ship Construction and Repair, J. O. Smith. Int. Mar. Eng., vol. 25, no. 1, Jan. 1920, pp. 47-48. Enumerates reasons for defective rivets and observes that as long as present practice for repairing leaky rivets is to weld defective spots question naturally arises why it would not be advisable to weld plates at first.

SHORT ARC, IMPORTANCE OF. Some First Principles of Arc Welding with Metal Electrodes, J. F. Springer. Ry. & Locomotive Eng., vol. 32, no. 12, Dec. 1919, pp. 373-374, 2 figs. Writer establishes that best safeguard against rupture or dislocation of jet is maintenance of short arc.

ELECTRIC WIRING

ELECTRIC DIAGRAMS FOR. Application of Vectors to Wiring Diagrams, Lewis A. Terven. Elec. World, vol. 75, no. 2, Jan. 10, 1920, pp. 60-63, 11 figs. Illustrates manner of working out relay and metering schemes by means of vector diagrams.

ELECTRICAL INDUSTRY

DEVELOPMENTS IN. A Review of Developments in the Electrical Industry in 1919, Ainslie A. Gray. Elec. Rev., vol. 76, no. 1, Jan. 3, 1920, pp. 1-8. All elements of industry, except electric railways, are described as being busy and prosperous.

ECONOMIC OUTLOOK. The Economic Outlook in Industry, Henry I. Harriman. Elec. World, vol. 75, no. 4, Jan. 24, 1920, pp. 200-201. It is emphasized that increased production and better human relations must be combined to attain lasting success.

ELECTRICAL MACHINERY

FLUX DISPERSION, CALCULATION. Calculation of the Dispersion of Flux in Electrical Machines (Calcolo delle dispersioni di flusio nelle macchine elettriche), E. Morelli. L'Elettrotecnica, vol. 6, no. 35, Dec. 15, 1919, pp. 774-779, 7 figs. Comparative study of various formulæ

SURFACE TEMPERATURES, MEASUREMENT OF. Study on the Measurement of Surface Temperatures in Connection with Electrical Engineering (Zur Frace der Messung von Oberflächentemperaturen in der Elektrotechnik), Max Jakob. Archiv. für Elektrotechnik, vol. 8, no. 4, Aug. 28, 1919, pp. 126-132, 3 figs. Its importance in electrical engineering and methods for measuring.

WINDINGS TEMPERATURE DISTRIBUTION IN. Distribution of Temperature in Electric Winding of Rectangular Cross-Section (Die Temperaturvertailung in einer elektrischen Wicklung von rechteckigem Querschnitt), Max Jakob. Archiv. für Elektrotechnik, vol. 8, no. 4, Aug. 28, 1919, pp. 117-126, 6 figs. Graphs and tables showing distribution in various cross-sections.

ELECTRIFICATION

See Railway Electrification.

ELECTROLYTES

COLLOIDAL. Colloidal Electrolytes: Soap Solutions as a Type, James William McBain, Mary Evelyn Laing and Alan Francis Titley. Jl. Chem. Soc., vols. 115 and 116, no. 685, Nov. 1919, pp. 1279-1300, 3 figs. Theory of colloidal electrolytes is derived from conception that ions may be created to form nucleus of colloidal particle, termed ionic miccelle, while retaining their equivalent electrical charges.

ELECTRONS

RADIUM AND. Radium and the Electron, Ernest Rutherford. Nature, vol. 104, no. 2610, Nov. 6, 1919, pp. 226-320. Survey of progress of atomic physics since 1869.

ELECTROPLATING

COPPER ON IRON. Electro-Plating on Iron in Copper Sulphate Solution, Oliver P. Watts. Metal Industry, (Lond.), vol. 14, no. 21, May 23, 1919, pp. 428-430. It is said that certain lead and antimony may be substituted for arsenic dip, previous to direct-current plating of copper on iron from copper sulphate.

ELEVATORS

BUCKET. Types and Uses of Bucket Elevators—III, Clarence C. Brinley. Coal Trade Jl., vol. 50, no. 53, Dec. 31, 1919, pp. 1507-1508. Uses and advantages of continous discharge elevator.

EMPLOYEES' REPRESENTATION

SHOP COMMITTEES. Industrial Democracy in Practice in England Clarence H. Northcott. Automotive Industries, vol. 41, no. 25, Dec. 18, 1919, pp. 1197-1200. Operation of "joint standing industrial councils."

One Year of Shop Committees, William Leavitt Steddard. Indus. Management, vol. 59, no. 1, Jan. 1920, pp. 31-33. Summary of experimental movement in industry.

Systems for Mutual Control of Industry, William L. Leiserson. Mech. Eng., vol. 42, no. 1, Jan. 1920, pp. 24-25 and 82. Writer discusses various plans of employees' organization and features of collective bargaining which he believes would contribute to its success and also those which he thinks would doom it to failure.

WORKS COUNCILS. Employee Representation in Industrial Plants, Magnus W. Alexander. Elec. World, vol. 75, no. 3, Jan. 17, 1920, pp. 121-122. Opinion is expressed that works council plan offers helpful method of securing better relationship between employer and employee.

EMPLOYEES, TRAINING OF

FOREMEN. Training the Foremen of Industry, Dudley R. Kennedy. Indus. Management, vol. 59, no. 1, Jan. 1920, pp. 67-70. Opinion is advanced that foremen must not only be taught and trained but that their knowledge of economic truth must become a part of themselves, so that they may transmit it to workers under their direction.

MOLDERS. Training Men in the Molding Art, R. R. Clarke. Foundry, vol. 48, no. 1, 1920, pp. 11-13. Suggests instilling in workmen under training desire to look for reason in all operations.

SAFETY AND EFFICIENCY TRAINING. The Management and Training of Men, W. W Gidley. Universal Engr., vol. 30, no. 4, Dec. 1919, pp. 34-36. Importance of establishing departments in safety and efficiency particularly as means of promoting safety.

EMPLOYMENT MANAGEMENT

COMMUNITY POLICY. Permanent Employment Is Assured, Pat Dwyer. Foundry, vol. 48, no. 1, Jan. 1, 1920, pp. 1-5, 7 figs. Labor policy in large steel foundry, patterned on community lines but more free in its interpretation forms.

INSPECTORS, GRADING OF. Materials for Mass Production—IV, E. A. Allcut, Eng. & Indus. Management, vol. 3, no. 1, Jan. 1, 1920, pp. 21-22, 1 fig. Concerning relative grading of inspectors and amount of responsibility to be borne by each grade.

SELECTING EMPLOYEES. Choosing the Worker, B. Muscio. Eng. & Indus. Management, vol. 3, no. 1, Jan. 1, 1920, pp. 5-9. Emphasizes importance of bringing about precise adaption of worker to his work.

ENGINEERS

CLASSIFICATION AND COMPENSATION. Classification and Compensation of Engineers as Proposed by Engineering Council Committee, Eng. & Contracting, vol. 53, no. 2, Jan. 14, 1920, pp. 41-45, 1 fig. Eight grades are defined, five professional and three sub-professional, and necessary qualifications are specified. Investigations of Committee are represented as having shown "lack of any adequate or consistent employment policy with respect to professional engineers."

CO-OPERATION AMONG. Co-operation among Engineers, F. H. Newell. Eng. & Contracting, vol. 52, no. 26, Dec. 24, 1919, pp. 732-733. Points out how engineers may best co-operate and for what reason they should co-operate. From address before Ohio Assn. of Tech. Socs.

FUTURE OPPORTUNITIES AND OBLIGATIONS. Future Opportunities and Obligations of Engineers, George W. Fuller. Jl. Boston Soc Civ. Engrs., vol. 6, no. 10, Dec. 1919, pp. 341-352. Writer praises efforts of National Engineering Societies in furthering proposed Nat. Dept. of Public Works, and further observes that "it is necessary to create and maintain and strengthen a wide appreciation of the opportunities of engineers to play, at this particular period, a full part in a betterment program for the future."

INDUSTRIAL, OPPORTUNITY OF. Industrial Engineers' Opportunity, L. W. Wallace. Indus. Management, vol. 58, no. 6, Dec. 1919, pp. 462-464. Writer places principle of honesty, fairness and justice in forefront of fundamentals that should govern relations of employers and employees. Future of industrial expert is visualized as presenting great opportunities with ever increasing demand for production.

RELATIONS WITH CITIES. Co-operation among Cities Ensures Better Relations with Engineering Profession, Charles A. Mullen. Contract Rec., vol. 33, no. 53, Dec. 31, 1919, pp. 1203-1206. Points out advantages of union in securing a centralizing bureau and a clearing house of information.

ETHYLENE

See Alcohol.

FACTORY MANAGEMENT

FURNACES, HEAT-TREATING

TOOL HARDENING. Drop-stamping. Drop-forgings, etc.—XIV. Joseph Horner. Mech. World, vol. 66, no. 1721, Dec. 26, 1919, pp. 307-308, 2 figs. Design of furnace for hardening milling cutters, dies, etc., of high-speed steel.

See also Refractories.

FURNACES, HEATING

PROGRESS IN 1919. Heating Furnace Fuel Progress During 1919, A. E. Blake. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 121-124, 2 figs. Impetus given by fuel situation to study of more economical combustion methods.

FURNACES, HOT-AIR

RESEARCH. Report of Progress in Warm-Air Furnace Research, A. C. Willard. Univ. of Illinois Bul., vol 16, no. 38, May 19, 1919, 68 pp., 22 figs. Investigation to determine efficiency and capacity of commercial warm-air furnace, satisfactory and simple methods for rating furnace, methods of increasing efficiency and capacity of furnace heating equipment, proper sizes and proportions of leaders, stacks and registers supplying air to various floors, and friction losses in cold air of recirculating ducts and registers.

GAGES

INSPECTION. Standardized Inspection Tools. Pac. Mar. Rev., vol. 17, no. 1, Jan. 1920, pp. 108-111, 8 figs. Inspection tools and gages manufactured by Taft-Peirce Mfg. Co.

GALVANIZING

CONTINUOUS FURNACE FOR. Continuous Sheet Galvanizing Furnace, A. E. Blake. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 124-125 and 128. Description of furnace installed at Apollo Steel Co. which is said to represent considerable fuel saving over previous furnaces.

MODERN PRACTICE. Modern Galvanizing Practice. A. J. Franklin. Metal Industry (Lond.), vol. 16, no. 1, Jan. 2, 1920, pp. 7-9, 2 figs. Classification and description of important processes.
See also Sherardizing.

GAS MANUFACTURE

COAL COSTS FOR VARIOUS SYSTEMS. Net Cost of Coal for Various Systems of Gasification, Gas Jl., vol. 148. no. 2952, Dec. 9, 1919, pp. 541-543. 6 figs. Systems considered are: Continuous vertical, high steaming retorts; horizontal retorts; mixture of 75 per cent coal gas from horizontals and 25 per cent blue water gas; continuous verticals, moderate steaming; and continuous vertical retorts, non-steaming.

EFFECT OF INERTS ON EFFICIENCY. Effects of Inerts on Thermal Efficiency, J. W. Wood. Gas World, vol. 71, no. 1846, Dec. 6, 1919, pp. 451-453. Also Gas Jl., vol. 148, no. 2952, Dec. 9, 1919, pp. 545-548, 1 fig. Admission of inerts to gas is characterized as being commercially advantageous because ingress of definite amount of inerts at retort is said to mean less likelihood of loss of valuable coal gas to settings.

GASES

ABSORPTION IN SPRAY COOLING SYSTEM. The Absorption of Gases in Spray Systems and Towers, Edwin M. Baker. Chem. & Metallurgical Eng., vol. 22, no. 3, Jan. 21, 1920, pp. 122-124, 3 figs. Account of tests made using spray system for liquidd cooling.

ABSORPTION BY CHARCOAL. Studies of the absorption of Gases by Charcoal—II, Harvey B. Lemon and Kathryn Blodgett. Phys. Rev. vol. 14, no. 5, Nov. 1919, pp. 394-402, 5 figs. To determine how equilibrium pressure at constant volume depends upon composition of mixture, ratio of mass of gas to mass of charcoal remaining the same, when activated and previously evacuated specimen of cocoanut shell charcoal is exposed to excess of mixture of oxygen and nitrogen.

IONIZATION OF. Ionization of Gases, J. S. Townsend. Nature, vol. 104, no. 2610, Nov. 6, 1919, pp. 233-234. Discoveries which have led to advances in knowledge of molecular physics.

LOW TEMPERATURES AND CHEMICAL CONSTANT. Note on the Significance of the Chemical Constant and its Relation to the Behaviour of Gases at Low Temperatures, F. A. Lindemann. Lond. Edinburgh. & Dublin Phil. Mag., vol. 39, no. 229, Jan. 1920, pp. 21-25. It is shown that chemical constant has dimensions of logarithm of pressure if atomic heat of monatomic gases becomes zero at absolute zero.

GASOLINE

SPECIFICATIONS. Motor Gasoline Specifications Revised. Automotive Manufacturer, vol. 61, no. 9, Dec. 1919, pp. 18-20. Committee on petroleum specifications reports new end point, higher 90 per cent point, and elimination of all gravity references.

GEAR CUTTING

SHAPING MACHINE FOR. New Gear-Shaping Machine. Machy. (Lond.), vol. 15, no. 379, Jan. 1, 1920, pp. 425-427, 4 figs. Designed for all classes of repetition work on internal and external gears or ratchets. Main frame is single casting bolted to circular cast base which can be mounted on bench or column.

GEARS

CHANGE, DESIGN OF. Designing Change Gears. Machy. (Lond.), vol. 15, no. 378, Dec. 25, 1919, pp. 381-384, 3 figs. Calculations involved in designing change gear mechanisms for machine tools so that speeds will vary in geometrical progression.

REDUCTION. High-Speed Gearing. Times Eng. Supp., no. 542, Dec. 1919, p. 364. Design and construction of high-speed turbine gears. Paper read before Manchester Assn. of Engrs.

GEOLOGY

SULPHATES IN ORE DEPOSITS. Primary (Hupogene) Sulphate Minerals in Ore Deposits. B. S. Butler. Economic Geology, vol. 14, no. 8, Dec. 1919, pp. 581-609, 2 figs. From experimental investigation it is concluded that some of the metals which at high temperature are combined with oxygen as temperature is reduced give up oxygen and both metals and oxygen combine with sulphur producing sulphates of metals and oxides of sulphur.

GEOPHONE

See Coal Mines, Fires, Location of.

GIRDERS

LATTICE, ROLLING LOAD DIAGRAM. Simple Stress Diagram for Rolling Loads, Norman G. Kapp. Engineering, vol. 109, no. 2819, Jan. 9, 1920, p. 35, 5 figs. Calculated for lattice girder of eight panels of 10-ft. each.

GLASS

WIRED, AS FIRE RETARDANT. Wired Glass as a Fire Retardant, M. I. Carr. Fire & Water Eng., vol. 66, no. 26, Dec. 24, 1919, pp. 1217-1218. Experience is said to have shown that wired glass is perfect barrier to flame so long as it remains in position and that it is capable of affording moderate degree of resistance to passage of heat through it.

GOLD MINES

PANEL STOPING IN. Panel System of Stoping at the Herman Mine, S. H. Brockunier. Eng. & Min. Jl., vol. 108, no. 21, Dec. 6, 1919, pp. 856-858, 2 figs. Stopes worked by system of raises within ore-shoot, followed by panel stoping.

GRAIN HANDLING

BRITISH INSTALLATION. An interesting Grain Handling Equipment. Elecn., vol. 83. no. 2169, Dec. 12, 1919, pp. 694-696, 3 figs. Installation comprises one telescopic elevator, external to warehouse, two elevators inside warehouse, two automatic weighing machines, one loading-out shoot from warehouse and one loading-out shoot from elevator head.

GRAVITATION

EINSTEIN'S RELATIVITY THEORY. Einstein's Relativity Theory of Gravitation. Nature, vol. 104, nos. 2614 and 2615, Dec. 4 and 11, 1919, pp. 354-356 and 374-376. Points out how Einstein evolved his theoru by investigating relation between gravitation and energy and apparent consequent necessity for a beam of light to have weight if it has momentum.
Time, Space and Gravitation. Albert Einstein. Science, vol. 51, no 1305, Jan. 2, 1920. pp. 8-10. Exposition of theory of relativity. From the London Times.

HEALTH

DUST HAZARDS. *See Dust.*

HAZARDS IN CHEMICAL INDUSTRY. Health Hazards in the Chemical Industry. Chem. Age, vol. 1, no. 7, Dec 25, 1919, pp. 308-310. Based on survey of conditions affecting labor employed in chemical industries of State of New York, made by Industrial Commission of State Dept. of Labor.
Health Hazards of the Chemical Industry, State of N. Y., Dept. Labor, Special Bulletin no. 96, Nov. 1919, 69 pp., 11 figs. Based on examination of 335 plants.

IMPROVEMENT IN COTTON INDUSTRY. Preventable Death in Cotton Manufacturing Industry, Arthur Reed Perry. U.S. Dept. Labor. Bur. Labor Statistics, no. 251, 1919, 534 pp. Extensive tables are presented showing death hazard by age groups for wage earners under 45 years. Discussion is given of factors which have been specially active in cutting off lives of wage earners during age periods which are normally of greatest productive activity.

INDUSTRIAL HAZARDS. Industrial Health Hazards, Charles A. Lauffer Safety Eng., vol. 38. no. 5, Nov. 1919, pp. 279-282. Classification of hazards of employees and suggested remedies. From Proc. of Eighth Annual Safety Congress.

MEDICAL CARE OF WORKERS. The Medical Care of Industrial Workers.—II, C. D. Selby. Eng. & Indus. Management, vol. 2, no. 24, Dec. 11, 1919, pp. 742-745, 2 figs. Concerning relation of medical departments and industrial organizations, and selection of industrial personnel.

HEAT TREATMENT

See Nichrome; Steel, Heat Treatment of.

HEATING

BUILDINGS, OIL FIRING IN. Heating Buildings by Fuel Oil. Am. Architect, vol. 116, no. 2291, Nov. 19, 1919, pp. 648-650. Relative cost of and relative storage space required for oil and coal.

HEATING, STEAM

HYDRAULIC TURBINES

HYDROELECTRIC PLANTS

INDUSTRIAL MANAGEMENT

INDUSTRIAL RELATIONS

INSULATING MATERIALS

THERMAL CONDUCTIVITY OF. Thermal Conductivity of Insulating Materials, T. S. Taylor. Mech. Eng., vol. 42, no. 1, Jan. 1920, pp. 8-10, 2 figs. Experimental. "Thermal bridge" recommended by Prof. Northrup (Jl. Instn. of E. E., Lond., vol. 48, 1912, p. 674) was found satisfactory for determining thermal conductivity of sheet materials, while "thermal meters," meters," one of circular cross-section and the other of square cross-section, were found entirely reliable for measurement of thermal conductivity of sheet and other materials. Table is included giving results of measurements of thermal conductivity for large number of materials both across and along laminations.

INSULATORS, ELECTRIC

LINE TESTS FOR. Present and Future of Line Insulators, F. W. Peck, Jr. Elec. World, vol. 75, no. 4, Jan. 24, 1920, pp. 209-211, 4 figs. Failure is attributed to expansion of metal parts, cement, etc. It is believed that combined electrical, mechanical and porosity test should be substituted for present tests.

INSULATORS, HEAT

THERMAL CONDUCTIVITY OF. The Thermal Conductivity of Solid Insulators, W. M. Thornton. Lond., Edinburgh & Dublin Phil. Mag., vol. 38, no. 228, Dec. 1919, pp. 705-707. It is concluded from examination of properties of various insulators that "chief practical qualification of a material as a heat insulator is that it should be light and inelastic."

INTERCHANGEABLE MANUFACTURE

DRAWINGS FOR. Component Drawings for Interchangeable Manufacture, Earle Buckingham. Machy. (Lond.), vol. 15, no. 379, Jan. 1, 1920, pp. 417-421, 18 figs. Methods of dimensioning drawings and indicating tolerances.

INTERNAL-COMBUSTION ENGINES

PROGRESS IN 1919. Internal Combustion Engine Progress in 1919. Gas & Oil Power, vol. 15, no. 172, Jan. 1, 1920, pp. 57-58. Progress is seen to have consisted principally in standardization of gas and oil engines.

See also Aeroplane Engines; Automobile Engines; Diesel Engines; Oil Engines; Tractor Engines.

INVENTIONS

See Mechanical Science.

IRON MANUFACTURE

PUDDLED IRON. On Future Development in Puddled Iron Manufacture, J. E. Fletcher. Engineering, vol. 108, no. 2816, Dec. 19, 1919, pp. 836-840, 6 figs. Possibilities of reducing puddling labor and of saving fuel. (Concluded.) Paper read before Staffordshire Iron & Steel Inst.

The Characteristics of Puddled Iron, J. E. Fletcher. Eng. & Indus. Management, vol. 2, no. 24, Dec. 11, 1919, pp. 739-741, 2 figs. Writer states that there is sound scientific reason for belief that mechanical puddling of metal at temperatures below melting point of borderland alloy between cast iron and steel (that containing about 2 per cent carbon) should be practically and economically possible. Paper read before Staffordshire Iron & Steel Inst.

JIGS

LOCOMOTIVE REPAIR SHOPS. Jigs and Special Devices in Locomotive Repair Shops, J. C. Bevelle. Ry. Mech. Engr., vol. 93, no. 12, Dec. 1919, pp. 725-727, 7 figs. Such as special cutter for milling quadrants, flue sheet cutters, etc.

JUTE

See Rope Drive.

LABOR

CONTRACTS. Essentials of a Labor Contract, Edwin Gruhl. Elec. Ry. Jl., vol. 55, no. 2, Jan. 10, 1920, pp. 96-101. Writer first outlines principles underlying proper relation of employer and employee and then sets forth and dicusses section by section suggested labor contract.

HOURS OF WORK, REDUCTION IN. Methods of Reducing Hours of Work in Great Britain. Monthly Labor Rev., vol. 9, no. 6, Dec. 1919, pp. 251-254. Three ways are explained: (1) one-break day system; (2) two day-shift system; (3) five-day week system.

MINIMUM WAGE, CALIFORNIA. Effect of Minimum Wage Orders in California. Monthly Labor Rev., vol. 9, no. 6, Dec. 1919, pp. 261-263. It is said that no establishment was forced out of existence by order and that number of employees was not decreased but increased 10 per cent. Minimum wage is considered in consequence as real remedial measure.

RESPONSIBILITIES OF. Labor ans Its Responsibilities, Charles Piez. Coal Age, vol. 16, no. 22, Dec. 11 and 18, 1919, pp. 882-884. Address delivered before Am. Min. Congress.

LIGHTING

COLOR MATCHING, LIGHT FOR. Artificial Daylight, A. P. Trotter. Times Eng. Supp., no. 542, Dec. 1919, p. 361. Concerning matching of colors.

FARM LIGHTING SYSTEM. Knight Engine Adapted to Two-Unit Farm Lighting System. Automotive Industries, vol. 42, no. 1, Jan. 1, 1920, pp. 14-17, 5 figs. Spherical combustion chamber is notable feature of this air-cooled motor.

INDUSTRIAL SURVEY OF CONDITIONS. Survey of Prevailing Conditions as to Industrial Lighting—I. Elec. Rev. (Chicago), vol. 65, no. 4, Jan. 24, 1920, pp. 139-141. Investigation of actual conditions in 15 States.

INTERIOR SYSTEMS, IMPROVING ILLUMINATION. Maintenance of Interior Lighting Systems, Ward Harrison and J. R. Colville. Elec. World, vol. 75, no. 4, Jan. 24, 1920, pp. 204-208, 7 figs. Case is cited where it is said illumination was raised from 2.7 to 7 foot-candles by cleaning lamps, reflectors, walls and ceiling.

RAILWAY STATIONS. Report of Committee, VI—On Buildings. Bul. Am. Ry. Eng. Assn., vol. 21, no. 220, Oct. 1919, pp. 123-138, 4 figs. Proposes standards of illumination for passenger-station interiors and surroundings and platforms, covered and uncovered.

RESIDENCE. Home-Lighting—How to Make It Comfortable and Effective, A. L. Powell and R. E. Harrington. Trans. Illum. Eng. Soc., vol. 14, no. 8, Nov. 10, 1919, pp. 394-406 and (discussion) pp. 407-414, 8 figs. Concerning avoidance of extreme contrasts and arranging lights so as to derive greatest flexibility of lighting.

STREET. Single Light Compared with Cluster Units for Street Lighting, S. L. E. Rose and H. E. Butler. Gen. Elec. Rev., vol. 22, no. 12, Dec. 1919, pp 1044-1055, 16 figs. Writers point out what they term inefficiency of cluster unit and present data in support of their contention that this type of unit should be discarded.

THEATERS. Artistic and Utilitarian Theater Lighting, Lyman Day Morgan. Elec. World, vol. 75, no. 1, Jan. 3, 1920, pp. 4-6, 7 figs. Scheme of concealed light sources at Milwaukee theater.

LOCOMOTIVES

DESIGNING. Locomotive Designing. Ry. & Locomotive Eng., vol. 32, no. 12, Dec. 1919, pp. 358-361, 3 figs. Features involved in locomotive using coal for fuel.

FEEDWATER HEATING. Locomotive Feed Water Heating. Ry. Gaz., vol. 31, no. 25, Dec. 19, 1919, pp. 818-820, 4 figs. Discusses application of exhaust steam and waste gases to feedwater heating.

FEEDWATER TREATMENT. Treatment of Water for Locomotives, William M. Barr. Ry. Rev., vol. 65, no. 26, Dec. 27, 1919, pp. 953-957. Notes on utility of boiler compounds, wayside treatment, boiler washing, etc., and conditions under which each of these is most useful.

FIREBOXES, STAYBOLT DEFLECTION. Deflection of Staybolts, George L. Fowler. Ry. Rev., vol. 65, no. 26, Dec. 27, 1919, pp. 949-953, 8 figs. Also Ry. Mech. Engr., vol. 93, no. 12, Dec. 1919, pp. 701-707, 13 figs. Account of investigation to determine nature and extent of staybolt movement under influence of temperature and pressure.

NUMBER NEEDED BEFORE 1923. Adequate Motive Power for Railroads a Necessity. Ry. Age, vol. 68, no. 1, Jan. 2, 1920, pp. 33-36. Figures indicating motive power required in next three years and estimated cost.

PULVERIZED-COAL-BURNING. Locomotive Fitted for Burning Pulverized Fuel. Ry. Gaz., vol, 32, no. 2, Jan. 9, 1920, pp 55-59, 7 figs. Scheme invented and patented by J. G. Robinson, chief mechanical engineer of Gt. Central Ry., England.

REDESIGNING. Changing Prairie Type to Mikado. Ry. Mech. Engr., vol. 93, no. 12, Dec. 1919, pp. 694-696, 4 figs. Redesigning of boiler to increase efficiency and provide ample steaming capacity for larger cylinders.

MACHINE TOOLS

FEEDS AND SPEEDS. The Androuin Series of Feeds and Speeds. Engineer, vol. 128, no. 3336, Dec. 5, 1919, pp. 556-559, 1 fig. Summary of studies by J. Androuin (see Bulletin de la Société d'Encouragement pour l'Industrie Nationale. Sept.-Oct., 1919) to discover series of figures for feeds and speeds of machine tools which, while suitable for all practical requirements, would also be such that time required to machine given piece of work could be calculated with great rapidity and care.

MAGNETIC SEPARATORS

TYPES. Electromagnetic Concentration and Separation of Iron Minerals and Metallurgical Waste (La concentration et le triage électromagnétique des minérais de fer et des déchets métallurgiques). Jean Escard. Génie Civil, vol. 75. nos 24, 25 and 26, Dec. 13, 20 and 27, 1919, pp. 603-607, 7 figs, pp. 622-627. 24 figs., and pp. 648-652, 10 figs. Particulars of construction and records of operation of Edison, Rowland, Waterhill, Humboldt, Negreanu, Blake, Steinert-Kertler, Gröndel and Luther magnetic separators.

MARINE BOILERS

SCOTCH, DESIGN OF. Application of Standardization and Graphical Methods to the Design of Cylindrical Return Tubular Boilers, Henry C. E. Meyer Boiler Maker, vol. 19, no. 12, Dec. 1919, pp. 351-355, 11 figs. Suggested rules for designing boilers of Scotch type. Paper read before Soc. of Naval Architects and Marine Engrs.

MARINE STEAM TURBINES

GOVERNOR. Westinghouse Marine Turbine Governor. Power, vol. 50, no. 20, Nov. 25, Dec. 2-9, 1919, pp. 766-767, 4 figs. Governor is of centrifugal type. Has arrangement for automatic control of steam and water supply to glands, which prevents leakage where rotor emerges from casing on both high- and low-pressure turbines.

MELTING POINTS

METALS

MINE RESCUE APPARATUS

MINES

MINING

MINING INDUSTRY

Pipe-Line Transmission. Oil-Pipe Line Transmission, H. W. Crozier. Jl. Electricity, vol. 44, no. 1, Jan. 1, 1920, pp. 24-27, 3 figs. Study of methods of determining viscosity, particularly in general case of pipe lines where oil, initially heated, cools rapidly as it flows along.

Rectified Petroleum Spirit. Composition of Rectified Petroleum Spirit from Toluol-Petroleum Spirit Runnings of Asiatic Petroleum, H. G. Evans. Jl. Soc. Chem. Indus., vol. 38, no. 23, Dec. 15, 1919, pp. 401T-402T, 1 fig. Account of investigations undertaken to determine approximate composition of petroleum spirit in toluol-petroleum spirit runnings from Asiatic petroleum.

Refinery Sludge, Utilization of. Utilization of Asphaltic Base Acid Sludge Obtained in Refining Petroleum and Shale Oils, Charles Baskerville. Jl. Indus. & Eng. Chem. ,vol. 12, no. 1, Jan. 1920, pp. 30-31. Method developed at Dept. of Chem., College of City of N.Y.

World Resources. Political and Commercial Geology Series. The Petroleum Resources of the World—II, John D. Northrop. Eng. & Min. Jl., vol. 109, no. 1, Jan. 3, 1920, pp. 34-38, 1 fig. It states that American British and Dutch interests control most of world's oil; also that U. S. is supreme in western hemisphere but has not aggressive nationalistic policy of foreign governments.

OIL ENGINES

Akroyd Type. Modern Development of Oil Engines, Mark Meredith. Gas Engine, vol. 22, no. 1, Jan. 1920, pp. 32-33. Particularly of type using Akroyd principle.

OIL FIELDS

Mackenzie River Basin. The Mackenzie River Basin, Philip Thompson. Eng. & Min. Jl. ,vol. 108, no. 31, Dec. 6, 1919, pp. 866-868, 1 fig. Geological features of the area and most favorable regions in which to prospect for mineral and oil.

OIL SHALES

Kiln Distillation. The Eventual Retort Plant for the Distribution of Oil Shales, Louis Simpson. Chem. & Metallurgical Eng., vol. 22, no. 2, Jan. 14, 1920, pp. 71-72. Alleges that horizontal revolving kiln, as constructed for burning of cement clinker, is more capable of handling spent shale than Scotch retort.

Nitrogen from. Recovery of the Nitrogen Contained in Oil Shales, Louis Simpson. Chem. & Metallurgical Eng., vol. 22, no. 1, Jan. 7, 1920, pp. 20-22. Writer believes that future of oil shale industry is largely dependent upon construction of "single purpose" retort that can be erected at low cost and which will recover maximum quantity of oil.

OIL WELLS

Mapping. Mapping of Oil Wells, S. S. Langley. Eng. & Min. Jl., vol. 108, no. 22, Dec. 13 and 20, 1919, pp. 908-911, 5 figs. Illustrates charts indicating undergrounds conditions, constructed from drillers' reports.

OPEN-HEARTH FURNACES

Acid, Action of Iron Oxides on. The Action of Iron Oxides Upon the Acid Furnace Structure, J. H. Whiteley and A. F. Hallimond. Engineering, vol 108, no. 2807, Oct. 17, 1919, pp. 528-532, 10 figs. Source of iron oxides carried from furnace by outgoing gases is considered and method is described by which comparative amounts present in gases at various stages of process may be ascertained. Paper read before Iron and Steel Inst.

Electric vs. Electric vs. Open Hearth Furnace Practice. E. H. Ballard. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, p. 62. Comparison of costs.

Large-Unit Practice. Open Hearth Practice with Large Units, N. E. Maccallum. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 52-55, 6 figs. Double ladle practice is upheld. Experience with metalkase brick is illustrated.

Martin-Siemens. Martin-Siemens Furnaces (Les fours Martin-Siemens), A. D. Williams. Revue de Métallurgie, vol. 16, no. 5, Sept.-Oct. 1919, pp. 313-339, 16 figs. Survey of technical and experimental researches of various investigators, undertaken with a view to determine best proportion of dimensions of furnaces, together with exposition of physical phenomena taking lace in furnace. (To be continued.)

ORE DRESSING

Ball Mills. Fine-Grinding in Ball-Mills, Henry Hanson. Min. & Sci. Press, vol. 120, no. 1, Jan. 3, 1920, pp. 17-20. Results of comparative tests.

OXY-ACETYLENE WELDING

Boiler Repairs. Boiler Repairs by Oxy-Acetylene Welding. Acetylene & Welding Jl., vol. 16, no. 194, Nov. 1919, pp. 214-215, 8 figs. Illustrates welding of cracks in tube plates.

Boilers. Autogenous Welding Accepted in Boiler and Pressure Vessel Repairs. Boiler Maker, vol. 20, no. 1, Jan. 1920, pp. 17-18. Committee report of Engineers' Committee of Steam Boiler and Fly-Wheel Service Bur. which was made up for representatives from all companies writing steam boiler insurance.

Blowpipe Manipulation. Blowpipe Manipulation. A New Method of Executing Welds. Acetylene & Welding Jl., vol. 16, no. 194, Nov. 1919, pp. 218-219, 3 figs. Executing welds by method in which welding rod follows blowpipe instead of preceding it.

Drop Forgings. Fusion Welding Applies to Drop Forgings, S. W. Miller. Can. Machy., vol. 23, no. 3, Jan. 15, 1920, pp. 92-93. Writer holds that oxy-acetylene process is more applicable to reclaiming of drop forging than electric, especially where defects are small, because "while the electric process is considerably cheaper . . . yet there is greater liability with the electric process."

Fractures. Metallurgy for Welders, Paul C. Tris. Acetylene Jl., vol. 21, no. 7, Jan. 1920, pp. 480-482. Photomicrographs illustrating various conditions which are likely to be found in fractures.

Iron Foundry Work. The Welder in the Iron Foundry, David Baster. Acetylene Jl., vol. 21, no. 7, Jan. 1920, pp. 469-472, 2 figs. Possibilities of effecting savings in foundry by introduction of welding.

Isolated Plant. Oxy-Acetylene Welding in an Isolated Plant, J. H. Sto.iker. Acetylene Jl., vol. 21, no. 7, Jan. 1920, pp. 475-478. Conditions for successful welding. Paper read before Can. Natural Gas & Petroleum Assn.

Procedure. Oxy-Acetylene Welding and Cutting, Hugh H. Dyar. Boiler Maker, vol. 19, no. 12, Dec. 1919, pp. 362-364. Concerning uniting of gases in torch, heat treatment of cast iron, uses of special jigs for tank welding, and strength of welds.

OXYGEN

Electrolytic Production. *See Hydrogen, Electrolytic Production.*

PAINTS

Rosin in. Use of Rosin in Paint and Varnish, Maximilian Toch. Chem. & Metallurgical Eng., vol. 21, no. 15, Dec. 24 and 31, 1919, pp. 767-768. Experiments are quoted in which it is said that rosin with china wood oil paint left better surface for repainting than linseed oil paint. Paper read before Am. Inst. Chem. Engrs.

PAPER MAKING

Cellulose Formations. Process for Cellulose Formations. Paper, vol. 25, no. 17, Dec. 31, 1919, pp. 23-24. German patent for producing cellulose formations by precipitating ammoniacal copper oxide cellulose solution.

Coloring. The Coloring of Paper, Otto Kress. Paper, vol. 25, no. 19, Jan. 14, 1920, pp. 17-20. Equipment required for testing dyes for strength and shade. (Continuation of serial.)

PAPER MILLS

See Roofs, Paper Mill, Decay Prevention.

PAVEMENTS, ASPHALT

Joining to Car Tracks. Asphalt Paving Laid Without Granite Blocks Alongside Rails, Clifford A. Elliott. Elec. Ry. Jl., vol. 55, no. 3, Jan. 17, 1920, pp. 158-159, 4 figs. It is said that Pacific Elec. Ry. has omitted granite paving blocks from alongside girder and T-rails in paved-street construction.

Mixtures. Asphalt Paving Mixtures, Prevost Hubbard. Better Roads & Streets, vol. 9, no. 11, Nov. 1919, pp. 369-370. Their classification.

PAVEMENTS, BITUMINOUS

Aggregates for. Mineral Aggregates for Bituminous Pavements, Wallace L. Caldwell. Mun & County Eng., vol. 57, no. 6, Dec. 1919, pp. 246-250. Classification of causes of failure of bituminous pavements and suggestions in regard to method of testing aggregates.

Foundations for. Foundations for Warrenite-Bitulithic, George C. Warren. Good Roads, vol. 18, no. 26, Dec. 24, 1919, pp. 261-262 and 264, 2 figs. Discussion of relative merits of resilient and rigid bases for warrenite-bitulithic surfaces and of use of old macadam.

PAVEMENTS, BRICK

Economical Construction. Suggested Economies in Brick Street and Road Construction, Will P. Blair. Mun. & Country Eng., vol. 57, no. 6, Dec. 1919, pp. 262-264. In designing of proper tools and appliances which will lessen actual labor necessary in construction.

Resurfacing with Asphalt. Method of Resurfacing Worn Brick Pavement with Asphalt, Charles E. Murphy. Eng. & Contracting, vol. 53, no. 1, Jan. 7, 1920, p. 7, 3 figs. Illustrates method of applying 2-in. asphaltic concrete.

PAVEMENTS, CONCRETE

Cold-Weather Construction. Precautions for Concrete Pavement Construction in Cold Weather. Concrete Age, vol. 1, no. 3, Dec. 1919, pp. 16-17. Arrangement which is said to have enabled placing of concrete at from 75 to 85 deg. during temperatures from 4 to 43 deg.

Voids in Aggregate. Does It Pay to Determine Void Percentages in Coarse Aggregate for Concrete Pavement? William G. Crandall. Mun. & County Eng., vol. 57, no. 6, Dec. 1919, pp. 264-266, 2 figs. Diagrams for obtaining interpolated values of factors when voids in either of coarse aggregates vary from multiple of 5 per cent.

PAVEMENTS, WOOD-BLOCK

Creosote Oil for Blocks. Proper Grade of Creosote Oil for Wood Paving Blocks, K. M. Waddell. Mun. & County Eng., vol. 52, no. 6, Dec. 1919, pp. 269-272, 3 figs. Characteristics required are said to be, (1) toxicity, (2) waterproofing values, (3) permanence, and (4) penetrance.

PETROLEUM

See Oil.

RECORDS

Filing System. Office Records—Their Filing and Indexing, Irene Warren. Jl. Electricity, vol 44, no. 1, Jan. 1, 1920, pp. 22-23, 3 figs. Advantages of central filing system.

RECTIFIERS

Large-Capacity. Mercury Arc Rectifiers for Large Outputs. Electrician, vol. 84, no. 2172, Jan. 2, 1920, pp. 10-13, 8 figs. Diagrammatic representation of types built by Brown Boveri & Co., Switzerland, for outputs of 150-kw. and 500-kw.

REDUCTION GEARS

See Gears, Reduction.

REFRACTORIES

Furnace Linings. Refractories in Heat-Treating Furnaces, John A. King. Proc. Steel Treating Research Soc., vol. 2, no. 8, 1919, pp. 16-19 and 32. Deals with linings and factors which determine life of linings, and gives general outline of kinds of refractories and various tests applied to them.

Silica Brick. Silica Bricks (Les briques de silice), Pierre Gilard. Revue Universelle des Mines, vol. 2, no. 3, July-Aug. 1919, pp. 559-582, 12 figs. Survey of technical researches concerning influence of nature of silica on properties of brick. (To be continued.)

RELATIVITY THEORY

See Gravitation.

RELAYS

Overload. Induction-Type Overload Relays—Their Operation and Application. Victor H. Todd. Power, vol. 50, no. 16, Nov. 22, 1919, pp. 583-585, 13 figs. Discusses construction and operation of overload relay, in which movement similar to watt-hour meter is used to obtain protective device of high accuracy.

RESEARCH

Industrial. Elements of Industrial Research, Frank B. Jewett. Chem. Age, vol. 1, no. 7, Dec. 25, 1919, pp. 285-286. Suggests co-operation of teacher and employer of technical men.

Industrial Research. Times Eng. Supp., no. 542, Dec. 1919, p. 367. Account of conference convened by Dept. of Sci. and Indus. Research with a view to exchanging views in regard to problems arising out of establishment and working of industrial organizations.

Organization of. The Organization of Research, Henry Prentiss Armsby. Science, vol. 51, no. 1300, Jan. 9, 1920, pp. 33-38. Its significance for advancement of science. Address delivered before Agricultural Section, British Assn. for Advancement of Science.

Workers, Development of. What Is Needed to Develop Good Research Workers, W. R. Whitney. Elec. World, vol. 75, no. 3, Jan. 17, 1920, pp. 151-154, 7 figs. Suggests that students be encouraged to share inspiration of engineering work instead of being instructed in facts only.

ROAD TRACTION

Present Status. The Present Position of Mechanical Road Traction, C. G. Conradi. Jl. Instn. Mech. Engrs., no. 9, Dec. 1919, pp. 661-701 and discussion, pp. 702-706, 53 figs., partly on eight supp. plates. Comparative study of costs of steam, gasoline and electric traction. Problems of goods transportation are classified and economical operation by one of these three systems of traction is determined for each.

ROLLER CHAINS

See Chains, Roller.

ROLLING MILLS

Draft and Peak Load Relations. Plate Mill Draft and Peak Load Relation, J. T. Eaton. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 94-96 3 figs. Discussion of draft and peak load relations as influenced by steel temperature and number of passes.

Friction and Spreading Forces. Friction and Spreading Forces in Rolling Mills, W. B. Skinkle. Mech. Eng., vol. 42, no. 1, Jan. 1920, pp. 11-13, 5 figs. Description of apparatus designed for special series of investigations to be made on experimental rolling mill at Carnegie Inst. of Technology.

Research Bureau Studies Practical Rolling Mill Technical Problems, W. B. Skinkle. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 84-88, 6 figs. Description of equipment to be installed at Rolling Mill Research Bur. for experimental measurement of friction losses and spreading forces on rolls and roll housings.

Hot Rolling, Theories. Theories of Hot Rolling (Les théories du laminage à chaud), P. Maringer. Revue Universelle des Mines, vol. 2, no. 3, July-Aug. 1919, pp. 425-533, 53 figs. Energy required for rolling and determination of efforts exerted by cylinders. (Concluded.)

Rolling Processes. Rolling Processes from Thermal and Mechanical Points of View, Frithiof Holmgren. Jernkontorets Annaler, vol. 103, May 31, 1919, pp. 87-124. Discussion of process of rolling of metals, both historical and technical view of heat application and power consumption.

Sheet Rolling. Development of Modern Sheet Rolling, W. H. Melaney. Blast Furnace & Steel Plant, vol. 8 no. 1, Jan. 1920, pp. 91-93. Outline of operations peculiar to manufacture of sheets.

ROOFS

Paper Mill, Decay Prevention. Paper Mill Roofs, R. J. Blair. Paper, vol. 25, no. 17, Dec. 31, 1919, pp. 15-23, 12 figs. Investigations of Forest Products Laboratories of Canada to determine best method of preventing decay in timber of pulp and paper mill roofs.

ROPE DRIVE

Indian Mills. Jute and Its Manufacture in India. Engineer, vol. 128, no. 3334, Nov. 21, 1919, pp. 505-506, 7 figs., partly on supp. plate. Rope driving from slow-speed horizontal side-by-side compound engines is mentioned as general practice in Indian mills.

RUBBER

Caoutchouc Industry. Caoutchouc Industry (L'industrie du caoutchouc). Génie Civil, vol. 75, no. 26, Dec. 27, 1919, pp. 661-662. Production, methods of testing and classification of caoutchouc.

Expansion During Vulcanization. The Expansion of Rubber Compounds During Vulcanization, C. W. Sanderson. Jl. Indus. & Eng. Chem., vol. 12, no. 1, Jan. 1920, pp. 37-40, 5 figs. Experiments to determine whether or not use could be made of expansion test in distinguishing between stocks which move freely and mold well and those which do if mold well.

Synthetic. Analytical Determination of Synthetic Rubber (Versuche zur analytischen Bestimmung von synthetischen Kautshuk), G. Hübner. Gummi-Zeitung, vol. 33, no. 23, Mar. 7, 1919, pp. 361-362. Results of tests.

Volume Increase Under Strain. Volume Increase of Compounded Rubber Under Strain, H. F. Schippel. Jl. Indus. & Eng. Chem., vol. 12, no. 1, Jan. 1920, pp. 33-37, 11 figs. Account of tests. It is concluded that "the greater the mean diameter of the pigment particles, the greater is the volume increase under strain."

RUST PREVENTION

Phosphatic Coatings for. Phosphatic Coating for Rust Proofing Iron and Steel, L. E. Eckelmann. Chem. & Metallurgical Eng., vol. 21, no. 15, Dec. 24 and 31, 1919, pp. 787-789, 4 figs. After exposing various methods of phosphatizing writer observes that while phosphatic coatings "are not so resistant to wear and abuse as sherardized or galvanized metals," nevertheless "phosphatic rustproofing is considerably cheaper than any other well known rustproofing process in use today."

SCIENTIFIC MANAGEMENT

British Shops. Scientific Management, H. W. Allingham. Eng. & Indus. Management, vol. 2, no. 26, Dec. 25, 1919, pp. 803-808, 5 figs. Its application in British shops.

Mining Industry. Taylorism in the Mine, M. Langrogne. Colliery Guardian, vol. 118, no. 3078, Dec. 27, 1919, pp. 1714-1715. Chief requirements for successful application are seen to be, unity of control, reinforced technical assistance, and precise definition of working program and means of carrying it out. (Concluded.) Paper read before Société de l'Industrie minérale de France.

Result from. Scientific Management: A Solution of the Capital and Labor Problem—II, J. M. Scott Maxwell. Machy. (Lond.), vol. 15, nos. 377 and 378, Dec. 18 and 25, 1919, pp. 366-369, 2 figs., and 354-357. Economical aspect of payment-by-results system. Gives charts showing comparison of efforts extended in manufacturing operations by experienced and inexperienced workers.

See also Factory Management; Industrial Management.

SEAPLANES

See Aeroplane Engines, Design.

SEMI-STEEL

See Cast Iron, Synthetic.

SEWAGE TREATMENT

Brooklyn, N. Y. Some Results of the Brooklyn, N. Y., Sewage Treatment Experiments. Eng. & Contracting, vol. 53, no. 2, Jan. 14, 1920, pp. 39-41. Data pertaining to Imhof tank operation, trickling filters, etc.

Plainfield, N. J., Plant. Plainfield's Sewage Treatment Plant. Mun. Jl. & Public Works, vol. 47, no. 22, Nov. 29, 1919, pp. 318-322, 7 figs. Details of operation of Imhoff tanks and sprinkling filters.

SHAFT SINKING

See Mines, Shaft Sinking; Iron Mines, Shaft Sinking.

SHAFTS

Keyways, Influence of. On the Influence of Keyways on the Stress Distribution in Cylindrical Shafts, T. H. Gronwall. Trans. Am. Math. Soc., vol. 20, no. 3, July 1919, pp 234-244, 1 fig. Mathematical expression of ratio between maximum stresses in keyed and full parts of shaft.

SILICA BRICK

STEAM

Self-Tempering, Critical Points. Critical Points of Self-Tempering Steels (Sur les points critiques d'aciers auto-trempants). P. Dejean. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 22, Dec. 1, 1919, pp. 1043-1045, 1 fig. Examination of cooling curves obtained by differential method of nickel-chrome-copper steel.

STEEL CHROME-NICKEL

Nichroloy Products. The Making of Nickel-Chromium Products W. F. Sutherlan. Can. Machy., vol. 23, no. 2, Jan. 8, 1920, pp. 57-60, 5 figs. Manufacture of "nichroloy" products. "Nichroloy" is composed principally of low-carbon steel, chromium, silicon, manganese, aluminum and nickel.

STEEL, HEAT TREATMENT OF

Alloy Steel. Alloy Steel and Heat Treatment in the Production of Special Forgings. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 106-108, 7 figs. Practice of Am. Forge & Machine Co. in manufacture of high grade chrome-vanadium and steel forgings.

Ball-Bearing Races. Electric Furnace Installation for Heat Treatment of Ball Bearing Races. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 115-117, 7 figs. Treating equipment consists of pusher type furnace, oil quench tank and oil drawing bath arranged in series for continuous flow of material.

Hardening. The Hardening of Steel, H. C. H. Carpenter. Chem. News, vol. 119, no. 3112, Dec. 5, 1919, pp. 261-264. Theories of hardening. (Concluded.)

See also Forgings, Electric Heat Treatment.

STEEL INDUSTRY

Electric Drive. Electricity in Steel Industry, 1919, G. E. Stoltz. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 4-7, 6 figs. Outlines usual methods of operating electric drive and presents charts showing costs and other data.

Metallurgical Progress. Metallurgical Progress in Steel Industry. Blast Furnace & Steel Plant, vol. 8, no. 1, Jan. 1920, pp. 56-58. No radical departures in metallurgical processes are believed to have been developed even during the war, and it is remarked that progress made consisted chiefly in a more intelligent application of processes already known.

STEEL, MANGANESE

Open-Hearth. Making Manganese Steel by the Open-Hearth Process, E. L. Shaner. Foundry, vol. 48, no. 2, Jan. 15, 1920, pp. 63-66, 8 figs. Attention is specially called to method of adding alloy and quenching heat-treated castings.

STEEL, MOLYBDENUM

Properties and Uses. Molybdenum and Molybdenum Steel, W. E. Simpson. Min. & Sci. Press, vol. 119, no. 25, Dec. 20, 1919, pp. 894-896. As example of toughening property imparted to steel by addition of over one per cent molybdenum, it is mentioned that plates of war tanks, which were made of this steel were unafftected by machine-gun fire at ten yards point-blank range. Commercial applications of molybdenum steel, particularly in mining industry, are quoted.

STREET RAILWAYS

Leakage Resistance of Roadbeds. Leakage Resistance of Street Railway Roadbeds and Its Relation to Electrolysis of Underground Structures, E. R. Shepard. Dept. Commerce, Technologic Papers of Bur. of Standards, no. 127, Oct. 6, 1919, 39 pp., 10 figs. Roadbeds constructed with solid concrete ballast, vitrified brick, or other nonporous pavements, were found to have low leakage resistance to earth, and roadbeds constructed with foundation of clean, crushed stone under concrete paving base much higher resistance than roadbeds with solid concrete ballast. Other types were experimented with. Comparative results are given.

Maintenance of Way. Maintenance of Way for Street Railways, W. R. Dunham. Elec. Ry. Jl., vol. 55, no. 2, Jan. 10, 1920, pp. 103-107, 10 figs. Describes organization and methods employed for carrying on work necessary for maintaining tracks of a Connecticut company.

Service-at-Cost Agreements. Service-at-Cost Agreements, Harlow C. Clark. Aera, vol. 8, no. 5, Dec. 1919, pp. 582-593. Analysis of laws and ordinances of city of Montreal.

Valuation. Valuation and Accruing Depreciation, P. J. Kealy. Jl. Western Soc. Engrs., vol. 25, no. 1, Jan. 5, 1920, pp. 11-14. In opinion of writer future of traction companies lies along way to private operation based on cost of service, with sufficient public supervision to insure proper costs and adequate service.

See also Electric Railways.

STRUCTURES

Statically Indeterminate, Analyzing. Advantages of the Slope Deflection Method of Analyzing Statically-Indeterminate Structures, M. Grodsky. Eng. & Contracting, vol. 52, no. 26, Dec. 24, 1919, pp. 720-723, 10 figs. Analysis of two statistically-indeterminate structures of slope-deflection method. Reference is made to computation of same structure by least-work method in Eng. & Contracting, Sept. 24, 1919.

SUBMARINE SIGNALING

Radius of Operation. Effect of Horizontal Temperature Layers of Sea Water on Radius of Sound Signals Under Water (Ueber den Einfluss horizontaler Temperaturschichtung des Seewassers auf die Reichweite von Unterwasserschallsignalen), H. Litche. Physikalische Zeitschrift, vol. 20, no. 17, Sept. 1, 1919, pp. 385-389, 2 figs. Equations and curves showing radius of sound.

SUBMARINES

Influence in Warfare. The Influence of the Submarine in Naval Warfare in the Future, W. S. King-Hall. Jl. Roy. United Service Instn., vol. 64, no. 455, Aug. 1919, pp. 359-381. Summarizing experience of last war, writer concludes that for purpose of tactical attack submarine did not prove its importance, but he notes that strategically, "a flotilla of submarines represent a concentration of armed force, and the fact that this concentration can emerge and disappear from sight is an important point."

SUBSTATIONS

Automatic. Automatic Substations Eliminate Labor Expense, R. J. Wensley. Elec. World, vol. 75, no. 3, Jan. 17, 1920, pp. 137-138. Operating expense of two stations, one used for industrial service and other for three-wire circuits.

SULPHURIC ACID

Recovery from Sodium Bisulphate. Recovery of Sulphuric Acid (La récupération de l'acide sulphurique). Génie Civil, vol. 75, no. 26, Dec. 27, 1919, pp. 655-657. Process of recovering sulphuric acid from sodium bisulphate obtained as residue in manufacture of explosives.

See also Coal, Pyrite, Use of.

TANKS

Concrete. Concrete Tanks for Industrial Purposes. Contract Rec., vol. 33, no. 53, Dec. 31, 1919, pp. 1211-1212. Construction requirements of concrete tanks for storage of mineral oils, brine, molasses, vegetable and animal oils and chemicals.

The Handling of Cocanut Oil, Charles W. Geiger. Power Plant Eng., vol. 24, no. 2, Jan. 15, 1920, pp. 121-126, 8 figs. Description of Philippine Vegetable Oil Co.'s storage plant including constructional features of reinforced-concrete storage tanks.

Oil. *See Concrete.*

Wooden. *See Water Meters, Railway Water Service.*

TAXES

British System of Levying. A Simple Progressive Tax and Its Bearing on the Federal Income Tax and Other Acts, H. S. Carslaw. Jl. & Proc. Roy. Soc. New South Wales for 1918, vol. 52, pp. 203-214, 2 figs. Mathematical analysis of systems of levying taxes in Great Britain and various states in Australia.

TELEGRAPHY

Baudot Quadruplex. The Baudot. Telegraph and Telephone Jl., vol. 6, no. 57, Dec. 1919, pp. 31-33, 6 figs. Electric weight lift attatchment as applied at Indian Government Telegraph Works to both distributor and receiver. (Continuation of serial.)

TELEPHONY

Progress in 1919. Progress in the Art of Communication, Bancroft Gherardi and Frank B. Jewett. Elec. World, vol. 75, no. 4, Jan. 24, 1920, pp. 202-204, 1 fig. Opinion is advanced that development of machine switching of telephone circuits and further application of vacuum tubes marked year of 1919.

TETRYL

See Explosives, Tetryl.

TEXTILE MILLS

Cleaning in. *See Compressed Air, Textile Uses.*

Conveyors for. Conveying Systems in Textile Mills. Textile World Jl., vol. 57, no. 2, Jan. 10, 1920, pp. 101-103, 5 figs. Their development and relation to transport. (To be continued.)

Drawing Rolls, Setting. The Setting of Drawing Rolls. Textile World Jl., vol. 57, no. 3, Jan. 17, 1920, pp. 45-46, 6 figs. Writer asserts that improper setting or neglect of any kind of setting of drawing rolls on moving and spinning frames in cotton mills is responsible for considerable amount of deficient work and waste.

Hot-Water Supply. Hot Water Supply of Textile Mills, W. C. Beekley. Textile World Jl., vol. 57, no. 2, Jan. 10, 1920, pp. 103-105. Need of careful analytical study of conditions in every plant is pointed out.

Use of Steam in. Steam Use in Textile Process, George H. Perkins. Mech. Eng., vol. 42, no. 1, Jan. 1920, pp. 14-16, 2 figs. Tables of comparative figures showing importance of use of steam for manufacturing processes in textile industry. Analyses are given of various uses to which steam is put, and suggestions are made for research and improvement of economy.

THERMOREGULATORS

TIDAL POWER

TIMBER

TIME

TRACTOR ENGINES

TRANSFORMERS

TRANSPORTATION

WAGES

WATER HAMMER

Remedy for. Water Hammer in Conduit Under Pressure (Les coups de bélier dans conduites forcées). Génie Civil, vol. 76, no. 1, Jan. 3, 1920, pp. 9-12, 6 figs. Suggests means of overcoming water hammer in hydroelectric installations. (To be continued.)

METERS

Railway Water Service. Report of Committee XIII—On Water Service. Bul. Am. Ry. Eng. Assn., vol. 21, no. 220, Oct. 1919, pp. 65-97, 6 figs. Report includes recommendations in regard to water meters considered as suitable for railroad water service and methods for testing and reading meters, and specifications for wooden water tank of 50,000-gal. capacity.

WATER PIPES

Laying in Frozen Ground. Laying a Pipe Line in Frozen Ground, William W. Elmer, Eng. & Min. Jl., vol. 108, no. 20, Nov. 22 and 29, 1919, pp. 823-824. Details of method used in British Columbia, where deep snows and 45 per cent grade were encountered.

WATER POWER

British Columbia. The Waterpowers of British Columbia—I and II. Power House, vol. 12, no. 21, and vol. 13, no. 1, Dec. 20, 1919, and Jan. 5, 1920, pp. 553-558 and 1-7, 11 figs. From report of Commission of Conservation on Waterpowers of British Columbia, giving information in regard to actual installations which are developing power for municipal and private use.

WATER PURIFICATION

Ozonizing Plant. Swimming Pool of the West Point Military Academy. Am. Architect, vol. 116, no. 2293, Dec. 3, 1919, pp. 701-705, 5 figs. Layout and features of ozone water purifying plant.

WATER SUPPLY

Winnipeg, Man. *See Conduits, Reinforced-Concrete.*

WELDING

Boilers. Boiler Welding, Ben. K. Smith. Welding Engr., vol. 5, no. 1, Jan. 1920, pp. 49-52 and 57-60, 14 figs. Its advantages over riveting.

Electric. *See Electric Welding.*

Joints, Design of. Design of Welded Joint. Universal Engr., vol. 31, no. 1, Jan. 1920, pp. 36-38, 13 figs. Various types of metallic joints are sketched and method of welding each is indicated.

Oxy-Acetylene. *See Oxy-Acetylene Welding.*

Ship Construction. Welding vs. Riveting in Ship Construction, Letson Balliet. Metal Trades, vol. 11, no. 1, Jan. 1920, pp. 27-28. Welding is decidedly preferred among other reasons because "total cost of welding the seam is but little more than the value of the metal-saved because of no lap being required."

Welding Mild Steel, H. M. Hobart. Welding Engr., vol. 4, no. 12, Dec. 1919, pp. 40-44 and 49-55. Investigations undertaken by Welding Research Sub-Committee of Welding Committee of Emergency Fleet Corporation. General object of investigations was to extend use of welding in construction of merchant ships and to provide definite basis for obtaining best economy and efficiency in employing welding in place of riveting in construction of hulls. (To be continued.)

WELFARE WORK

Factories. Welfare Work in Factories, J. Badcliffe. Jl. Roy. Sanitary Inst., vol. 39, no. 3, Feb. 1919, pp. 93-99. Necessity for promoting it.

Welfare Work in Factories and Workshops, Ethel Brown. Jl. Roy. Sanitary Inst., vol. 39, no. 3, Feb. 1919, pp. 99-106. Experience of textile plant in England quoted as example of successful accomplishment.

Physical Care of Employees. Physical Care of Cement Plant Employees, Charles E. Coleman. Cement Mill and Quarry, vol. 16, no. 1, Jan. 5, 1920, pp. 21-23. Practice of treating injured at two large Illinois mills. From proceedings of Annual Safety Congress.

WELLS

Pollution of. Pollution of Deep Wells at Lansing, Michigan, Edward D. Rich. Mun. & County Eng., vol. 52, no. 6, Dec. 1919, pp. 278-282. Pollution came about, writer says, because sense of security created by clearance of water, depth of wells and absence of epidemics, led to lack of watchfulness "which shouls always be maintained over every water supply."

WINCHES

Electrically Driven. Electrically-Driven Winches and Capstans. Elecn., vol. 83, no. 2169, Dec. 12, 1919, pp. 689-691, 8 figs. Features of design that have to be provided in order to meet special requirements of these plants, such as their being submerged by heavy seas breaking on board and tropical conditions of heat and moisture.

WIRELESS

See Radiotelegraphy.

WOMEN WORKERS

Post-War Employment, England. Post-War Employment of British Women. Monthly Labor Rev., vol. 9, no. 6, Dec. 1919, pp. 292-298. Report of Women's Employment Committee of British Ministry of Reconstruction. Importance is emphasized of giving women "as wide an opportunity of employment as other considerations may permit."

WOOD

Moisture Content. Method for Determining the Moisture Content of Wood. Ry. Mech. Engr., vol. 93, no. 12, Dec. 1919, pp. 717-716, 4 figs. Directions issued by Forest Products Laboratory.
See also Timber.

WOOD PRESERVATION

Building Material. Timber: Its Conversion, Decay and Preservation, William Ransom. Surveyor, vol. 56, no. 1456, Dec. 12, 1919, pp. 379-380. With special reference to characteristics which must be possessed by timber intended to be used in erection of buildings. (To be continued.) Paper read before Instn. of Municipal & County Engrs.

Surface Perforation. Timber Perforating Patent Given to Public. Ry. Maintenance Engr., vol. 16, no. 1, Jan. 1920, pp. 17-18, 2 figs. Goss patent which consist of method of puncturing surface of wood to be treated by holes systematically located at uniform distances apart, both transversely and longitudinally, distances depending on know normal absorption of preservative with and across grain of wood under given time of immersion, pressure and size of perforations.

Treating Methods. Inaccuracy of Treating Methods Due to Moisture in Wood, Ernest Bateman. Chem. & Metallurgical Eng., vol. 22, no. 2, Jan. 14, 1920, pp. 57-59. Account of experimental work to determine reactions taking place in treatment of wood with inorganic salt preservatives. It was concluded that "there is no apparent reason to suppose that a chemical combination results from the treatment of wood with most inorganic salts, such as zinc chloride, zinc sulphate, sodium fluoride, calcium chloride, etc." and that "any system of measuring the absorption of salt by wood during treatment which is based on a measurement of the weight or volume of the solution before or after treatment is liable to a very considerable error."

WORKS COUNCILS

See Employees' Representation, Shop Committees.

Ore Smelting. *See Electric Furnaces, Zinc-Ore Smelting.*

Engineering Index

This Index is prepared by the American Society of Mechanical Engineers

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ABRASIVE WHEELS

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AIR COMPRESSORS

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AIR CONDITIONING

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AIRSHIPS

Rigid, Construction, Principles of. The Principles of Rigid Airship Construction, A P Cole. Aeronautics, vol. 18, no. 328, Jan. 29, 1920, pp 101-104. Formulæ for determining structural strength of airship members. (To be continued.) Paper read before Roy. Aeronautical Soc.

Ethyl, From Wood. Ethyl Alcohol from Wood, F. W. Kressman. Chem. Age, vol. 2, no. 1, Jan. 10, 1920, pp. 319-321. Successful production of ethyl alcohol from wood is visualized to depend primarily upon steady uniform supply of wood waste available at low price for period of twelve years or more.

ALLOY STEELS

Metallurgy of. Progress in Metallurgy of Alloy Steels, Harold F. Wood. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 25-27. No material change is seen in basic principles of alloy-steel production during 1919. It is said that lessons learned during war showed clearly that good alloy steel can be made by either electric-furnace, crucible or open-hearth process, and that also by merely specifying process to be used does not insure buyer of high-quality product.

Molybdenum in. Molydenum in Commercial Alloy Steel. Iron Age, vol. 105, no. 6, Feb. 5, 1920, pp. 407-409, 1 fig. Effect on physical properties and heat-treatment temperature range when substituted for portions of nickel or chromium. Graph is included showing relative properties of chrome-molybdenum steel at various temperatures and heat-treatment conditions. From book soon to be published by Climax Molybdenum Co., New York.

ALLOYS

Corrosion-Resisting. Alloys of High Corrosion Resistance (Gegen Korrosion widerstandsfähigere Legierungen), Hugo Rieger. Giesserie-Zeitung, vol. 16, nos. 19 and 20, Oct. 1 and 15, 1919, pp. 289-291 and 316-319. Circumstances to be considered in choice of alloy. Formulæ are given for armature gun-metal alloys employed in manufacture of gages, pump cases, plungers, valves and other parts in distilleries and breweries, sugar factories, canneries, etc.; and also for manufacture of vessels for production of alcoholic beverages and sugar, various chemical products, aniline dyes, etc.

Various Tests of. Alloys (Alliages), Maillard. Fonderie Moderne, vol. 12, no. 8, Aug. 1919, pp. 170-172. Physical tests conducted by various companies with copper-zinc-lead, aluminum-beryllium and zirconium-nickel alloys.

ALTERNATORS

See Electric Generators, A. C.

ALUMINUM

Substitution for Steel. Notes on the Uses of Aluminum (Notes concernant quelques applications de l'aluminium), M. Legrand. Industrie des Tramways et Chemins de Fer, vol. 13, nos. 151-152-153, July-Aug.-Sept. 1919, pp. 77-80. Discusses economy of substituting aluminum for steel in automobile and electrical industries.

ALUMINUM ALLOYS

See Bronzes, Aluminum.

AMMONIA COMPRESSORS

Vilter High-Speed. Two New Vilter High-Speed Ammonia Compressors. Power, vol. 50, no. 21, Dec. 16-23-30, 1919, pp. 804-806, 6 figs. Double trunk piston with piston rings to stop both ammonia and oil is fitted to guard against oil getting past piston and draining crankpit.

ARMATURES

See Electrical Machinery Dipping and Baking Coils.

ARTILLERY

Ammunition. Modern Artillery Ammunition—II, H. M. Brayton. Am. Mach., vol. 52, no. 2, Jan. 8, 1920, pp. 95-101, 4 figs. Study of calculation involved in modern artillery ammunition and description of developments during war at Frankford Arsenal.

Big Guns, Life of. The Death of a Big Gun, Arthur Benington. Sci. Am. Monthly, vol. 1, no. 1, Jan. 1920, pp. 33-35. 4 figs. Theories accounting for hardening and cracking of rifled surface. From book on artillery by Admiral Ettore Bravetta of Italian navy.

German Long-Range Gun. The German Long-Range Gun, H. W. Miller. Mech. Eng., vol. 42, no. 2, Feb. 1920, pp. 89-100, 25 figs. Account of German super-gun bombardment of Paris from Forest of Gobain, 70 miles distant, in spring of 1918, together with authentic details regarding design of gun, carriage, emplacement and projectile.

Railway, Clearances for. Railway Clearances for Railway Artillery, E. D Campbell. Jl. U. S. Artillery, vol. 52, no. 2, Feb. 1920, pp. 147-152, 4 figs. Composite clearance diagrams of various railway systems, prepared by Ordnance Department.

ASH HANDLING

Bucket Carrier System. An Efficient Coal and Ash Handling Plant—II, Henry I. Edsall. Coal Trade Jl., vol. 51, no. 4, Jan. 28, 1920. Installation using Peck overlapping pivoted bucket carrier to distribute fuel and take away ashes.

Vacuum and Steam Systems. Ash-Handling in Power Plants—IV, Robert June. Elec. Rev. (Chicago), vol. 76, no. 8, Feb. 21, 1920, pp. 308-310, 1 fig. Comparative study of vacuum and steam ash-handling systems.

ATMOSPHERE

Transperency, Measurement of. Method of Measuring Transparency of Atmosphere (Sur une méthode pour la mesure de la transparance atmosphérique), André Bloudel. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 2, Jan. 12, 1920, pp. 93-97, 1 fig. Differential method analogous to that employed for measuring absorbing power of a liquid.

AUDIONS

See Radiotelegraphy, Audions.

AUTOMOBILE ENGINES

Air Cooling of. The Air-Cooling of Petrol Engines. Autocar, vol. 44, no. 1267, Jan. 31, 1920, pp. 217-218, 5 figs. Results of experimental work conducted during war in order to determine best shape of fins, most adequate surface of cylinder, etc. Paper read before Instn. Automobile Engrs.

Continental. New Continental Engine an Exceptional Production Job. Automotive Industries, vol. 17, no. 6, Feb. 5, 1920, pp. 400-402, 5 figs. Engine is 3¼ x 4½-in. 6-cylinder-unit power plant type with removable cylinder head and aluminum crankcase.

Cylinder Head, Detachable. The Detachable Cylinder Head, Georges Funck. Autocar, vol. 44, no. 1266, Jan. 24, 1920, pp. 139-142, 14 figs. Various constructions criticized from point of view of designer, manufacturer and user.

Cylinders, Casting. Precautions That Must Be Taken in the Manufacture of Automobile Cylinders (Precautions à prendre pour la fabrication des cylindres d'automobiles), Charles Bichon. Fonderie Moderne, no. 9, pp. 207-211, 2 figs. Suggestions in regard to manner of drying molds, proportioning metal, etc.

Cylinders, Machinery. *See Cylinders, Machining.*

Double-Piston Type. New Crank Motion Embodied in Engine, P. M. Heldt. Automotive Industries, vol. 17, no. 6, Feb. 1920, 5 1920, pp. 405-407, 3 figs. Description of engine of double-piston type, each cylinder containing two pistons between heads of which explosion takes place.

Mixture Requirements. Mixture Requirements of Automobile Engines, O. C. Berry. Gas Engine, vol. 22, no. 2, Feb. 1920, pp. 57-63, 11 figs. It is concluded from tests at Purdue University Engineering Experiment Station that: (1) Mixture giving maximum power does not vary materially with brake load carried, but remains constant at about 0.0775 lb. of gasoline per lb. of dry air; (2) at light loads, engine will not operate well with as wide a range of mixtures as it can use when carrying more nearly its full capacity; and (3) mixture giving maximum thermal efficiency becomes leaner as brake load is increased, specially between no load and half load.

Testing Beds. Torque Reaction Beds for Engine Tests. Aviation, vol. 7, no. 12, Jan. 15, 1920, p. 536. Design which is said to eliminate effect of forces through engine axis. From Zeitschrift des Verenes deutscher Ingenieure.

AUTOMOBILES

Bodies. Body Features at the New York Show, George J. Mercer. Automotive Industries, vol. 42, no. 4, Jan. 22, 1920, pp. 300-305, 11 figs. Points out various refinements and novelties in coach work of models exhibited at Grand Central Palace.

Whirls and Eddies. Autocar, vol. 44, no. 1266, Jan. 24, 1920, pp. 167, 168, 2 figs. Suggests applying principles of aeroplane construction to design of automobile body.

Braking, Four-Wheel. Braking on All Four Wheels, W. F. Bradley. Automotive Industries, vol. 42, no. 7, Feb. 12, 1920, pp. 460-462, 5 figs. Comparison of European and American practices.

Design, Trend of. British Tendencies in Passenger Car Design. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 124-129. Lists are included giving specifications of British and Continental passenger cars.

Trend in Passenger Car Design, P. M. Heldt. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 114-117, 11 figs. Points out such changes as slight falling off in eight and twelve-cylinder engines decline of T-head type engine, continued decline of gravity fuel feed and almost complete disappearance of dual ignition system.

Dynamotor for. A Flywheel Dynamotor. Autocar, vol. 44, no. 1266, Jan. 24, 1920, pp. 156-157, 2 figs. Bowman-Aspden device combining dynamo, starting motor and fiywheel.

1920 Cars, Data on. 1920 Passenger Automobiles Listed with Their Technical Specifications. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 118-123. Over 120 cars are listed, and specifications refer to systems of lubrication, carburation, ignition, electric system transmission nature of running gear, type of bearings, etc.

Parts, Machining on Automatic. Ford Mult-au-matic Practice, Edward K. Hammond. Machy. (N. Y.), vol. 26, no. 4, Dec. 1919, pp. 299-308, 18 figs. In machining automobile parts on Bullard mult-au-matics.

BOILER FIRING

BRIDGES, RAILWAY

NIAGARA, REINFORCEMENT OF. Niagara Railway Arch Reinforced for Heaviest Traffic. Eng News-Record, vol 83, no. 19, Nov. 13-20, 1919, pp. 877-881, 4 figs. Stresses in 550-ft. arch span were redistributed by changing crown shims. Floor was reconstructed for E 70 loading.

PLATTE RIVER, RECONSTRUCTION OF. Platte River Bridge Reconstruction, Rock Island Lines. Eng. News-Rec., vol. 84, no. 6, Feb. 5, 1920, pp. 287-289, 5 figs. Pile-bent piers with concrete caps to carry girder-spans, and sheathed pile bents fitted with pile breakers, are prominent features of design.

BRONZES

ALUMINUM, INGOT-CASTING METHOD. Further Progress in Ingot Production, Charles Meigh. Metal Industry (Lond.), vol. 16, no. 4, Jan. 23, 1920, pp. 61-62, 3 figs. Method of casting alloy aluminum bronzes at low temperature with minimum fall and exposure to air, while molten, and automatic feed.

MANGANESE, METALLURGY OF. Metallurgy of Manganese Bronze, Ernest J. Davis. Foundry, vol. 48, no. 3, Feb. 1, 1920, pp. 109-111, 4 figs. Photomicrographs indicating percentage of alpha and beta solid solutions.

PHOSPHOR BRONZE, TESTING. The Testing of Phosphor Bronze, Leslie Aitchison. Metal Industry (London), vol. 15, no. 26. Dec. 26, 1919, pp. 525-526. Opinion is expressed that Brinell test or scleroscope test should be disregarded for cast phosphor bronze and that metal should be passed upon tensile test.

BUILDINGS

VIBRATION PREVENTION. Means Employed for preventing Transmission of Vibrations to Buildings (Moyens d'empêcher la transmission des vibrations aux bâtiments). Industrie Electrique, vol. 29, no. 661, Jan. 10, 1920, pp. 1-2, 6 figs. Gerb anti-vibrator and other types are described.

BUREAU OF MINES

EXPERIMENT STATIONS. Experiment Stations of the Bureau of Mines Van H. Manning. Bur. of Mines, bul. 175, 1919, 105 pp., 22 figs. Character of work and organization of each of the eleven mining experiment stations es a' .ished since the creation of the Bureau in 1910.

CABLEWAYS

SEMI-PORTABLE. Semi-Portable Aerial Ropeway, Engineering, vol. 109, no. 2820, Jan. 16, 1920, pp. 80-82, 20 figs. Ropeway erected to handle timber on Lond. and South-Western Ry.

CAMS

TANGENTIAL, DESIGN. Cam Design and Construction, Franklin DeR. Furman. Am. Mach., vol. 52, no. 1, Jan. 1, 1920, pp. 21-27, 14 figs. Tangential cams.

CANALS

NEW YORK STATE BARGE. The New York State Barge Canal—I and II, Frank M. Williams. Sci. Am., vol. 122, nos. 1 and 2, Jan. 3 and 10, 1920, pp. 14-15, 40-41 and 51, 13 figs. How some of engineering problems involved in construction were net, particularly that of obtaining sufficient water to provide for minimum depth at all times.(To be continued.)

CAR AXLES

See Car Wheels.

CAR FLOATS

CONCRETE. Concerte Floats Meet hard Test, W. T. Duggan. Mar. Rev., vol. 50, no. 2, Feb. 1920, pp. 88-90, 6 figs. Tests of various floats built for army-transport service and survey of uses of car floats in New York Harbor are said to have demonstrated that working of floats does not set up stresses on steel sufficient to cause fatigue of metal as it would be occasioned on the high seas.

CAR WHEELS

ENGLISH AND AMERICAN. Railway Wheels and Axles, T. H. Sanders. Engineering, vol. 109, no. 2820, Jan. 16, 1920, pp. 99-100. Certification of types used in English and American practice, and discussion of tests to which wheels and axles are submitted before acceptance by railway authorities. Paper read before Sheffield Section of Jl. Instn. of Engrs.

CARBON

ACTIVATION OF. The Activation of Carbon, N. K. Chaney. Chem. Engr., vol. 28, no. 1, Jan. 1920, pp. 19-22. Technical study of method of activation by differential oxidation.

CARBURETORS

PREHEATING AND ATOMIZING IN. Preheating and Atomizing in Carburetors (Etude du réchauffage et de la pulvérisation dans les carburateurs), M. Carbonaro. Génie Civil, vol. 76, no. 4, Jan. 24, 1920, pp. 93-97, 6 figs. Influence of these processes upon the condition of mixture at the moment of admission into cylinder. It is concluded that preheating has no action except in case of very long piping and in case of motors running at very low speeds; in all cases improvement due to preheating is calculated never to exceed 40 per cent. (To be continued.)

CARS, FREIGHT

HARTEND GENERAL SERVICE TYPE. Hartend General Service Car, and Hart Door Gear. Ry. Mech. Eng., vol. 94, no. 1, Jan. 1920, pp. 51-52, 2 figs. Between bolster and end sill at either end floor plates are sloped downwardly and outwardly from center sill, thus forming hopper at each corner of car. Outer sides of these hoppers are closed by swinging doors hinged at top and closed and locked by hand.

INSPECTION OF. The Inspection of Freight Equipment, L. K. Sillcox. Ry. Mech. Engr., vol. 94, no. 2, Feb. 1920, pp. 93-96, 2 figs. Defects that must be avoided in selection of freight cars for certain commodities.

CARS, REFRIGERATOR

COMPARATIVE TESTS. Comparative Tests of Refrigerator Cars, Ry. Mech. Engr., vol. 94, no. 1, Jan. 1920, pp. 28-32, 5 figs. Temperature readings in actual service on cars equipped with overhead and end ice bunkers.

STANDARD TYPE. The Development of a Standard Refrigerator Car, M. E. Pennington. A.S.R.E. Jl., vol. 6, no. 1, July, 1919, pp. 1-12 and (discussion), pp. 12-24, 7 figs. Essentials laid down by railroad administration Mechanical Department Circular No. 7.

CEMENT

HANDLING IN BULK. Handling and Storing Bulk Cement Wallace R. Harris. Jl. Western Soc. Engrs., vol. 24, no. 1, Jan. 1919, pp. 21-26 and (discussion), pp. 26-30, 8 figs. Saving effected by handling cement in bulk are pointed out and various schemes for bulk handling of cement are outlined.

CEMENT MANUFACTURE

WET PROCESS. Latest Development in Wet Process Portland Cement Plants. Rock Products, vol. 23, no. 1, Jan. 3, 1920, pp. 48-56, 29 figs. Plant at Greencastle, Ind., which is laid out to fu nish capacity of 1200 to 1500 bbl. of cement per 24 h.

OPERATING RATIO DECREASE. Central Station Operating Ratio Decreasing, Elec. World, vol. 75, no. 5, Jan. 31, 1920, pp. 260-261, 5 figs. Claims that in spite of increasing costs of labor and materials, manufacturing and distribution costs per kilowatt-hour are now on decline.

See also Electric Plants; Heating, District Heating Service.

CHARTS

WEIGHT OF ROUND BARS. Weight Chart for Bar Stock Articles, Hans Ernest. Am. Mach., vol. 52, no. 7, Feb. 12, 1920, pp. 351, 1 fig. Chart for determining length and weight of round stock.

WEIGHTS OF RODS AND TUBES. Time-Saving Tube and Rod Chart, Melvin D. Casler. Am. Mach., vol. 52, no. 2, Jan. 8, 1920, pp. 67-70, 1 fig. For calculating weights of rods and tubes of different shapes.

CHEMICAL INDUSTRY

JAPAN. The Chemical Industry and Trade of Japan, O. P. Hopkins. Jl. Indus. & Eng Chem., vol. 12, no. 2, Feb. 1920, pp. 110-119. Efforts are said to have so far been directed mainly toward development of coal-tar industry, production of alkalies for paper, glass, textile, and soap industries, progress in metal refining and greatest possible utilization of water power in electrochemical processes.

CHEMISTRY

COLLOIDAL. Colloid Chemistry and Its Application in the Arts, Joseph V. Meigs. Chem. Age, vol. 2, no. 1, Jan. 10, 1920, pp. 325-329. Brings out how colloid chemistry furnishes clearer understanding of many manufacturing processes and their products and consequently makes possible development of former and more effective exploitation of latter.

CLAY

FOUNDRY, TESTS OF. How to Test Clay for Foundry Use, Homer F. Staley. Foundry, vol. 48, no. 3, Feb. 1, 1920, pp. 101-102. Opinion is expressed that time of slaking bonding power, vitrification temperature and softening point rather than chemical analysis are factors which determine adaptability of clays for this prupose. Paper presented before American Foundrymen's Assn.

CLOCKS

ERRORS IN PRECISION TIMEPIECES. Errors in Timepieces of Precision, E. P. Cotton. Surveyor (Sydney), vol. 32, no. 1, Feb. 28, 1919, pp. 10-16, 1 fig. Records of two clocks at Besançon observatory are given to illustrate variations of their daily mean rate.

CLUTCHES

DESIGN. Clutch Design, H. M. Brayton, Machy. (N. Y.), vol. 26, no. 5, Jan. 1920, pp. 415-418, 4 figs. Analysis of forces which must be considered in designing multiple disk, cone, and toother clutches, and application of inclined plane principle to tooth form of solenoid-operated clutch.

COAL

BITUMINOUS, WASHING TESTS OF. Washing Tests of a Bituminous Coal, H. F. Yancey and Thomas Fraser. Coal Industry, vol. 3, no. 1, Jan. 1920, pp. 32-36, 3 figs. Tests made in laboratories of University of Ill. to determine methods for washing clover-run coal from Mahaffy, Pa.

COPPER

Export and Import. *See Iron, Export and Imports.*

COPPER ALLOYS

Copper-Antimony. Expansion of Copper-Antimony Alloys (Sur la dilatation des alliages cuivre-antimoine), Paul Braesco. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 2, Jan. 12, 1920, pp. 103-105, 2 figs. Experimental measurement of coefficient of expansion of tempered and preheated samples of different compositions of copper-antimony alloys at temperatures between 100 and 300 deg. cent.

Copper-Silicon. The Alloys of Copper and Silicon, A. Sanfourche. Foundry Trade Jl., vol. 22, no. 217, Jan. 1920, pp. 52-53, 1 fig. Maximum in liquidus curve is interpreted to have composition $Cu_{13}Si_4$ and Y crystals to be definite compounds of composition $Cu_{19}Si_4$. Translated from Revue de Métallurgie.

CORES

Electrically Heated Ovens for. Tests Conducted of Electrically Heated Core Ovens. Iron Age, vol. 105, no. 3, Jan. 15, 1920, pp. 193-195, 3 figs. Current used and weight of cores baked per kilowatt.

COST ACCOUNTING

See Factory Management, Routing.

COST SYSTEMS

Forms for. A Cost System that Guides Policies, William R. Rassett and S. R. Gordon. Factory, vol. 24, no. 1, Jan. 1920, pp. 43-48, 7 figs. Forms for charge register, expense analysis, distribution, payroll, etc. Their use in knitting mill is explained.

Requirements for Success. Advantages of Uniformity in Costs, C. E. Knoeppel. Foundry, vol. 48, no. 4, Feb. 15, 1920, pp. 133-135. Writer maintains that an accurate cost system based on uniform plan is only successful when it serves with equal fidelity sales, production and financial departments.

CRANKSHAFTS

Diesel-Engine, Machining. Machining Diesel Engine Crankshafts. Motorship, vol. 5, no. 2, Feb. 1920, pp. 122-123, 3 figs. Method patented by John M. Larsen, N.Y.C., in which operations carried out in drilling, planning and slotting machines are eliminated.

Stresses in. Stresses in Crankshafts, Victor M. Summa. Machy. (N.Y.), vol. 26, no. 3, Nov. 1919, pp. 240-241, 3 figs. Calculations involved in design of shaft of uniform strength.

CREDIT

Equating Value of Credit Instruments. Can the Standard Measure of Value be Improved? Jl. Eng. Inst. of Canada, vol. 2, no. 11, Nov. 1919, pp. 720-727. Urges enacting and suggests draft of act "for equating of the value of letters of credit and promises to pay, which change in value on account of the fluctuation of the value of the dollar."

CUPOLAS

Combustion Process in. Combustion Process in a Foundry Cupola and the Predetermination of Gas Composition (Der Verbrennungsvorgang im Giessereischachtofen (Kupolofen) und die Vorausbestimmung des Zusammensetzung der Gichtgase), Bernhard Osann. Giesserei Zeitung, vol. 16, no. 15, Aug. 1, 1919, pp. 225-230, 3 figs. Writer seeks to demonstrate that when gas is composed of a large quantity of carbon monoxide and small quantity of carbon dioxide, absolute amount of carbon burned to carbon dioxide is not diminished.

CUTTING METALS

Barth Slide Rules. Supplement to Frederick W. Taylor's "On the Art of Cutting Metals"—VI, Carl G. Barth. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 153-155, 2 figs. Construction and operation of lathe slide rule for cutting steel.

Stellite Tools for. How to Use Stellite, G. L. Kronfeld. Am. Mach., vol. 52, no. 6, Feb. 5, 1920, pp. 293-295, 11 figs. Rakes recommended for stellite tools.

CUTTING TOOLS

Formed, Formulae for. Formulas for Formed Tools, W. E. Thompson. Machy. (N.Y.), vol. 26, no. 5, Jan. 1920, pp. 424-428, 8 figs. Also Machy. (Lond.), vol. 15, no. 381, Jan. 15, 1920, pp. 493-495, 8 figs. Angular position of tools used for planing formed tools. Calculations for making circular tools used on automatic screw machines.

CYANIDING

Cheap Processes for. Some Aspects of Cheap Cyanide Processes, Herbert Phillipp. Chem. & Metallurgical Eng., vol. 22, no. 7, 18, 1920, pp. 313-317. Reviews developments made in cyanide synthesis, and improvements made in ferrocyanide process.

New Type of Cyanide. A New Cyanide, W. S. Landis. Chem. & Metallurgical Eng., vol. 22, no. 6, Feb. 11, 1920, pp. 265-268. Development of process at plant of American Cyanamid Co. is illustrated by quoting that while in 1917 there was produced approximately 2,187,000 lb. equivalent of 100 per cent sodium cyanide, in 1918 this grew to 2,350,000. In 1919, during the seven months the plant operated, it produced at rate of 4,000,000 lb. per year. Account is given of experiments conducted and modifications introduced in design of furnace which resulted in so great an increase of production.

CYLINDERS

Automobile, Machining. How We Make Automobile Cylinders, Fred H. Colvin. Am. Mach., vol. 52, no. 3, Jan. 15, 1920, pp. 123-126, 10 figs. Survey of Methods in different shops in United States.

Impeller Pump, Machining. Machining Impeller Pump Cylinders. Machy. (N.Y.), vol. 26, no. 4, Dec. 1919, pp. 330-331, 5 figs. Also Machy. (Lond.), vol. 15, no. 383, Jan. 29, 1920, pp. 552-553, 5 figs. Methods employed for facing flanges, drilling and tapping flange holes, and boring cylinder.

Steel, Stresses During Tempering. Method of Determining Tensions in a Circular Cylinder (Méthode de détermination des tensions existant dans un cylindre circulaire), M. Mesnager. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 26, Dec. 29, 1919, pp 1391-1393. Suggested procedure for determining stresses developed in steel cylinder during tempering.

Tractor, Machining. Machining Cylinders for the Fordson Tractor, Fred. H. Colvin. Am. Mach., vol. 52, no. 6, Feb. 5, 1920, pp. 269-273, 15 figs. Types of continuous milling machines used.

DIE MAKING

Die-Sinking Machine. Becker Die-Sinking Machine. Machy. (N.Y.), vol. 26, no. 3, Nov. 1919, pp. 277-278, 3 figs. Attention is especially called to feature of machine which allows operator, standing in his position at front of machine, to operate all hand and power feeds conveniently.

Swaging-Machine Dies. The Swaging Machine and Toolroom Methods of Making the Dies, W. E. Thompson. Am. Mach., vol. 52, no. 6, Feb. 5, 1920, pp. 275-277, 7 figs. Toolroom method for producing dies used in swaging machine and for reducing and shaping steel and other wires.

DIE STOCKS

Machining. Machining Operations on Die Stocks, J. V. Hunter. Am. Mach., vol. 52, no. 5, Jan. 29, 1920, pp. 231-232, 3 figs. Methods used by Reed Mfg. Co., Erie, Penn., in manufacturing die stocks for pipe dies.

DIES

Trimming and Shaving. Adjustable Trimming and Shaving Dies, Frank A. Stanley. Am. Mach., vol. 52, no. 4, Jan. 22, 1920, pp. 177-180, 9 figs. Method of blanking, trimming and shaving set of nine steel cams for calculating machine, cams varying in length throughout group of nine parts.

Combined Trimming and Shaving Dies, Frank H. Stanley. Am. Mach., vol. 52, no. 6, Feb. 5, 1920, pp. 297-299, 10 figs. Forms of shaving dies combined with piercing tools.

Lubrication of. Approved Methods of Diesel-Engine Lubrication, R. C. DeMary. Elec. Rev. (Chicago), vol. 76, no. 5, Jan. 31, 1920, pp. 188-190. Advocates use of asphalt-base oil with graphite.

DILUTION

Law of, Investigations on. Some Recent Investigations on the Dilution Law J. R. Partington. Trans. Faraday Soc., vol. 15, part 1, Dec. 1919, pp. 98-121. Survey of technical literature on dilution law which has appeared since 1910.

DISSOCIATION

Electrolytic. Some Aspects of the Electrolytic Dissociation Theory, Nil Ratan Dhar. Trans. Faraday Soc., vol. 15, part 1, Dec. 1919, pp. 81-93. Discusses hypothesis on conditions of dissolved electrolytes put forward by Snethlage (Zeit. phys. Chem., 1915, 90, 1, 139).

DRILLS

Tap. Tap Drills, Clearances and Tolerances, Walter J. Rudolph. Am. Mach., vol. 52, no. 2, Jan. 8, 1920, pp. 65-66. Tables of tolerances and clearances.

DRINKING WATER

Sanitary Fountains for. Final Report of the Committee on Sanitary Drinking Fountains of the Iowa Section of the American Water Works Association. Jl. Am. Water Works Assn., vol. 7, no. 1, Jan. 1920, pp. 33-40. It is concluded from experiments that (1) all types of drinking fountains with vertical jets are to be condemned, (2) most types of drinking fountains with slanting jets are to be condamned and (3) to be sanitary, jets should be slanting and orifices of jet s should be perfected in such a manner that they cannot be touched by fingers or lips, or contaminated by droppings from mouth or by splashings from basins beneath orifices.

DRY DOCKS

Caisson Gates for. Lowering a 400-Ton Dock Caisson Gate with Sand Jacks, G. W. Plaisted. Eng. News-Rec., vol. 83, no. 19, Nov. 13-20, 1919, pp. 886-890, 8 figs. Tests on manipulation of sand jacks are said to have led to their use in placing gate to Navy's Puget Sound shipbuilding dock.

Structural Design of Caisson Gates for Dry Docks, Eugene E. Jalmos. Eng. News-Rec., vol. 84, no. 2, Jan. 8, 1920, pp. 89-91, 1 fig. Theoretical design, using method of least work with practical application to actual caisson structure.

Floating. A 50,000-Ton Floating Dock, Shipbuilder, vol. 22, no. 113, Jan. 1920, pp. 16-23, 5 figs., partly on supp. plate. Dock has overall length of 218 m., clear width of 44.5 m. and draft over keel-blocks of 12 m. Pumping machinery designed to lift vessel of 45,000 tons displacement and 9 m. draft in 3 hr.

Floating Dry Docks, G. B. Canaga. Freight Handling & Terminal Eng., vol. 6, no. 1, Jan. 1920, pp 17-22, 2 figs. Considerations which determine dimensions of floating docks, together with remarks in regard to stresses in them. Reference is made to various 10,000-ton docks now building by Emergency Fleet Corp. Paper read before Soc. Terminal Engrs.

TROLLEY FREIGHT IN NEW ENGLAND. Trolley Freight in New England, R. E. Cosgrove. Elec. Ry. Jl., vol. 55, no. 4, Jan. 24, 1920, pp. 197-199. Business is said to be constantly growing in spite of motor-truck competition and to amount now to more than $2,000,000 per year. Writers gives suggestions regarding equipment, schedules and other details.

ELECTRIC TRANSMISSION LINES

1100-MILE LINE, CALIFORNIA. Proposed Transmission Line for California, R. W. Sorenson, H. H. Cox and G. E. Armstrong. Eng. World, vol. 16, no. 3, Feb. 1, 1920, pp. 127-130, 4 figs. Salient features of 220-kw. line to transmit 1,500,000 kw. 1100 miles.

ELECTRIC WELDING, ARC

APPLICATIONS. Application of Electric Arc Welding—I, C. B. Auel. Indus Management, vol. 59, no. 2, Feb. 1920, pp. 107-116, 19 figs. Apparatus used is described and applications of welding to repairing of flywheels, locomotive frames, etc., are illustrated.

CAST IRON. Restoring Cast Iron Cylinder by Electric Welding Process. Mar. News, vol. 6, no. 9, Feb. 1920, p. 97, 3 figs. Work involved operation of arc on working surface of cylinder and was done without removing cylinder from engine.

Welding Cast Iron With the Electric Arc, Otis Allen Kenyon. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 12-16, 17 figs. Typical illustrations of welding methods and suggestions in regard to overcoming brittleness and cracking.

RAILWAY REPAIR WORK. Electric Arc Welding in Railroad Maintenance, E. Wanamaker and H. R. Pennington. Ry. Elec. Engr., vol. 11, no. 1, Jan. 1920, pp. 21-28, 38 figs. Illustrating repairing and recovery of locomotives, frames members, axles, couplers, knuckles, car bolsters, etc.

ELECTRIC WELDING, RESISTANCE

SPOT WELDERS. The A-1 Electric Spot Welders. Iron and Coal Trades Rev., vol. 100, no. 2707, Jan. 16, 1920, pp. 79-80, 5 figs. Standard type constructed by A-1 Manufacturing Co., which has welding capacities for mild steel from 1-64 in. up to 7-8-in. made-up thickness.

ELECTRICAL INDUSTRY

DEVELOPMENT IN 1919. Some Developments in the Electrical Industry During 1919, John Liston. Gen. Elec. Rev., vol. 23, no. 1, Jan. 1920, pp. 4-56, 118 figs. Among prominent developments recorded are electric propulsion equipment installed on board marine ships, 265-ton gearless passenger locomotive built for Chicago, Milwaukee & St. Paul, 60-cycle, 500-kv-a. automatic hydro-electric generators, and direct current welding which delivers current directly to arc without use of any form of ballast resistance or external regulation device.

ELECTRICAL MACHINERY

DIPPING AND BAKING COILS. An Almost Laborless Dipping and Baking Plant. Elec. Ry. Jl., vol. 55, no. 8, Feb. 21, 1920, pp. 386-387, 5 figs. Equipment of International Ry., Buffalo, for dipping and baking armatures and field coils.

ELECTRICAL MEASUREMENTS

INDUCTANCE AND CAPACITY. A Universal Inductance and Capacity Testing Bridge, C. V. Drysdale. Elecn., vol. 84, nos. 2175 and 2176, Jan. 23 and 30, 1920 pp. 80-82, 12 figs., and 108-109, 9 figs. Consists of plain four-arm Wheatstone bridge, each arm being provided with four coils of 1, 10, 100 and 1000 ohms. Article describes manner of conducting tests and of measuring electrolytic resistance.

ELECTRIFICATION

See Railway Electrification.

ELECTROLYTIC CELLS

RESISTANCE OF. The Resistance of an Electrolytic Cell, E. Newberry. Trans. Faraday Soc., vol. 15, part 1, Dec. 1919, pp. 126-136. Experimental determination of that part of irreversible resistance of electrolytic cell which is concerned in transfer of current from electrode to electrolyte in various types of cells.

ELECTROMAGNETIC WAVES

TRANSMISSION ABOUT EARTH. The Transmission of Electro-Magnetic Waves About the Earth, J. Erskine-Murray. Wireless World, vol. 7, no. 83, Feb. 1920, 651-664, 15 figs. Survey of researches by different experimenters. Paper read before Wireless Soc. of Lond.

ELECTROPLATING

COPPER. Metal Plating, W. G. Knox. Metal Industry (N. Y.), vol. 18, no. 1, Jan. 1920, pp. 14-15, 1 fig. Compilation of tables showing time required to deposit given thickness of copper.

ELECTROTHERAPY

PRINCIPLES AND TECHNIQUE. The Physical Principles and the Technique of Electrotherapy (Die physikalischen Grundlagen und die Technik der Elektrotherapie), K. Bangert, Elektrotechnische Zeitschrift, vol. 40, nos. 41 and 42, Oct. 9 and 16, 1919, pp. 508-511 and 520-523, 7 figs. Suggests co-operation of physicians, physicists and technical engineers and outlines briefly a joint course based on physical principles. Some of the subjects discussed are: The human body as line resistance, qualitive and quantitative measurements, the electrodes, electro-medical apparatus, Röntgen rays, etc. Address delivered before Electrotechnical Society.

EMPLOYEES

SAVINGS SYSTEMS FOR. Systematizing Thrift Among Employees, F. R. Hickman. Iron Age, vol. 105, no. 2, Jan. 8, 1920, pp. 133-134. Saving system operated by Locomobile Co. is said to prove effective.

The Solvay Thrift Plan for Industrial Employees, H. W. Jordan. Iron Age, vol. 105, no. 8, Feb. 19, 1920, pp. 543. Voluntary savings of employees deposited to individual accounts by weekly check from employing company.

EMPLOYEES' REPRESENTATION

COLORADO FUEL & IRON CO. PLAN. Successful Trial of Industrial Representation Plan, E. S. Cowdrick. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 123-125. Colorado plan approved by employees and directors of Colorado Fuel and Iron Co. in 1915 after the bitter strike of 1913.

PASSAIC METAL WARE CO. SYSTEM. Representative Government in a Manufacturing Plant, J. J. Calahan. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 256-258. Experience of Passaic Metal Ware Co. where system of management is modeled after government of United States. Senate, which is composed of foremen, heads of departments, or supervisors, elects whatever committees are needed. Employees throughout plant elect members of House, each class of workers being represented.

EMPLOYEES, TRAINING OF

TEXTBOOKS FOR. Text Books Used to Educate Employees. Iron Age, vol. 105, no. 5, Jan. 29, 1920, pp. 334, 335. Manuals prepared by Am. Inst. Corp.

EMPLOYMENT MANAGEMENT

BIBLIOGRAPHY ON. Progress in Industrial Personnel, Eugene J. Benge. Iron Age, vol. 105, no. 8, Feb. 19, 1920, pp. 541-543, 3 figs. Bibliography including articles in current journals, military publications and books.

FORMS USED. How One Manufacturer Handles Labor, Robert I. Clegg. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 27-31, 25 figs. Forms used by employment department of Graton & Knight Mfg. Co.

WESTINGHOUSE ELEC. & MFG. CO. METHODS. Westinghouse Employment Department, John C. Bower. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 243-246, 8 figs. Methods used by Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., in hiring men and in retaining working force. Records kept in employment department are illustrated.

ENGINEERS

BUSINESS TRAINING FOR. Commercial Engineering, Glen Levin Swiggett. Department of the Inter. Bur. of Education, bul., 1919, no. 58, 180 pp., 5 figs. Report of conference on business training for engineers and engineering training for students of business.

CLASSIFICATION. Classification and Compensation of Engineers. Mech. Eng., vol. 42, no. 2, Feb. 1920, pp. 138-140. Report of Engineering Council committee proposing classification of engineering positions in federal, state, country, municipal and railroad services.

COMPENSATION OF. Engineering Council's Committee Reports on Compensation of Engineers. Eng. News-Rec., vol. 84, no. 3, Jan. 15, 1920, pp. 117-121, 1 fig. Presents uniform grading plan for "professional" and "sub-professional" services. Standard salary schedule is submitted and duties and titles are defined.

Low Pay of City and State Engineers Disclosed by Answers to Questionnaire. Eng. News-Rec., vol. 84, no. 5, Jan. 29, 1920, pp. 217-221. Report of State, County and Municipal Sections of Engineering Council Committee on Classification and Compensation of Engineers, based on statements from engineers in service of 35 states and 66 cities in United States.

See also Classification.

NEEDS OF, IN GOVERNMENT ADMINISTRATION. The Engineer in National Affairs, Herbert C. Hoover. Chem. & Met. Eng., vol. 22, no. 7, Feb. 25, 1920, pp. 349-352. Writer suggests outline of national policy with regard to railroads, shipping and industrial relations, and points out need of engineering thinking in Government administration. Presidential address at meeting of Am. Inst. Min. & Met. Engrs.

EVAPORATORS

AIR-PUMP CAPACITIES REQUIRED. Air-Pump Capacities and Incondensible-Gas Volumes in Industrial Vacuum-Evaporator Plant, Edward Corner. Engineering, vol. 109, no. 2820, Jan. 16, 1920, pp. 74-75, 3 figs. Theoretical principles implied in derivation of empirical formulæ.

EXPLOSIONS

COAL-DUST, STEEL MILLS. Steel Mill Coal Dust Explosion Hazards, L. D. Tracey. Blast Furnace & Steel Plant, vol. 8, no. 2, Feb. 1920, pp. 147-148. Results of tests and investigations made by U. S. Bur. of Mines in ascertaining liability of coal dust causing explosions.

EXPORT TRADE

PACKING FOR. Packing for Domestic and Export Shipping, Harry N. Knowlton. Am. Mach., vol. 52, no. 7, Feb. 12, 1920, pp. 323-326. Economic aspect of good packing.

See also Machine-Tool Industry, South American Trade; Spanish Trade; Swedish Trade.

FATIGUE

FERRIES

FERROALLOYS

FIREBRICK

FLOW OF WATER

POWER HOUSES. Power House Foundations, E. M. Lurie. Power Plant Eng., vol. 24, no. 3, Feb. 1, 1920, pp. 167-173, 7 figs. Suggestions in regard to testing soils, methods of compacting, column footing, and draining.

FOUNDRIES

ACID-STEEL. New Acid Steel Foundry at Alliance, Ohio. Iron Age, vol. 105, no. 7, Feb. 12, 1920, pp. 457-460, 5 figs. Attention is directed to method employed in conserving water supply and specially designed bearings used on cars for mold drying ovens.

ALUMINUM-CASTINGS. Modern Foundry for Aluminum Castings, F. L. Prentiss. Iron Age, vol. 105, no. 8, Feb. 19, 1920, pp. 535-539, 10 figs. System of conveyors for handling castings as well as sand installed at plant of Aluminum Manufacturers, Inc.

AUTOMOBILE-CYLINDER. Plant for Casting Automobile Cylinders. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 23-26, 6 figs. Attention is directed to arrangement permitting molding machine to travel and equipment for handling sand from bins along side.

INCREASING OUTPUT, METHODS FOR. Foundry Reduces Unit Cost of Manufacture, Gilbert L. Lacher. Iron Age, vol. 105, no. 3, Jan. 15, 1920, pp. 191-193, 1 fig. Piece-work system and improvements in material-handling methods and molding practice are said to have increased output per employee.

SAND-HANDLING EQUIPMENT. Modern Foundry Sand Handling Equipment, H. L. McKinnon. Metal Industry (Lond.), vol. 16, no. 5, Jan. 30, 1920, pp. 83-84, 2 figs. Use of rubber conveyor belt is recommended because it is said to possess smooth operating surface which cannot become impregnated with sand and which resists wear for long period.

FRAMES

RIGID, ECCENTRICALLY LOADED. Eccentric Loading in Rigid Frames, F. L. Richart. Eng. News-Rec., vol. 84, no. 7, Feb. 12, 1920, pp. 331-332, 4 figs. Explains how fundamental frame formulæ may be applied when columns of frame have loads applied eccentrically.

FREIGHT HANDLING

MECHANICAL METHODS. Electric Auto-Mechanical Freight Handling, Zenas W. Carter. Ry. Rev., vol. 66, no. 8, Feb. 21, 1920, pp. 282-284. Gattie system in London and Cincinnati schemes are outlined as typical of installations and possibilities of mechanical freight handling. Paper read before N.Y.R.R. Club.

FUEL OIL

BURDON OIL-GAS FIRING SYSTEM. The Burden Oil-Gas System. Iron & Coal Trades Rev., vol. 100, no. 2708, Jan. 23, 1920, p. 115, 2 figs. In Burdon system of oil firing oil is broken up finely by high-pressure air, or air and steam in combination working through atomizer attached direct to furnace.

COSTS, HEATING VALVES, BURNERS, ETC. Oil Fuel, F. W. Staley. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 1, Jan. 1920, pp. 73-83. Data of comparative costs of various fuels, solid and liquid, heat value of different fuel oils, and also classification and outline of types of oil burners.

FUEL OIL VS. STOKER-FIRED COAL. Fuel Oil Versus Coal on Mechanical Stokers, F. H. Daniels. Iron Age, vol. 105, no. 3, Jan. 15, 1920, pp. 203-204, 1 fig. Chart to determine what price of oil of different grades must be to compete with coal of various grades at varying prices.

TEXTILE MILL INSTALLATIONS. Fuel Oil in Textile Mills, J. J. Tyrrell. Textile World Jl., vol. 57, no. 6, Feb 7, 1920, pp. 465-467, 3 figs. Installations in New England.

FUELS

COLLOIDAL. Colloidal Fuel, London W. Bates. Can. Chem. Jl., vol. 41, no. 2, Feb. 1920, pp. 40-47. Nature of colloidal fuel, its development during war, results by trial, with review of its present and future general industrial possibilities.

LIQUID, SPONTANEOUS IGNITION OF. Spontaneous Ignition-Temperatures of Liquid Fuels, Harold Moore. Petroleum Times, vol. 3, nos. 55 and 56, Jan. 24 and 31, 1920, pp. 101-103 and 123-124. Results of experiments (with table) conducted to determine property of oils originating from coal tars, which causes their spontaneous ignition. Paper read before Instn. of Petroleum Technologists

See Pulverized Coal, Fuel Oil.

FURNACES, ELECTRIC

See Electric Furnaces.

FURNACES, HEATING

FORGING WORK. A Review on Designs of Forge Furnaces, H. B. Dempsey. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 22-24, 7 figs. It is emphasized that accurate temperature control is absolutely necessary to obtain best results in forge work.

GAS-FIRED. Multi-Flame and Rotary-Flame Gas-Fired Furnaces. Iron and Coal Trades Rev., vol. 100, no. 2706, Jan. 9, 1920, pp. 40-41, 4 figs. Chantraine patent. It is built with double roof, space between two arches forming hot air chamber. Furnace is built with athermanous blanket of gas into which jets of hot air are directed.

REHEATING. Recuperative Furnaces for Re-Heating, N. R. Rees. Iron & Coal Trades Rev., vol. 100, no. 2709, Jan. 30, 1920, pp. 139-146, 1 fig. Types used for metallurgical purposes. Paper read before Staffordshire Iron & Steel Inst.

FURNACES, HEAT-TREATING

CARBONIZING. Carbonizing Furnaces, Theodore G. Selleck. Jl. Am. Steel Treaters Soc., vol. 2, no. 4, Jan. 1920, pp. 206-213, 4 figs. Suggested form of construction

FURNACES, INDUSTRIAL

FUEL COSTS. Fuel Consumption and Its Wastes as Affected by the Proper Use of Pyrometers and the Design of Furnaces, Claude S. Gordon. Jl. Am. Steel Treaters Soc., vol. 2, no. 5, Feb. 1920, pp. 241-250. Includes table giving relative and theoretical cost of energy in various fuels. Results of tests on three different nut stamping furnaces.

GAS-FIRED. Improvement in the Construction of Furnaces, Newton Booth and G. H. Roberts. Gas Jl., vol. 149, no. 2959, Jan. 27, 1920, pp. 188-189. Experiments are related and from results obtained rules are formulated as guide for designing gas furnaces to work at high temperatures with "reasonably high thermal efficiencies." Paper read before Instn. Gas Engrs.

GAGES

PRECISION-BALL, INSPECTION OF. Use of Precision Balls for Accurate Measurements, R. L. Rankin. Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 236-238, 6 figs. Practice of U. S. Bur. of Standards in use of precision balls as attachments for machines and for taking direct measurements in inspection of gages.

SCREW-THREAD. Thread Gage Standards, J. E. Collins. Machy. (N. Y.), vol. 26, no. 5, Jan. 1920, pp. 427-433, 6 figs. System for thread plug and ring gages for U. S. standard threads.

SNAP, PLUG AND RING. Snap, Plug and Ring Gages, J. E. Collins. Machy. (N.Y.). vol. 26, no. 3, Nov. 1919, pp. 212-218, 10 figs. Methods of construction, proportion, tolerances, etc. Article is based upon practice of Gage Division of Ordnance Department during war.

Making Special Snap Gages, John Teckeer. Am. Mach., vol. 52 no. 2. Jan. 8, 1920, pp. 83-85, 5 figs. Fixtures for grinding large and small snap gages so that they will not have to be remade on account of warping. Method of regulating pull of magnetic chuck is also given.

TAPER, MEASUREMENT OF. The Measurement of Taper Gages. Inspector, vol. 2, no. 1, Dec. 15, 1919-Jan. 15, 1920, pp. 5-11, 9 figs. Methods commonly applied by Gage Section, U. S. Bureau of Standards, for measuring simple tapered plug, plug having double taper, plug having triple taper, taper ring gages and profile gages having tapered surfaces.

GARBAGE DISPOSAL

WASTE RECLAMATION AND. Garbage Disposal and the Economic Recovery of Valuable Constituents of Municipal Waste, Samuel A. Greeley. Mun. & County Eng., vol. 58, no. 1, Jan. 1920, pp. 22-26, 2 figs. Writer observes that garbage disposal should be considered with a view to economic recovery of valuable constituents, but he warns that lure of profit should not overshadow development of operation for convenience and comfort of householder and for economy of collection.

See also Refuse Disposal.

GAS MANUFACTURE

BY-PRODUCT RECOVERY. Rochester By-Product Activity, R. E. Krueger. Gas Age, vol. 45, no. 2, Jan. 26, 1920, pp. 59-65, 6 figs. Experience of Rochester Gas and Electrical Corp. in recovery, utilization and marketing of by-products produced in making gas.

COAL COSTS FOR VARIOUS SYSTEMS. Net Cost of Coal for Various Systems of Gasification. Gas Jl., vol. 148, no. 2953, Dec. 16, 1919, pp. 604-605, 5 figs. Charts indicating net cost of coal and cost of B.t.u. delivered to consumer, prepared for prices from $5.00 to $11.00 per ton. (Concluded.)

HEATING VALUE INDICATOR. Heating Value Indicator, Edward J. Brady. Gas Industry, vol. 20, no. 1, 1920, pp. 27-29. Flame is burned with continually increasing ratio of air to gas. When yellow tip disappears heating value is read off from prepared scale.

GAS PIPE

CAST IRON, JOINTS FOR. Cast Iron Pipe Joints. Natural Gas & Gasoline Jl., vol. 14, no. 1, Jan. 1920, pp. 13-16. Recommendations made by Am. Gas Assn. Committee appointed for purpose of preparing satisfactory design for joints for cast-iron mains.

GASES

FLOW RATE, MEASUREMENT OF. The Effect of Pressure and Temperature on a Meter for Measuring the Rate of Flow of a Gas, N. W. McLachlan. Phys. Soc. of London, vol. 32, part 1, Dec. 15, 1919, pp. 1-20, 11 figs. Theory of instrument for measuring rate of flow of gas is outlined, effects of variation of temperature and pressure of gas being taken into consideration. This theory is tested experimentally for pressures varying from 1250 to 250 mm. Hg., and for temperatures from 10 to 100 deg. cent.

FLOW THROUGH ORIFICES. Efflux of Gases Through Small Orifices, Edgar Buckingham and Junius David Edwards. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 359, Jan. 28, 1920, pp. 573-615, 8 figs., partly on 7 supp. plates.

GEAR CUTTING

GEARS

GRAIN HANDLING

GRAVITATION

GREAT LAKES

GUNS

HACK SAWS

HEALTH

HEAT TREATMENT

See Steel, Heat Treatment of.

HEATING

HIGH ALTITUDE

HIGHWAYS

HYDRAULIC TURBINES

HYDROGEN

Electrolytic Production of. Electrolytic Production of Hydrogen, Harry L. Barnitz. Chem. & Met. Eng., vol. 22, no. 5, Feb. 4, 1920, pp. 201-206, 8 figs. Theoretical principles involved in calculation of cell efficiency are outlined and various types of electrolytic cells for commercial production of hydrogen and oxygen are described.

Magnetic Susceptibility of. On the Magnetic Susceptibilities of Hydrogen and Some Other Gases, Také Soné. Sci. Reports Tohoku Imperial Univ., vol. 8, no. 3, Dec. 1919, pp. 115-167, 12 figs., partly on supp. plate. Account of relative measurement of susceptibility of gases in which susceptibility of pure water was taken as 0.720 x 10—6.

Ozone Form of. The Ozone Form of Hydrogen, Gerald L. Wendt. Proc. Nat. Academyjof Sciences, vol. 5, no. 11, Nov. 1919, pp. 518-521. Evidence said to establish existence of form of hydrogen which bears same ralation to ordinary hydrogen that ozone bears to oxygen.

ILLUMINATION

Daylight, Factory. Daylight Illumination in the Shops. Int. Mar. Eng., vol. 25, no. 2, Feb. 1920, pp. 122-126, 6 figs. Illustrates how "daylight factor" can be increased by devoting maximum amount of wall space to galss.

INDUSTRIAL CONDITIONS

France. French Industrial Conditions, A. L. Valentine. Machy. (N.Y.), vol. 26, no. 5, Jan. 1920, pp. 409-410. Writer expects that France will shortly get back to stable basis.

INDUSTRIAL MANAGEMENT

See Factory Management; Scientific Management.

INDUSTRIAL ORGANIZATION

Laws of. Laws of Industrial Organization—V, C. E. Knoeppel. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 145-148. It is emphasized that competence must not only prevail in industry but likewise in public offices of all kinds.

Power-Plant Employees. Efficient Organization of Power Plant Help—II, H. A. Wilcox. Power Plant Eng., vol. 24, no. 3, Feb. 1, 1920, pp. 174-176. Points out duties and responsibilities of central-station operators.

Whitley Plan for British Industries. Whitley Plan in Fifty British Industries. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 16-18. It is reported that after more than two years of agitation, 50 industries have been organized according to Whitley plan.

INDUSTRIAL RAILWAYS

See Railways, Industrial.

INDUSTRIAL RELATIONS

Collective Bargaining. Collective Bargaining in Practice, Dubley R. Kennedy. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 149-152. Argues that collective bargaining must be accepted or rejected not on its theory but on its practical application in industry: and that collective bargaining of organized labor is the closed shop with all bargaining done by trade-union officials.

Taft, Hughes and Hoover on Collective Bargaining. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 93-97. Quotations from their public addresses as reported in press despatches.

Legislation Required. View on Industrial Relations, Daniel Guggenheim. Eng. & Min. Jl., vol. 109, no. 4, Jan. 24, 1920, pp. 252-254. Legislation which affects present-day business, it is pointed out, must be such as will make proper provision for settlement of industrial disputes, compel proper living and working conditions, and eliminate industrial unrest.

Lessons of Labor Crisis. Lasting Lessons of the Labor Crisis. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 89-93 and 96a-96b. Comments on letter by Franklin K. Lane, Secretary of the Interior, to editor of Indus. Management in which Secretary Lane States that "chief delinquency in this present government" has been "lack of engineering." Efforts of industrial conference called by President are explained.

Progress in Harmonizing. Labor Statistics Give Definite Industrial Facts. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 259-267. Optimistic view is presented of labor situation and it is said that latest labor statistics show industrial conflict is not on the increase and that definite progress is being made toward peaceful settlement of industrial disputes.

Public Status in. Capital, Labor and the Public, Robert Julius Andersen. Indus. Management, vol. 59, no. 2, Feb. 1920, pp. 117-119. Points out that "we have had too much one-sidedness on this subject" of bringing capital and labor together and that before better relations can be brought about between these forces pleas of the third party, namely, the public, must be heard.

Social Unrest. Science and Social Unrest. Ernest R. Grove. Sci. Monthly, vol. 10, no. 2, Feb. 1920, pp. 157-162. Situation in the world is attributed to "impossibility of a people socially unscientific living a satisfactory life in a scientific era." The way out is foreseen to be "through popularizing of the spirit of science," that is, "socializing of science and the acceptance on the part of the scientist of his obligation as a public teacher."

See also Works Councils.

INSPECTION

Opical Methods for. Optical Aids for the Engineer, R. J. Whibley. Machy. (Lond.), vol. 15, no. 380, Jan. 8, 1920, pp. 451-459, 18 figs. Optical methods that have been developed at National Physical Laboratory. Teddington, England, for aiding inspection work in metrology department.

INSULATORS

High-Voltage. Researches in High-Voltage Insulation, Harris J. Ryan. Elec. World, vol. 75, no. 5, Jan. 31, 1920, pp. 253-256, 4 figs. Tests of suspension insulators at Leland Stanford Jr. University are said to have shown that temperature changes are most serious causes of failure.

INTERCHANGEABLE MANUFACTURE

Drawings for. Component Drawings for Interchangeable Manufacture, Earle Buckingham. Machy. (N.Y.), vol. 26, nos. 3, 4 and 5, Nov., Dec. 1919 and Jan. 1920, pp. 259-263, 18 figs., 332-336, 14 figs. and 438-442, 7 figs. Methods of dimensioning drawing and indicating tolerances.

INTERNAL COMBUSTION ENGINES

See Aeroplane Engines; Automobile Engines; Diesel Engines; Oil Engines.

IRON

Export and Import of. Iron and Copper, F. T. Eddington and F. E. Wormser. Eng. World, vol. 16, no. 3, Feb. 1, 1920, pp. 135-137. Data on movements of iron ore and pig iron to and from United States and movements of copper to and from the United States.

IRON MINING

Production in U. S. in 1919. Iron Mining in the United States. Eng. & Min. Jl., vol. 109, no. 3, Jan. 17, 1920, pp. 240-241. Production throughout various mining districts is said to have been lower than that of 1918, particularly so in Lake Superior districts where, it is quoted, shipments amounted to only about 80 per cent of that obtaining in either of two years previous.

JIGS

Indexing. A Progressive Indexing Jig. Am. Mach., vol. 52, no. 1, Jan. 1, 1920, pp. 7-9, 4 figs. Tools used in making roller cage for roller bearing of rolling mill.

KILNS

Producer-Gas-Fired. Producer Gas Solves Fuel Problem. Rock Products, vol. 23, no. 1, Jan. 3, 1920, pp. 60-62, 11 figs. Kiln designed for either wood or gas burning without change, or also combination of these two fuels.

LABOR

Periodicals Relating to. Publications Relating to Labor. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 284-303. List of official and unofficial periodicals published in U. S. Australia, Canada, France, Germany, Great Britain, India, Italy, New Zealand, Roumania and Switzerland.

Problem of. The Labor Problem, Harry Tipper. Jl. Soc. Automotive Engrs., vol. 5, no. 6, Dec. 1919, pp. 395-398 and (discussion) pp. 398-401. Historial survey of economic and social motives which have brought about present in industrial problems.

LATHES

Turret Practice. Turret Lathe Practice, Erik Oberk. Machy. (N.Y.), vol. 26, nos. 3 and 4, Nov. and Dec. 1919, pp. 227-235, 35 figs., and 344-351, 28 figs. Tooling equipment, order of operations for turret-lathe work and examples of practice. Based upon experience and practice of Gisholt Machine Co., Madison, Wis.

LEAD

Recovery from Lead Sulphate. The Problem of Reducing Lead Sulphate, F. N. Flynn. Eng. & Min. Jl., vol. 109, no. 8, Feb. 21, 1920, pp. 487-489, 1 fig. Present methods of treatment are discussed and process is suggested for recovering lead by electrolytic means.

LEAD PIPE

See Pipe, Lead.

LIGHTING

Diffuse Reflection. An Absolute Method for Determining Coefficients of Diffuse Reflection, F. A. Benford. Gen. Elec. Rev., vol. 23, no. 1, Jan. 1920, pp. 72-76, 6 figs. It is called absolute because no photometric standards are involved, brightness measurements being made with uncalibrated lamps and unknown instrument constants.

Factories. Survey of Prevailing Conditions as to Industrial Lighting—II. Elec. Rev. (Chicago), vol. 76, no. 5, Jan. 31, 1920, pp. 180-183, 7 figs. Technical and commercial data gathered from visit to 450 plants in 57 cities located in 15 of leading industrial states.

METALS

Analysis of. Analysis of Metals by Electrolysis Without Using External Source of Electrical Energy (Sur un procédé de dosage des métaux par dépôt électrolytique sans emploi d'une énergie électrique extérieure), Maurice François. Annales de Chimie, vol. 12, Sept.-Oct. 1919, pp. 178-192, 1 fig. Solution under examination is placed in platinum crucible. Across border of crucible nickel bar is placed which supports zinc element immersed in salt. Analysis is made by measuring deposit collected at bottom of crucible.

Progress in Metal Analysis in 1917 and 1918 (Fortschritte auf dem Gebiete der Metallanalyse in den Jahren 1917 und 1918), Th. Döring. Chemiker-Zeitung, vol. 43, nos. 114, 118, 120 and 122, pp. 626-628, 653-655, 665-668 and 681-684. Analyses of lead and arsenic. Analyses of antimony, bismuth, manganese and iron. Determination of phosphorus in pig iron and steel carried out alkalimetrically; determination of chrome in iron ore and ferrochrome; colorimetric process for determination of wolfram in solution of alkali-wolframate.

Cold Work, Effect of. The Effect of Cold Work on Metals and Alloys—V. O. W. E. Ellis. Metal Industry (London), vol. 15, no. 24, Dec. 12, 1919, pp. 452-455, 5 figs., and vol. 16, nos. 1 and 2, Jan. 2 and 9, 1920, pp. 4-6, 6 figs. and 21-24, 7 figs. Theories which have been propounded to account for continuity of structure and changes in mechanical and physical conditions of cold-worked metal and alloys, are exposed and various views are discussed which have been expressed relative to critical degree of deformation at which slackening in increase of tensile strength, etc., occurs. "Season cracking" of brass is attributed primarily to internal stresses.

Fatigue of. Fatigue of Metals under Repeated Stress, Herbert F. Moore, Jl. Western Soc. Engrs., vol. 24, no. 6, June 1919, pp. 331-336 and (discussion) pp. 336-340, 4 figs. Endurance diagram for various metals tested under repeated stress.

Fusion and Thermal Conductivity. On the Variation of Thermal Conductivity During the Fusion of Metals, Seibei Konno. Sci. Reports Tohoku Imperial Univ., vol. 8, no. 3, Dec. 1919, pp. 169-179, 6 figs., partly on two suppl. plates. Thermal conductivity of tin, lead, zinc and aluminum was found to decrease gradually with rise of temperature up to melting point and abruptly during melting. It is noted that changes of thermal conductivity corresponded to those of electric conductivity for same metals.

Protective Coatings. *See Schoop Spraying Process.*

Sheet, Testing. The Testing of Sheet Metals, A. G. C. Gwyer. Metal Industry (Lond.), vol. 16, no. 3, Jan. 16, 1920, pp. 42-45, 6 figs. Hardness tests are discussed with special reference to scleroscopic, punching, and cupping tests.

METEOROLOGY

Atmospheric Turbulence. Taylor's Theory of Atmospheric Turbulence, Eric E. Miller. Monthly Weather Rev., vol. 47, no. 10, Oct. 1919, pp. 703-706. Turbulence is regarded as made up of eddies and an eddy is considered as air that moves from a stratum where it has the same temperature, humidity, and momentum as its surroundings to another stratum with which it mixes.

Pilot-Balloon Flights. Note on Pilot-Balloon Flights in a Thunderstorm Formation, Ivan R. Tannehill. Monthly Weather Rev., vol. 47, no. 10, Oct. 1919, pp. 725-727, 3 figs. Horizontal projections of balloon paths during storm.

Wind Velocity. Wind Velocity in the Stratosphere (Sur la vitesse du vent dans la stratosphère), Ch. Maurain. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 26, Dec. 29, 1919, pp. 1419-1420. Tabulated results of observation with sounding balloons at altitudes from 11,000 m. to 19,000 m. Mean velocities given vary from 8 to 14 m. per sec.

MICROBALANCE

Simple Arrangement. A Cheap and Simple Micro-Balance, J. H. Shaxby. Phys. Soc. of London, vol. 32, part I, Dec. 15, 1919, pp. 21-25, 5 figs. It consists of long horizontal fiber joining lower ends of two vertical beams each pivoted very little above its center mass so that small weight acting at middle of fiber causes considerable depression. This is read off by arranging slider on vertical millimeter scale about 2-ft. in front.

MILLING

Duplicate Part Work. Production Milling on Automatic Machines, Edward K. Hammond. Machy. (N.Y.), vol. 26, no. 3, Nov. 1919, pp. 247-251, 12 figs. Practice in milling of duplicate parts. Third article.

String Milling Fixtures. String Milling Fixtures, Edward K Hammond. Machy. (N. Y.), vol. 26, nos. 4 and 5, Dec. 1919 and Jan. 1920, pp. 337-341, 9 figs., and 443-447, 11 figs. Discussion of typical examples of design and results obtained in operating fixtures.

MILLING CUTTERS

Cast Alloy Steel. Chrobaltic Cast Milling Cutters, Edward K. Hammond. Machy. (N.Y.), vol. 26, no. 4, Dec. 1919, pp. 354-358, 9 figs. Methods used in casting milling cutters form chromium cobalt alloy steel.

MILLING MACHINES

Rockford. Rockford Number Three Milling Machine, J. V. Hunter. Am. Mach., vol. 52, no. 8, Feb. 19, 1920, pp. 377-379, 5 figs. Features of machine are rectangular overarm saddle support and reinforced base for elevating screw.

Toledo Vertical. Toledo Vertical Milling Machine. Machy. (N.Y.), vol. 26, no. 4, Dec. 1919, pp. 363-364. Attention is called to design and weight of main column of miller. It is machined from casting weighing 1½ tons, metal being so proportioned as to give greater resistance against strain.

MINE SHAFTS

Sinking, Water Problems in. A Water Problem in Shaft Sinking, James E. Harding. Eng. & Min. Jl., vol. 109, no. 4, Jan. 24, 1920, pp. 263-264, 4 figs. How pumping was tried from churn-drill hole at one side of shaft in order to dispose of excessive flow struck in sinking shaft in Atacama Desert, Chile.

MINES

Fire Prevention in. Subterranean Fires (Etude sur les feux souterrains), M. Frantzen. Annales des Mines, vol. 8, no. 3, 1919, pp. 5-140, 28 figs. Survey of systems for protection against fire, employed in various mines of France, Germany and Austria.

MOULDING MACHINES

French. Moulding Machines and the Preparation of Model Patterns (Les machines à mouler et la préparation des plaques modèles). Fonderie Moderne, no. 9, Sept. 1919, pp. 194-198, 9 figs. Patents recently granted to Establissements Glaenzer et Perraud. Paris.

MOLYBDENUM

Molybdenite Deposits. Molybdenite Deposits of Lacorne Township, Abitibi, P. Q. Adhemar Mailhiot. Can. Min. Jl. vol. 41, no. 7, Feb. 18, 1920, pp. 135-138, 4 figs. Outline is given of both general and economic geology and description of work done on veins individually.

Reaction of Water on. Reversible Reaction of Water on Molybdenum (Réaction réversible de l'eau sur le molybdène), Georges Chaudron. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 3, Jan. 19, 1920, pp. 182-185, 2 figs. Study of equilibrium of system: water vapor molybdenum, hydrogen, molydenum bioxide.

MOTOR TRUCKS

British War Models. Mechanical Transport in the war, Richard Twelvetrees. Soc. of Engrs. Jl. & Trans., vol. 10, no. 10, 1919, pp. 279-300 and (discussion) pp. 300-314, 8 figs. Models developed in England during war are analyzed and it is concluded that heavy vehicle will have to undergo much modification of detail, specially to eliminate defects developing as result of war and to avoid complicated designs.

De Dion. 1920 3½-Ton deDion Chassis. Motor Traction, vol. 30, no. 775, Jan. 7, 1920, pp. 11-14, 13 figs. Specifications: engine, 25 h.p., 4 cyl., 100 x 140 mm.; lubrication pump; gears, four and reverse; final drive, internal gear; wheelbase, 13 ft. 5 in.

Design, Trend of. The 1920 Trend in Truck Design, J. Edward Schipper. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 135-137, 4 figs. Tendency to build trucks larger than two tons for pneumatic tire equipment is visualized as outstanding feature at beginning of year. Influence of Class B military truck, higher speed engines, influence of good roads, gains for internal gear final drive and propect of increased prices are also pointed out.

German Types. Analysis of German Trucks by the Motor Transport Corps, C. R. Hays. Automotive Industries, vol. 42, no. 4, 5, 6 and 7, Jan. 22, 25, Feb. 5 and 12, 1920, pp. 306-309, 354-355, 403-404 and 454-457. Jan. 22: Specifications of Saurer and Yomag. Jan. 29: Investigations and tests on Opel truck. Feb. 5: Data on Hercules truck. Feb. 12: Characteristics of Hering and Nacke types.

New York Show. New York Truck Show. Commercial Vehicle, vol. 21, no. 12, Jan. 15, 1920, pp. 486-497 and 504-507, 27 figs. Attention is called to greatly increased number of vehicles shown mounting on pneumatic tires. Notable developments of parts and accessory equipment are illustrated.

1920 Trucks, Data on. Detailed Technical Specifications of Gasoline Motor Trucks for 1920. Automotive Industries, vol. 42, no. 3, Jan. 15, 1920, pp. 138-155. Details of 516 gasoline and 22 electric Chassis as produced by 208 American manufacturers. Particulars of types and makes of principal truck parts, parts, including engines, clutches, gear-sets, rear axles, steering gears, governors and also electric and fuel systems.

Operating Costs vs. Road Conditions. Heavy Motor Vehicles in Relation to Roads, W. D. Williamson. Engineer, vol. 128, no. 3338, Dec. 19, 1919, pp. 608-610. Figures are presented which show effect of roads on running cost of vehicles. (Concluded.) Paper read before Roads & Transport Congress.

MOTORSHIPS

Steel Tanker. Another Hudson-Built Steel Motor Tanker. Motorship, vol. 5, no. 2, Feb. 1920, pp. 117-118, 3 figs. Dimensions: Length overall, 216 ft. 7 in.; molded breadth, 35 ft. 6 in.; molded depth, 17 ft. 4 in.; main engine power, 500 shaft hp.; dead weight, 750 tons.

MUNICIPAL IMPROVEMENTS

Risks in Untried Processes. What Risks Should Cities Take in Installing Relatively Untried Processes? Eng. News-Rec., vol. 84, no. 3, Jan. 15, 1920, pp. 132-135. Letters from consulting engineers, municipal engineers and engineers of state departments of health, particularly in reference to drifting sand filters and electrolytic process of sewage treatment.

NITRIC ACID

Manufacture. Manufacture of Nitric Acid from Nitrogen Oxide (Sur la formation de l'acide nitrique à partir de l'oxyde azotique), A. Sanfourche. Bulletin de la Société chimique de France, vol. 25-26, no. 12, Dec. 1919, pp. 633-655, 5 figs. Account of experimental study of conditions of oxidation of NO temperatures from—50 to 500 deg. cent.

OIL WELLS

OPEN-HEARTH FURNACES

OXYACETYLENE WELDING

OXYGEN

PAPER

PAVEMENTS

PILES

PIPE

PIPE LINES

PISTON RINGS

PISTONS

PLATINUM

Bibliography. Bibliography of the Metals of the Platinum Group, Jas. Lewis Howe and H. C. Holtz. Dept. of Interior, U. S. Geological Survey, Bul. 694, 1919, 558 pp. List of articles which have appeared in scientific literature from 1748-1917.

POLES

Cedar, Life of. Natural Life of Cedar Poles, Page Golsan. Elec. World, vol. 75, no. 5, Jan. 31, 1920, pp. 257-258, 4 figs. Quantitative study of butt rot is claimed to have shown that cedar poles should last from 14 to 17 years. It is noted that mechanical strength is determined largely by side pull and it is advised that poles be well guyed.

POLISHING

Methods Used. Polishing Methods, Edward K. Hammond, Machy. (N. Y.), vol. 26, no. 3, Nov. 1919, pp. 203-210, 15 figs. Information concerning wheels, belts, and abrasives used by Royal Typewriter Co.

PORCELAIN

Shrinkage Equivalents. A Table of Porcelain Shrinkage Equivalents, L. M. Case. Am. Mach., vol. 52, no. 7, Feb. 12, 1920, pp. 352-353. Gives equivalent of dimensions from 0.001 in. to 1 in. by thousandths, based on annual shrinkage of 0.1406 in. per inch for porcelain products.

POWER GENERATION

Coal vs. Water, Norway. Coal or Water (Utenlandske Kul eller norsk Vandkraft som Warmekilde i vore Boliger), A. Saxegaards. Teknisk Ukeblad, vol. 67, no. 4, Jan. 23, 1920, pp. 49-52. Discussion of whether imported coal or local water power should be used as a source of power generation. Statistics are given applying to Norwegian conditions.

Cost of Gas Engines and Electric Motors. Hydro-Electric Power Pumping in the Oil Fields, R. A. Hopkins. Min. and Oil Bul., vol. 6, no. 2, Jan. 1920. pp. 83-85 and 108, 4 figs. Comparative cost of gas engines and electric motors.

PRECIPITATION

Cottrell Process. The Cottrell Process in Japan, Ritaro Hirota and Kyoshi Shiga. Min. & Sci. Press, vol. 120, no. 7, Feb. 14, 1920, pp. 223-228, 7 figs. Process said to have made comparatively rapid progress. Article briefly describes electrical precipitators installed in Japan up to present time.

PROBABILITY

Normal Curve. A Derivation of the Equation of the Normal Probability Curve, W. D. Cairns. Bul. Am. Math. Soc., vol. 26, no. 3, Dec. 1919, pp. 105-108. Method consists in controlling what are termed points of inflection of polygon of symmetrical distribution of magnitudes about their mean, so that these points approach predetermined positions on each side of mean.

PRODUCTION

Electricity Supply and, Parallel Increase of. Central Station Power as a Factor in Effecting Economies and in Increasing Production, George H. Jones. Western Soc. Engrs., vol. 25, no. 2, Jan. 20, 1920, pp. 59-65, 4 figs. Diagram is presented showing relative growth in investment and in electricity sold in kw-hr. in years 1900 to 1928, and curve showing increase in number of employees compared with increase in kw-hr. sold.

PROPELLERS, SHIP

Design. The Propeller (L'hélice propulsive), M. le Besnerais. Bulletin technique du Bureau Veritas, vol. 2, no. 1, Jan. 1920, pp. 7-13, 5 figs. Various theories explaining operation of propeller are surveyed and method is developed for ascertaining characteristics which must be possessed by a propeller in order to satisfy a given set of conditions. (To be continued.)

PULVERIZED COAL

Fineness Factor. Status of the Powdered Fuel Problem, Joseph F. Shadgen. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 32-34. Plea for establishing factor of fineness.

Preparation of. Methods of Preparing Pulverized Coal, Joseph F. Shadgen. Iron Age, vol. 105, no. 6, Feb. 5, 1920, pp. 389-392. Descriptions of devices for crushing, pulverizing, drying, handling, cleaning, weighing and ventilating.

Uses. Pulverized Fuel, E. R. Knowles. Jl. Am. Soc. Heat. & Vent. Engrs., vol. 26, no. 1, Jan. 1920, pp. 17-72, 38 figs. Illustrates typical applications of pulverized fuel to heating furnace with waste-heat boiler, to open-hearth furnaces, and arrangement of plant for pulverizing coal. Advantages and disavantages of pulverized coal as fuel are discussed and figures are presented giving costs of coal-pulverizing plants and cost of pulverizing coal per ton.

PUMPING ENGINES

Unaflow. Tests of the Unaflow Pumping Engine, D. A. Decrow. Jl. N. E. Water Works Assn., vol. 33, no. 4, Dec. 1919, pp. 535-543 and (discussion) pp. 543-544, 4 figs. Set of indicator cards from condensing engines are shown and discussed.

PUMPS, CENTRIFUGAL

Motor-Driven, Water-Works. A Remarkable Pumping Performance at the Northeast Pumping Station, Minneapolis, F. W. Cappelen. J.l Am. Water Works Assn., vol. 7, no. 1, Jan. 1920, pp. 88-101. Specifications for electric-motor-driven centrifugal pump designed to deliver 30,000,000 gal. of water in 24 hours against average dynamic head of 250 ft.

Motors for Driving. Synchronous Motors for Driving Centrifugal Pumps, Soren H. Mortensen. Power, vol. 51, no. 3, Jan. 20, 1920, pp. 90-93, 7 figs. Difference between self-starting and plain synchronous motor is explained and cases are discussed where, it is stated, synchronous motor should be used in preference to induction motor.

PUMPS

Electrically Operated. Observations on Electrically Operated Pumps in Indiana, G. C. Blalock. Elec. Rev. (Chicago), vol. 76, no. 5, Jan. 31, 1920, pp. 184-187, 5 figs. Forms and types of cells and methods of pumping water employed. Paper read before Indiana Eng. Society.

Submersible. Submersible Pumps. Engineer, vol. 128, no. 3337, Dec. 12, 1919, p. 595, 3 figs. Motor is enclosed in water-tight cylindrical casting of boiler plate and is directly coupled to centrifugal pump.

QUARRYING

Methods of. Methods of Quarry Operation. Rock Products, vol. 23, no. 2, Jan. 17, 1920, pp. 22-25, 25 figs. Practice and experience of France Stone Co. Toledo, Ohio.

RADIO COMMUNICATION

Progress During War. Wireless Telegraphy and Telephony During the War (La télégraphie et le téléphone sans fil pendant la guerre), Camille Gutton. Société industrielle de l'Est, Bulletin no. 153, Dec. 1919, pp. 5-19, 8 figs. Survey of progress.

See also Radiotelegraphy.

RADIOTELEGRAPHY

Audions as Receivers and Dampers. Graphical Study of the Operation of Resonator Audions as Sensibilized Receivers and as Dampers (Étude graphique du fonctionnement des audions à circuit résonant comme récepteurs sensibilisés ou comme désamortisseurs), M. André Blondel. Comptes rendus des Séances de l'Académie des Sciences, vol. 169, no. 26, Dec. 29, 1919, pp. 1377-1382, 2 figs. Example of dynamic characteristics of audion generator deduced by anamorphosis from static characteristic of audion on hypothesis that saturation current remains invariable.

Detector. The Use of Three-Electrode Lamp-Valves by the French Military Radiotelegraphy (L'emploi des lampes-valves à 3 électrodes par la radiotélégraphie militaire), C. Gutton. Bulletin de la Société d'Encouragement pour l'Industrie nationale, vol. 131, no. 6, Nov.-Dec. 1919, pp. 389-408, 11 figs. Explains operation of three-electrode valve as detector and as generator of electric oscillations.

High-Frequency Current Measurements. Measurement of Electrical Quantities in Circuits Carrying Currents at High Frequencies (Mesures électriques en haute fréquence), Léon Brillouin. Bulletin de la Société Française des Electriciens, vol. 9, no. 83, Aug.-Nov. 1919, pp. 555-572, 11 figs. Apparatus developed by French military radiotelegraphy.

Oscillations, Generation of. *See Detector.*

Vacuum Valves. Structure and Operation of the Vacuum Valve, Robert W. A. Brewer. Jl. Electricity, vol. 44, no. 3, Feb. 1, 1920, pp. 102-105, 5 figs. Features upon which uniformity of operation of vacuum valve depends.

RAILWAY ELECTRIFICATION

Direct-Current Transmission System. The Direct Current Transmission System in Main Line Railway Electrification, Alfred Raworth. Ry. Gas., vol. 32, no. 3, Jan. 16, 1920, pp. 84-85, 1 fig. Proposes arrangement embodying installation along each track of two insulated and conductor rail for direct-current transmission.

French Commission Report. Railway Electrification (L'électrification des chemins de fer). Industrie des tramways et Chemins de Fer, vol. 13, nos. 151-152-153, July-Aug.-Sept. 1919, pp. 84-88, 4 figs. Report submitted by commission sent to America by French Ministry of Public Works.

RAILWAY MANAGEMENT

Suggested Reorganization Plan. The Railway Problem, Charles Whiting Baker. Eng. News-Rec., vol. 83, nos. 17 and 18, Oct. 23 and 30, 1919, pp. 752-758 and 789-796. Suggests organization of railway corporations under Federal charters, all profits above fair return on capital to be invested for public benefit, to supply need for new railway capital and amortize existing capital.

RAILWAY OPERATION

Automatic Train Control. Report of the Automatic Train Control Committee. Ry. Rev., vol. 66, nos. 6 and 7, Feb. 7 and 14, 1920, pp. 204-209 and 248-251. Committee was appointed by U. S. Railroad Administration to study automatic train-control devices undergoing test upon various lines of railroad and to offer recommendations in regard to installation and further practical test of any devices available for that purpose.

ROADS, BRICK

Beam Strength in. Is Beam Strength the Important Item in Brick Roads? Will P. Blair. Eng. News-Rec., vol. 83, no. 15, Oct. 9, 1919, pp. 699-700. It is claimed practice shows beam strength is not essential.

Rapid Laying of. Tamping Templet Expedites Brick Road Construction, F. A. Churchill. Eng. News-Rec., vol. 84, no. 6, Feb. 5, 1920, pp. 282-283, 2 figs. It is said that 12 miles of monolithic brick road were completed in Ohio in 92 working days. Itemized manipulation cost of laying is given.

Types and Records of Service. The Construction of Brick Pavements in and Near Danville, Illinois, Harlan H. Edwards. Mun. & County Eng., vol. 58, no. 1, Jan. 1920, pp. 3-8, 12 figs. Survey of types of pavements in use and records of their service. In particular it is mentioned that monolithic brick 9-ft. wide and 6 miles in length, which was built in 1916, by using 4-in. brick laid on 1-in. bed of fine gravel concrete has given very satisfactory service.

ROADS, CONCRETE

Construction. Concrete Road Contract Has Plant for Rapid Progress. Eng. News-Rec., vol. 84, no. 1, Jan. 1, 1920, pp. 28-31, 5 figs. Plant for building 9-mile stretch of Lincoln Highway in Illinois comprised system for loading batch boxes, revolving crane traveling on concrete mixer of high capacity and large machinery equipment.

Fast Roadbuilding with Concrete Hauled Four Miles. Eng. News-Rec., vol. 84, no. 6, Feb. 5, 1920, pp. 280-281, 5 figs. Sketch plan of central mixing plant and truck system for building 6-mile road.

Reinforcement for. Should "Binding Steel" Be Used in Concrete Highways? W. C. Conger. Concrete, vol. 16, no. 2, Feb. 1920, pp. 77-79. It is claimed the binding steel "will increase the direct tensile property of the concrete," and "will positively prevent the many hair cracks which form in the slab."

The Roads and Public Works Utilities. Concrete & Constructional Eng., vol. 15, no. 1, Jan. 1920, pp. 47-59, 19 figs. Various exhibits are illustrated, particularly those of mesh and bar reinforcement for concrete roads.

Requirements in Contractor for. An Appraisal of Modern Plant Performance in Concrete Road Construction, H. D. Hammond. Eng. News-Rec., vol. 83, no. 18, Oct. 30-Nov. 6, 1919, pp. 784-788, 7 figs. Emphasizes importance of managerial ability and organizing genius on the part of contractor.

State Specifications. Charted Summary of State Concrete Road Specifications, A. N. Johnson. Cement and Eng. News, vol. 32, no. 1, Jan. 1920, pp. 32-33. Chart covers main requirements of various State Highway Departments in regard to fine and coarse aggregate, mixing, consistency, forms, expansion joints, reinforcement, finishing and curing.

Value of. Reinforcement Concrete Roads, J. H. Walker. Surveyor, vol. 57, no. 1459, Jan. 2, 1920, pp. 7-8. Writer sees in reinforced concrete road "the road that, laid now, will not only take present-day traffic, but also the greatly increased traffic of some years hence."

ROLLING MILLS

Electrically Driven, Temple-borough. Electrical Rolling Mills at Templeborough. Engineer, vol. 128, no. 3337, Dec. 12, 1919, pp. 586-588, 9 figs., partly on two supp. plates. Designed for reducing 3-ton ingots of 20-in. by 20-in. section principally into blooms 6 in. by. 6 in., which will then pass to 21-in. and subsequently to an 18-in. Morgan continuous mill.

SAFETY

Standards Available. What Constitutes Good Inspection? Lew R. Palmer. Safety Eng., vol. 38, no. 6, Dec. 1919, pp. 323-326. List of available industrial safety standards which have been formulated by representative national organizations, such as Nat. Safety Council, Am. Soc. M. E., and U. S. Shipping Board Emergency Fleet Corp.

SAFETY DEVICES

Railway Operation. Annual Report of the Bureau of Safety. Ry. Mech. Engr., vol. 94, no. 1, Jan. 1920, pp. 26-28. Account of tests of automatic stops and train pipe connectors. Use of hand brakes on heavy grades condemned.

SAND BLAST

Applications. Application and Growth of Sand Blasting, H. D. Gates. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 14-16, 5 figs. Types of machines are described and illustrations are presented which show work before and after being sandblasted.

SCALES

Railway Track. Specifications for the Manufacture and Installation of Railroad Track Scales. Circular of Bur. of Standards, no. 83, Jan. 31, 1920, 35 pp. for knife-edge scales of straight and torsion lever types only, not including overheaded suspension scales.

SCHOOP SPRAYING PROCESS

Simplified Apparatus for. A Simplified "Schoop Pistol," M. V. Schoop. Metal Industry (Lond.), vol. 16, no. 3, Jan. 16, 1920, pp. 41-42, 3 figs. New feed of wire-spraying pistol consists mainly in pushing wire to be moved into interior of hollow axle of turbine causing wire to engage with several dies, which are provided with thread-like pressure faces and rotate with axle of turbine.

SCIENTIFIC MANAGEMENT

Layout of Departments and Machinery. Scientific Management, Henry Atkinson. Eng. & Indus. Management, vol. 3, no. 5, Jan. 29, 1920, pp. 131-134, 3 figs. Concerning layout of department in new works and machinery in each department.

See also Time Study.

SCREW THREADS

Hartness Comparator. Hartness Screw Thread Comparator. Machy. (N. Y.), vol. 26, no. 5, Jan. 1920, pp. 467-469, 5 figs. Projection type of apparatus designed to show instantly magnitude and kind of errors in screw threads.

See also Gages, Screw-Thread.

SEWER CONSTRUCTION

Bank Slides in. Earth Slips Prove Disastrous to Open-Cut Sewers. Eng. News-Rec., vol. 83, no. 21, Dec. 11-18, 1919, pp. 989-991, 5 figs. Methods devised to correct trouble arising from bank slides and bottom upheavals in work on Detroit sewers.

SEWAGE PLANTS

Electrolytic. Idle Electrolytic Sewage-Works in Oklahoma. Eng. News-Rec., vol. 84, no. 3, Jan. 15, 1920, pp. 135-136, 1 fig. Official report of engineer of state department of public health is quoted as saying that "average municipality will not give sufficient attention to an electrolytic plant to justify expenditure of an installment."

Screening Plant. Operating Results of Dyckman Street Sewage-Screening Plant, Charles E. Gregory. Eng. News-Rec., vol. 84, no. 4, Jan. 22, 1920, pp. 171-172. Table giving results of tests of Riensch-Wurl screens.

SEWAGE TREATMENT

Doten Tank. Sewering War-time Housing Developments. Mun. Jl. & Public Works, vol. 48, no. 2, Jan. 17-24, 1920, pp. 25-28, 3 figs. Doten tank as modified in Emergency Housing Projects for Construction Division of War Department.

Testing Apparatus. Sewage-Treatment Report Forms and Testing Apparatus, E. J. Tully and James H. Mackin, Eng. News-Rec., vol. 83, no. 18, Oct. 30-Nov. 6, 1919, pp. 825-826, 2 figs. Monthly blank sheet for daily test records and apparatus for finding settleable solids and sludge depths.

SEWERS

Storm-Water Drain Design. A Diagram Adaptation of the Rational Method of Storm-Water Drain Design, Harold G. McGee. Eng. News-Rec., vol. 83, no. 19, Nov. 13-20, 1919, pp. 868-872, 7 figs. Review of maps, population estimates, rainfall intensities, probability charts and various instruments and methods associated with storm-sewer design, and illustration of how diagram is used.

SHIP CONSTRUCTION

Isherwood System. An Analysis of the Isherwood System, John Flodin. Int. Mar. Eng., vol. 25, no. 2, Feb. 1920, pp. 128-131, 4 figs. Experience of shipbuilding company is referred to which changed from transverse to longitudinal system of construction. Design under consideration was: Length between perpendiculars, 380 ft.: length overall, 395 ft.; breadth, molded, 53 ft.; depth, molded, 29 ft. 3 in.; load draft, 23 ft. 6 in.; deadweight cargo capacity, 7500 tons. (To be continued.)

Joining Sections, New Method. New Method of Joining Ship Sections, James Nacy. Int. Mar. Eng., vol. 25, no. 2, Feb. 1920, pp. 115-116, 2 figs. Methods designed with object of eliminating use of dry dock in assembling several sections. Process is to render each section seaworthy unit by closing ends with special watertight bulkheads and to arrange pipe connections in each section so that usual trouble of pipe fitting after assembly is avoided.

Pre-assembly Methods. Pre-assembly in Ship Construction, R. D. Gatewood. Am. Mach., vol. 52, nos. 1 and 4, Jan. 1 and 22, 1920, pp. 1-6, 12 figs., and 171-176, 8 figs. Describes and illustrates pre-assembly methods of building ships in 12-slip yards turning out an 880-ton ship every two weeks.

SHIP DESIGN

Special Form of Keel Structure. Special Form of Ship Keel Structure Providing a Clear Fore-and-Aft Passage, E. F. Spanner. Steamship, vol. 31, no. 368, Feb. 1920, pp. 189-191. Urges arranging leads along compact but accessible duct clear of cargo spaces. Paper read before Inst. Mar. Engrs.

Thrust Block. The Marine Thrust Block. Mech. World, vol. 67, no. 1723, Jan. 9, 1920, pp. 27-28, 6 figs. Formulæ for determining dimensions of various parts.

SHIP PROPULSION

Steam-Turbine. Westinghouse Propelling and Auxiliary Machinery Installed in Fabricated Ships, P. M. Robinson. Int. Mar. Eng., vol. 25, no. 2, Feb. 1920, pp. 83-100, 35 figs. Machinery consisted of Westinghouse turbines of impulse-reaction, cross-compound type, consisting of high-pressure and low-pressure unit, each of which was connected to first reduction opinion through flexible shaft and coupling.

SHIP PROPULSION, ELECTRIC

SHIPS

SIGNALING

SLIDE RULE

SNOW PLOWS

SNOW REMOVAL

SOLUTIONS

SPECTRA

STEAM ENGINES

STEAM POWER PLANTS

STEAM TURBINES

STEEL

PHOSPHORUS AND SULPHUR IN. Phosphorus and Sulphur in Steel. Iron Age, vol. 105, no. 6, Feb. 5, 1920, pp. 397-398. Plans for investigation by joint committee of Am. Soc. for Testing Materials, Railroad Administration and U. S. Bur. of Standards.

WOODY FRACTURES. Woody Structures of Fractures of Transverse, Test-Pieces Taken from Certain Special Steels, J. J. Cohade. Chem. & Metallurgical Eng., vol. 22, no. 6, Feb. 11, 1920, pp. 259-264, 5 figs. Observations are claimed to indicate that acid open-hearth metal is less liable to give woody fractures, while molybdenum and high-carbon nickel steel give poor transverse tests by virtue of their chemical composition.

See also Alloy Steels.

STEEL CASTINGS

HEAT TREATMENT. The Use of the Microscope in Foundry Problems, G. R. Bolsover. Metal Industry (Lond.), vol. 16, no. 5, Jan. 30, 1920, pp. 85-87, 16 figs. Variations in properties of steel effected by suitable heat treatment are pointed out. Paper read before Instn. British Foundrymen.

STEEL, HEAT TREATMENT OF

AUTOMOBILE AND TRUCK GEARS. Development of Commercial Heat Treating, W. H. Phillips. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 28-30, 4 figs. Refers particularly to developing of processes for heat-treating automotive gears.

BALL-BEARING RACES. Electric Heat-Treatment of Ball Bearing Races, F. T. Cope. Elec. Furnace, vol. 1, no. 1, Jan. 1920, pp. 11-12. Equipment comprises through-type pusher furnace, oil quench tank and oil drawing bath, arranged in series for continuous flows of material.

ELECTRIC FURNACES FOR. Electric Furnaces for Heat Treating, R. E. Talley. Proc. Steel Treating Research Soc., vol. 2, no. 9, 1920, pp. 24-28 and (discussion) 28-29 and 38-40, 11 figs. Surveys development of various types.

FACTORS IN. Factors to be considered in the Heating and Cooling of Steel, C. D. Barnhart. Jl. Am. Steel Treaters Soc., vol. 2, no. 4, Jan. 1920, pp. 201-206. It is emphasized that "it is the uniformity of the final set or adjustment of the structure in cooling that determines the uniformity of the actual heat treatment."

HUMP METHOD. The Hump Method of Heat Treatment, George W. Tall. Jl. Am. Steel Treaters Soc., vol. 2, no. 4, Jan. 1920, pp. 185-195 and (discussion) pp. 195-198, 11 figs. Essential feature of method lies in treating steel from change in rate of heating of neutral body at time transformation in steel occurs.

LOW-CARBON STEEL. The Effect of Heat Treatment and Mechanical Work on the Physical Properties of Mild Steel, Wilfred Hanby. Jl. Am. Steel Treaters Soc., vol. 2, no. 5, Feb. 1920, pp. 226-234, 16 figs. Gives results of tests made on steel containing 0.24 per cent carbon, which are said to show that "information obtained from tensile tests alone is by no means sufficient criterion as to true value of material for all purposes of construction."

RIFLES AND GUNS. The Heat Treatment of Rifles and Guns, Arthur W. F. Green. Am. Drop Forger, vol. 6, no. 1, Jan. 1920, pp. 36-40, 8 figs. Photo-micrographs showing grain growth at a high temperature and sorbitic structure throughout piece of steel. Experience of plant is discussed where it is said that production of heat-treated rifle and machine-gun barrels is accomplished practically without rejection.

SCREW-MACHINE STOCK, WATER-QUENCHING. Results of a Series of Tests of Water-Quenched Free-Cutting Steel, C. P. Miller. Am. Mach., vol. 52, no. 2, Jan. 8, 1920, pp. 87-88, 3 figs. It is concluded from tests that water quenching raises tensile strength of 1 in. screw-machine steel 27 per cent, yield point 28 per cent, reduction of area 8 per cent, while elongation is decreased 22 per cent.

TOOL-ROOM EQUIPMENT AND METHODS. Heat Treatment of Steel in the Tool Room, M. H. Williams. Ry. Mech. Engr., vol. 94, no. 1, Jan. 1920, pp. 39-47, 7 figs. Equipment and methods for tempering carbon and high-speed steel, hardness tests and service records.

STEEL, HIGH-SPEED

MOLYBDENUM-ALLOY. The New High Speed Steel, Leslie Aitchison. Autocar, vol. 44, no. 1264, Jan. 10, 1920, pp. 56-57. Examination of formulæ of cutting steels with special reference to patent by Professor Arnold of Sheffield University. Arnold's discovery consists in substituting in high-speed steel about 6 per cent of molybdenum for 18 per cent tungsten which it normally contains.

STEEL INDUSTRY

ELECTRIC STEEL. The Status of the Electric Steel Industry, Edwin F. Cone. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 75-77 and 98. It is noted that United States still leads in output with 323 furnaces, a gain of 12 per cent in 1919. Number of furnaces in world's steel industry is placed at about 875.
The Electric Furnace and Electric Steel. Blast Furnace & Steel Plant, vol. 8, no. 2, Feb. 1920, pp. 135-137, 2 figs. Data collected by Electric Furnace Assn. relative to quality of electric furnace products. Statistics on electric steel production.

GERMAN OUTLOOK. The German Iron and Steel Trade. Iron Age, vol. 105, no. 8, Feb. 19, 1920, pp. 558-559. Represented as sold months ahead with no bright outlook for expanding production.

GREAT BRITAIN, 1919. British Iron and Steel in 1919. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 63-65. Decreasing production, unsatisfied demand, record profit and still advancing prices are recorded.

INDIA. Development of India's Iron and Steel Industry. Iron and Coal Trades Rev., vol. 100, no. 2707, Jan. 16, 1920, pp. 74-75. From report of British Senior Trade Commissioner in India and Ceylon relating to present conditions and prospects of British trade in Indian Empire as viewed from importer's standpoint.

METALLURGICAL PROGRESS, 1919. The Year in Iron and Steel Metallurgy, Lewis B. Lindemuth. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 61-62. It is considered that while year brought out little that is new, nevertheless general application of metallurgical principles necessitated by economy has raised standard of iron and steel production.

STATUS IN 1919. A Troubled Year in the Steel Trade. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 1-3 and 43-44. Production is said to have been 75 to 80 per cent of average for war years 1916, 1917 and 1918. Little progress is seen to have been made on road to readjustment.

STEEL MANUFACTURE

COOLING RATE OF INGOTS. The Cooling of Highly-Heated Iron Masses and the Distribution of Temperature Within Them (Die Abkhülung hocherhitzer Eisenkörper und die Temperaturverteilung in deren Innerem), F. Riedel. Stahl und Eisen, vol. 40, no. 1, Jan. 1, 1920, pp. 1-9, 12 figs. Curves and formulæ are given for calculating time necessary for cooling off by heat radiation and heat-reduction processes.

DUPLEX PROCESS, PROPOSED. Proposed Duplex Process for making Steel, G. L. Fisk. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 38-41, 2 figs. Cost comparisons with bessemer and straight open-hearth process.

USE OF SPIEGELEISEN IN. Use of Spiegeleisen in Steel Manufacture, Henry D. Hibbard. Chem. & Met. Eng., vol. 22, no. 5, Feb. 4, 1920, pp. 209-210. Data in which estimate of requirements for 1918 was based. From monthly report of investigations, Bureau of Mines.

STEEL, MOLYBDENUM

QUALITIES OF. The Qualities of the Molybdenum Steels. Automotive Industries, vol. 42, no. 5, Jan. 29, 1920, pp. 358-361, 9 figs. Elastic limit, tensile strength, elongation percent and reduction of area are quoted and photomicrographs are presented of alloy containing 0.32 per cent. carbon, 0.49 per cent. manganese 0.10 per cent. silicon, 0.90 per cent. chromium and 0.10 per cent. molybdenum.

STEEL WORKS

AUSTRALIA. The Infant Steel Industry of Australia, Clement F. Poppleton. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 7-11, 1 fig. Features of two existing producing plants and of proposed design for third.

INDIA. New Steel Plant Being Built in India. Iron Age, vol. 105, no. 1, Jan. 1, 1920, pp. 18-19, 2 figs. Blast furnace of 350-ton capacity and 168-oven by-product coke plant.

STEELITE

See Cutting Metals, Steelite Tools for.

STOKERS

CHAIN-GRATE. Developing the Chain-Grate Stoker, H. F. Gauss. Power, vol. 51, no. 4, Jan. 27, 1920, pp. 144-146, 2 figs. Application of forced draft, it is said, has resulted in much higher rates of combustion, reduction of ignition troubles, better air control to various sections of grate and less leakage of air into furnace.

MARINE-BOILER. Mechanical Stokers Aboard Ships, Charles H. Bromley. Power, vol. 51, no. 3, Jan. 20, 1920, pp. 86-89, 8 figs. Illustrates various types which are being installed aboard ships in England and United States.

STRESSES

ENGINEERING MATERIALS, DISTRIBUTION IN. Stress Distribution in Engineering Materials, L. N. G. Filon. Engineering, vol. 109, no. 2819, Jan. 9, 1920, pp. 64-66, 4 figs. Principle of dynamical similarity applied to deformable elastic structures.

SUBMARINES

ELECTRIC STEERING. Electric Rudder Engines on U-Boats, Their Development and Adaptability for Large Warships and Merchant Ships (Die elektrischen Rudermaschinen auf U-Booten, ihre Entwickelung und Anwendung für grösser-Kriegs- und Handelsschiffe). Schiffbau, vol. 21, nos. 5 and 6, Dec. 10 and 24, 1919, pp. 220-228, 36 figs. Studies of advantages and disadvantages, based on several years' experience, of original electric rudder machines and their gradual development. Details of pilot switch and direct automatic steering. (To be continued.)

ENGLISH. English Submarines during the War and the Battle against the German Submarines (Les sous-marins anglais pendant la guerre et la lutte contre les sous-marins allemands), A. Poidloué. Génie Civil, vol. 76, no. 4, Jan. 24, 1920, pp. 85-89, 10 figs. English types. Specifications are: Length, 55.15 m.; breadth, 6.95 m.; depth, 3.85 m.; displacement, 662 tons; power plant, 1600 hp.

SUBWAYS

LONDON, OPERATIONS AND FARES. Operating London's Underground Railways, Walter Jackson. Elec. Ry. Jl., vol. 55, no. 6, Feb. 7, 1920, pp. 276-283, 9 figs. How differential fare works out and why former flat-fare lines changed to graduated fare beginning at lower rate. Intensive utilization of double-track lines and non-stop and skip-stop trains is pointed out as interesting feature of operation.

WATER HAMMER

CALCULATION OF. Calculation of Water Hammer in Conduits Formed of Two or Three Sections of Different Diameters (Calcul du coup de bélier dans les conduites formées de deux ou de trois tronçons de diamètres différents), E. Carey. Bulletin technique de la Suisse romande, vol. 47, no. 1, Jan. 10, 1920, pp. 5-7, 2 figs. Water-hammer curve is constructed for conduit of assumed characteristics, in order to illustrate method outlined in previous installments. (Continuation of serial.)

LAWS OF PRESSURES DROP. Laws of Pressure Drop Resulting in Conduits from the Sudden Shutting of Gates (Les lois de fermeture rapide déduites des abaques de M. Allievi), D. Gaden. Revue générale de l'Electricité, vol. 7, nos. 3 and 4, Jan. 17 and 24, 1920, pp. 75-89 and 115-121, 17 figs. Based on theory of water hammer developed by L. Allievi in Teoria del Colpo d'Ariete, published in Atti del Collegio regli Ingegneri el Architetti, Milan, Italy.

WATER POLLUTION

NIAGARA RIVER. Pollution of Niagara River by Wash Water from Filtration Plant Enjoined. Jl. Am. Water Works Assn., vol. 7, no. 1, Jan. 1920, pp. 52-59. Concerning court action to prevent pollution brought by water company against public water board, pollution in question being due to discharge of waste and wash water from water filtration plant.

TYPHOID FROM INFILTRATED SEWAGE. Water-Supply Typhoid Outbreak at Lansing, Mich., J. R. Daugherty. Eng. News-Rec., vol. 84, no. 2, Jan. 8, 1920, pp. 92-94, 5 figs. Wells with leaky casings were polluted by sewage forced into soil during high water in Grand River, March, 1919.

WATER PURIFICATION

CHLORINE TREATMENT, FRENCH ARMY. The Progress in the Purification of Water by Chlorine (Les progrès de l'épuration des eaux par le chlore), A. Moreau. Bulletin d'Encouragement pour l'Industrie nationale, vol. 131, no. 6, Nov.-Dec. 1919, pp. 416-423, 4 figs. Bunau-Varilla automatic aparatus employed by French army.

OZONE IN. Ozone as a Disinfectant in Water Purification, Joseph W. Ellms. Jl. Am. Water Works Assn., vol. 7, no. 1, Jan. 1920, pp. 60-64. Also Fire & Water Eng., vol. 67, no 3, Jan. 21, 1920, pp. 147-148. It is pointed out that ozone used as disinfecting agent is "no more a cure-all for a polluted water supply than are other disinfecting agents that are at present more widely employed," and that it cannot be denied "that the process needs investigation and scientific development in order to make it economically efficient."

RAPID SAND FILTRATION PLANTS. Twin Falls Water Purification Plant. Mun. Jl. & Public Works, vol. 48, no. 3, Jan. 31, 1920, pp. 41-43, 4 figs. Rapid sand filtration plant with capacity of 6,000,000 gal. per 24 hours.

Rapid Sand Filtration Plant at Hawkesbury, J. O. Meadows. Contract Rec., vol. 34, no. 3, Jan. 21, 1920, pp. 52-54, 5 figs. Plant consists of two Allis-Chalmers low lift centrifugal pumps, each having capacity of 750-gal. per minute against head of 30-ft., coagulation basin, two reinforced-concrete chemical solution tanks, each with capacity of 620-gal. and chemical feeding devices.

TORONTO DRIFTING SAND FILTRATION PLANT. Description, Operation and Purification Effected by Drifting Sand Filtration System in Toronto During 1918, Norman J. Howard. Jl. N. E. Water Works Assn., vol. 33, no. 4, Dec. 1919, pp. 504-520 and (discussion) pp. 521-534, Capacity of plant is 60,000,000 gal. in 24 hr., but maximum rate of 72,000,000 gal. must be maintained for period of ten hours. Rate of filtration is 150,000,000 gal. per acre per day.

The Toronto Drifting Sand Water Purification Plant, William Gore. William Storries. Jl. Eng. Inst. of Canada, vol. 2, no. 11, Nov. 1919, pp, 701-713, 17 figs. Details of construction and characteristic curves of sand-lifting.

WATER SOFTENING

LIME-SODA ASH PROCESS. A Study of the Lime-Soda Ash Water-Softening Process, Max R. Herrle and Francis M. Gleeson. Chem. & Metallurgical Eng., vol. 22, no. 6, Feb. 11, 1920, pp. 269-272, 3 figs. Observations on changes in alkalinity and hardness with addition of lime and soda ash separately and consecutively to hard water. Effects of insufficient, correct and excessive amounts of reagents.

WATER SUPPLY

PURE, LEGAL RESPONSIBILITY FOR. Legal Responsibility for a Pure Water Supply, John Wilson. Jl. Am. Water Works Assn., vol. 7, no. 1, Jan. 1920, pp. 44-51. Discussion of legal proceeding resulting from typhoid epidemic at Mankato in 1908.

SNOW-FIELD, DETERMINATION OF. Determination of Water-Supply from Snow Fields. Eng. News-Rec., vol. 83. no. 17, Oct. 23, 1919, pp. 766-768, 1 fig. Snow sampler measurements and tables based on investigations made in Sierra Nevada Mountains.

STORAGE IN OPEN RESERVOIRS. Sanitary Effect of Water Storage in Open Reservoirs, Abel Wolman and S. T. Powell. Eng. News-Rec., vol. 83, no. 18, Oct. 30-Nov. 6, 1919, pp. 804-805, 2 figs. Studies of chemical and bacterial characteristics of water on entering and leaving two reservoirs in Maryland.

WATERSHED LEAKAGE. Watershed Leakage in Relation to Gravity Water Supplies, Rob. E. Horton, Can. Engr., vol. 38, no. 6, Feb. 5 1920, pp. 195-198, 6 figs. Writer makes suggestions for investigating likelihood of watershed leakage, maintaining that the shallower the soil mantle, and the closer to surface the rock, the steeper the slopes, and the more impervious the soil and lock, the less likelihood of serious watershed leakage.

WATER TANKS

CONCRETE. Concrete Water Tank on the Western Railway of Havana, John P. Risque. Ry. Maintenance Engr , vol. 16, no. 2, Feb. 1920, 3 figs. Five 50,000-gal. tanks said to have been erected at cost of 27½ cents per gal. of capacity and to have given uniformly good service with material reduction in amount of painting required. Details of construction are given.

WATER TOWERS

See Coal Bunkers, Reinforced Concrete.

WATER WORKS

Pumps, see Pumps, Centrifugal.

WATERWAYS, INLAND

TRANSPORTATION, FUTURE OF. What Is the Future of Inland Water Transportation? Charles Whiting Baker. Eng. News-Rec., vol. 84, nos. 1-5, Jan. 1, 8, 15, 22 and 29, 1920, pp. 19-28, 85-89, 137-144, 184-199, 234-242. Economic condition of inland water transportation is studied, field which it should occupy with relation to railway transport is pointed out, and conclusions are drawn in regard to policy which it is believed should be adopted with reference to waterway development.

WEIRS

See Flow of Water, Improved Weir for Measuring.

WELDING

See Oxy-Acetylene Welding; Electric Welding.

WIRE DRAWING

See Dies, Wire-Drawing.

WIRED GLASS

See Fire Protection, Wired Glass.

WIRELESS

See Radio Communication; Radiotelegraphy.

WORKMEN'S COMPENSATION

ACCIDENT FREQUENCY AND SEVERITY RATES. New Basis for Measuring Accident Frequency and Severity Rates. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 218-219. Committee on Statistics and Compensation Insurance Cost of Int. Assn. of Indus. Accident Board and Commissions recommends that accident rates, both frequency rates and severity rates, be computed on basis of 1000 hours' exposure instead of 3000 hours' exposure.

DIGEST OF STATE LAWS. A Workman's Compensation Digest, Chesla C. Sherlock. Am. Mach., vol. 52, no. 2, Jan. 8, 1920, pp. 77-80, 1 fig. Digest of practice in States which have compensation acts.

WORKS COUNCILS

INTERNATIONAL HARVESTER CO. PLAN. Some Experiences in Industrial Relations, Arthur H. Young. Factory, vol. 24, no. 2, Feb. 1, 1920, pp. 259-264. Eleven months' test of Harvester Co.'s industrial council plan, principal feature of which consists in establishment of Works Council for considering and shaping plant's policies with relation to matters of mutual interest to employers and employees.

INITED STATES. Works-Councils in the United States. Metal Trades, vol. 11, no. 2, 2 Feb. 1920, pp. 78-81. Summary of Report of Nat. Indus. Conference Board.

Engineering Index

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STRUTS, DESIGN OF. The Loads and Stresses on Aeroplanes, John Case. Aeronautics, vol. 18, nos. 329, 331, 332 and 333, Feb. 5, 19, 26 and March 4, 1920, pp. 123-124, 1 fig., pp. 160-161, 2 figs., pp. 178-179, 4 figs., pp. 196-197, 3 figs. Feb. 5: Results of tests on solid ground steel specimens and on tubular steel struts. Feb. 19. Account of experiments made on 1¼. No. 185 W. G. tubes 3¼ in. long. Theory of composite struts. Feb. 26: Euler failing load of symmetrical strut of any taper. March 4: Design of short tapered strut. (Continuation of serial.)

WING BEAMS, DEFLECTION OF. The Graphical Method for the Deflection of Beams of Non-Uniform Section, B. C. Boulton, H. M. Priest. Aerial Age, vol. 11, no. 1, Mar. 15, 1920, pp. 17-19, 7 figs. Method is developed on principle that deflection curve of wing beams of aeroplane can be obtained from loading curve by four successive integrations or from moment curve by two successive integrations. Integrations are performed graphically.

WING DESIGN. Theories of Wing Design. Aeronautics, vol. 18, no. 332, Feb. 26 1920, p. 185, 3 figs. Measurements taken by means of borings are said to have supported theory that efficiency of wing is due to rarefactions of air and consequent suction action on upper surface of wing.

See also Flying Boats.

AIR COMPRESSORS

TURBO-COMPRESSOR CALCULATIONS. Turbo-Compressor Calculations, Allen H. Blaisdell. Mech. Eng., vol 42, no. 3, March 1920, pp. 151-156, 6 figs. Number of stages to be used in a given case is discussed and method of laying out compression diagram and of subdividing it according to number of stages to be provided for is explained. Expressions are derived for actual and effective impeller radii and axial depth of channel of any radius and graphical method is outlined for calculating theoretical head to be developed by an impeller.

AIR EJECTORS

THEORY AND DESIGN. Air Ejectors; Theory and Design, E. J. Lashinger. Jl. South African Inst. of Engrs., vol. 18, no. 6, Jan. 1920, pp. 89-91 and (discussion) pp. 91-95, 5 figs. Formulæ for determining proportions of nozzles to throat.

AIRCRAFT

DESIGN. Characteristics of Design Affecting Production Operation, and Maintenance of Aircraft, Percy Bishop. Flight, vol. 12, no. 8, Feb. 19, 1920, pp. 216-219. Paper read before Royal Aeronautical Society.

See also Aeroplanes; Airships; Seaplanes.

AIRCRAFT CONSTRUCTION MATERIALS

WOODS. Supplies and Production of Aircraft Woods. Nat. Advisory Committee for Aeronautics, report no. 67, 1919, 62 pp., 23 figs. Summary of available information regarding supplies of kinds of wood that have been used of seem likely to become important in construction of airplanes, and on amount of lumber of each species put on market each year.

AIRCRAFT PRODUCTION

UNDERCARRIAGES. Aircraft Undercarriages, John D. North. Flight, vol. 12, no. 6, Feb. 5, 1920, pp. 161-163, 2 figs. Study of stresses developed in undercarriage during landing with notes on design of undercarriage with a view to diminishing these stresses. (Concluded.)

AIRSHIPS

ENGINES FOR. The Power Plant of a Modern Airship, W. T. Van Orman. Gas Engine, vol. 22, no. 3, March 1920, pp. 69-73, 6 figs. General requirements of airship engine are pointed out and engine of naval airships built by Goodyear Tire & Rubber Co. is described.

RIGID, PRINCIPLES OF CONSTRUCTION. The Principles of Rigid Airship Construction, A. P. Cole. Flight, vol. 12, nos. 6, 7 and 8, Feb. 5, 12 and 19, 1920, pp. 159, 1 fig., 183-186, 5 figs., and 205-209, 6 figs. Feb. 5: Formula for determining structural strength of ship, Feb. 12: Transverse wiring of frames, Feb. 19: Manufacture of gas bags.

The Principles of Rigid Airship Construction, A. P. Cole. Aeronautics, vol. 18, no. 32, Feb. 5, 1920, pp. 126-127 and (discussion) pp. 127-130. Dimensions of German Zeppelin rigid airships. (Concluded). Paper read before Roy. Aeronautical Soc.

RIGID, STRESS DISTRIBUTION IN. The Distribution of Bending Stresses in a Rigid Airship, E. H. Lewitt. Aeronautics, vol. 18, no. 330, Feb. 12, 1920, pp. 140-143, 8 figs. Technical examination of stresses leads to conclusion that built-up tube behaves as heated beam only when (1) cross-section is inscribed in circle, (2) lengths of sides are equal, and (3) there is no variation in size of diagonal wiring in any one bay.

ALCOHOL

COKE-OVEN GAS AS SOURCE OF. Ethyl Alcohol from Coke Oven Gas, Ernest Bury and O. Ollander. Am. Gas. Eng. Jl., vol. 112, no. 10, Mar. 6, 1920, pp. 179-183. Writers expressed their conviction before Cleveland Instn. Engrs. that alcohol extraction from coke-oven gas is commercially practical in Great Britain. Sequence of process for successful recovery of ethylene by means of concentrated sulphuric acid in connection with ordinary by-product recovery plant is defined.

ALLOY STEELS

TOOL STEEL. Tool Steel's Influence on Progress and Prosperity. Raw Material, vol. 2, no. 2, Feb. 1920, pp. 54-59, 10 figs. Alloy steels intermediate between carbon and high-speed steels are described. Ingot improvements by Gathman molds patented by the Gathmann Eng. Co. of Baltimore, are pointed out and illustrated.

ALLOYS

ELECTRICAL MELTING OF. Electrical Melting of Alloys—II, H. W. Gillett. Foundry, vol. 48, no. 6, Mar. 15, 1920, pp. 229-231 and 238. Essential and desirable features of furnaces for melting nonferrous metals are outlined and distinctions are drawn between their relative merits.

HARDNESS OF. Hardness of the Most Important Alloys for Technical Purposes, P. Ludwik. Metal Industry (Lond.) vol. 16, no. 7, Feb. 13, 1920, pp. 125-129, 5 figs. Hardness of most important alloys of copper, tin, lead, zinc and aluminum is examined, both in case of cast specimens which have been suddenly quenched and those which have been annealed by means of chemical pressure in order to establish hardening effect on various individual constituents of alloys. Translated from Zeitschrift des Vereins deutscher Ingenieure.

See also Non-Ferrous Metals.

ALTERNATORS

See Bearings, Thrust; Electric Generators, A. C.

ALUMINUM

ANALYSIS, METHOD OF. The Analysis of Aluminum, Its Compounds and Alloys, J. E. Clennell. Min. Mag., vol. 22, no. 2, Feb. 1920, pp. 88-93. General survey of methods of analysis, methods of separation of aluminum, gravimetric methods for estimation of aluminum in pure substances, and details of separation and estimation of aluminum by gravimetric analysis. (To be continued.)

NAVY SPECIFICATIONS. Aluminum Rolling-Mill Practice—I. Commercial Pig and Scrap, Robert J. Anderson and Marshall B. Anderson. Chem. & Metallurgical Engr., vol. 22, no. 11, Mar. 17, 1920, pp. 489-491. Navy Department specifications for pig aluminum are included.

ALUMINUM ALLOYS

ANALYSES OF. Aluminum Alloys New and Old. Raw Material, vol. 2, no. 2, Feb. 1920, pp. 52-53. Analyses of 26 aluminum alloys and their uses are presented.

DURALUMIN. Heat Treatment of Duralumin, P. D. Merica, R. G. Waltenberg and H. Scott. Sci. Papers of Bur. of Standards, Dept. Commerce, no. 347, Nov. 15, 1919, pp. 271-316, 26 figs. Heat treatment of alloys of duralumin type was investigated and effect observed of variations in heat-treating conditions, such as quenching temperature, temperature of quenching bath, and of aging or tempering, and time of aging upon mechanical properties. Theory of mechanism of hardening of duralumin during aging after quenching from higher temperatures is developed, which is based upon decreasing solubility of compound $CuAl_2$ in solid solution in aluminum with decreasing temperatures from 520 deg. cent. to ordinary temperatures.

AMMETERS

SPLITDORF. Steps in Making an Aluminum Moving Coil for an Ammeter, K. H. Condit. Am. Mach., vol. 51, no. 23, Dec. 18, 1919, pp. 1055-1056, 4 figs. Discussion of moving coil of Splitdorf meter with illustrations of various stages in transformation of an aluminum disk into finished coil.

AMMONIA

SYNTHESIS OF. An Electrically Heated Bomb for Ammonia Synthesis, R. O. E. Davis and Harry Bryan. Jl. Indus. & Eng. Chem., vol. 12, no. 3, Mar. 1920, pp. 287-288, 3 figs. Type used at Bureau of Soils, Department of Agriculture, Washington, D. C.

Purification of Compressed Gases in Testing Catalysts for Ammonia Synthesis, R. O. E. Davis. Jl. Indus. & Eng. Chem., vol. 12, no. 3, Mar. 1920, pp. 289-290, 3 figs. Method used at Arlington, Va., plant, in work on synthesis of ammonia carried on in co-operation with Bureau of Soils, Department of Agriculture and Nitrate Division of War Department.

AMPLIFIERS

MULTIPLE-STAGE. The Design of Multiple-Stage Amplifiers Using Three-Electrode Thermionics Valves, C. L. Fortescue. Jl. Inst. Elec. Engrs., vol. 58, no. 287, Jan. 1920, pp. 65-74 and (discussion) pp. 74-82, 14 figs. Amplifying circuits are illustrated and limitations to effective amplification are discussed.

AQUEDUCTS

SAN FRANCISCO, WATER SUPPLY. Hetch Hetchy Water Supply—I. Public Works, vol. 48, no. 8, Mar. 6, 1920, pp. 165-167, 3 figs. Details of 154-mile aqueduct and auxiliaries for ultimate delivery of 400,000,000 gal. daily to San Francisco at estimated cost of $45,000,000. Description of Hetch Hetchy railroad, 68 miles long, built by city of San Francisco.

ARCHES

PARABOLIC ELASTIC. Rapid Calculation of Deflecting Moments in Parabolic Elastic Arch (Calculo rapido de momentos flectores en el arco elastico parabolico), Cesar Chiodi. Revista del Centro de Estudiantes de Ingenieria, no. 203. May 1919, pp. 532-542, 8 figs. Graphs are given for determination of K and R.

ASH HANDLING

AUTOMATIC PLANTS. Automatic Ash-Removing Plants (Selbsttätige Entaschungsanlagen), A. Rüster. Zeitschrift des Bayerischen Revisions-Verein, vol. 23, no. 20, Oct. 31, 1919, pp. 157-159, 5 figs. Details and illustrations of light ash suction plant, ash retainer, suction nozzle, travelling machine for breaking clinkers, and air-pump suction apparatus for cleaning flue.

BONUS SYSTEMS

Comparison with Efficiency Systems. Wages and Bonus Systems—VI, Herbert C. Armitage. Eng. & Indus. Management, vol. 3, no. 6, Feb. 5, 1920, pp. 163-165. Comparative study of bonus and efficiency systems of wage payment.

Foundry Output Increased by. Efficiency Methods Triple Foundry Output, C. E. Wright. Iron Age, vol. 104, no. 13, Sept. 25, 1919, pp. 849-855, 13 figs. It is stated that Bullard Machine Co., Bridgeport, Conn., greatly increases production by bonus plan. Daily record per man is said to be up from 360 to 1020 lb.

BRAKES

Back-Steam. The Use of Back-Steam as a Brake; Its Power and Its Present Use, A. Herdner. Bul. Int. Ry. Assn., vol. 1, no. 4-5-6, Oct.-Nov.-Dec. 1919, pp. 197-206. Objections against using back steam as brake are examined and separately discussed.

Electromagnetic. Theory of Electromagnetic Brake (La teoria del freno electromagnético), Richard Gans. Contribucion al Estudio de las Ciencias fisicas y matematicas, Universidad nacional de la Plata, vol. 2, no. 43, Sept. 1919, pp. 391-412, 5 figs. Behavior of metallic sphere turning in magnetic field is determined theoretically. Equations for braking couple are derived and stability of motor provided with electromagnetic brake is discussed.

Freight-Train. Continuous Brakes for Heavy Goods Trains. Ry. Gaz., vol. 32, no. 6, Feb. 6, 1920, pp. 189-193, 9 figs. "Loud" brake which provides for augmentation of brake power, when desired, on loaded cars fitted with automatic vacuum brake. Device is being used on Great Indian Peninsula Ry.

Development and Arrangement of Brakes for Through Freight Trains (Die Ausbildung und Einrichtung der durchgehenden Güterzugbremse), G. Oppermann. Annalen für Gewerbe und Bauwesen, vol. 85, no. 2, July 15, 1919, pp. 13-16, 6 figs. Details of Kunze-Knorr and Oppermann compound brakes.

BRASS

Nickel, Effect of Adding. Copper, Zinc and Nickel Alloys (Sur les alliages de cuivre, de zinc et de nickel), Léon Guillet. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 8, Feb. 23, 1920, pp. 460-462. Experiments established that effect of nickel in brass is to raise position of transformation points and to facilitate its forging at high temperatures.

Standardization of. The Standardization of Metals and Metal Alloys. Metal Industry (Lond.), vol. 16, nos. 8 and 9, Feb. 20 and 27, 1920, pp. 141-143 and 161-163. Report submitted to German Committee for Standardization of Metals and Metal Alloys, dealing with standardization o most important brass and bronze alloys.

BRICKYARDS

Management. *See Industrial Management, Brickyards.*

BRIDGES

County, System for Numbering. A Comprehensive System for Numbering County Bridges, Harry F. Harris. Good Roads, vol. 19, no. 6, Feb. 11, 1920, pp. 81-82. Exposition of Dewey decimal system.

BRIDGES, RAILWAY

Raising and Repairing. The Raising and Repair of the Railway Bridge at Houplines, E. M. Sinauer. Bul. Int. Ry. Assn., vol. 1, nos. 4-5-6. Oct.-Nov.-Dec. 1919, pp. 238-244, 2 figs. Bridge consisted of single span, 125 ft. clear, total weight being about 100 tons.

Steel, Specifications for. Report of Committee XV—On Iron and Steel Structures. Bul. Am. Ry. Eng. Assn., vol. 21, no. 223, Jan. 1920, pp. 429-520, 46 figs. General specifications for steel railway bridge, and comparison of column formulæ.

BUILDING CONSTRUCTION

Standardization of Specifications. Practical Economics Secured by Standardization of Construction Specifications, R. C. Marshall, Jr. Am. Architect, vol. 117, no. 2302, Feb. 4, 1920, pp. 165-168. It is pointed out that Department of Public Works, in conference with national technical societies, could establish in most effective manner standard specification for Government work which would insure both safety and economy of design and results would in very few years pay thousand-fold return on investment. Extracts from address before Nat. Department of Public Works Assn.

CAPSTANS

Electric. Electric Capstans for Railway Work. Ry. Gaz., vol. 32, no. 6, Feb. 6, 1920, pp. 195-196, 3 figs. Capstan made by Thomas Broudbent & Sons, Ltd., Hubbersfield, England.

CARBURETORS

Atomization vs. Preheating. Study of Preheating and Atomization in Carburetors (Etude de réchauffage et de la pulvérisation dans les carburateurs). Génie civil, vol. 76, no. 5, Jan. 31, 1920, pp. 119-121, 6 figs. Advantages of atomization over preheating are pointed out. (Concluded.)

CARS, FREIGHT

Equipment, Inspection of. The Inspection of Freight Equipment, L. K. Sillcox. Ry. Mech. Engr., vol. 94, no. 3, Mar. 1920, pp. 149-152. Defects of couplers and related parts are summarized and federal requirements for safety appliances are mentioned.

CARS, TANK

Wrecks and Derailments, Handling. Handling Wrecks and Derailments Involving Loaded Tank Cars, W. S. Topping. Ry. Mech. Engr., vol. 94, no. 3, Mar. 1920, pp 157-158. Rules are formulated for safely handling wrecks while tank cars are leaking gasoline copiously, or gasoline which has already escaped in quantity is still uncared for.

CAST IRON

Silicon, Influence. Investigation of Silicon Reviewed, T. Turner. Foundry, vol. 48, no. 5, March 1, 1920, pp. 184-186. Highest tensile strength of cast iron has been obtained with 1.8 per cent silicon and hardness has been found to decrease until iron contained approximately 2.5 per cent silicon. Paper read before Coventry branch, Instn. of British Foundrymen.

The Influence of Silicon in Cast Iron Foundry Trade Jl. & Pattern Maker, vol. 22, no. 218, Feb. 1920, pp. 101-108, 7 figs. Results of various experimentors are quoted. It is noted that bar of pure washed iron contracts uniformly throughout cooling; immediately on addition of 0.23 per cent silicon marked expansion of units becomes evident after solidification, expansion increasing by 160 units to 240 units on formation of graphite.

CEMENT

Fineness, Effect of. Effect of Fineness of Cement, Duff A. Abrams. Bul. 4, Structural Materials Research Laboratory, Dec. 1919, 81 pp., 36 figs. Report covers compression tests on over six thousand 6-in. by 12-in. concrete cylinders, nine thousand compression and tension tests of mortar and several thousand miscellaneous tests. Strength tests of concrete and mortar were made at ages of seven days to one year. Information was secured on effect of fineness of cement under following conditions: (1) Effect of fineness of cement on strength of concrete; (2) quality of concrete using different cements; (3) effect of quantity of cement used; (4) effect of consistency of concrete; (5) effect of size and grading of aggregate; (6) variation in type of aggregate; (7) effect of age of concrete; (8) elongation and contraction of concrete; (9) effect of fineness of cement on workability of concrete. Reprint from Proc. of Am. Soc. for Testing Materials.

CEMENT, PORTLAND

Raw Materials. Analysis of Portland Cement Raw Mixture, J. C. Witt. Cement, Mill and Quarry, vol. 16, no. 5, Mar. 5, 1920, pp. 23-27, 2 figs. Of two classes of methods for determining calcium carbonate content of portland-cement raw mixture, namely those in which calcium is determined and those in which other constituent is determined, methods of latter class are held to be simpler and more rapid.

Producing Raw Materials for Portland Cement—V and VI, Oliver Bowles. Cement, Mill & Quarry, vol. 16, nos. 4 and 5, Feb. 20 and Mar. 5, 1920, pp. 13-17, 5 figs., and 19-22, Feb. 20: Notes on use of tripod drills where rock contains pockets of clay, use of hammer drills, arrangement of churn-drill holes for multiple shots, difficulties encountered in steeply inclined beds, and "gopher-hole" or "tunnel" method of blasting. Mar. 5: Types of explosives used in quarrying cement rock.

CENTRAL STATIONS

Communication with Substations. Intercommunication of Central Electric Station and Substations Feeding High Tension Net-work (Note sur les liaisons entre une centrale électrique et les sous-stations alimentant un réseau de distribution à haute tension), A. Laucagne. Revue générale de l'Electricité, vol. 7, no. 5, Jan. 31, 1920, pp. 157-162, 5 figs. Discusses introducing system of wireless telegraphy and telephony, similar to that at present used in telephone systems, which centralizes control at office of load-dispatcher.

Economy of Installation. Economy in Fuel Consumption, C. E. Stromyer. Eng. & Indus. Management, vol. 3, no. 7, Feb. 12, 1920, pp. 195-198. Writer suggests that wherever two works are situated not too far apart, one requiring much power and the other much steam for boiling, they could with advantage combine their steam requirements and thus reduce their joint coal bill by one-half.

CHEMICAL INDUSTRIES

Span. The Chemical Industry and Trade of Spain, O. P. Hopkins. Jl. Indus. & Eng. Chem., vol. 12, no. 3, March 1920, pp. 223-227. With tables giving imports and exports of chemicals and allied products.

CHIMNEYS

Earthquake-Resisting. Self-Supporting Chimneys to Withstand Earthquake, C. R. Weymouth. Mech. Eng., vol. 42, no. 3, March 1920, pp. 157-160 and 204-205, 2 figs. Studies of Japanese investigating committee are examined in light of records secured from San Francisco earthquake of 1906. Theory is developed that a chimney should be considered as body oscillating about center of percussion.

Radial Brick. Anaconda Chimney Largest and Tallest in the World. Public Works, vol. 48, no. 9, Mar. 13, 1920, pp. 181-183, 3 figs. Structure is 585 ft. tall weighs 30,000 tons and has 60 ft. inside diameter at top. It is said that 6,000,000 radial bricks were required.

Reinforced-Concrete. *See Water Towers, Reinforced-Concrete.*

CINEMATOGRAPH

See Motion-Picture Photography.

COST ACCOUNTING

Man-Hour Rate Basis. The Philadelphia Electric Company Payroll System for Cost Work on Departmental Man-Hour Rate Basis, G. P. Landwehr. Nat. Elec. Light Assn. Bul., vol. 7, no. 1, Jan. 1920, pp. 47-51, 6 figs. Forms used in connection with determination of costs of constructing operating and maintaining necessary equipment for production of article to be sold.

Scientific Basis for. Scientific Basis for Cost Accounting, G. Charter Harrison. Indus. Management, vol. 59, no. 3, March 1920, pp. 237-242. Formulæ are given for determining cost variations for different classes of expense.

CUTTING METALS

Barth Slide Rules. Supplement to Frederick W. Taylor's "On the Art of Cutting Metals"—VII. Carl G. Barth. Indus. Management, vol. 59, no. 3, March 1920, pp. 222-231, 3 figs. Gives formulæ and shows how to make slide rules for cutting cast iron.

DAMS

Earth Miami Conservancy District. Huffman Dam Outlet. Contrasting, vol. 9, Jan. 1, 1920, pp. 243-244, 2 figs. It is stated that structure in Miami Conservancy District, 70 ft. high through earth dam, was built in seven months, 32,450 yd. concrete having been placed in it by two 95-ft. derrick booins.

Masonry, Up-Stream Treatment of. The Value of Up-Stream Treatment in Dams Founded on Stratified Rock. Indian Eng., vol. 67, no. 3, Jan. 17, 1920, p. 38, 3 figs. on supplement plate. Methods carried out in two masonry dams founded on rock having vertical and horizontal fissures full of argillaceous material in India is explained and rules are suggested for building dams on stratified rock.

DIE CASTING

Advantages of. Modern Die Cast Parts and Metals—II. Raw Materials, vol. 2, no. 2, Feb. 1920, pp. 45-50, 9 figs. Writer points out that late developments of dies now allows casting of brass, both in steel and in plastic dies of high heat resistance, and concludes that process has many advantages from viewpoint of machine-part designer whereby part itself can be strengthened as well as most efficiently and economically produced by die casting. Illustrations of various die cast parts are included.

DIES

Thread-Cutting, Caps for. The Manufacture of Caps for Threading Dies, F. E. Merriam. Am. Mach., vol. 51, no. 19, Nov. 6, 1919, pp. 827-830, 12 figs. It is stated that much of efficiency of die depends upon correct machining of cap.

DIRECTION FINDERS

Method of Using. A Method of Direction Finding of Wireless Waves, and Its Applications to Aerial and Marine Navigation, James Robinson. Radio Rev., vol 1, no. 5, Feb. 1920, pp. 213-219, 3 figs. Methods in which coils can be placed actually on position which indicates bearing, thus avoiding necessity of having to determine two positions where signals are just audible. (To be concluded.)

DREDGING

Electric. Electric Dredging on the Yukon, Allen E. Ransom. Elec. Jl., vol. 17, no. 3, Mar. 1920, pp. 86-90, 13 figs. Dredge and characteristics and operating data.

DRILLING MACHINES

See Machine Tools, Special.

DRILLS

Twist, Manufacture of. The Manufacture of Twist Drills and Taps. Machy. (London). vol. 15, no. 386, Feb. 19, 1920, pp. 641-643, 7 figs. Production methods of Sir W. G. Armstrong, Whitworth & Co., Ltd. Openshaw, Manchester, England.

DROP FORGINGS

Heat Treatment of. The Heat Treatment of Drop Forgings,—1, Leslie Atchison Am. Drop Forger, vol. 6, no. 2, Feb. 1920, pp. 107-109, 2 figs. Effect of alloying elements on general characteristics of steel.(To be continued.) Paper presented before Association of Drop Forgers, England.

DRY DOCKS

Floating, Mobile, Ala. New Floating Dry Dock Built at Mobile. Int. Mar. Eng., vol. 25, no. 3, Mar. 1920, pp. 214-218, 8 figs. Donnelly-Type 10,000-ton wooden deck added to Pinto Island plant of Alabama Dry Dock and Shipbuilding Co.

Wooden, Floating, Durability of. A Sixty-Year-Old Floating Dry Dock, Paul H. Macneil, Int. Mar. Eng., vol. 25, no. 3, Mar. 1920, pp. 178-180, 5 figs. Durability of wooden floating dry dock is said to be proven by Bruce drydock at Pensacola, Fla., which has been in service since before outbreak of Civil War and is still in active operation.

DURALUMIN

See Aluminum Alloys.

DUST

Explosions. *See Explosions, Grain-Dust.*

DYNAMETER

See Testing Machines.

ELECTRIC CONDUCTORS

Parallel, Potential Distribution on. Equal Parallel Cylindrical Conductors in Electrical Problems, F. J. W. Whipple. Proc. Roy. Soc., vol. 96, no. A680, Feb. 3, 1920, pp. 465-475, 4 figs. Distribution of charge and potential determined by method of conjugate functions.

ELECTRIC CURRENTS

Alternating. *See Harmonic Mean.*

Direct, Heavy, Measurement of. A New Method of Measuring Heavy Direct Currents, R. E. Neale. Elec. Rev. (Lond.), vol. 86, no. 2206, Mar. 5, 1920, p. 292, 2 figs. Method depends upon change in choking effect of choking coil fed with alternating current when iron core of coil is magnetized by direct current to be measured as well as by alternating current. Translated from Elektrotechnische Zeitschrift.

ELECTRIC DISCHARGE

Theory of. The Quantum Theory of Electric Discharge, D. N. Mallik and A. B. Das. London, Edinburgh and Dublin Philosophical Mag., vol. 39, no. 230, Feb. 1920, pp. 233-238, 1 fig. Interprets behavior of electric discharge in vacuum-tube in terms of quantum theory.

Ludlum Type. The Ludlum Type of Electric Furnace, W. F. Sutherland. Can. Machy., vol. 23, no. 10, Mar. 4, 1920, pp. 249-251, 3 figs. Description of an electric furnace distinguished by ellipsoidal shape of hearth and by arrangement of 3-phase electrodes in line which is said to insure proper heat distribution.

Uses. Electric Furnace Progress. Metal Industry (N. Y.), vol. 18, no. 2, Feb. 1920, pp. 65-67. Rapid increase in use of electric furnaces for melting and heating metals is pointed out.

ELECTRIC FURNACES

See also Steel Manufacture, Electric Furnace for.

ELECTRIC GENERATORS

Losses, Measurement of. Measurement of Losses and Efficiency by Temperature Rise of Ventilating Air, Wm. F. Dawson. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 153-161, 9 figs. Two methods are discussed: Measuring average inlet and outlet temperatures and volume of ventilating air assuming specific weight and heat of air: and measuring average inlet and outlet temperatures, passing discharged air through electric heater of known capacity and measuring average temperature of air from heater.

ELECTRIC GENERATORS, A. C.

Dissimilar. Oscillating Frequency of Two Dissimilar Synchronous Machines, R. E. Doherty. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 125-129, 2 figs. Avoidance of "hunting" in parallel operation of two dissimilar alternators.

Short-Circuit Tests. Short-Circuit Tests on a 10,000-kv-a. Turbine Alternator, E. S. Henningsen. Gen. Elec. Rev., vol. 23, no. 3, Mar. 1920, pp. 214-221, 11 figs. Tests were conducted under different conditions of short circuit, with various arrangements of reactors in circuit and with no reactors in circuit. Empirical expressions are formulated, from results of tests, for effective symmetrical initial short-circuit current of turbine generator and percentage synchronous reactance. Relation is established that for practical purposes per cent leakage reactance may be considered as varying inversely with voltage.

Sine-Wave Testing Sets. Sine Wave Testing Sets, E. J. Burnham. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 177-180, 10 figs. Generator designed to produce accurate sine wave under different load conditions. Large number of stator and rotor slots is used and also cylindrical rotor on which exciting coils are displaced in phase.

Small. Belted Alternating-Current Generators, A. L. Hadley. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 171-176, 13 figs. Principal features in construction of line of small alternators ranging from 37½ kv-a. to 300 kv-a.

Synchronous. Some Mechanical Features of Synchronous Machines, A. P. Wood. Gen. Elec. Rev., vol. 23, no. 2, Feb. 1920, pp. 130-135, 11 figs. Illustrations are given of improvements which have been made in design and construction by introduction of arc welding and spot welding. Descriptions are included of oil starting system and oil circulating system, coreless and cored box type of stator frame, and rotor spiders of various types and speeds.

Voltage Transformation. Transforming 600-kva Alternator from 500 to 220 Volts (Transformation d'un alternateur de 600 kva de 500 volts à 220 volts), Léon Depierris. Electrician, vol. 50, no. 1246, Feb. 15, 1920, pp. 49-54, 10 figs. Instance is related in which transformation was effected by connecting coils in ten groups of two coils in series on each phase.

EMPLOYEES

PHYSICAL EXAMINATION OF. Making Examinations Universal, T. E. Jennings. Iron Trade Rev., vol. 66, no. 4, Jan. 22, 1920, pp. 284-285. Writer believes that physical examination of all employees will reduce losses from labor turnover, conserve man power and prove advantageous to employer and workmen. Objections of labor are answered.

EMPLOYEES' REPRESENTATION

STATUS IN UNITED STATES. Employees' Representation in Management of Industry, Royal Meeker, U. S. Dept. Labor. Bur. Labor Statistics, vol. 10, no. 2, Feb. 1920, pp. 1-14. Reference is made to establishment of Whitley plan in Great Britain and comparison is made of conditions in that country with those in U. S. Opinion is expressed that of the many systems of industrial democracy introduced in U. S. "very few give promise of accomplishing much in the way of winning enthusiasm and support of the workers, because little, if any, additional authority over or responsibility for methods and results is accorded them."

ENGLISH

FACTORY TRAINING IN. Preparing Industrial English Lessons, George F. Quimby and Charles H. Paull. Indus. Management, vol. 59, no. 3, March 1920, pp. 231-236, 3 figs. Lessons prepared by Industrial Service Department of Associated Industries of Massachusetts and Bureau of Vocational Guidance at Harvard University, which have been working co-operatively on industrial Americanization projects during past year.

EXPLOSIONS

COAL DUST IN STEEL MILLS. Explosion Hazard in Steel Mills From Partly Consumed Coal Dust. Chem. & Met. Eng., vol. 22, no. 9, March 3, 1920, pp. 422-423. Example is quoted of metal plant where there were a number of puddling furnaces some of which used pulverized coal as fuel. Draft of air blew some of coal dust over red-hot iron. Dust immediately ignited and communicated flames to roof trusses.

GRAIN-DUST, PREVENTION OF. Firemen and Prevention of Grain Dust Explosions, David J. Price. Fire & Water Eng., vol. 47, no. 7, Feb. 14, 1920, pp. 379-381 and 400, 4 figs. Examination of reason for dust explosions. It is concluded that special provision should be made in design of mills and elevators to prevent accumulation of dust throughout various parts of plant.

EXPORT TRADE

ENGLISH AS WORLD LANGUAGE. The English Language and International Trade, Alfred E. Hayes. Jl. Royal Soc. of Arts, vol. 68, no. 3508, Feb. 13, 1920, pp. 198-207 and (discussion) pp. 207-209. German and Bulgarian reviews are quoted as suggesting use of English as international trade language, and it is remarked how personal advantages and intellectual interests have prompted establishment of English-speaking associations in Belgium, Russia and other nations. Impracticability of adopting any artificial tongue is concluded from persistent failure of Volapük, Esperanto, Ido, Pëus, and other world languages.

SHIPPING QUOTATIONS, STANDARDIZATION OF. Standardized Practice for American Export Quotations. Automotive Industries, vol. 42, no. 8, Feb. 19, 1920, pp. 520-522. Rules for standardization of shipping quotations adopted at recent conference of trade organizations.

See also Metric System.

EXTENSOMETERS

See Testing Machines, Extensometer.

FACTORY MANAGEMENT

See Industrial Management.

FATIGUE

PREVENTION OF. Prevention of Fatigue in Industry—III, Reynold A. Spaeth. Indus. Management, vol. 59, no. 3, Mar. 1920, pp. 215-217, 1 fig. It is advised to analyze physical, physiological and psychological requirements of various processes and establish standards for each job. For strength testing, spring balance method of Lovett & Martin (Am. Jl. Orthopedic Surgery, 1916, no. 14, p. 415) is recommended.

REDUCTION OF. Unnecessary Fatigue, Frank B. Gilbreth and Lillian M. Gilbreth. Sci. Am. Monthly, vol. 1, no. 2, Feb. 1920, pp. 154-156, 7 figs. Recommends making regular fatigue surveys and points out ways of reducing unnecessary fatigue.

REST-DAY PROVISION. A Rest Day in Continuous Operation Industry, Fred C. Croxton. U. S. Dept. Labor, Bur. Labor Statistics, vol. 10, no. 2, Feb. 1920, pp. 118-127, 3 figs. Three plans are submitted which cover six working positions. The one suggested as simplest provides for full 24-hour rest after six consecutive turns.

FILTERS, SAND

HARTFORD, CONN. Building the Hartford Filter. Public Works, vol. 48, no. 8, Mar. 6, 1920, pp. 159-162, 4 figs. Describes methods and plant used by contractor in building slow-sand filter covering five acres and roofed over. It is related that concrete was distributed entirely by spouting and collapsible roof forms were used eight times.

FILTRATION

COMMERCIAL. Commercial Filtration—IV, J. E. Springer. Color Trade Jl., vol. 6, no. 3, Mar. 1920, pp. 73-76, 3 figs. Notes on disk filter, long-leaf pressure type of filter and method of operating it, and cleaning of filter cloths.

INDUSTRIAL. Industrial Filtration, Henry B. Faber. Jl. Soc. Chem. Industry, vol. 39, no. 3, Feb. 16, 1920, pp. 21T-22T. Process invented by George Moore. Involves use of filter leaves operating in open tank.

FIRECLAYS

COMPOSITION OF. The Use of Fire-Clay in Laying Fire-Clay Bricks, Raymond M. Howe. Gas Jl., vol. 149, no. 2962, Feb. 17, 1920, pp. 366-368, 7 figs. Experiments to determine effect of adding different amounts of water, glass, salt, portland cement, carborundum, asbestos and lime to plastic fireclay.

MORTARS, TESTS OF. Tests of Fire Clay Mortars, Raymond M. Howe. Gas Age, vol. 45, no. 4, Feb. 25, 1920, pp. 174-176, 7 figs. Addition of ground bats was found beneficial.

FLAME PROPAGATION

VELOCITY IN ENGINE CYLINDERS. The Velocity of Flame Propagation in Engine Cylinders, Donald MacKenzie and R. K. Honaman. Jl. Soc. Automotive Engrs., vol. 6, no. 2, Feb. 1920, pp. 119-122, 5 figs. Method is described for measuring rate of flame propagation in gaseous mixtures. Method depends upon fact that bodies at high temperature ionize space about them. Empirical expression for velocity of flame propagation is formulated from results of experiments.

FLIGHT

SOARING. Theory of Soaring Flight (Etude du vol à la voile dans la Haute-Guinée), M. P. Idrac. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 5, Feb. 2, 1920, pp. 269-272. From records of observations of direction and velocity of wind and calculated absolute velocity of bird, forces operating in flight are determined.

FLOOD CONTROL

See Rivers, Scioto, Improvement of.

FLOTATION

BRADFORD PROCESS. Selective Flotation by the Bradford Process. Eng. & Min. Jl., vol. 109, no. 12, Mar. 20, 1920, pp. 700-701. Method as developed at Broken Hill, Australia, is said to be particularly suited to separation of lead-zinc sulphides and to possess advantages over electrolytic, Horwood, magnetic and other treatment.

FLYING BOATS

HULL DIMENSIONS. Flying-Boats: The Form and Dimensions of Their Hull, G. S. Baker. Flight, vol. 12, no. 10, Mar. 4, 1920, pp. 270-272, 1 fig. Diagram showing effect of hull dimension on power required to overcome water resistance. (To be continued.) Paper read before North-East Coast Instn. Engrs. & Shipbuilders.

FOREMEN

QUALIFICATIONS. Qualifications for Foremanship, Charles W. Clark. Indus. Management, vol. 59, no. 3, Mar. 1920, pp. 199-202. Qualifications enumerated are force, idealism, positive personality, common sense, good health and unquestioned loyalty.

FORGING

CANADIAN PLANT. The Dominion Forge Plant at Walkerville. Am. Drop Forger, vol. 6, no. 2, Feb. 1920, pp. 96-101, 10 figs. Plant at present comprises group of 13 buildings on 10-acre tract of ground, 410 ft. wide by average of 800 ft. deep.

FOUNDRIES

BRITISH PRACTICE. Some Aspects of British Foundry Practice. Iron Age, vol. 104, no. 13, Sept. 25, 1929, pp. 873-874. Correspondent claims no notable improvements have apparently result from war activity. Great attention is being paid, it is pointed out, to chill castings with object of reducing subsequent machining operations to minimum.

STEEL, ECONOMIC OPERATION. Steel Foundry Starts Operations—I. Foundry, vol. 48, no. 5, Mar. 1, 1920, pp. 187-191, 9 figs. Efforts made by Vulcan Iron Works, Wilkes-Barre, Pa., to reduce operating expense.

MAGNETIC SEPARATION OF IRON FROM REFUSE. Magnetic Separation of Iron from Foundry Refuse from an Economic Standpoint (Ueber die Wirtschaftlichkeit der magnetischen Aufbereitung von Schutt und Schlacken in der Eisenund Stahlgiesserei), Hubert Hermanns. Giesserei-Zeitung, vol. 16, nos. 16, 17 and 18, Aug. 15, Sept. 1 and Sept. 15, 1919, pp. 244-248, 260-263 and 275-277, 13 figs. Illustrations and operating costs of traveling, portable and stationary separation plants are given. Traveling plants are said to have shown most satisfactory results in average works.

MALLEABLE-IRON. Economies in a Malleable Iron Foundry, A. F. Conant. Iron Age, vol. 104, no. 13, Sept. 25, 1919, pp. 859-861, 5 figs. It is claimed good working conditions have been provided in annealing department of Rhode Island Malleable Iron Works, Hills Grove, R. I., by constructing building with unusually high roof; great economies are said to have been effected by concreting entire yard to depth of 6 or 8 in., except beneath stock piles.

FUEL OIL

FUELS

FURNACES, ELECTRIC

See Electric Furnaces.

GAGES

GAS ENGINES

GAS MANUFACTURE

GAS MASKS

GEARS

GRAVITATION

HANDLING MATERIALS

English Docks, System on. Cargo Handling in England, F. T. Chambers. Nautical Gas., vol. 98, no. 10, Mar. 6, 1920, pp. 381-382. Writer, who was sent abroad in 1918 at head of mission to study various features of port management and development, believes American engineers could profitably study system followed in construction of modern British docks.

Gravel. Mechanical Handling of Gravel or Broken Stone, Alan Mair Jackson. Can. Engr., vol. 38, no. 11, Mar. 11, 1920, pp. 273-275, 1 fig. Installation at Brant County, Ontario, combining slot, elevator and bin method. Paper read before County Road Superintendents & Engrs. of Ontario.

HEALTH

Miners' Nystagmus. A Lecture on Miners' Nystagmus, T. Lister Lewellyn. Trans. Instn. Min. Engrs., vol. 58, part 3, Feb. 1920, pp. 167-175 and (discussion) pp. 175-182. Theory that disease is due to deficient illumination is upheld, symptoms are explained and factors determining occurrence of disease are discussed.

HEAT INTERCHANGERS

Double Pipe. Double Pipe Heat Interchangers, George A. Richter. Chem. & Met. Eng., vol. 22, no. 12, March 24, 1920, pp. 551-556, 13 figs. It is concluded from experimental work that double pipe heat interchanger in form of helix gives marked increase in K over same tubular parts put into form of straight pipe lengths, also that conductivity in all cases increases slightly with increase in average temperatures in system. Helical cooler consisting of 2-in. pipe within 4-in. pipe was found to give higher conductivity than corresponding cooler equipped with 1-1.2-in. inner coil. Paper read before Am. Inst. Chem. Engrs.

HEAT TREATMENT

See Steel, Heat Treatment of.

HEATING

Gas vs. Electricity. The Relative Merits of Gas and Electricity for Heating and Power. Gas Jl., vol. 149, no. 2963, Feb. 24, 1920, pp. 434-436. Debate at University of Birmingham (Eng.) on utilization of fuel for generation of power; industrial application of the two agents (furnaces in particular): domestic appliances (other than lighting); transmission or distribution of power.

HEATING, ELECTRIC

Cost of. The Idaho Commission's Decision on Electric Heating of Houses and Building, George E. Erb. Nat. Elec. Light Assn. Bul., vol. 7, no. 1, Jan. 1920, pp. 11-13. Testimony and facts before Commission showed, it is claimed, that on account of cost "it is impossible to furnish electricity for house heating as a commercial proposition in competition with wood or coal", and that "only when an excess of current is generated and may be sold as a by-product can it be used for heating purposes."

Switzerland. The Prospects of House Heating with Electricity in Switzerland (Die Aussichten der elektrischen Raumheizung in der Schweiz), M. Hottinger. Schweizerische Bauzeitung, vol. 75, no. 6, Feb. 7, 1920, pp. 57-60. Question is discussed of how large a part of quantity of electricity obtainable by water power in Switzerland would be available for house-heating purposes in future. Writer refers to this as a problem of great national and economic importance.

HEATING AND VENTILATION

Preliminary Work. Plan and Specification Data Sheets for Heating and Ventilating—II. Heat. & Vent. Mag., vol. 17, no. 2, Feb. 1920, pp. 29-32. Suggests forms suitable for use in preliminary work prior to design of installation itself.

Research. Heating and Ventilating Research Work—I. Masao Kinoshita. Domestic Eng. & Estate Engr., vol. 40, no. 14, Feb. 1920, pp. 20-21. Researches carried out at London University by Research Committee of Institution of Heating and Ventilating Engineers.

HIGHWAYS

Canada, Federal Aid in. Federal Aid, A. W. Campbell. Can. Engr., vol. 38, no. 11, Mar. 11, 1920, pp. 275-276. Act was passed July 7, 1919, by Dominion government appropriating $20,000,000 to be divided among provinces according to their population, this sum to be used in paying 40 per cent of cost of improving roads designated by provincial governments and approved by federal department of highways. Suggestions as to best manner of utilizing this appropriation in provinces are pointed out.

Drainage of. Highway Drainage, U. W. Christie. Can. Engr., vol. 38, no. 10, March 4, 1920, pp. 263-265. Economy in drainage is pointed out. Paper read before Assn. of Ontario Land Surveyors.

Saskatchewan, Canada. Developments of Saskatchewan's Highway System, Charles W. Dill. Can. Engr., vol. 38, no. 8, Feb. 19, 1920, pp. 222-225. Organization and duties of department. Paper read before Association of Dominion Land Surveyors.

Tests of. New Highway Tests Being Made by the Bureau of Public Roads. A. T. Goldbeck. Good Roads, vol. 19, no. 7, Feb. 18, 1920, pp. 97-98 and 102-103. Investigations being undertaken cover (1) study of amount of impact delivered by motor trucks to roads, (2) study of effect of this impact on different types of road surfaces, (3) study of effect of traffic on different types of road surfaces, and (4) study of bearing power of subgrades as affected by moisture.

See also Roads.

HOUSES

Pisé de Terre. Pisé de Terre and Its Possibilities. Clough Williams-Ellis. Surveyor, vol. 57, no. 1466. Feb. 20, 1920, pp. 183-184. Definition of pisé de terre and plant required for pisé building: method of construction end extracts from specifications of house built of pisé.

HOUSES, CONCRETE

Construction. Concrete Cottage Building. Concrete & Constructional Eng., vol. 15, no. 2, Feb. 1920, pp. 84-91, 7 figs. Basis of construction is steel frame encased in expanded metal, which forms reinforcement for concrete outside walls, inside walls being of slabs.

HYDRAULIC TURBINES

Wear of. Wear of Hydraulic Turbines, Its Consequences and the Methods of Reducing It (L'usure des turbines hydrauliques, ses conséquences et les moyens d'y parer), Henri Dufour. Bulletin Technique de la Suisse Romande, vol. 46, nos. 3 and 4, Feb. 7 and 21, 1920, pp. 25-26, 2 figs., and 37-41, 5 figs. Feb. 7: Suggests improvement of Boucher apparatus for precipitating alluvial loams. Feb. 21: Reservoirs near Santiago, Chile, for removal of sand and loams from water. Railings are specially arranged to cause precipitation of matter in suspension without permitting it to form deposits at bottom. (Concluded.)

HYDROELECTRIC PLANTS

Automatic Operation. Development of Automatic Hydro-Electric Generating Stations, T. A. E. Belt. Elec. World, vol. 75, no. 9, Feb. 28, 1920, pp. 477-479, 4 figs. Successful operation of plant installed by Iowa Railway & Light Co. at Cedar Rapids, Iowa, is quoted as establishing practicability of automatically operating hydro-electric generating stations. Wiring schemes for remote control and automatic hydro-electric plant are illustrated.

France. Developing Hydroelectric Steelmaking. Iron Trade Rev., vol. 66, no. 2, Jan. 8, 1920, pp. 151-152, 1 fig. It is stated that hydraulic power of French Alps represents today 6,270,000 tons of coal, of which metallurgical operations absorb 303,000 hp. and chemical industry 255,000.

Pond-Level Control. Pond-Level Control for Hydro Plants, Earl Stafford. Elec. World, vol. 75, no. 12, Mar. 20, 1920, pp. 663-665. Comparative study of devices used to regulate pond levels and provide discharge capacity for floods.

ICE PLANTS

Raw-Water vs. Distilled-Water. Raw Water vs. Distilled Water Ice Plants—Steam to Electricity, A. H. Hutchinson Refrigeration, vol. 26, no. 1, Feb. 1920, pp. 36-38. Writer concludes that, on the whole, the raw-water plant is most surely the plant of the future. Paper prepared for convention of Southern Ice Exchange.

INDUSTRIAL CONDITIONS

England and France. Industrial and labor Conditions abroad, Luther D. Burlingame. Am. Mach., vol. 51, no. 24, Dec. 25, 1919, pp. 1079-1083. Views based on experiences of writer's recent trip to England and France, as member of Nat. Screw Thread Commission, presented with thought that they may serve as guide and warning to both employers and workmen engaged in American industries.

INDUSTRIAL MANAGEMENT

Machine Work. *See Cutting Metals, Barth Slide Rules.*

Planning. Output Planning as a Function of Management, S. Robert Stelling. Eng. & Industrial Management, vol. 3, no. 9, Feb. 26, 1920, pp. 259-261, 2 figs. Suggested forms of cards for use in planning work in shop.

Production Control. A Plea for Better Harmony Between Theory and Practice. Machy. (Lond.), vol. 15, no. 388, Mar. 4, 1920, pp. 705-716, 40 figs. Co-ordination of castings and machining operations for production on large scale. (Continuation of serial.)

Graphic Production Control, E. T. Spidy. Ry. Rev., vol. 66, no. 10, Mar. 6, 1920, pp. 364-368, 6 figs. Account, with illustrations, of methods employed at Angus shops of Can. Pacific Ry., in scheduling work through shops, and in accounting for time, labor and materials. From paper read before Can. Ry. Club.

Visualizing Facts for Control—III, L. V. Estes. Indus. Management, vol. 59, no. 3, March 1920, pp. 209-214, 3 figs. Explains operation of dispatch board for shop control, control board for shipping goods in mail-order house and chart for production control in manufacturing plant, as examples of control mechanisms.

Routing. Stock Parts and Their Routing, L. D. Burlingame. Machy. (Lond.), vol. 15, no. 385, Feb. 12, 1920, pp. 617-621, 12 figs. System of classifying, ordering, routing and storing of stock parts at plant of Brown & Sharpe Co.

Time Study. *See Time Study.*

Tool Room Organization. Tool Room Organization. Eng. & Indus. Management, vol. 3, no. 8, Feb. 19, 1920, pp. 233-235, 4 figs. Suggestions in regard to organization of tool room in factory.

Tool-Storage System. A Group Tool Storage System, Peter F. O'Shea. Am. Mach., vol. 51, no. 20, Nov. 13-20, 1919, pp. 887-889, 4 figs. Tool crib, tool identification card, and belt-storage rack in machine shop of large plant.

LUBRICANTS

ENGINE, DILUTION BY FUEL. Dilution of Engine Lubricants by Fuel, Gustave A. Kramer. Jl. Soc. Automotive Engrs., vol. 6, no. 2, Feb. 1920, pp. 123-128, 13 figs. Experiments to determine effect of dilution by fuels on viscosities of lubricants, fuels being diluted either by average grade of fuel gasoline or by commercial kerosene. Use of oil renovator as part of engine itself is suggested.

The Proper Balancing of Fuel, Lubricant and Motor, William F. Parish. Mech. Eng., vol. 42, no. 3, Mar. 1920, pp. 164-168, 8 figs. Experiments conducted to determine cause of dilution of motor lubricating oil demonstrated, it is claimed, that it is due mainly to leakage past piston rings during compression stroke. It is recommended that selection of motor oil for given motor be based upon scientific grounds and that engines be designed to permit entire consumption of fuel on top of pistons.

LUBRICATION

THEORY OF. Notes on the Theory and Practice of Lubrication, J. P. Hamer. Managing Engr., vol. 6, no. 10, Feb. 1920, pp. 239-243, 4 figs. Mechanics of parallel surface in relative tangential motion is discussed and equations are derived for tangential forces operating and diagrams of pressure are constructed.

MACHINE DESIGN

LABOR-SAVING MACHINERY. Specialization in Design of Labour-Saving Machine, C. H. Smith, Eng. & Industrial Management, vol. 3, no. 9, Feb. 26, 1920, pp. 266-270. Suggestions in regard to designing and installing of labor-saving machines. Paper read before Birmingham Assn. of Mechanical Engrs.

WORKING OUT DETAILS. Designing a Special Machine. Machy. (Lond.), vol. 15, no. 385, Feb. 12, 1920, pp. 609-612, 6 figs. Value of schedules in working out preliminary details is illustrated by working out example of special duplex grinding machine.

MACHINE-TOOL INDUSTRY

CHINESE MARKETS. China as a Machine Tool Market, Julean Arnold. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, p. 616. Writer, who is American commercial attaché at Pekin, China, gives his views of possibilities of future machine tool trade with China, and points out that Chinese engineering schools provide one of the best means for advertising American machine tools to Chinese.

MACHINE TOOLS

AMERICAN, FRENCH DEMAND FOR. American Machine Tools Needed in France, L. W. Alwyn-Schmidt. Am. Mach., vol. 51, no. 19, Nov. 6, 1919, pp. 825-826. It is pointed out that during first four months of 1919 value of American machine tools shipped to France reached $5.000,000. Factors advised to be taken into consideration in studying present and future machine-tool needs of France are destruction of industrial equipment in northeastern France and likely expansion of French iron industry following acquisition of iron mines of Lorraine.

FEEDS AND SPEEDS. The Androuin Progression Ratio for Speeds and Feeds for Machine Tools, Machy. (Lond.), vol. 15, no. 385, Feb. 12, 1920, pp. 613-616, 1 fig. Proposes progressive ratio of 1.259, that is, 1¼ approximately. It is claimed that this series ratio facilitates calculation of cutting times. Translated from Bulletin de la Société d'Encouragement pour l'Industrie Nationale.

INERTIA EFFECTS. Inertia Effects in the Operation of Shop Machinery, C. E. Clewell. Am. Mach., vol. 51, no. 13, Sept. 25, 1919, pp. 607-609, 6 figs. Discusses problem of inertia in quick acceleration and retardation of machine tools with reference to frequent reversals of planing, shaping and punching machines. Notes are included on reduction of inertia in pulleys by use of aluminum and on ways of reducing inertia in a rapidly revolving motor that is subject to frequent reversals.

MAGAZINE FEEDS FOR. Maganize Feed Mechanisms, Edward K. Hammond. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 593-601, 19 figs. Description of mechanisms and mechanical movements used in design of magazine feeding devices for automatic machines employed by Diamond Chain & Mfg. Co. Their advantages are pointed out.

MAGNETS

PERMANENT, LINES OF FORCE IN. Dependence of Temperature Coefficients of Permanent Magnets on Their Form (Über die Abhängigkeit des Temperaturkoeffizienten permanenter Magnete von deren Gestalt), E. Gumlich. Annalen der Physik, vol. 59, no. 7, Sept. 4, 1919, pp. 668-688, 6 figs. Experimental determination of distribution of lines of force in a simple horseshoe magnet, both open and closed. Information from Natl. Physical and Tech. Inst.

MAGNETOS

MAGNETS FOR. *See Steel, Magnet.*

MALLEABLE IRON

RESEARCH. Research Work on Malleable Iron, Enrique Touceda. Can. Foundryman, vol. 11, no. 2, Feb. 1920, pp. 40-41, 6 figs. Results of 4 years of research work for American Malleable Casting Association. (Concluded.)

METALS

NON-FERROUS PRICES IN 1919. Exports Sustain Metal Markets. Iron Trade Rev., vol. 66, no. 1, Jan. 1, 1920, pp. 113-114. It is stated that heavy demands from abroad are partially met, despite exchange rate, while domestic requirements for most non-ferrous metals, except copper and brass, are slack. Table of average monthly non-ferrous prices in 1919 is presented.

PROGRESS IN 1919. The Year's Progress in Metals. Metal Industry (N. Y.), vol. 18, no. 2, Feb. 1920, pp. 85-86. Review of important work conducted in United States and England on metals and alloys. Abstracts are presented of important articles which have appeared in technical papers in both countries. (Concluded.)

See also Ores.

METEOROLOGY

BRIGHTNESS OF SKY. The Brightness of the Sky, A. F. Moore and L. M. Abbot, Smithsonian Misc. Coll., vol. 71, no. 4, Feb. 4, 1920, 36 pp., 2 figs. Account of set of observations made at Hump Mountain, Elk Park, N. C., from July 1917 to April 1918, with pyranometer, an instrument constructed by Smithsonian Instn. for purpose of measuring radiation of various kinds. Measurements were made on intensity of radiation from sky, clear, hazy, cloudy and foggy; radiation under trees, plants, etc.; snow reflection, radiation, etc. Instrument was taken to Calama, Chile, and other sky-radiation measurements were made there.

PRESSURE AND WEIGHT OF AIR VS. ALTITUDE. Experimental Laws of Variation of Barometric Pressures and Specific Weight of Air with altitude (Lois expérimentales des variations de la pression barométrique et du poids spécifique de l'air avec l'altitude), Rodolphe Soreau. Aérophile, vol. 27, no. 21-22, Nov. 1-15, 1919, pp. 335-342, 1 fig. Barometric formulæ derived from fundamental differential equation combining pressure, specific weight and altitude. Records of observations at various places are also given.

TEMPERATURE EQUATION. Determination of Normal Temperatures by Means of the Equation of the Seasonal Temperature Variation and a Modified Thermograph Record, F. L. West, N. E. Edlefsen and S. Ewing. Jl. Agricultural Research, vol. 18, no. 10, Feb. 16, 1920, pp. 499-510, 6 figs. It is illustrated how equation can be derived from observations of Weather Bureau for determining normal temperature at certain place at an assigned hour of day on particular day of year.

METRIC SYSTEM

EXPORT TRADE AND. The Metric System and Our Export Trade. Chem. Engr., vol. 28, no. 2, Feb. 1920, 49-50. Bureau of Standards is quoted as expressing opinion that American exporters are hampered by retention of present system of measurement. It is stated that 34 countries have adopted metric system.

MILLING

FIXTURE FOR. Some Examples of Profile Milling Practice, F. Scriber. Can. Machy., vol. 23, no. 9, Feb. 26, 1920, pp. 215-218, 12 figs. Various fixtures are shown and discussed.

MILLING MACHINES

BRACINGS FOR. Recent Machine Tool Developments—XI, Joseph Horner. Eng., vol. 109, no. 2825, Feb. 20, 1920, pp. 236-239, 32 figs. Details of bracings for pillar and knee machines, Lincoln machine braces, gear-cutter bracings and shapers.

INGERSOLL CIRCULAR-TABLE. Ingersoll Circular-Table Continuous Milling Machines, J. V. Hunter. Am. Mach., vol. 51, no. 21, Nov. 27-Dec. 4, 1919, pp. 915-918, 7 figs. Types of continuous milling machines that have been developed for maximum production with minimum labor.

INGERSOLL DIFFERENTIAL TYPE. The Ingersoll Differential-Type Continuous-Milling Machine, J. V. Hunter. Am. Mach., vol. 51, no. 14, Oct. 2, 1919, pp. 645-650, 7 figs. Outstanding features are said to be; (1) Large capacity on relatively large pieces of work in connection with minimum amount of floor space; (2) small amount of labor required, only one operator being required; and (3) fact that it carries large number of milling cutters, each of which may be arranged for simultaneous operation of different pieces of work.

SPLINE, TWO-SPINDLE. Two-Spindle Spline Milling Machine. Can. Machy., vol. 23, no. 9, Feb. 26, 1920, pp. 228-229, 4 figs. Description and illustrations of machine recently placed on market by Taylor & Fenn Co., Hartford, Conn.

MINE HOISTING

ELECTRIC CONTROLLERS FOR. Electric Controllers for Mine Hoists, W. C. Goodwin. Elec. Jl., vol. 17, no. 3, Mar. 1920, pp. 119-122, 6 figs. Typical installation of high-voltage electric motor mine hoist.

WINDING-ROPE STRESSES. Winding Ropes and Bending Stresses, O. Speer. Colliery Guardian, vol. 119, no. 3085, Feb. 13, 1920, p. 449, 7 figs. Writer holds that spirally twisted wires in rope are more flexible than same wire straightened out. Deductions from winding rope statistics of the Dortmund district. (Translated from Glückauf.)

MINE TIMBERING

FAILURE. Failure of Mine Timbers, George J. Young. Eng. & Min. Jl., vol. 109, no. 10, March 6, 1920, pp. 611-612, 2 figs. Influence of ventilation and high temperatures in reducing strength of timbers.

MINERALS

U. S., SOURCES OF SUPPLY. Our Mineral Supplies, H. D. McCaskey and E. F. Burchard. Dept. of Interior, U. S. Geol. Survey, Bul. 666, 1919, 278 pp. Compilation of reports issued by U. S. Geol. Survey. Each report discusses source of supply of mineral considered, its uses, both in peace and in war, and normal demand, and for some minerals probable demand under war conditions is indicated.

TUBES. Tube Welding by the Oxy-Acetylene Process, F. W. Smith. Am. Mach., vol. 51, no. 20, Nov. 13-20, 1919, pp. 845-848, 6 figs. It is pointed out that as tubes welded by oxy-acetylene process are almost invariably butt-welded, heat, which is applied to seam only, must be of intensity to raise edges under flame immediately to fusing point. Material from which tubing is made is usually low-carbon steel.

See Foundries, Welding, Applications of.

PAPER MILLS

HYDROELECTRIC DRIVE. Electric, Steam and Water Power Drive in a Paper Mill. Elec. Rev., vol. 76, no. 9, Feb. 28, 1920, pp. 345-347, 6 figs. Hydroelectric unit comprises 907-kva. Three-phase alternator operating at 2300 volts, 60 cycles, and driven by 39-in. S. Morgan Smith water turbine having speed of 240 r.p.m. and equipped with Woodward governor.

PATENTS

VALUATION OF INVENTION. Patenting and Promoting Inventions, Mois H. Avram. Chem. Engr., vol. 28, no. 2, Feb. 1920, pp. 37-40. It is pointed out that value of an invention can be estimated only after careful survey of market it is designed to supply. It is held that such survey is as indispensable as investigation of technical character of invention.

PATTERNS

TURNING OF. Notes on Pattern Turning. Model Engr. & Elecn., vol. 42, no. 982, Feb. 19, 1920, pp. 178-183, 34 figs. Details and illustrations of typical examples. (Continuation of serial.)

PAVEMENTS

CONSTRUCTION STATISTICS. Annual Paving Statistics—IV. Public Works, vol. 48, no. 7, Feb. 28, 1920, pp. 150-151. Facts and figures in tabulated form from several hundred cities concerning amount and nature of work done by each during 1918.

PAVEMENTS, ASPHALT

NEW YORK CITY. Resurfacing Asphalt Pavements in New York. Public Works, vol. 48, no. 8, Mar. 6, 1920, pp. 170-172, 2 figs. Describes how city forces removed about half an inch of worn and deteriorated wearing surface without injuring remainder and replaced it with new asphalt thoroughly welded. It is said that 183,000 yd. were resurfaced in 1919 at cost of less than $1 per yd.

PAVEMENTS, CONCRETE

DESIGN. Fundamental Considerations for Concrete Pavement Design, S. T. Morse. Eng. & Contracting, vol. 53, no. 9, Mar. 3, 1920, pp. 245-247. Writer describes effect of roadway width on thickness of pavement and gives formula for design of concrete slabs. Reference is made to Prof. Duff A. Abrams' tests at Lewis Inst., Chicago.

PAVEMENTS, WOOD-BLOCK

ECONOMICAL VALUE. Wood Block Paving, Walter Buehler. Jl. West. Soc. of Engrs., vol. 25, no. 3, Feb. 5, 1920, pp. 73-84 and (discussion) pp. 84-92, 6 figs. Inspection of creosoted-block pavements in loop district of Chicago is said to demonstrate that these pavements have been an economic investment.

PETROLEUM

BIBLIOGRAPHY. Recent Articles on Petroleum and Allied Substances. Monthly Reports of Investigations, Bur. of Mines, Feb. 1920. 33 pp. Covering history, geology and origin, development and production, transportation, storage and distribution, properties and their determination, refining, and utilization.

ORIGIN OF. The Origin of Petroleum, I. A. Stigand. Min. Mag., vol. 22, no. 1, Jan. 1920, pp. 11-22. Author reviews various theories put forward to explain origin and lays particular stress on marine sources of origin, especially small forms of organism, both animal and vegetable and adduces new evidence in favor of this theory. Summary of required conditions or factors for production of deposits of petroleum, originating from organic matter.

UNITED STATES, RESERVES OF. The Petroleum Reserves of the United States, Petroleum Times, vol. 3, no. 59, Feb. 21, 1920, p. 190. It is said that Dr. David White, chief geologist of U. S. Geol. Survey, forecasts exhaustion in twenty years, total available supply being approximately 7,000,000,000 bbl.

See also Oil.

PHOSPHATES

MINING OF. Hydraulic Methods in the Florida Phosphate Fields, Victor J. Milkowski. Rock Products, vol. 23, no. 3, Jan. 31, 1920, pp. 17-19, 5 figs. Sketch showing arrangement of nozzles and sumps.

PHOTOGRAPHY

AERIAL. *See Aerial Photography.*

PHOTOTELEGRAPHY

METHOD. Method for Conversion of Light Rays into Code Characters for Phototelegraphy (Anordnung zur Umwandlung von Lichtstrahlen in Schriftzeichen für Lickttelegraphic), Georg Schmidt. Elektrotechnischer Anzeiger, vol. 36, no. 90, Aug. 26, 1919, pp. 420-422, 1 fig. Details of new method and device for converting rays of light by means of selenium or similar photoelectric cells into mechanical work. Discovery, it is ert forth, is for purpose of establishing by means of differential connection system, electric connection in one or more local circuits under any lighting conditions either by day or night.

PIERS

See Terminals, Marine, Piers.

PIPE

LEAD, EXTRUSION OF. The Extrusion of Lead Pipe, Ellsworth Sheldon. Am. Mach., vol. 51, no. 21, Nov. 27, Dec. 4, 1919, pp. 909-913, 10 figs. Possibility of extruding iron is mentioned and notes are added on lead refining and alloying, and making shrapnel balls.

STANDARD THREADS FOR. Gauging American Standard Pipe Threads, J. H. Rodgers. Can. Machy., vol. 23, no. 8, Feb. 19, 1920, pp. 195-198, 15 figs. Summary or revised formulation of Briggs' standard and gaging system adopted by different manufacturers of pipes, valves and fittings.

PIPE, CAST-IRON

CENTRIFUGALLY CAST. Centrifugally Cast Pipe in South America, Iron Age, vol. 104, no. 13, Sept. 25, 1919, pp. 863-865, 7 figs. Account of new plants in Brazil and Argentine using the DeLavaud process of iron pipe. Notes on method of tapping hot iron from cupolas at plant in Buenos Aires.

JOINTS. Cast Iron Pipe Joints. Gas Industry, vol. 20, no. 2, Feb. 1920, pp. 43-46. Report of Committee appointed by American Gas Association to prepare satisfactory design for joints for cast iron mains. New design of bell for tentative alternating standard is recommended.

PIPE, CONCRETE

PRESSURE, TESTS OF. Reinforced Concrete Pressure Pipe Test Concrete Products, vol. 18, no. 2, Feb. 1920, pp. 13-15, 3 figs. Service tests of Meriwether reinforced-concrete pressure pipe which is designed for use in water conduits, power-house and similar work requiring watertight pipe.

PLATINUM

CANADIAN DEPOSITS. Possibilities for Platinum in Western Canada, W. L. Uglow. Can. Min. Inst. Bul., no. 95, Mar. 1920, pp. 207-220. It is concluded from survey of platinum-bearing deposits that possibilities for future supply of metal are good Rules are formulated for distinguishing rocks and ore bodies which may be possible carrier of platinum.

GERMAN PRODUCTION, 1919. German Potash Production and Prices. Cement, Mill & Quarry, vol. 16, no. 4, Feb. 20, 1920, pp. 19-21. According to Commercial Attache Edwards at The Hague, Netherlands German Potash Syndicate reports total production of actual potash for 1919 at 946,000 tons, of which 264,000 tons were sold abroad, remainder meeting about 41 per cent of home requirements.

POWER GENERATION

EUROPE, PROGRESS IN. Progress of Power Engineering—I, L. W. Alwyn-Schmidt. Power Plant Eng., vol. 24, no. 5, March 1, 1920, pp. 268-270. Analysis of recent developments in Europe based on U. S. consular and commercial reports. Opportunities for American trade are pointed out.

PROGRESS IN. Progress of Power Engineering—II, L. W. Alwyn-Schmidt. Power Plant Eng., vol. 24, no. 6, Mar. 15, 1920, pp. 321-323. Review of power developments in Asia, Australia, and South and Central America during last few years, and possibilities for future expansion.

REPAIR SHOPS. The Power Plant Repair Shop. Power Plant Eng., vol. 24, no. 5, March 1, 1920, pp. 271-274, 5 figs. Suggests outline of equipment, location and arrangement for shop suited to medium-size plant.

PRECIPITATION

ELECTRICAL, BIBLIOGRAPHY OF. Bibliography of Selected Articles on Electrical Precipitation of Suspended Matter. Cement, Mill & Quarry, vol. 16, no. 4, Feb. 20, 1920, p. 18.

See also Gases, Cleaning by Electricity.

PULLEYS

See Machine Tools, Inertia Effects.

PULVERIZED COAL

ADVANTAGES. Pulverized Coal for Fuel Makes Good Saving in Milwaukee, John Anderson. Elec. Ry. Jl., vol. 55, no. 10, March 6, 1920, pp. 473-477, 1 fig. Ease with which fuel feed and draft and controlled, ability to take and drop heavy overloads quickly without waste, thorough combustion and uniformly high efficiency are claimed as advantages of pulverized coal.

BLAST FURNACES, USE IN. Progress in the Use of Pulverized Fuel in Blast Furnaces, W. L. Wotherspoon. Iron & Steel of Canada, vol. 3, no. 1, Feb. 1920, pp. 5-8, 2 figs. Description of Vortex tuyere and its adaptation to form small combustion chamber.

CANADIAN REPORT ON. The General Fuel Situation in Canada. Power House, vol. 13, no. 4, Feb. 20, 1920, pp. 76-77. Abstract of report of Commission of Conservation, Ottawa, on pulverized coal.

CENTRAL STATIONS. Pulverized Coal in Central Stations, John Anderson. Elec. World, vol. 75, no. 11, Mar. 13, 1920, pp. 589-591, 2 figs. In tests conducted by engineers of Milwaukee Elec. Ry. & Light Co. efficiency of 80 per cent is said to have been obtained for pulverized-fuel installation.

RAILWAY TRACK

BALLAST. A Scientific Study of Railway Track Under Load—II Ry. Age, vol. 68, no. 11, Mar. 12, 1920, pp. 775-779. Results of field and laboratory tests are said to have indicated that presence of ballast above level of bottom of tie has little influence on quiescent load which will be carried before ballast will or out from under tie and allow it to settle, but that under repeated applications of load and particularly under jarring and vibratory loads ultimate carrying capacity of ballast is considerably increased by raising level of ballast surface to top of tie.

Report of Committee II—On Ballast. Bul. Am. Ry. Eng. Assn., vol. 21, no. 222, Dec. 1919, pp. 365-409, 15 figs. Standardization of ballast tools is suggested; specifications are recommended for storm ballast, and instructions are formulated to govern ballasting on operated line.

FISHPLATES. Experiments on the Strength and Deflection of Fishplates Made, E. W. Stoney. Indian Eng., vol. 67, no. 4, Jan. 24, 1920, p. 52, 2 figs. Tabular statement showing results obtained in testing strength of Madras Railway fishplates and rail joints is presented and illustration is given of two forms of cast-iron joint sleepers, designed by writer, one for supported joint and one for suspended joint.

FROG ANGLES, MEASURING OF. Model Railway Matters—VI. Model Engr. & Elecn., vol. 42, no. 983, Feb. 26, 1920, pp. 197-199, 4 figs. Details of curves, points and crossings. Method of measuring railway frog angles and of calculating length of cross-overs.

SLIP ROADS, SHORTENING OF. Devices for Shortening Slip Roads, A. Goupil. Bul. Int. Ry. Assn., vol. 1, nos. 4-5-6, Oct.-Nov.-Dec. 1919, pp. 245-249, 7 figs. By lengthening connecting curve of switch by eliminating continuation of nose of frog to mathematical intersection point. Translated from Génie Civil.

STRESSES UNDER LOAD. A Scientific Study of Railway Track Under Load. Ry. Age, vol. 68, no. 10, Mar. 5, 1920, pp. 670-673, 2 figs. Investigations of Special Joint Committee of Am. Soc. Civil Engrs. and Am. Ry. Eng. Assn.

TIE TAMPER, ELECTRIC. The Jackson Electric Tie Tamper. Ry. Rev., vol. 66, no. 3, Jan. 17, 1920, pp. 90-93, 5 figs. Tamper consists of electric motor, the shafts of which carries unbalanced weight which revolving at 3600 r.p.m. causes motor to vibrate.

TIES, CAST-IRON. Experiments made to Determine the Strength of Cast-Iron Bowl Sleepers, E. W. Stoney. India Eng., vol. 67, no. 6, Feb. 7, 1920, pp. 80-81, 13 figs., on two supp. plates. Weight of 479 lb. was allowed to fall from heights from 1 ft. 6 in. increasing by from 3 to 6 in. till failure took place. Results are shown in tabular statement and diagrams are included indicating particulars of ties tested and manner in which each failed.

TIES, DURABILITY OF. Report of Committee III—On Ties. Bul. Am. Ry. Eng. Assn., vol. 21, no. 223, Jan. 1920, pp. 521-560, 11 figs. Account of experimental study undertaken to determine effect of design of tie plates and spikes on durability of cross-ties.

RAILWAYS

FRANCE. The Railways of France, Charles Weiss. Cornell Civ. Engr., vol. 28, no. 4, Jan. 1920, pp. 179-185, 1 fig. Account of war and peacetime operation, station and other facilities, rolling equipment, track, signals, etc.

SAND

HORIZONTAL PRESSURE OF. Experiments on the Horizontal Pressure of Sand, Ponsonby Moory Crosthwaite. Eng., vol. 109, no. 2825, Feb. 20, 1920, pp. 253-254. Results of experiments recently made by author to ascertain angle of internal friction in sand, clay and other materials by loading a plunger of known diameter and measuring penetration caused by known weights. Author presents conclusions drawn from his investigations. Abstract of paper read before Instn. C. E.

SAWS

BAND, HORIZONTAL LOG-CUTTING. Horizontal Log-Cutting Band Saw. Eng., vol. 109, no. 2825, Feb. 20, 1920, pp. 256-257, 9 figs. Description and illustrations of improved tensioning gear applied to horizontal log-cutting band saws, constructed by Thomas Robinson & Son, Ltd., Rochdale, England.

SCIENTIFIC MANAGEMENT

See Industrial Management.

SCREW MACHINES

HAND, PRACTICE FOR. Hand Screw Machine Practice. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 620-624, 18 figs. Examples of work finished in hand screw machine, based on practice of Warner & Swasey Co., Cleveland, Ohio.

SCREW THREADS

PIPE THREADS. *See Pipe, Standard Threads.*

PITCH AND ANGLE ERRORS, COMPENSATION OF. British Standard Tables, for Use in Engineering Workshops giving Corrections to Effective Diameter Required to Compensate Pitch and Angle Errors in Screw Threads of Whitworth Form. British Eng. Standards Assn., no. 95, Dec. 1919, 59 pp.

SQUARE, MILLING. Milling Square Threads, Francis W. Shaw. Machy., vol. 15, no. 385, Feb. 12, 1920, pp. 627-630, 5 figs. Attempts to evolve cutter to mill square thread are reviewed and it is concluded that "while the possibility exists of cutting by thread milling an approximately correct square thread, the expense of making special cutters is not warranted in view of the existence of the readily-producible 'acme' thread."

STANDARDS FOR. Standards for Screw Threads, Herbert T. Wade. Sci. Am. Monthly, vol. 1, no. 2, Feb. 1920, pp. 149-153, 8 figs. Discusses possibility of evolving universal and international system.

SEARCHLIGHTS

CARBON-ARC. Carbon Arcs for Searchlights, C. C. Paterson, J. W. T. Walsh, A. K. Taylor and W. Barnett. Jl. Inst. Elec. Engrs., vol. 58, no. 287, Jan. 1920, pp. 83-97 and (discussion) pp. 97-106, 20 figs. Experiments at National Physical Laboratory undertaken at request of British Admiralty, with object (1) to develop the best method of testing carbons in order to prove their value for searchlights, (2) to compare relative qualities of existing carbons, other than flame carbons, for producing high-intensity searchlight beams, (3) to determine what improvement can be made either in the carbons themselves or in the methods of burning them.

PHOTOMETRY OF. Photometry of Searchlights—II (Ueber das Photometrieren von Scheinwerfen), Georg Gerlhoff and Helmuth Schering. Zeitschrift für Beleuchtungswesen Heizungs—u. Lüftungstechnik, no. 17-18, Sept. 1919, pp. 83-89, 13 figs. Explains theoretical and practical fundamental principles of photometry of the maximum and medium intensity of a searchlight with usual light sources.

SELENIUM

APPLICATIONS. Practical Applications of Selenium—II and III, Louis Ancell. Sci. Am. Monthly, vol. 1, nos. 2 and 3, Feb. and Mar. 1920, pp. 157-159, 4 figs., and 253-255, 5 figs. Feb.: Its utilization in biological chemistry and in glass and rubber industries. Mar.: Utilization for controlling draft of factory chimneys and in telemechanics. Translated from Chimie et Industries.

SEMI-DIESEL ENGINES

VICKER-PETTERS. Vickers-Petters Semi-Diesel Marine Oil Engine. Eng., vol. 109, no. 2825, Feb. 20, 1920, pp. 246 and 248, 5 figs., 4 on supp. plate. Described as 2-cycle type with crank-case compression, and made in sizes from 10-b. hp. to 450-b. hp. with from one to six cylinders.

SEWAGE TREATMENT

ACTIVATED SLUDGE. Manchester's Experience with Activated Sludge. Contract Rec., vol. 34, no. 8, Feb. 25, 1920, pp. 180-182. Excerpts of reports of Manchester (Eng.) River Department in which reference is made to activated sludge sewage purification plant in the city. Average of 172,000 gal. per day of sewage, which are screened and passed through detritus tanks, are treated. Tabulated date on typical average analytical returns.

SEWER CONSTRUCTION

BROOKLYN, N.Y. Ralph Avenue Sewer, Brooklyn. Public Works, vol. 48, no. 7, Feb. 28, 1920, pp. 145-146, 3 figs. Details of construction. Account of deep-sheeted trench excavated by steam shovel and clamshell buckets and large invert concrete far in advance of arch. Plant is said to be largely operated by electric power.

CALCULATIONS IN. Expedients for Sewer Calculation (Hilfsmittel fur die Kanalberechnung), H. Kräwinkel. Gesundheits-Ingenieur, vol. 42, no. 41, Oct. 11, 1919, pp. 417-424, 6 figs. Sewer calculations are discussed referring to relations between such variable quantities as water volume and velocity, hydraulic co-efficients, degree of roughness, etc. Graphic and logarithmic tables are included.

REINFORCED CONCRETE. Storm Water Sewer Construction at Hamilton, O. Eng. & Contracting, vol. 53, no. 10, Mar. 10, 1920, pp. 258-261, 6 figs. Reinforced concrete sewers, 4-ft. to 5-ft. 8-in. in size, a total length of 4160 ft.

SEWERS

CONCRETE STORM-WATER. Building Storm Water Sewers in Hamilton, Ohio, Roger B. McWhorter. Mun. & County Eng., vol. 58, no. 2, Feb. 1920, pp. 52-56, 6 figs. Details of concrete storm-water sewers built by Miami Conservancy District as part of local flood-proteetion work.

DESIGN OF SYSTEM. Design of York Township Sewerage System, J. M. M. Greig. Can. Engr., vol. 38, no. 10, Mar. 4, 1920, pp. 255-258, 4 figs. Description of methods adopted in preparing report recently submitted to township council. Paper read before Toronto Branch, Eng. Inst. of Canada.

NARROW-GAGE. The Gage of Narrow-Gage Railways (Die Spurweite der Kleinbahnen), H. Blum. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 39, Sept. 27, 1919, pp. 946-951, 1 fig. Writer states that the 60-cm. gage has been found so uneconomic that not only will its construction be discontinued, but many lines now esisting will probably be rebuilt with wider gage; the 75-cm. gage has given general satisfaction; greatest possible standardization and classification are recommended. (Concluded.)

RAINFALL

REFRIGERATION

RESEARCH

RESERVOIRS

RETAINING WALLS

RIVERS

ROAD CONSTRUCTION

ROADS

ROADS, CONCRETE

ROADS, MACADAM

SYNTHETIC. The Employment of Old and Artificial Rubber for the Manufacture of Automobile Tires During the War (Die Verwertung von Altgummi und kunstlichem Kautschuk wahrend des Krieges). H. Memmler. Verhandlungen des Vereins zur Beförderung des Gewerbfleisses, no. 7, Sept. 1919, pp. 83-89. Brief survey of what is described as phenomenal work accomplished by the German Army Administration and rubber industry during war, although it is admitted that inspite of these efforts, the final result aimed at has not been achieved. Writer believes no definite statement can yet be made as to future development of synthetic rubber.

RUSTPROOFING

ELECTRIC PROCESS. Electro Sherardizing. Machy. (N. Y.), vol. 26, no. 7, Mar. 1920, pp. 649-652, 5 figs. Describes application of a rustproof coating to miscellaneous products including sheet metal. Special reference is made to practice of the Wise Electro Sherardizing Co., of Detroit, and the General Electric sherardizing equipment. Limitations of sherardizing process are pointed out.

SHIP CONSTRUCTION

ISHERWOOD SYSTEM. An Analysis of Isherwood System, John Flodin. Int. Mar. Eng., vol. 25, no. 3, Mar. 1920, pp. 205-210. 11 figs. It is concluded that Isherwood system of longitudinal framing offers important advantages and that disadvantages are relatively slight. (Concluded.)

The Effect of the Isherwood System. Shipping, vol. 10, no. 10, Mar. 10, 1920, pp. 18 and 45. States that within twelve years nearly 1300 ships have been constructed or are now under construction on longitudinal system invented by Isherwood and that system has had revolutionizing effect on shipbuilding industry.

STANDARDS FOR. Standards for Ship Construction, Creighton Churchill. Int. Mar. Eng., vol. 25, no. 3, Mar. 1920, pp. 198-205, 3 figs. Chart showing relative costs of 9000-deadweight-ton cargo vessel for different times of building, number of men being the same; also chart showing number of men per way (direct labor) at different man efficiencies and for efficient building programs.

STERN-FRAME CASTINGS. Castings Used in Ship Construction—II, Ben Shaw and James Edgar. Foundry Trade Jl. & Pattern Maker, vol. 22, no. 218, Feb. 1920, pp. 119-125, 29 figs. Type of stern frame used in single-screw ships.

RESISTANCE FORMULAE. Analysis of Resistance of a Ship Based on Experiments with Models (Eine Zerlegung des Schiffswiderstandes auf Grund von Modellversuchen), Wilhelm Schmidt. Schiffbau, vol. 21, no. 5, Dec. 10, 1919, pp. 174-182, 11 figs. Formulæ and equations are presented and compared with former formulæ. Differences between these and the Froude tests are pointed out. (Concluded.)

SHIP PROPULSION

COMPARISON OF SYSTEMS. Sulzer Two-Cycle Engines and the Propulsion of Cargo Boats. Motorship, vol. 5, no. 3, Mar. 1920, pp. 209-212, 11 figs. Comparison with four-cycle Diesel engines, steam-reciprocating engines and steam turbines.

DIESEL-ELECTRIC DRIVE. Converting the Ferris-Type Wooden Hulls Into Diesel-Electric Driven Motorships, Renwick Z. Dickie. Int. Mar. Eng., vol. 25, no. 3, Mar. 1920, pp. 166-169, 5 figs. How Winton Engine Works, Cleveland, Ohio, in collaboration with Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., is manufacturing direct-connected stationary engines for this purpose which are light enough to allow main power plant of vessel to be placed on deck.

INTERNAL-COMBUSTION ENGINE. Internal Combustion Engine Used as Locomotive in English Tests, Henry F. Grady. Bul. Nat. Ga Engine Assn., Feb. 1920, pp. 17-18. It is reported that oil-burning apparatus is being installed in the reconditioning of White Star liner Olympic, and that oil-burning gear is also being introduced in Mauretania and Aquitania, as well as other Cunard and associated vessels under construction.

SHIP SALVAGE

REINFORCED-CONCRETE FLOATS FOR. Christiani-Nleisen Reinforced-Concrete Floats for Salvaging Ships (Flotteurs en béton armé, système Christiani et Nielsen, pour le renflouage des navires). Génie Civil, vol. 76, no. 8. Feb. 21, 1920, pp. 211-212, 8 figs. Each float is a cylinder 68 ft. long and 11 ft. in diameter. It is divided into six compartments and emptying is accomplished by compressed air.

SHIPBUILDING

TECHNICAL PROGRESS. Recent Technical Progress in Shipbuilding. Nautical Gaz., vol. 98, no. 10, Mar. 6, 1920, pp. 376-377. Advance during past year said to be largely confined to improvements in propelling machinery.

SHIPS

CARGO STEAMERS, DESIGNS OF. From Warships to Cargo Steamers. Shipbuilding & Shipping Rec., vol. 15, no. 9, Feb. 26, 1920, pp. 266-270, 5 figs. Designs of 500 tons d.w., 2000 tons d.w. and 4300 tons d.w. being built by John I. Thornycroft & Co., Ltd., Southampton, Eng.

DETACHABLE-POWER-PLANT TYPE. Constan Type of Ship With Detachable Power Plant (Navires a "pousseurs," système Constan). Génie Civil, vol. 76, no. 6, Feb. 7, 1920, pp. 152-154, 13 figs., partly and supplement plate. Power plant is carried on special hull, wedge-shaped in front, which is fastened rigidly at edge of wedge to edge of diehedral angle in stern of cargo hull.

SILOS

LOADS IN. Calculation of Loads in Silos (Métodos de calculo del empuje en los silos), Fernando D. da Silva. Revista del Centro Estudiantes de Ingenieria, no. 201, Mar. 1919, pp. 199-209, 4 figs. Graphs for computing loads produced by wheat and by corn.

SILVER METALLURGY

EXTRACTION AND REFINING. The Extraction and Refining of Silver, Metal Industry (Lond.), vol. 16, no. 10, Mar. 5, 1920, pp. 193-194. Summary of report by Professor H. C. H. Carpenter and Professor C. G. Cullis on World's Production of Silver, which was included among appendices to report of committee appointed by British Secretary of State for India to inquire into Indian exchange and currency.

SPARK GAPS

BREAKDOWN VOLTAGE. The Breakdown Voltage of a Spark Gap, L. B. Loeb and F. B. Silsbee. Sci. Am. Monthly, vol. 1, no. 3, Mar. 1920, pp. 218-220, 5 figs. It was confirmed by experiments that breakdown voltage of spark gap depends only upon density of gas and varies with pressure and temperature only as they affect density. This relation was found to be valid up to 800 deg. cent. and 8 atmospheres pressure. From report 54 of National Advisory Committee for Aeronautics.

Effect of Temperature and Pressure on the Sparking Voltage, L. B. Loeb and F. B. Silsbee. Aerial Age, vol. 10, no. 19, Feb. 23, 1920, pp. 691-693, 6 figs. Experiments at Bureau of Standards are said to have confirmed relation that breakdown voltage of spark gap depends only upon density of gas and varies with pressure and temperature only as they affect density. This relation was found to be valid up to 800 deg. cent. and 8 atmospheres pressure.

SPARK PLUGS

PREIGNITION CAUSED BY. Preignition and Spark-Plugs, Standwood W. Sparrow. Jl. Soc. Automotive Engrs., vol. 6, no. 2, Feb. 1920, pp. 129-132, 14 figs. Experiments were made with various types of spark plugs in some of which porcelain part was cracked and subsequently partially removed. It was found that preignition occurred when procelain was so placed that it became instrumental in heating central electrode to igniting temperature.

X-RAY. *See X-Ray.*

See also Platinum, X-Rays, Intensity of.

SPECTROGRAPH

ULTRA-VIOLET STUDY, WITH. Spectograph for Extreme Ultraviolet Study (Dispositif spectrographique pour l'étude de l'ultraviolet extrême), Léon et Eugène Block. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 4, Jan. 26, 1920, pp. 226-228. Combination of constant deviation Broca-Pellin fluorine prism and fluorine lenses.

STAIRWAYS

REINFORCED-CONCRETE. *See Concrete Construction, Reinforced.*

STEAM ENGINES

COMPOUND. A Method of Combining Cards of a Compound Engine, Julius Wolf. Southern Engr., vol. 33, no. 1, Mar. 1920, p. 49, 1 fig. Suggests using low-pressure spring scale and high-pressure piston displacement scale as common scales for combined diagram.

STEAM POWER PLANTS

CONNECTICUT. Eastern Connecticut Served by New Station, E. T. Phillips. Elec. World, vol. 75, no. 10, Mar. 6, 1920, pp. 533-535, 7 figs. Two horizontal Curtis steam turbines rated at 10,000 kw. (continuous) and 1800 r.p.m. drive 12,500-kva., three-phase, 60-cycle, 11,000-volt generators.

STEAM TURBINES

OPERATING DATA. Operating Features of Steam Turbines, Power House, vol. 13, no. 4, Feb. 20, 1920, pp. 78-81, 2 figs. Data relative to operation of steam turbines, particularly from safety standpoint, published by "Travellers' Standard."

STEEL

CHROME-NICKEL. *See Steel, Chrome-Nickel.*

HIGH-SPEED. *See Steel, High-Speed.*

MAGNET, STANDARD SECTIONS FOR. British Standard Rolled Sections for Magnet Steel. British Eng. Standards Assn., no. 107, Oct. 1919, 6 pp., 2 figs. Table is included giving dimensions of rolled steel sections for permanent magnets for the ignition magnetos.

STEEL CASTINGS

STEEL HEAT TREATMENT

STEEL RAILWAYS

TRACKWORK, STANDARD. Report on British Standard Special Trackwork for Tramways. British Eng. Standards Assn., no. 79, Dec. 1919, 36 pp., 29 figs. Diagram are given illustrating various types of point, crossing and layout used in actual practice and standard title for each is suggested.

STRESSES

DISTRIBUTION AROUND CIRCULAR HOLES. Photo-Elastic and Strain Measurements of the Effects of Circular Holes on the Distribution of Stress in Tension Members, E. G. Coker, K. C. Chakko and Y. Satake. Eng., vol. 109, no. 2825, Feb. 20, pp. 259-264, 19 figs. Account of extension of some experimental work undertaken on transparent plates to find nature of distribution around circular hole. (To be continued.) Paper read before Instn. Engrs. & Shipbuilders.

SUBMARINES

NAVAL WARFARE, USE IN. The Influence of the Submarine in Naval Warfare in the Future, C. M. Faure. Jl. Roy. United States Service Instn., vol. 64, no. 456, Nov. 1919, pp. 563-582. Urges use of submarine by Great Britain to preserve her supremacy of naval power. It is argued that to abolish the submarine would be to compromise, which is "fatal for strategy." If war is to be abolished, it is observed, "idialists should banish all armaments."

SUBWAYS

LONDON, CARS FOR. New Types of Cars on the Metropolitan and District Railways. Tramway & Ry. World, vol. 47, no. 8, Feb. 12, 1920, pp. 69-72, 5 figs. Car used on underground and suburban railways of London. It has five side doors for rapid movement of passengers.

MAINTENANCE. Engineering Maintenance on Underground Railways—I, A. R. Cooper. Ry. Engr., vol. 41, no. 481, Feb. 1920, pp. 57-62, 13 figs. Features of organization and detail work which are necessary in order to give prompt attention to breakdowns or defects that may interfere with train service.

SWAGING MACHINES

See Machine Tools, Special.

TANK STEAMERS

CONVERTED SAILING SHIP. Sailing Ship to Oil Tanker. Shipbuilding & Shipping Rec., vol. 15, no. 8, Feb. 19, 1920, pp. 232-233, 2 figs. Conversion carried out at Glasgow, Scotland, by Alex. Stephen & Sons, Limited. Propelling machinery consists of two Vickers four-stroke: reversing type, eight-cylinder internal-combustion engines adjusted to give 630 b. hp. each at 320 r.p.m.

TANKS

CYLINDRICAL, CONSTRUCTION OF. Tank Construction—XXXVIII, Ernest G. Beck. Mech. World, vol. 67, no. 1729, Feb. 20, 1920, pp. 120-121, 5 figs. Describes floors of cylindrical tanks and recommends, as tending toward facility and economy in manufacture of such floors, that transverse (5 ft.) seams be of single-riveted butt joints, with inside covers, instead of lap joints.

TANKS, MILITARY

CATERPILLARS. Caterpillars and Their Construction—I, K. H. Condit. Am. Mach., vol. 51, no. 13, Sept. 25, 1919, pp. 601-604, 5 figs. Brief history of work of the Holt "caterpillars" for the Allies.

TAPS

MANUFACTURE. *See Drills, Manufacture of.*

TAR

FRACTIONAL CONDENSATION. Fractional Condensation of Tar. Gas Age, vol. 45, no. 5, Mar. 10, 1920, pp. 220-222. Direct recovery of pitch and coal-tar oils from gas in German Tar Works. Translated from Journal fur Gasbeleuchtung.

RECOVERY FROM SHALE. Development of Coking Industry for the Recovery of Tar and Oil from Bituminous Shale and Lignite (Die Entwiekelung der Schwelindustrie zur Gewinnung von Teer and Oel aus bituminösen Schiefern u. Braunkohlen), R. Beyschlag. Zeitschrift für das Berg-Hütten und Salinenwesen, vol. 67, no. 3, 1919, pp. 185-256, 44 figs. Historical review of coke industry in Germany and other countries and modern experiments and investigations in Germany. Recovery of oil from shale; details of preliminary tests near Berlin, the experimental station in Schandelah near Braunschweig, and in Württengerg; recovery of tar from lignite; description of plants at Lützkendorf and Rosits; modern construction of large recovery plants.

TELEGRAPHY

LINE INTERFERENCE. Effects of Heavy-Current Installations on Telegraph and Telephone Lines (Einwirkung von Starkstromanlagen auf Schwachstromleitungen), H. Brauns. Telegraphen- u. Fernsprech-Technik, vol. 8, no. 5, Aug. 1919, pp. 61-75, 7 figs. Survey of nature and extent of above-mentioned effect and measures for combating it.

TELEPHONY

LINES, CALCULATION OF. Calculation of Telephone Lines (Berechnung von Fernsprechleitungen), F. Lüschen. Telegraphen- u. Fernsprech-Technik, vol. 8, no. 6, Sept. 1919, pp. 81-93, 4 figs. Discusses wave resistance and propagation constants of homogeneous lines, and also their efficiency "distortion." Compound lines, or those consisting of two unequal homogeneous sections, are subsequently taken up.

TERMINALS, MARINE

DIMENSIONS FOR. Quay Design for Ocean, Lake, Inland River and Canal Terminal, H. McL. Harding. Int. Mar. Eng., vol. 25, no. 3, Mar. 1920, pp. 182-178, 7 figs. Generalization and codification of dimensions generally adopted in quay terminals.

MECHANICAL HANDLING. Mechanical Handling in Marine Terminal Work. Harwood Frost. Freight Handling & Terminal Eng., vol. 6, no. 2, Feb. 1920, pp. 48-56. Writer divides devices available for handling freight into three general classes— portable, stationary, and so-called "semi-portable," and points out value of portable conveyor, its adaptability and capacity. Writer also points out objections to mechanical equipment. Paper read before Soc. Terminal Engrs.

PIERS. Piers Design for Ocean and Lake Terminals, H. McL. Harding. Pac. Mar. Rev., vol. 17, no. 3, Mar. 1920, pp. 102-104, 2 figs. Opinion is expressed that single unit piers about 700 ft. long should be 140 to 150 ft. wide with slips 280 to 300 ft. wide and that sheds should be equipped with overhead tiering machinery to give large capacity for storage.

SAN FRANCISCO. Pacific Port Terminal, B. F. Cresson, Jr. and C. W. Staniford. Pac. Mar. Rev., vol. 17, no. 3, Mar. 1920, pp. 98-101, 3 figs. Project for increasing shipping facilities of San Francisco.

TESTING MACHINES

IMPACT TYPES. The Impact Testing of Metals, F. C. Thompson. Sci. Am. Monthly, vol. 1, no. 2, Feb. 1920, pp. 138-140. Types of machines designed for conducting tests.

See also Gears, Spur-Gear Testing Machine.

TEXTILE MILLS

ELECTRIC DRIVE FOR. Textile Mill Equipment—Its Advance and Systems, C. S. Ickringill. Elecn., vol. 84, no. 2181, Mar. 5, 1920, pp. 254-259, 6 figs. Advantages of electric drive are explained. Instance is quoted where production was increased 5½ per cent. by introducing electric drive.

The Development of Electric Supply to Textile Mills, W. Browning, Elecn., vol. 84, no. 2181, Mar. 5, 1920, pp. 263-265, 1 fig. Economy of electric drive is discussed.

ELECTRIC POWER SUPPLY. Electric Power Supply of Southern Textile Mills, J. E. Sirrine. Mech. Eng., vol. 42, no. 3, Mar. 1920, pp. 161-163 and 205, 7 figs. Typical examples of generating plants, distribution lines, substatious and motor installations are illustrated.

GAS ENGINES FOR. Gas Engines for Textile Mills, J. G. Walthew. Elecn., vol. 84, no. 2181, Mar. 5, 1920, pp. 266-268, 3 figs. Operating costs of actual installations are quoted.

THERMIONIC VALVES

AMPLIFICATION, MEASUREMENT OF. On the Measurement of Amplification given by Triode Amplifiers at Audible and at Radio Frequencies, F. E. Smith and H. C. Napier. Proc. Physical Soc. of Lond., vol. 32, no. 182, part 2, Feb. 15, 1919, pp. 116-132, 7 figs. Mutual inductance method in which alternating voltage applied between filament and grid of first valve is varied by quickly changing connections to air-core transformer having two secondaries at right ang es, these secondaries to be capable of rotation so as to give any desired ratio of mutual inductances between primary and respective secondaries.

OSCILLATIONS OF. On the Variations of Wave-Length of the Oscillations Generated by Three-electrode Thermionic Tubes due to Changes in Filament Current, Plate Voltage, Grid Voltage, or Coupling, W. H. Eccles, and J. H. Vincent. Proc. Roy. Soc., vol. 96, no. A680, Feb. 3, 1920, pp. 455-465, 7 figs. Experimental investigation conducted to study effects of altering each of chief variables with view to finding conditions most favorable for production of continuous waves of constant frequency.

TESTING. A Comparative Method of Testing Thermionic Valves for Passing no Reverse Current at High Voltages, N. W. McLachlan. Proc. Physical Soc. of Lond., vol. 32, no. 182, part 2, Feb. 15, 1919, pp. 72-77, 4 figs. Anode of standard valve known to pass no reverse current is connected to that of valve under tests and filaments are joined to terminals of high-tension alternating-voltage supply. Low-reading electrostatic voltmeter with parallel condenser is arranged to indicate if valve under examination passes reverse current.

TIDAL POWER

TIME STUDY

TIN

TOOLS

TRACTOR ENGINES

TRACTORS

TUBES

TUNNELS

TURBO-GENERATORS

UNEMPLOYMENT

URANIUM

VACUUM TUBES

VOCATIONAL EDUCATION

Federal Board for. Training and Placement of Disabled ex-Service Men in the United States. U. S. Dept. Labor, Bur. Labor Statistics, vol. 10, no. 2, Feb. 1920, pp. 138-147. Regulations regarding training and placement adopted by Federal Board for Vocational Education.

WAGES

Piece-Work System. Piece Work System at Hog Island. C. S. Bundesman. Pac. Mar. Rev., vol. 17, no. 3, Mar. 1920, pp. 77-81, 8 figs. System followed for organizing work.

See also Bonus Systems.

WATER HAMMER

Conduits of Varying Section. Water Hammer in Conduits Formed of Two or Three Sections for Different Diameters (Calcul du coup de bélier dans les conduites formées de deux ou de trois tronçons de diamètres différents), Ed. Carey. Bulletin Technique de la Suisse Romande, vol. 47, no. 2,Jan. 24, 1920, pp. 21-23, 2 figs. Illustrates by numerical examples application of formulæ worked out in previous installments. (Continuation of serial.)

WATER POWER

United States. Water Powers of the United States. Elec-World, vol. 75, no. 12, Mar. 20, 1920, pp. 654-659, 3 figs. Analysis of developed and undeveloped sources. Figures given for total potential warer power is 59,360,000 hp., of which it is said, only 9,823,540 hp. is developed.

Utilization of. Recent Advances in Utilization of Water-Power, Eric B. Bergstrom. Jl. Instn. Mech. Engrs., no. 1, 1920, Feb. 1920, pp. 55-128, 37 figs. Rapid extension of use of Francis turbine is pointed out from manufacturing records of European firm of turbine makers. It is believed that it has now superseded all other known types of low-pressure turbines. Modern tendency of installing fewer units but of larger capacity is also pointed out. Records of operation of Francis turbines at various installations are given and characteristics of this type are discussed at length.

WATER SUPPLY

Industrial Housing Projects. The Water Distribution System of Industrial Housing Projects for Shipbuilders, William H. C. Ramsey. Jl. Am. Water Works Assn., vol. 7, no. 2, Mar. 1920, pp. 239-263, 7 figs. Systems installed in housing projects of Emergency Fleet Corporation.

Newark, N. J., Metering of. Method of Metering the Water Supplied to the Five Distribution Systems of the City of Newark, N. J. George Sanzenbacher. Jl. Am. Water Works Assn., vol. 7, no. 2, Mar. 1920, pp. 163-170, 6 figs. Continuous automatic record of quantity of water supplied to each of five service districts is kept.

See also Pumping, Electric, Califormia.

WATER TOWERS

Reinforced-Concrete. Concrete in Water Works Construction, A. C. Irwin. Jl. Am. Water Works Assn., vol. 7, no. 2, Mar. 1920, pp. 203-211, 1 fig. Examples are illustrated of reinforced-concrete water tower and chimney.

See also Electric Welding; Electric Welding, Arc; Oxy-Acetylene Welding; Thermit Welding; Welds.

WELDS

Strength of. Effects of the Chemical Composition of Welding Electrodes, J. S. Orton: Am. Mach., vol. 51, no. 13, Sept. 25, 1919, pp. 625-626, 2 figs. Results of tests undertaken to determine effects of chemical composition of electrode on strength of weld.

Welding Ships at Tampa. Welding Engr., vol. 5, no. 2, Feb. 1920, pp. 44-48, 5 figs. It is said that welded specimen was bent cold until ends met at 180 deg. and later was hammered that without any defects showing in welding.

WELFARE WORK

Coal Mine. Welfare Work at an Anthracite Colliery Dever C. Ashmead. Coal Age, vol. 17, no. 9, Feb. 26, 1920, pp. 382-385, 6 figs. Welfare endeavours of company include service and advice in connection with maintenance of schools for children of miners.

WELLS

Drilling, Cost of. Electric Well Drilling. Natural Gas & Gasoline Jl., vol. 14, no. 2, Feb. 1920, pp. 61-63, 2 figs. Comparative cost of drilling by electricity and steam.

WIRE ROPE

Stresses in. Winding Ropes and Bending Stresses, C. Speer. Quarry, vol. 25, no. 277, Mar. 1920, pp. 57-59, 6 figs. Experiments are reported which proved that spirally twisted wires in rope are more flexible than when straightned out. Reasons for this phenomenon are advanced. Translated from Gluckauf.

WIRING

Portable Cord. The Wiring Committee's Investigation of Portable Cords. Nat. Elec. Light Assn. Bul., vol. 7, no. 1, Jan. 1920, pp. 65-66. Durability tests conducted by Electrical Testing Laboratorires.

WOOD PRESERVATION

A. R. E. A. Specifications. Report of Committee XVII—Wood Preservation. Bul. Am. Ry. Eng. Assn., vol. 21, no. 222, Dec. 1919, pp. 295-337, 18 figs. Specifications and quoted for preservative treatment of wood, (2) with zinc chloride, (2) with creosote oil, full-cell process, (3) with zinc chloride and creosote oil, (4) with creosote oil, empty-cell process with final vacuum, and (5) with creosote oil, empty-cell process with initial air and final vacuum.

ZINC

Production of. New Method of Zinc Production, Stanley C. Bullock. Meta Industry (Lond.), vol. 16, no. 7, Feb. 13, 1920, pp. 121-123. Possibilities of electrolytic, and electrothermic processes as substitutes for distillation process. Electrolytic process is considered as capable of competing with distillation, but it is pointed out that to do this, plant must be erected with large capacities as economy of process depends upon its mechanical features and these only show to advantage when quantity of raw product to be handled is such that man-handling is impossible under present conditions of labor.

Engineering Index

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Load Factors. Schedule of Load Factors for Heavier-than-Air Craft. Eng. & Indus. Management, vol. 3, no. 11, March 11, 1920, pp. 332-333. Report adopted by sub-committee appointed by Advisory Committee for Aeronautics to consider and report as to definite rules which should be adopted to govern load factors required for all classes of civil aircraft, and upon which certificates of airworthiness may be based.

Paris Show. The Paris Aviation Show—II. Engr., vol. 129, no. 3342, Jan. 16, 1920, pp. 63-64, 1 fig. Machines exhibited are believed to have shown that "there is a good, if limited, choice of big aeroplanes suitable for the transport of merchandise and passengers.

Radiators. General Discussion of Test Methods for Radiators. Nat. Advisory Committee for Aeronautics, report no. 60, 1920, 24 pp., 16 figs. Apparatus involved and methods of taking observations and of computing results employed in connection with measurements of (1) core characteristics, (2) heat dissipated, (3) power needed to lift radiator and overcome head resistance, and (4) mass flow of air through core.

General Analysis of Airplane Radiator Problems. Nat. Advisory Committee for Aeronautics, report no. 59, 1920, 9 pp. Basis on which experimental work is conducted at Bureau of Standards is explained and technical terms are defined.

Stability and Balance. Stability and Balance in Airplanes, D. R. Husted. Aviation, vol. 8, no. 5, Apr. 1, 1920, pp. 193-194, 4 figs. Practice of measuring dynamic stability of a machine in laboratories of Curtiss Engineering Corp. at Garden City, L. I. It is assumed that when model test gives pitching moment-angle of incidence curve having negative slope of proper magnitude, actual machine will have sufficient pitching stability.

Stresses on. The Loads and Stresses on Aeroplanes, John Case. Aeronautics, vol. 18, nos. 334 and 335, March 11 and 18, 1920, pp. 218-219, 5 figs. and 235-236, 5 figs. Mar. 11: Load curves of ribs, Mar. 18: Initial stresses in ribs due to fabric. (Continuation of serial.)

Struts. The Use of the Hollow Strut on the New Airplanes, Edward P. Warner. Automotive Industries, vol. 42, no. 12, Mar. 18, 1920, pp. 716-720, 20 figs. Analytical determination of possible saving in weight as compared with solid struts.

See also Flying Boats; Wind Tunnels.

AIR COMPRESSORS

Low-Pressure. Driving Air Compressors by Exhaust Steam. A. Dessemond. Colliery Guardian, vol. 119, no. 3089, March 12, 1920, pp. 745-746, 3 figs. Description of low-pressure compressor at Villiers Colliery. (Concluded.) Translated from Bulletin de la Société de l'Industrie Minérale.

Turbo-Driven. Driven Air Compressors by Exhaust Steam, A. Dessemond. Colliery Guardian, vol. 119, no. 3088, Mar. 5, 1920, pp. 659-660, 3 figs. Rateau system of direct drive from mixed pressure turbine. Translated from Bul. de la Société de l'Industrie Minérale.

AIR FLOW

Venturi-Meter Calculations. Simplification of Venturi-Meter Calculations, Glenn B. Warren. Mech. Eng., vol. 42, no. 4, Apr. 1920, pp. 220-221 and 260, 3 figs. Graphs for facilitating slide-rule calculation of flow of compressed air, also suggested sumplification of venturi-meter formula given by Herbert B. Reynolds in Trans. Am. Soc. M. E., vol. 38, p. 799.

AIRCRAFT CONSTRUCTION MATERIALS

Aeroplane Woods. Supplies and Production of Aircraft Woods. Nat. Advisory Committee for Aeronautics, report no. 67, 1920, 62 pp., 23 figs. Compilation of avialable information regarding supplies of kinds of wood that have been used or seem likely to become important in construction of airplanes and amount of lumber of each species normally put on the market each year: uses to which each kind of wood is or may be put.

Glues. Glues Used in Airplane Parts. Nat. Advisory Committee for Aeronautics, report no. 66, 1920, 28 pp., 3 figs. Glues are divided into five types: Animal glues; liquid glues; vegetable glues; casein glues; and blood albumin glues. Manufacture, preparation and application of each of these types is discussed.

AIRSHIPS

Machinery of. Airship Machinery: Past Experience and Future Requirements, C. F. Abell. Aeronautics, vol. 18, nos. 335 and 336, Mar. 18 and 25, 1920, pp. 244 and 260-261. Mar. 18, Description of engines and installation work which were used in various ships built during war. Paper read before Royal Aeronautical Society, Mar. 25: Mechanical equipment of principal types, particularly R 33 and R 34. (To be continued.)

Performance During War. Dirigible Balloons and Airships During the War (Dirigeables et aérostats pendant la guerre), Charles Dollfus. L'Aérophile, vol. 28, nos. 1-2, Jan. 1-15, 1920, pp. 23-30, 7 figs. Structural details and records of operating performances of principal French, English, Italian and German types. (To be continued.)

Regid Construction. The Principles of Rigid Airship Construction. Aeronautical Jl., vol. 24, no. 111, March 1920, pp. 98-118 and (discussion) pp. 119-131, 12 figs. Glossary of terms is given, mechanical discussion of stresses in the various parts of an airship is taken up and typical designs of German zeppelins and structural characteristics of R34 are illustrated and analyzed.

ALLOY STEELS

Molybdenum, Effect of. The Effect of Molybdenum in Alloy Steels. Ry. Mech. Engr., vol. 94, no. 4, April 1920, pp. 205-207, 7 figs. Data presented are stated to be results of tests of ordinary commercial steels taken from records of users of these alloys. It appears that increased toughness and wide hardening range characterize molybdenum steels. From book recently issued by Climax Molybdenum Co., New York.

Pickling, Effect of. Effect of Pickling on Alloy Steels, H. L. Hess. Iron Age, vol. 105, no. 9, Feb. 26, 1920, pp. 593-594, 6 figs. Tests made by metallurgical department of Hess Steel Corporation, Baltimore, Md., to determine degree of interference with quality and machinability of material. It was concluded that pickling in itself, as well as pickling followed by various treatments does not interfere in any noticeable way with quality or machinability of steel.

ALTERNATORS

See Electric Generators, A. C.

ALUMINUM

Corrosion of. The Action on Aluminum of Hard Industrial Waters. Richard Seligman and Percy Williams. Metal Industry (Lond.); vol. 16, no. 12, March 19, 1920, pp. 233-236.

Rolling-Mill Practice. Aluminum Rolling-Mill Practice—III; Ingot Heating and Mill Calculations, Robert J. Anderson and Marshall B. Anderson. Chem. & Met. Eng., vol. 22, no. 13, March 31, 1920, pp. 599-604. Specifications and some of uses for sheet aluminum are given, together with discussion of furnaces for heating ingots preparatory to slabbing. Tables and examples of calculations are included whereby individual orders may be rolled with minimum allowance for scrap.

Uses in Electrical Industry. Uses of Aluminum in the Electrical Industry (L'aluminium dans l'appareillage électrique). C. Zetter. Revue générale de l'Electricité, vol. 6, no. 26, Dec. 27, 1919, special supplement, pp. 63-78, 2 figs. Steel, aluminum, duralumin, and brass are compared from viewpoints of initial costs, ease of manufacture and adaptability to electrical uses.

ALUMINUM ALLOYS

Aluminum Bronze Casting. The Still Process for Casting Aluminum Bronze. Metal Industry, vol. 18, no. 3, March 1920, pp. 118-120, 6 figs. Method was devised specially for preventing formation of alumina in aluminum bronze.

Reflective Properties of. Preparation and Reflective Properties of Some Alloys of Aluminum with Magnesium and with Zinc. Dept. Commerce, Scientific Papers of Bur. of Standards, no. 363, Feb. 12, 1920, pp. 653-657, 1 fig. Alloys of aluminum with magnesium and with zinc are not considered suitable for mirrors where permanency is of prime importance, but it is said that $Al_3 Mg_4$ deteriorates less rapidly than any other alloy examined and could be used in apparatus where highly reflecting mirror is desired for a short time.

ANTENNAE

Capacity Calculations. Calculation of Antenna Capacity, Louis W. Austin. Proc. Inst. Radio Engrs., vol. 8, no. 2, April 1920, pp. 164-168. Two empirical formulæ—one applying to broad antennæ and the other to elongated antennæ—are given. Results obtained from their use are shown to agree closely with actual experimentally determined values.

APPRENTICES, TRAINING OF

School for Apprentices. The Production and Instruction in an Apprentice School, Peter F. O'Shea. Am. Mach., vol. 52, no. 10, March 4, 1920, pp. 505-508, 3 figs. Apprentice school of Greenfield Tap and Die Corporation.

ARMY SUPPLY BASES

Philadelphia. Planning and Process on a Big Construction Job—II, Charles Penrose. Eng. News-Rec., vol. 84, no. 13, March 25, 1920, pp. 627-633, 6 figs. How charts kept during building of Philadelphia army base showed performance in various details of engineering work.

ARTILLERY

Caterpillar Traction of Heavy Guns. Artillery Motorization as Related to Carterpillar Traction, George W. Dunham. Jl. Soc. Automotive Engrs., vol. 6, no. 3, Mar. 1920, pp. 161-173, 21 figs. Progress in design of caterpillar vehicles by Ordnance Department during war is recorded and lines are indicated along which further improvement may be effected. Opinion is expressed that greater speed ranges for heavy-duty purposes can be obtained by using light track shoes and very small amount of unsprung weight, emdodying use of considerable quantity of rubber or other cushioning medium in connection with rolling members and track.

ARTILLERY FIRE CONTROL

Work of Field Survey Troops. Field Survey Troops: Their Work at the Front, E. W. Berry. Can. Engr., vol. 38, no. 13, March 25, 1920, pp. 317-320, 2 figs. How draftsmen, photographers, lithographers and topographers assisted artillery commanders.

BRASS

INTERNAL STRESS, REMOVAL OF. The Removal of Internal Stress in 70: 30 Brass by Low Temperature Annealing, H Moore and S. Beckinsale. Metal Industry (Lond.), vol 16, no 14, Apr. 2, 1920, pp. 267-269, 4 figs. It was found in experiments that minimum times in which internal stress was completely removed by low-temperature annealing were: at 200 deg. cent, 96 hr; 225 deg. cent, 48 hr; 250 deg. cent, 5 hr.; 275 deg cent., 1 hr; 300 deg cent, 20 min; 325 deg. cent, 5 min Internal stress was not removed and did not appear to be appreciably reduced by annealing at 100 deg. cent for many weeks.

BRASS FOUNDING

ELECTRIC-FURNACE MELTING. Developments in Brass Melting—III, Otis Allen Kenyon. Iron Age, vol. 105, no. 13, March 25, 1920, pp. 880-883, 7 figs. Electric casting shop of Bridgeport Brass Co., Bridgeport, Conn., is described as illustrating broad commercial scale of electric furnace use.

BRIDGE DESIGN

STRESSES, DETERMINATION OF. Primary Stress-Determination in Space Frames, R. V. Southwell. Eng., vol. 109, no. 2823, Feb. 6, 1920, pp. 165-168, 10 figs. Analytical method is exemplified with reference to steel cantilever bridge.

See also Bridges, Railways.

BRIDGES, RAILWAYS

STEEL, DESIGN. Report on Iron and Steel Structures. Ry. Age (Daily Edition), vol. 68, no. 11c. Mar. 18, 1920, pp. 911-915, 3 figs. Curve comparing column formulæ is given and a formula is recommended for use with ordinary structural steel for which basic unit tensile stress is 16,000 lb. per sq. in. and for ratios of l/r not greater than 200. Also specification loading for design of steel railroad bridges. Committee report presented to Am. Ry. Eng. Assn.

WOODEN. Report on Wooden Bridges and Trestles. Ry. Age (Daily Edition), vol. 68, no. 11c, Mar. 18, 1920, pp. 915-917. Specifications for Southern yellow pine and Douglas fir. Committee report presented to Am. Ry. Eng. Assn.

BRIDGES, STEEL

ANCHOR PINS, RENEWAL OF. Anchor Pins of Cornwall Cantilever Bridge Bored Out and Renewed, H. T. Welty. Eng. News-Rec., vol. 84, no. 10, March 4, 1920, pp. 453-456, 8 figs. Repair work of steel bridge involved boring out of worn and weak pins and replacing them with new pins of larger diameter. It is said work was accomplished without use of supporting falsework under bridge and with practically on interruption to traffic.

RECONSTRUCTION. Reconstructing Poughkeepsie Cantilever Bridge for Heavy Traffic, Clement E. Chase. Eng. News-Rec., vol. 84, no. 11, March 11, 1920, pp. 528-534, 11 figs. Double-track deck over three trusses changed to gauntlet-track deck. Structure is 6767 ft. long over all. Main spans over Hudson constitute cantilever system with two fixed spans 525 ft. long, three cantilever spans 546 and 548 ft. long, and two anchor arms 200 ft. 10 in. long.

Strengthening a County Bridge to Carry Motor-Truck Traffic, Morris Goodkind. Eng. New-Rec., vol. 84, no. 13, March 25, 1920, pp. 617-618, 3 figs. Replacement of stringers and reinforcements of floor beams in 52-ft. span steel bridge.

BRONZE

See Brass.

BUILDING CONSTRUCTION

STEEL FRAMING. Steel Framing for Public Hall in Cleveland, Eng. News-Rec., vol. 84, no. 9, Feb. 26, 1920, pp. 414-415, 7 figs. Special arrangement of steel stresses for hip-roof framing designed in order to avoid placing large columns at points where they would encroach upon inclines which take place of stairways between floors, and at the same time meet roof lines chosen by architect.

U. S. ARMY, CONSTRUCTION DIVISION. The Work of the Construction Division of the United States Army from Coast to Coast, 1917-1919, E. B. Morden. Jl. Engrs. Club of Philadelphia, vol. 37-3, no. 184, March 1920, pp. 86-137, 50 figs. Scope, origin and evolution, and general demonstration of Construction Division is first outlined, and account of projects undertaken from 1917 to 1919 is subsequently presented, and article is concluded with general statistics of work of Construction Division.

BUSES

GREAT BRITAIN. The Place of the Bus—II, Walter Jackson. Elec. Ry. Jl., vol. 55, no. 14, April 3, 1920, pp. 683-689, 6 figs. Details are presented of relative costs of car and bus operation in Great Britain, together with some notes on bus design, weight and capacity, operating speeds, legal regulations, and fuel and roadway taxes.

CABLES

HOISTING, FLEXIBILITY OF. Should the Flexibility of Haulage Rope Be Computed? (Sollen Forderseile auf Biegung berechnet werden)?, O. Speer. Glückauff, vol. 55, nos. 44 and 45, Nov. 1 and 8, 1919, pp. 849-853 and 869-878, 13 figs. Gives tables of cable data from which author concludes that the bending stress has no great bearing on the life, strength and efficiency of the main haulage cable, and in calculation of cable, its flexibility need not be taken into account.

HOISTING, INSTALLATION IN MINES. The Installation of a Shaft Cable at Kirkby Colliery, Joseph Bircumshaw. Colliery Guardian, vol. 119, no. 3088, Mar. 5, 1920, pp. 657-658, 9 figs. Cable is three-core cable 0.25 sq. in. in area, paper-insulated, bitumen-sheathed, double-wire armored, and carries 3300 volts. Method of lowering cable into position in shaft by winding engines is explained.

See also Wire Rope.

CABLES, ELECTRIC

BREAKS, LOCALIZATION OF. On the Localization of High-Resistance Breaks in Submarine Cables, A. Poulsen. Elecn., vol. 84, no. 2183, March 19, 1920, pp. 312-315, 3 figs. Corrections are proposed for Siemens method which consists in determining resistance of cable up to break by means of combined resistance and capacity test.

JOINTS. Report of Committee IX—Wires and Cables. Ry. Age (Daily Edition), vol. 68, no. 11b, Mar. 17, 1920, pp. 882-884, 8 figs. Specifications for wire joints and copper bond wires recommended by committee of Am. Ry. Eng. Assn.

CAISSONS

See Foundations, Caissons.

CANALS

SWITZERLAND. The Swiss Rhone-Rhine Navigation Project, A. Wharton Metcalfe. Engr., vol. 129, nos. 3348 and 3350, Feb. 27 and Mar. 12, 1920, pp. 212-214, 3 figs., and 264-265; 1 fig. Discussion of economical aspects of project under consideration by Swiss Government for over ten years, together with maps showing proposed works between Geneva and Seyssel.

CAR WHEELS

CHILLED-IRON, MANUFACTURE. Manufacturing Chilled Iron Car Wheels—I, H. E. Diller. Foundry, vol. 48, no. 7, April 1, 1920, pp. 259-265, 5 figs. History, metallurgy, molding, testing and construction of chilled-iron car wheels.

CARS, FREIGHT

INSPECTION OF. The Inspection of Freight Equipment, L. K. Sillcox. Ry. Mech Engr., vol. 94, no. 4, April 1920, pp. 216-220. Classification of defects to be reported by federal inspectors, also specification covering installation of air-brake equipment of freight cars.

CARS, PASSENGER

CANADIAN NATIONAL RAILWAYS. New Sleeping Cars, Canadian National Rys. Ry. Rev., vol. 66, no. 13, March 27, 1920, pp. 511-512, 4 figs. Cars are specially insulated in consideration of extreme weather conditions under which they will operate.

LONDON UNDERGROUND RAILWAY. New Electric Cars Built for British Line, Frederick C. Coleman. Ry. Mech. Engr., vol. 94, no. 4, April 1920, pp. 211-213, 5 figs. Passenger cars of Metropolitan Railway of London designed with five side doors for reducing stopping time at stations.

CASE-HARDENING

SHIMER PROCESS. A Practical Talk on Some Modern Methods of Heat-Treatment, Hohn E. Halbing and Frank Shepherd. Jl. Am. Steel Treaters Soc., vol. 2, no. 6, March 1920, pp. 257-278, 12 figs. Various suggestions are given, specially method for heat treating tools made from one per cent straight carbon steel. Analysis is also made of Shimer case-hardening process in which calcium chloride and sodium chloride are used as base and when in molten state calcium cyanamid is immersed to add case hardening properties.

CEMENT

STRENGTH OF. Determination of Breaking Strength (Bestimmung der Bruchfestigkeit), R. Grun. Tonindustrie-Zeitung, vol. 43, no. 97, Aug. 19, 1919, pp. 871-872, 2 figs. Writer describes a simple device and process worked out and employed by him for several years before the war, for determining in figures the breaking strength of cement after 24 hours.

CEMENT, PORTLAND

RAW MATERIALS FOR. Producing Raw Materials for Portland Cement—VII, Oliver Bowles. Cement, Mill & Quarry, vol. 16, no. 6, March 20, 1920, pp. 15-20, 4 figs. Arrangement of charges in drill holes.

CHROMIUM

ELECTROLYTIC PRODUCTION. Electrolytic Chromium, George J. Sargent. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 18, pp. 275-292. Alludes to history of deposition of chromium, including unpublished work done at Cornell University. Gives details of electrolysis of various mixtures of chromic sulphate and chronic acid, showing that yield of chromium from chromic-acid solutions is greatly increeased by addition of chromic sulphate.

COAL

PURCHASING ON SPECIFICATIONS. Purchase of Coal on Specifications, John Howatt. Jl. Western Soc. Engrs., vol. 24, no. 9, Nov. 1919, pp. 535-552 and (discussion) pp. 553-556. Method is outlined for purchasing coal on B.t.u. basis. System provides definite basis for cancellation of contract.

STORAGE YARDS. Reading's Storage Yards Keep the Mines Running Steadily, Dever C. Ashmead. Coal Age, vol. 17, no. 13, March 25, 1920, pp. 581-586, 6 figs. Experience of Philadelphia & Reading Coal and Iron Co. is quoted as proof that coal storage results in decrease of cost of fuel to consumer by equalizing demand. Capacity of storage yard of this company is 1,000,000 tons.

STRIPED. Striped Coals, H. Winter. Colliery Guardian, vol. 119, no. 3081, Jan. 16, 1920, pp. 172-173. Results of microscopical examination and chemical analysis of various samples.

CONCRETE CONSTRUCTION. REINFORCED

Australian Structures. Typical Examples of Reinforced Concrete Structures in Australia, Æ. G. Stone. Commonwealth Engr., vol. 7, no. 7, Feb. 2, 1920, pp. 204-212, 15 figs. Structures illustrated and described are wheat silos, sewerage pipes, aqueduct, pontoons, etc.

Stresses in Frames. Problems in the Theory of Construction. Regid Reinforced Concrete Frames, Ewart S. Andrews. Concrete and Constructional Eng., vol. 15, no. 3, March 1920, pp. 161-165, 5 figs. Graphical derivation of formulæ. (Concluded.)

CONCRETE, REINFORCED

Specifications. Report of Committee on Masonry. Ry. Age (Daily Edition), vol. 68, no. 11, Mar. 17, 1920, pp. 862-867. Specifications for plain and reinforced concrete and for billet-steel concrete reinforcement bars, recommended by committee of Am. Ry. Eng. Assn.

CONVEYORS

Belt. Methods Used in the Installation of Conveyor Belts. Belting and Transmission, vol. 16, no. 5, March 5, 1920, pp. 27-30, 8 figs. Attention is called to precision required in putting big belt in place in order to secure efficient service and freedom from shut-downs for repairs.

See also Coal Handling, Belt Conveyors.

COPPER

Properties, Determination of. Relationship of Physical and Chemical Properties of Copper, Frank L. Antisell. Min. & Metallurgy, no. 157, section 2, Jan. 1920, 5 pp. Reasons for rejecting refined copper on physical examination are enumerated. Electrical conductivity of copper is considered as most convenient method of determining its general properties.

COPPER ALLOYS

Commercial Compositions. Copper Alloys, Brasses and Bronzes, H. L. Reason. Managing Eng., vol. 6, no. 9, Jan. 1920, pp. 212-218, 18 figs. Specifications for various commercial compositions, specially such patented alloys as delta metal, together with curves giving physical characteristics of copper alloys. (To be continued.)

COPPER MINING

British Columbia. Boundary District, British Columbia, C. M. Campbell. Eng. & Min. Jl., vol. 109, no. 17, April 24, 1920, pp. 968-973, 5 figs. Historic development of mining operations in regious which within 20 years have produced 20,000,000 tons of low-grade copper ores.

Sampling. Mine-Sampling, William Huff Wagner. Min. & Sci. Press, vol. 120, no. 13, March 27, 1920, pp. 451-453, 4 figs. Sampling practice followed in mining copper ore in Butte district.

CORROSION

See Aluminum, Corrosion of.

COST ACCOUNTING

Record Forms. An improved System of Engineering Costing, G. E. Hitchen. Machy. (Lond.), vol. 15, no. 389, March 11, 1920, pp. 751-756, 14 figs. Forms for recording weekly cost of each job, weekly proportion of labor to materials, exact cost of job and of any desired section of job as soon as completed.

Tools in Stock Room. Cadillac Stock-Room Methods. Machy. (N. Y.), vol. 26, no. 6, Feb. 1920, pp. 501-502, 2 figs. System of cost accounting consists of figuring average price of all tools of given type, which are on hand in stock-room at time each new shipment of tools of that type is received.

CRANES

Floating. Load Strain-Gage Test of 150-Ton Floating Crane for the Bureau of Yards and Docks U. S. Navy Department, Louis J. Larson and Richard L. Templing. Technologic Papers Bur. Standards, no. 151, March 18, 1920, 34 pp., 27 figs. Arrangements made to take strain-gage measurements on important members of 150-ton revolving, floating crane built for use in navy yard at Norfolk, Va.

CRIPPLES

Reeduction of. Minnesota Plan for the Reeducation and Placement of Cripples, Oscar M. Sullivan. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 184-189. Act follows plan of Mass. act, but authority is placed under State Board for Vocational Education instead of industrial accident commission and scope includes all cripples.

CRUCIBLES

Clays. Properties of American Bond Clays and Their Use in Graphite Crucibles and Glass Pots. Dept. Commerce, Technologic Papers of Bur. of Standards. no. 144, Jan. 28, 1920, 52 pp., 24 figs. Physical properties of three typical German clays formerly imported in large quantities are given on basis of constants which permit comparison and evaluation of American materials. Physical characteristics of 23 American and 2 English bond clays are determined.

DAMS

Concrete-Arch. Concrete Arch Dam Built from Superposed Trestle. Eng. News-Rec., vol. 84, no. 9, Feb. 26, 1920, pp. 421-422, 3 figs. Frame work was erected complete before starting dam. Concrete was elevated to cars on top and dropped through chutes.

Design Details and Field Methods on Thin Arch Dam. Eng. News-Rec., vol. 84, no. 10, March 4, 1920, pp. 474-476, 7 figs. Straddling trestle method of construction used on Warm Springs concrete dam in Oregon.

Failures of. The Record of 100 Dam Failures, Lars Jorgensen. Jl. Electricity, vol. 44, no. 6, March 15, 1920, pp. 274-276, 2 figs. Presented as warning to engineers designing hydroelectric projects involving utilization of natural water powers.

See also Hydroelectric Plants, Quebec; Water Works, Denver.

DIESEL ENGINES

Augsburg. World's Highest-Powered Naval-Type Diesel Engine. Automotive Manufacturer, vol. 61, no. 11, Feb. 1920, pp. 14-19 and p. 34. Details of Augsburg ten-cylinder 3000-hp. heavy-oil unit used in German submarine cruisers. Main dimensions are; Length overall, 37 ft. 5 in.; height, 11 ft. 6 in.; width, 5 ft.; bore and stroke, $20\frac{7}{8}$ x $20\frac{7}{8}$ in.; weight, 75 tons; engine speed, 375 r.p.m.

Cammellaird-Fullagar. Cammellaird-Fullagar Diesel Marine Engine—II. Motorship, vol. 5, no. 4, April 1920, pp. 302-306, 6 figs. Description of 1000-shaft-hp. opposed-piston type heavy-oil marine engine. It weighs 91 long-tons and is 19 ft. 9 in long.

Castings for. Diesel Engine Castings, F. J. Cook. Eng., vol. 109, no. 2823, Feb. 6, 1920, pp. 177-179, 9 figs. Proportions of various chemical elements which were found to give good results for Diesel-engine cylinders, liners and pistons are: Total carbon, 3 per cent to 3.2 per cent; silicon, 1 per cent to 1.2 per cent; phosphorus, not over 1 per cent; sulphur, 0.12 per cent; manganese, not over 0.5 per cent. Paper read before North-East Coast Instn. Engrs. & Shipbuilders.

Solid-Injection Type. Notes on the Care and Maintenance of the Solid Injection Diesel Engine, David P. Peel. Trans. Inst. of Marine Engrs., vol. 31, Feb. 1920, pp. 563-572, 4 figs. Notes, based on writer's experience with the Vickers' solid-injection submarine Diesel engine, on smoking, knocking in the cylinders, bearing lubrication, cylinder lubrication, the governor, water cooling, fuel, setting sprayer valves, and diagram of operations.

Two- vs. Four-Cycle in Marine Service. Comparison Between Marine Diesel-Engines of the Two and Four Cycle Types. Motorship, vol. 5, no. 4, April, 1920, pp. 313-315, 6 figs. Practice of principal motorship builders of the world. Opinion is expressed that four-cycle engines, judging from present tendencies, "will be the marine motor of the future." Paper read before Norwegian Veritas.

DIRECTION FINDERS

Method of Using. A Method of Direction Finding of Wireless Waves and Its Applications to Aerial and Marine Navigation, James Robinson. Radio Rev., vol. 1, no. 6, March, 1920, pp. 265-275, 4 figs. Application of method described in previous installments to Bellini-Tosi system is explained. (Concluded.)

Multiple-Spindle Horizontal Type. Special Types of Drilling Machines. Machy. (Lond.), vol. 15, no. 390, March 18, 1920, pp. 778-780, 5 figs. Multiple-spindle horizontal drilling machine with cam-controlled quickreturn feed.

Special Types. Special Types of Drilling Machines, F. E. Johnson. Machy. (N. Y.), vol. 26, no 6, Feb. 1920, pp. 511-513, 5 figs.

DROP FORGING

Shipbuilding Application. Drop Forging as Applied to Shipbuilding—I, Joseph L. Murphy. Am. Drop Forger, vol. 6, no. 3, March, 1920, pp. 125-128, 6 figs. Examples of work done in various plants.

DURALUMIN

See Aluminum, Uses in Electrical Industry.

ECONOMIZERS

Savings Due to. Savings Due to Economizer, R. G. Bohn. Power Plant Eng., vol. 24, no. 7, April 1, 1920, pp. 367-370, 2 figs. Methods of calculating heat tranfer, final temperatures and net savings.

ELECTRIC CIRCUITS, D. C.

Regulation of. Inherent Regulation of Continuous Current Circuits, A. L. Ellis and B. W. St. Clair. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 135-142, 13 figs. Discusses voltage changes inherent in d. c. circuits upon change of load. Means of mitigating their effect is given.

ELECTRIC CURRENTS, ALTERNATING

Multiphase, Measurement of. Measurements of Multiphase Currents (Mehrphasenstrommessungen), H. Michalke. Archiv für Elektrotechnik, vol. 8, nos. 6-7, Oct. 10, 1919, pp. 205-209, 2 figs. Compares Fröhlich and Friese systems of connection and shows how to determine total output of multiphase current system by means of torsion dynamometer.

ELECTRIC GENERATORS, A. C.

ELECTRIC MOTORS, A. C.

ELECTRIC PLANTS

ELECTRIC POWER

ELECTRIC WELDING, ARC

Short Arc, Advantages of. The Groove and Arc in Arc Welding, J. F. Springer. Ry. & Locomotive Eng., vol. 33, no. 1, Jan. 1920, pp. 21-22, 2 figs. Advantages of short arc are indicated and preheating of cast-iron welds is advised.

ELECTRICAL MACHINERY

No-Load Losses. A Method for Separating No-Load Losses in Electrical Machinery, Carl J. Fechheimer. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 162-164, 3 figs. Method proposed makes use of idle operation of machine as motor, voltage being varied and speed kept constant. After deducting armature I^2R losses from watts input remaining watts are plotted against voltage. Formula is derived based upon assumption that watts are equal to constant windage and friction loss plus core loss, which latter varies as constant power of voltage.

ELECTRICAL MEASUREMENTS

High Alternating Voltages. Notes on the Synchronous Commutator, J. B. Whitehead and T. Isshiki. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 105-116, 19 figs. Magnitude of errors which may arise due to relatively small amounts of capacity in commutator and galvanometer circuits is studied for number of different connections, and methods for eliminating them are pointed out.

ELECTRIFICATION

See Railway Electrification.

ELECTROMETALLURGY

Rare Metals. Progress in Electrometallurgy of Rare Metals (Neuerungen in der Elektrometallurgie der Edelmetalle), Franz Peters. Glückauf, vol. 55, nos. 47 and 49, Nov. 22 and Dec. 6, 1919, pp. 917-923 and 964-965. Notes on recent electrothermal, wet and cyanide processes, electro-amalgamation, electrolytic purification and gold and silver electroplating.

EMPLOYEES' REPRESENTATION

Clark Equipment Co. Stimulating Co-operation Between Employer and Employee. Machy. (N.Y.), vol. 26, no. 6, Feb. 1920, pp. 544-550, 8 figs. Experience of Clark Equipment Co., Buchanan, Mich., where employees' representation plan is said to be successfully operating.

President's Industrial Conference. Employee Representation Indorsed. Iron Age, vol. 105, no. 13, Mar. 25, 1920, pp. 875-879. Final report of President's second industrial conference. Plan makes machinery available for collective bargaining with only incidental and limited arbitration. Conference places emphasis upon proposal for joint organization and management of employees as means of preventing misunderstanding and of securing co-operative effort.

EMPLOYEES, TRAINING OF

Success in. Results of Mastering Power Production, L. P. Alford. Indus. Management, vol. 59, no. 4, Apr. 1920, pp. 273-280, 9 figs. Instances are related which illustrate successful introduction of systematic training of workmen in factories.

ENAMELING

Enamel-Lined Apparatus. The Manufacture of Enamel Lined Apparatus, Emerson P. Poste. Jl. Am. Ceramic Soc., vol. 2, no. 12, Dec. 1919, pp. 944-976, 34 figs. Deals with manufacture of steel and cast-iron apparatus including by way of contrast details relative to other types of enamels.

EXECUTIVES

Training of. Trains Executives in Its Own Plants. Iron Age, vol. 105, no. 13, Mar. 25, 1920, pp. 869-872, 7 figs. It is said that Westinghouse Electric & Mfg. Co., which has conducted its own schools since 1900, finds plan of benefit in development of men.

EXPLOSIONS

See Coal Dust.

EXPLOSIVES

Explosion Temperature. Comparison of Values for Explosion Temperatures Obtained from Specific Heats with Those Calculated from Explosive Pressures (Comparaison des températures d'explosion calculées à partir des chaleurs spécifiques et des températures d'explosion calculées à partir des pressions explosives), Henri Muraour. Annales des Mines, vol. 9, no. 2, 1920, pp. 166-180, 1 fig. Graphs are plotted from figures given in tables calculated by various writers and from values determined in experiments with several explosives.

High, Manufacture of. The Manufacture and Use of High Explosives, R. Blane. Jl. South African Instn. Engrs., vol. 18, no. 8, Mar. 1920, pp. 128-136, 5 figs. Processes followed at Watford Factory, England, in manufacture of T.N.T and other high explosives.

FACTORY MANAGEMENT

See Industrial Management.

FANS

See Coal Mines, Fans.

FATIGUE

Prevention of. Prevention of Fatigue in Industry—IV, Reynold A. Spaeth. Indus. Management, vol. 59, no. 4, Apr. 1920, pp. 311-313. Results of psychological tests made with large number of girls engaged in gaging and inspecting shells for rifle cartridges. Inspectors recommended by these tests worked much longer than those who were not so recommended, but were hired. (To be concluded.)

The Promotion of Industrial Efficiency. South African Jl. Industries, vol. 3, no. 1, Jan. 1920, pp. 56-68. Discusses influence, upon efficiency and output, of hours of labor, rest pauses and holidays. From Bulletin issued by Advisory Council of Science and Industry of Australia.

Unnecessary Fatigue—The Immense Loss It Causes to the State, Frank B. Gilbreth, Lillian M. Gilbreth. Eng. & Indus. Management, vol. 3, no. 2, Jan. 8, 1920, pp. 50-52. Attention is directed to painting factory interiors with a view to diminishing eye strain, providing chairs for permitting workers to sit during periods of unavoidable delay in standing operations, etc.

FERROALLOYS

Electric-Furnace Manufacture. Recent Developments in the Ferro-Alloy Industry, Robert J. Anderson. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 13, pp. 177-206. Discussion of conditions in industry, with special reference to relations of industry in the United States to that in foreign countries. It is stated that "the electric furnace has made the growth of the industry possible" and that "further development and use of alloy steels is certain to continue and at the same time increase the normal demand for all kinds of ferroalloys."

The Manufacture of Ferro-Alloys in the Electric Furnace, C. B. Gibson. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 17, pp. 265-273. Notes on design of electric furnaces for producing alloys, with data on power consumption and raw materials handled per kw.-year, published by various experimenters.

(*See also Ferrosilicon; Ferrotungsten.*)

FERROSILICON

Fusion Diagram. Contribution to the Study of Ferrosilicon (Contribution à l'étude des ferro-siliciums), M. A. Sanfourche. Revue de Métallurgie, vol. 16, no. 3, May-June, 1919, pp. 217-224, 2 figs. Fusion diagram is constructed from results of experiments. Melting point of iron is lowered from 1515 deg. cent. to 1445 by addition of 1.5 Si; it is raised to 1516 with 3 per cent; it diminishes to 1410 with 6 per cent and again increases to 1427 with 7 per cent; lowering is continuous regularly after this point, it is 1256 with 14.3 per cent, 1392 with 33.3 per cent and 1185 with 53.5 per cent.

FERROTUNGSTEN

Tungsten Content of. The Determination of Tungsten in Ferrotungsten (Zur Wolframbestimmung in Ferrowolfram), Ludwig Lövy. Zeitschrift für angewandte Chemie, vol. 32, no. 100, Dec. 16, 1919, pp. 379-380. Details and results of experiments carried out at the laboratory of the Mannesmann Works in Saarbrücken.

FLIGHT

Transcontinental. Report on First Transcontinental Reliability and Endurance Test Conducted by the Air Service, U.S.A., October 8 to October 31, 1919. Air Service Information Circular, vol. 1, no. 2, Feb. 5, 1920, 35 pp., 1 fig. Experience is discussed principally with regard to influence of organization of personnel in successfully undertaking long-distance flights, and account is given of difficulties encountered in above-cloud flying and other aeronautical problems.

FLOOD CONTROL

Winnipeg. Flood Prevention Projects to Protect Winnipeg, Douglas L. McLean. Can. Engr., vol. 38, no. 14, Apr. 1, 1920, pp. 333-335, 4 figs. It is predicted that unless works are constructed to control flood waters of Red River of the North, next inundation at Winnipeg may cause damage totalling millions of dollars. Reservoirs, dikes and channel improvements are proposed.

FLYING BOATS

Design of. Flying-Boats, G. S. Baker. Flight, vol. 12, no. 11, Mar. 11, 1920, pp. 290-301, 1 fig. Table indicating variation of maximum power with hull beam for machines of 10,000 lb. total displacement. (Continuation of serial.)

FOREMEN

Training of. The foreman and Industrial Democracy, John Calder. Iron Age, vol. 105, no. 14, April 1, 1920, pp. 951-954. Training of foremen to properly handle workmen is urged. Experience of Swift & Co. in this direction is related Paper read before Soc. of Indus. Engrs.

FOUNDRIES

Continuous Operation. Keeping the Foundry in Continuous Operation, John H. Eastham. Can. Foundryman, vol. 11, no. 3, Mar. 1920, pp. 63-65, 4 figs. Survey of practice in various Canadian shops.

Organization. Organization in Non-Ferrous Foundries, O. Bertoya. Metal Industry (Lond.), vol. 16, no. 12, Mar. 19, 1920, pp. 225-229, 10 figs. Order cards, pattern registers and other foundry cards used at various English works, are illustrated.

GOLD MINING

ELECTRICITY IN. Electricity in Gold and Silver Mining, B. B. Beckett. Jl. Electricity, vol 44, no. 6, March 15, 1920, pp. 263-265, 4 figs. Records of power consumption of typical property in Nevada.

GRAB BUCKETS

ELECTRICALLY-DRIVEN. The Modern Development of Electrically-Driven Automatic Grab Buckets. (Die neuzeitliche Entwicklung des elektrisch betriebenen Selbstgreifers), H. Wintermeyer. Elektrotechnische Zeitschrift, vol. 40, nos. 47 and 48, Nov. 20 and 27, 1919, pp. 600-602 and 610-612, 18 figs. Description and illustrations of automatic grab buckets with electric motor attached to frame, with stationary electric drive, with a single stationary driving motor, and with two stationary driving motors.

GRINDING MACHINES

UNIVERSAL. A New Universal Grinding Machine. Machy. (Lond.), vol. 15, no. 389, March 11, 1920, pp. 760-761, 4 figs. Grinder has all-gear drive, weighs 6000 lbs., and is designed for rapidly grinding external, internal and face work. Wheel-slide suspension weight is contained in body of machine and permits slide to be set round to any angle without interference by weight, tension on slide maintained irrespective of its angular position.

HEALTH

BRITISH NATIONAL INSURANCE ACT. The British National Health Insurance System, Henry J. Harris. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 45-59. By act of Dec. 16, 1911, which came into operation on July 15, 1912, system of compulsory health and invalidity insurance was introduced into Great Britain. Article summarizes provisions of this act as amended by legislation of 1913, 1918 and 1919.

MINERS' NYSTAGMUS. Miners' Nystagmus, Lister Llewelyn. Colliery Guardian, vol. 119, no. 3081, Jan. 16, 1920, pp. 170-171. Attributes production of this disease principally to insufficient illumination. Paper read before North Staffordshire Inst. Min. Engrs.

SICKNESS REPORTING. A Standard Method of Sickness Reporting. Monthly Labor Rev., vol. 10, no. 1, Jan. 1920, pp. 220-223. Formulated by Special Committee on Industrial Morbidity Statistics, Vital Statistics Section of Am. Public Health Assn., in co-operation with Public Health Service and with advice and assistance of other Government bureaus.

See also Mining Industry, Health of Workers.

HEAT

DISSIPATION BY VARIOUS SURFACES. The Dissipation of Heat by Various Surfaces, T. S. Taylor. Mech. Engr., vol. 42, no. 4, Apr. 1920, pp. 230-232 and 259, 4 figs. Using bare tin as standard of reference, it was found in experiments that tin covered with 0.013 in. of sheet asbestos dissipated about 37 per cent more heat; asbestos-covered tin having layer of dust, 32 per cent more; and tin with layer of dust only, 7 per cent more. Thickness of 0.4 in. of asbestos resulted in saving of 25 per cent over that of bare pipe, and seven layers of 0.013-in. sheet asbestos loosely applied, 75 per cent.

HEAT TREATMENT

See Steel, Heat Treatment of.

HEAT TRANSMISSION

MASH COOKERS AND BREW KETTLES. Transmission of Heat in Mash Cookers and Brew Kettles (Ueber den Wärmedurchgang an Heizkörpern von Dampfphannen), Karl Fehrmann, Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 40, Oct. 4, 1919, pp. 973-978, 6 figs. Deals with heat transmission in kettles and cookers employed in breweries for boiling mash and wort. Experiments are said to demonstrate the dependence of coefficient of heat transfer on pressure of superheated steam.

HEAVY-OIL ENGINES

NEW TYPE. A New Crude Oil Engine. Engr., vol. 129, no. 3350, March 12, 1920, pp. 278-280, 9 figs. Four-cylinder hot-bulb heavy-oil engine manufactured by W. H. Allen, Son & Co., Ltd., Bedford, England. Engine is said to be capable of running at no load even when operating on heavy residual oil. Reason for this is ascribed to spherical shape of combustion chamber and the fact that, in regulating injection to suit load, governor not only varies quantity but also time of injection, so that at light load injection may take place as much as 50 deg. before dead centre.

HIGHWAYS

See Road Construction.

HOISTS

MINE, ELECTRIC. Electric Winding Engines and Mine Hoists, H. H. Broughton. Elecn., vol. 84, nos. 2182 and 2186, March 12 and April 9, 1920, pp. 286-289, and 390-392, 3 figs. Mar. 12: Methods of estimating moments of inertia are explained, and tables are given indicating inertia of rotors of 50-cycle induction motors and inertia of cylindrical drums. Apr. 9: Geared three-phase window for shaft of uniform slope. (Continuation of serial.)

HOUSES

WALLS, HEAT PERMEABILITY OF. A Simple and Practical Method for Determining Insulation of Various Forms of Building Construction (Ein einfaches, praktisches Verfahren zur Bestimmung des Wärmeschutzes verschiedener Bauweisen), Karl Hencky. Gesundheits-Ingenieur, vol. 42, no. 46, Nov. 15, 1919, pp. 469-472, 3 figs. Methods for determining heat permeability of walls which, it is claimed, is specially adaptable for examination of walls of completed houses.

HOUSES, CONCRETE

OLYMPIA SHOW. Housing Exhibition at Olympia. Concrete & Constructional Eng., vol. 15, no. 3, March 1920, pp. 193-198, 8 figs. Examples of methods of small construction which have been approved by Ministry of Health as suitable for use in connection with housing schemes.

PLASTERED TYPE. Plastered or Concrete Gun Types of Concrete Houses. Eng. & Contracting, vol. 53, no. 12, March 24, 1920, p. 325. Committee report presented at National Conference on Concrete House Construction.

HYDRAULIC TURBINES

SEEWER GOVERNOR. Seewer's Method of Regulating High-Head Pelton Wheels (Seewers Universalregelung für Hochdruck-Pelton-Turbinen), F. Prasil. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 48, Nov. 29, 1919, pp. 1194-1200, 24 figs. Discusses principle of jet dispersion and its realization by means of movable guide plates in the nozzle. Description of construction and operation based on verbal and written report of Seewer, as well as observations of writer and his assistants during tests. Results of experiments are presented with aid of tables and diagrams.

Seewer Universal Governor for High-Pressure Pelton Turbines (Le régulateur universel système Seewer pour turbines hydrauliques à haute chute (Pelton), L. Joeffre. Revue générale de l'Électricité, vol. 6, no. 26, Dec. 27, 1919, pp. 935-940, 7 figs. Deviation of jet is accomplished by dispersing it by means of guiding elements placed in interior of piping. Successful operation of this governor is said to have been secured in trial at laboratories of Zurich Polytechnic School.

HYDROELECTRIC PLANTS

AUTOMATIC STATIONS. Automatic Hydro-Electric Stations, T. A. E. Belt. Elec. World, vol. 75, no. 15, Apr. 10, 1920, pp. 827-830, 6 figs. Performance of plant of Iowa Railway & Light Co. of Cedar Rapids, Iowa and of plant of Ontario Power Co. of Cal. are said to attest reliability of automatic devices.

OUTDOOR INSTALLATION. The Outdoor Generating Station, H. W. Buck. Gen. Elec. Rev., vol. 23, no. 3, Mar. 1920, pp. 194-197, 2 figs. Drawings are shown of hydro-electric plant which was designed and submitted to War Department for development at Muscle Shoals, Ala. It is argued that a plant of this kind is entirely feasible and offers decided advantages from standpoint of economy and construction.

QUEBEC. Hydro-Electric Development at St. Jerome, Que., L. A. Wright. Can. Engr., vol. 38, no. 12, Mar. 18, 1920, pp. 299-302, 7 figs. Concrete dam, with 190-ft. spillway, carries railway siding. Shaft of hydraulic turbine is direct connected to generator and also drives main power shaft of factory by means of speed-reducing silent chain.

SCANDINAVIAN. Power Developments in Scandinavia, J. W. Beckman. Gen. Meeting Electrochemical Soc., April 8-10, 1920, no. 29, pp. 403-409. Résumé of developments of water power for various purposes in Norway and Sweden, showing chronological rise of this development and its cost and the cost of power in those countries. It is estimated that Norway has potential water power of 7,500,000 hp., or 3020 hp. per 1000 inhabitants; Sweden, 6,200,000 hp. or 1050 hp. per 1000; and United States, 67,000,000 hp. or 540 hp. per 1000.

SWITZERLAND. The Navigation and the Harnessing of the Rhine (Le Rhin aux points de vue de la navigation et des forces hydrauliques). Vie Technique & Industrielle, vol. 1, no. 5, Feb. 1920, pp. 357-363, 14 figs. Hydroelectric power plant under construction at Eglisan where it is expected maximum power of 24,000 hp. will be developed. (Continuation of serial.)

ICE PLANTS

ELECTRIC OPERATION. Operating an Ice Plant, C. E. Rose. Refrigerating World, vol. 55, no. 3, Mar. 1920, pp. 13-16, 2 figs. Substitution of electric motors for oil engines at plant of Arkansas Cold Storage Co., Little Rock, Ark., is said to have resulted in decrease of operating cost.

MANAGEMENT. Men and Machinery in the Ice Plant, Erle S. Ormsby. Am. Soc. Refrigerating Engrs., vol. 6, no. 2, Sept. 1919, pp. 103-107. Instances are related where, it is said, introduction of modern methods and organization by modern methods improved efficiency and increased output of plant.

INDUSTRIAL MANAGEMENT

INDUSTRIAL RELATIONS

INSULATION, ELECTRIC

INTERNAL-COMBUSTION ENGINES

LABOR TURNOVER

MEASUREMENT. The Mathematics of Labor Turnover, Carl G. Barth. Indus. Management, vol. 59, no. 4, Apr. 1920, pp. 315-318, 4 figs. It is concluded from mathematical analysis that labor turnover should be measured by dividing average total payroll into factor of total separations of workers from a force.

LATHES

RELIEVING. The Relieving Lathe, Francis W. Shaw. Machy. (Lond.), vol. 15, no. 387, Feb. 26, 1920, pp. 673-684, 11 figs. Principles and operation of spiral relieving mechanism.

TURRET. Labour Saving Machines of the Capstan Lathe and Combination Turret Lathe Class for Commercial Purposes, G. H. Smith. Managing Eng., vol. 6, no. 9, Jan., 1920, pp. 205-211. Suggestions in regard to design of headstocks, pulley mounting, friction clutches, shafts and positive clutches, gearing, etc. Turret Lathe Practice. Machy, (N. Y.), vol. 26, no. 6, Feb., 1920, pp. 514-520, 28 figs. Practice of Warner & Swasey Co., Cleveland, Ohio.

LIGHTING

DAYLIGHT SAVING. Daylight Saving, Preston S. Millar. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb., 1920, pp. 146-158, 13 figs. It is estimated that annual saving in United States of 19,250,000 could be effected by daylight saving, but as economic losses resulting in consequence of interference with agriculture, dairying and truck gardening are valued at over 1,000,000,000, it is concluded that solution of problem lies in diversification of hours of industry.

STREETS. Constant Potential Series Lighting, Chas. P. Steinmetz. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 3, Mar., 1920, pp. 245-248. Comparison of three types of high-voltage street-lighting systems: constant-current series, constant-potential series, and constant-potential multiple systems.

VILLAGE COMMUNITIES. Lighting for Country Homes and Village Communities, Wm. Kunerth. Official Publication Iowa State College Agriculture & Mechanic Arts, vol. 18, no. 19, Oct. 8, 1919, 32 pp., 26 figs. Necessity for better light in village communities is emphasized by statement that New York State Health Department has found that while 21 per cent of country school children have defective vision, only five per cent of city school children are so afflicted. Schemes of illumination for such communities are suggested and their comparative costs indicated.

See also Illumination.

LIGNITE

GERMANY, UTILIZATION IN. The Utilization of Lignite Mines for Alleviation of the Coal Famine (Die Heranziehung des Braunkohlenbergbanes zur Linderung der Kohlennot), H. Kegel. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 6, Feb. 7, 1920, pp. 125-129, 4 figs. States that the German lignite fields contain more than 15 billion tons. The low peat value necessitates production of rich briquets from dry raw lignite; along with recovery of low-temperature tar, lignite coke can be recovered which is said to be a valuable house fuel. (To be continued.)

See also Boiler Firing, Pulverized Lignite; Fuels, Lignite, etc.

LIQUID AIR

See Explosives, Liquid Air.

LOCOMOTIVE BOILERS

TUBE COSTS. Locomotive Boiler Tubes. Ry. Gaz., vol. 32, no. 13, Mar. 26, 1920, pp. 495-496. Table showing cost of tubes for each of 604 engines of London, Brighton & South Coast Railway in copper, brass, and steel.

LOCOMOTIVES

COALING STATION FOR. New Coaling Station Speeds up Engine Service. Ry. Age., vol. 68, no. 14, April 2, 1920, pp. 1085-1087, 3 figs. Station of Pittsburgh and Lake Erie with capacity of 750 tons. Locomotives are given coal, sand, ashes and water service during stop of 20 min. with train leaving on estimated spacing of 10 min.

CYLINDERS. The Casting and Machining of Locomotive Cylinders. Ry. Engr., vol. 41, no. 483, April 1920, pp. 175-183, 12 figs. Methods employed in production of cylinder castings with piston-valve steam chests for three-cylinder express freight locomotive of Great Northern Ry.

ELECTRIC. *See Electric Locomotives.*

MINE. *See Mine Locomotives.*

STOKERS ON. Mechanical Stokers on Locomotives. Ry. Jl., vol. 26, no. 2, Feb. 1920, pp. 17-19. Committee report before Traveling Engrs.' Assn.

VALVES, ADJUSTMENT OF. Effect of Lame Engines on Fuel Consumption, J. W. Hardy. Ry. Jl., vol. 26, no. 2, Feb. 1920, pp. 24-26. Tests made on Houston & Galveston divisions of Southern Pacific to determine increase in fuel consumption resulting from operating locomotive engines with valves out of adjustment. Paper read before Int. Ry. Fuel Assn.

See also Railway Repair Shops.

LUBRICATING OILS

ECONOMIC UTILIZATION. The Economic Utilization of Lubricating Oils (Wirtschaftliche Schmieröl-Ausnutzung), H. Winkelmann. Kraft und Betrieb, vol. 3, nos. 14 and 15, Oct. 15 and Nov. 1, 1919, pp. 154-155 and 163-164. Instructions for utilization of lubricating oil and the production and application of substitutes.

LUBRICATION

FATTY OILS AND ACIDS. The Theory and Practice of Lubrication; The "Germ" Process, Henry M. Wells and James E. Southcombe. Jl. Soc. Chem. Industry, vol. 39, no. 5, March 15, 1920, pp. 51T-55T and (discussion) pp. 55T-60T, 5 figs. Writers conclude from physical and physico-chemical study of lubrication, as well as from their experience that fatty compounded oils are unnecessary for many purposes of lubrication and that fatty acids can entirely and completely displace oils for such purposes.

MAGNETOS

HIGH TENSION, CHARACTERISTICS OF. Characteristics of High-Tension Magnetos. Nat. Advisory Committee for Aeronautics, report no. 58, 1920, 23 pp. 22 figs. Analysis of successive operations, showing connection between several phenomena concerned and their relative importance on basis of energy transformed. Method for measuring ratio of turns of high-tension magnetos or induction coils is suggested and result of its application to various magnetos is quoted.

MANGANESE

ORE, ELECTRIC SMELTING OF. Electric Furnace Smelting of Montana Manganese Ores, E. S. Bardwell. Chem. & Metallurgical Eng., vol. 22, no. 15, Apr. 14, 1920, pp. 681-685. Balance sheet of 10-day electric furnace test. Discussion of slag and furnace losses, together with method of calculating charges. Description of electric furnace plant at Great Falls. Paper read before Am. Electrochemical Soc.

MANOMETERS

GAGING OF. Tavel Apparatus for Gaging Metallic Manometers (Appareil, système Tavel, pour l'étalonnage des manomètres métalliques). Génie Civil, vol. 76, no. 2, Jan. 10, 1920, pp. 47-48, 1 fig. Manometric column of apparatus is made up of steel-pipe sections, each of length corresponding to mercury column giving pressure of 1 kg. p. sq. in. Isolated nickel points at each junction of sections are connected in series with battery and lamp. As mercury ascends pressure is read off by number opposite last lamp lighted.

MARINE BOILERS

COMBUSTION-CHAMBER TEMPERATURE, MEASUREMENT. Observing Temperatures in Marine Propelling Installations. Engr., vol. 129, no. 3348, Feb. 27, 1920, pp. 226-228, 10 figs. Diagrams are presented which show results of measuring temperatures in combustion chambers in multi-tubular marine boiler by means of thermo-couples. Paper read before Northeast Coast Instn. Engrs. & Shipbuilders.

MARINE ENGINES

VERTICAL QUADRUPLEX-EXPANSION TYPE. Machining and Erecting Marine Engines, William Wylde and R. M. Sherman. Int. Mar. Eng., vol. 25, no. 4, April 1920, pp. 305-318, 21 figs. Practice at shops of Newport News Shipbuilding and Dry Dock Company, Newport News, Va. Engine, construction of which is described, has cylinders 24 in., 35 in., 51 in., and 75 in. in diameter, by 51-in. stroke. Stephenson link-valve gear and is designed for 2600 i.hp. at 70 r.p.m.

See also Diesel Engines, Cammellaird.Fullagar; Two vs. Four-Cycle; Oil Engines, Bergsund; Neptune.

MARINE STEAM TURBINES

HIGH-SPEED IMPULSE TYPE. High-Speed Impulse Type Marine Turbines. Shipbuilding & Shipping Rec., vol. 15, no. 11, March 11, 1920, pp. 337-340, 7 figs. Units constructed for ship propulsion by Fraser & Chalmers Engineering Works, Erith, England.

METAL ORES

BALKAN STATES, DEPOSITS IN. The Balkan States as a Source of Supply of Raw Material for the German Metal Industry (Der Balkan als neue Rohstoffquelle der Metal-industrie Deutschlands), H. Ed. Kepler. Metall und Erz, vol. 16, nos. 16, 18 and 19, Aug. 22, Sept. 22 and Oct. 8, 1919, pp. 373-375, 415-420 and 444-455, 4 figs. Notes on gold, silver, zinc, lead, copper, chromium, granite, limestone and other ores found in Macedonia, Moravia and Bulgaria. (Continuation of serial.)

MILLING CUTTERS

DROP FORGINGS FOR. High Speed Steel Drop Forgings for Milling Cutters and Special Tools, A. F. MacFarland. Jl. Am. Steel Treaters Soc., vol. 2, no. 6, March 1920, pp. 279-287, 17 figs. Advantages claimed are more homogeneous structure, lower machine cost, lower scrap losses, time saved in making tool, elimination of physical defects, and increased production obtained per tool.

SCREW-THREAD, TESTS OF. Cutting Pressure, Cutting Speeds, Feed and Life of High-Speed Steel Screw Thread Milling Cutters, H. Ederheimer. Eng. & Indus. Management, vol. 3, no. 10, Mar. 4, 1920, pp. 309-311, 5 figs. Results of tests showing influence of cutting feed and speed of high-speed screw thread milling cutters of 38.5, 48 and 53 mm. diameter upon number of cuts possible before first regrinding is necessary and upon total life of cutter, as well as dependence of life upon cutting pressure. Translated from Zeitschrift des Vereines Deutscher Ingenieure.

The Cutting Pressure, Cutting Speed, Feed and Durability of High-Speed-Tool-Steel Thread-Milling Cutters (Schnittdruck, Schnittgeschwindigkeit, Vorschub und Lebensdauer bei Gesindefräsern aus Schnellstahl), Hermann Ederheimer. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 7, Feb. 14, 1920, pp. 149-153, 15 figs. By means of experiments described, writer has determined for thread-milling cutters of 38.5, 48 and 53.5 mm. diam., influence of cutting speed and feed, on number of cuts up to first grinding and on total life of cutters, as well as the dependence of life of cutter on cutting pressure.

OIL FIELDS

Decline Curves. Variation in Decline Curves of Various Oil Pools Roswell H. Johnson. Min. & Metallurgy, no. 157, section 8, Jan. 1920, 5 pp. Based on data given in Manual of the Oil and Gas Industry published by Treasury Department, Washington.

Marine Boilers. Utilization of Liquid Fuel in Marine Boilers (Utilisation des combustibles liquides dans les chaudières marines). Bulletin technique du Bureau Veritas, vol. 2, no. 2, Feb. 1920, pp. 26-28, 7 figs. Description of Koerting, and Wallsend-Howden burners.

Mechanical Atomizers. Burning Oil with Mechanical Atomizers, Robert Sibley and C. H. Delany. Elec. World, vol. 75, no. 13, March 27, 1920, pp. 727-728, 4 figs. Advantages claimed for mechanical atomizing burner are that mixture of air and gases occurred throughout entire furnace and that large quantities of oil can be burned in furnace of given volume. Disadvantages mentioned are tendency for small orifice in burner to choke up and separate adjustment of air supply for each burner required every time there is change in quantity of oil burned.

Safety in Firing. The Installation and Cost of Oil Firing (Einbau und Kosten von Oel-Feuerungen), H. Viesohn. Jl. für Gasbeleuchtung, vol. 62, no. 50, Dec. 13, 1919, pp. 746-752, 10 figs. Notes on safety measures to be observed and experiences in the Hattersheim waterworks. Frankfort. Regulations are formulated for preventing accidents with tar-oil firing and it is concluded that its use should be of great value in bridging over the coal shortage in German public and industrial works. Address read before Central Rhenish Assn. of Gas and Water Engineers.

OIL WELLS

Pumping. Oil Well Pumping Methods and Equipment, Seth S. Langley. Eng. & Min. Jl., vol. 109, no.,13, March 27, 1920, pp. 748-754, 7 figs. Details of equipment necessary and statement of costs in California.

OPEN-HEARTH FURNACES

Design. Design of Open Hearth Furnaces, A. D. Williams. Iron Age, vol. 105, no. 12, March 18, 1920, pp. 805-806, 2 figs. Bearing of time factor on thickness of checker brick is illustrated by graph showing rise in temperature on medium line of fireclay brick in percentage of surface temperature.

OXY-ACETYLENE WELDING

Forge Work. Fusion Welding as Applied to Forge Work, S. W. Miller. Ry. Jl., vol. 26, no. 2, Feb. 1920, pp. 20-22. Oxy-acetylene process is perferred to electric process for fusion welding because "while the electric process is considerably cheaper. There is greater liability with the electric process of not getting through fusion at the beginning of the work. Paper read before Am. Drop Forge Assn.

Steam Boilers. Autogenous Welding and the Steam Boiler, T. H. Fenner. Power House, vol. 13, no. 6, Mar. 20, 1920, pp. 134-136 and 143, 7 figs. Examples of firebox-sheet failures are given, together with rules of Steam Boiler and Fly Wheel Service Bureau, New York, organization which includes engineering staffs of large insurance companies of North American continent.

PAVEMENTS, WOOD BLOCK

Street Railway Tracks. Wood Block Paving Between Street Railway Tracks, Andrew F. Macallum. Am. City (City Edition), vol. 22, no. 3, March 1920, pp. 237-238, 2 figs. Method of tract construction employed on Elgin Street, Ottawa, in 1919. Wood blocks are laid on pitch cushions and sandstone blocks on mortar cushions.

PEAT

Classification of. Quality and Value of Important Types of Peat Material, Alfred P. Dachnowski. U. S. Department of Agriculture, bul. no. 802, Dec. 29, 1919, 40 pp. A classification of peat based upon its botanical composition and physical and chemical characteristics.

PETROLEUM

Geology. Geology Distillation of Petroleum, Bailey Willis. Min. & Metallurgy. no. 157, section 10, Jan. 1920, 7 pp., 1 fig. Peckham's hypothesis is applied to and found to be confirmed in Appalachian field.

Industry, Features of. Methods for More Efficiently Utilizing our Fuel Resources, Chester G. Gilbert and Joseph E. Pogue. Gen. Elec. Rev., vol. 23, no. 3, Mar. 1920, pp. 198-207, 5 figs. Treats of nature and occurrence of petroleum and essential features of petroleum industry, including production, transportation and refining, as well as distribution of products. Chart is included showing relative values of principal petroleum products in United States from 1899 to 1914.

Mapping. The Barometric Method of Geologic Surveying for Petroleum Mapping, Frederic H. Lahee. Economic Geology, vol. 15, no. 2, Mar. 1920, pp. 150-169, 8 figs. Comparison is included of barometric and plane table methods.

PHOTOGRAPHY

See Aerial Photography.

PILES

Greosote Treatment. A Conclusive Record for Creosoted Piles. Ry. Maintennaec Engr., vol. 16, no. 1, Jan. 1920, pp. 23-25, 4 figs. Three-mile approach on Indiana end of Louisville & Nashville bridge over Ohio river at Henderson, Ky., of which 177 bents at south end were built of creosoted, long-leaf, yellow pine piles has had, it is said, a useful life of 35 years.

PLATES

Flat, Strength and Stiffness of. The Strength and Stiffness of Flat Plates. F. H. Hummel. Mech. World, vol. 67, no. 1732, March 12, 1920, pp. 172-173. Table giving maximum deflection at centre, stress at centre and maximum stress in plate for plates of different forms and dimensions.

PLOWS

See Tractors, German.

POWER FACTORS

Measurement for Rates. Measurement of Power Factor for Rates, C. E. Brown. Elec. World, vol. 75, no. 13, March 27, 1920, pp. 721-722, 5 figs. It is indicated how average power factor may be obtained over period of time by using standard watt-hour meters connected to register energy and reactive components of load.

PRODUCTION

Central Consulting Council. The Question of Production, John Holloway. Eng. & Indus. Management, vol. 3, no. 2, Jan. 8, 1920, pp. 40-43. Suggests collaboration and exchange of ideas between different manufacturers as to best plans of increasing production and setting up Central Consulting Council in various districts of county (England) which would constitute an avenue through which ideas and practices for intensified production could be distributed.

PROJECTILES

Velocity Measurement. The Measurement of Projectile Velocities, Paul E. Klopsteg and Alfred L. Loomis. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 98-104, 6 figs. Development of "Aberdeen chronograph" adopted as standard by Ordnance Department during war and designed for rapid production. Comparative results as to speed and accuracy of measurement of Aberdeen and Boulangé chronographs are given.

PULVERIZED COAL

Cost of. Powdered Coal Winning Out in Special Fields, Charles Longenecker. Coal Trade Jl., vol. 51, no. 13, March 31, 1920, pp. 353-355, 4 figs. Table is given showing comparative cost of powdered coal with other fuels.

Distribution to Small Plants. Distributing Pulverized Coal to Small Plants, B. J. Cross. Coal Age, vol. 17, no. 14, April 1, 1920, pp. 635-637, 5 figs. It is stated that using pulverized coal from central plant is becoming general practice in West. It is emphasized that pulverized sub-bituminous coal must be kept dry and air so far as possible excluded if fuel is to be handled safely.

Economy of Burning. Forecasting the Fuel of the Future, V. Z. Caracristi. Chem. Age, vol. 2, no. 2, Feb. 1920, pp. 361-365, 2 figs. Economies of burning coal, pulverized and in suspension, are pointed out.

Metallurgical Furnaces. Pulverized Coal in Metallurgical Furnaces at High Altitudes, Otis L. McIntyre. Mech. Eng., vol. 42, no. 4, Apr. 1920, pp. 225-227, 4 figs. Preliminary experiments with pulverized coal which led to installation of apparatus for its use in blast furnaces, reverberatories and sintering machines of Cerro de Pasco Copper Corporation at La Fundiction, Peru, works situated at an elevation of 14,000 ft.

Milwaukee Plant Equipment. Pulverized Coal in a Milwaukee Power Plant. Elec. Rev. (Chicago), vol. 76, no. 12, Mar. 20, 1920, pp. 469-472, 5 figs. Plant layout, methods and special features of Oneida Street station of Milwaukee Elec. Ry. & Light Co. Details of equipment and sizes of motors used. Data on operating experiences.

RAILWAYS

BALTIC STATES. The Railroads of Lithuania and the Baltic States Under Russian Administration and Their Development During the War (Die Eisenbahnen Litauens und des Baltikums zu rushischer Zeit und ihre Entwickelung durch den Krieg), Georg Neumann. Zeitung des Vereins deutscher Eisenbahnverwaultungen, vol. 59, nos. 83 and 84, Nov. 1 and 5, 1919, pp. 879-883 and 893-895, 4 figs. Account of the neglected state of these railroad systems before the war and improvements effected by German railroad engineers which, it is claimed, will prove of future benefit to the countries in question.

BRITISH, SPEEDS IN 1919. Railway Speed in 1919. Engr., vol. 129, no. 33-42, Jan. 16, 1920, pp. 59-60. Tables giving fastest start-to-stop and longest non-stop runs in United Kingsdom.

RECLAMATION

POSSIBILITIES IN U. S. Report on Development of Unused Lands. Eng. News-Rec., vol. 84, no. 8, Feb. 19, 1920, pp. 375-377. Study of possibilities of reclaiming arid, wet and cut-over timber lands, made by U. S. Reclamation Service in latter part of 1919.

REFRACTORIES

CHEMICAL ANALYSIS. Are Images in Chemical Analysis, Wm. Roy Mott. General Meeting Am. Electrochemical Soc., April 8-10, 1920, paper 11, pp. 121-160. Method of chemical analysis is formulated which consists of bringing materials to be tested into or under influence of carbon arc in specified manner. It is claimed that method has unique advantages in analysis of all refractory materials, minerals and compounds, and that major constituent of any mineral alloy, refractory or chemical precipitate, can be easily identified in less than ten minutes.

PHYSICAL PROPERTIES OF. Physical Characteristics of Specialized Refractories, M. L. Hartman and O. A. Hougen. Gen. Meeting Am Electrochemical Soc , April 8-10, nos 22 & 23, pp 349-354, 9 figs., pp. 355-358—1 fig. No. 22: Comparative tests of resistances of 12 different kinds of refractory bricks to rapid cooling by air blast after heating to 1350 deg. cent. Percentage loss of weight varied from 0.3 per cent with bonded carborundum to 100 per cent with chrome, silica and magnesia samples. No. 23: Account of tests of different refractory materials at ordinary temperatures and at 1350 deg. cent., made by carborundum cutting wheel under constant pressure and measuring depth abraded in given time.

INDIA. The Organization of Scientific Work in India. Nature, vol. 104, no. 2625, Feb. 19, 1920, pp. 659-654. Policy contemplated consists in centralizing scientific work in Imperial Department of Industries of Government of India.

INDUSTRIES AND. How Research Helps Rejuvenate Industries, Arthur Van Vlissinger, Jr. Factory, vol. 24, no. 6, Apr. 1, 1920, pp. 947-952, 4 figs. Based on experience of various manufacturers.

NATIONAL RESEARCH COUNCIL. Constructive Scientific Research by Co-operation, Burton E. Livingston. Science, vol. 51, no. 1316, Mar. 19, 1920, pp. 277-283. Slow progress of science is attributed to scientific research problems being attacked by individuals or by small, local groups of workers influenced by a single individual. It is suggested to organize system of co-operative research under auspices of National Research Council.

RETAINING WALLS

LARGE BUILDINGS. Retaining Walls for Large Buildings. Concrete & Constructional Eng., vol. 15, no. 3, Mar. 1920, pp. 155-160, 5 figs. Instead of customary procedure of excavating whole area, trenches were dug against road frontages to accommodate retaining walls, sufficient amount of earth being left against backs of street frontage to render them self-supporting.

ROAD CONSTRUCTION

LIMITING FACTORS. Factors Which Will Limit Highway Construction During the Coming Season, O. P. Chamberlain. Good Roads, vol. 19, no. 9, Mar. 3, 1920, pp. 123-126. Labor difficulties in plants producing road building materials, it is feared, will limit highway construction.

PROGRESS IN 1919. County Highway Data. Public Works, vol. 48, no. 12, Apr. 3, 1920, pp. 276-287. Tabulated data on county highway work done during 1919, practice as to road shoulders, resurfacing county highways and maintenance of water-bound macadam county highways.

TOP SOIL BASE. Value of Top Soil as Base for Modern Highways, D. S. Humphrey. Eng. News-Rec., vol. 84, no. 12, Mar. 18, 1920, pp. 566-567. It is recommended that earth's crust be unmolested and that side ditching be avoided.

ROADS

TESTING WITH CORE DRILLS. Core Drills as a Means of Securing Road Samples for Testing Purposes, F. A. McLean. Contract Rec., vol. 34, no. 11, Mar. 17, 1920, pp. 255-257, 2 figs. Because samples secured by core drills are of uniform size, it is believed that they may be depended upon to give more accurate indication of strength and wearing qualities of road bed than those extracted by hand.

ROADS, CONCRETE

NEW YORK PRACTICE. State Highway Construction in New York, Jas. H. Sturdevant. Public Works, vol. 48, no. 10, Mar. 20, 1920, pp. 207-209. Standard practice for concrete roads.

Utilizing Old Macadam to Increase Width of Concrete Road. Eng. News-Rec., vol. 84, no. 10, Mar. 4, 1920, pp. 461-463, 3 figs. Reconstruction of old macadam roads by building concrete surface in two strips with old surface left in middle. Work done by New York State Highway Department.

ROLLING MILLS

STEEL-CHANNEL, LUXEMBURG. The Rolling of Steel Channels (Le calibrage des fers en U), Norbert Metz. Revue de Métallurgie, vol. 16, no. 3, May-June 1919, pp. 157-174, 50 figs. Technique of manufacturing practice followed at mills of Dudlange, Luxemburg, with tables of dimensions of their standard sections.

RUDDERS

CAST STEEL. Machining Rudders for Troopships, Albert Fisher. Am. Mach., vol. 52, no. 12, Mar. 18, 1920, pp. 610-612, 8 figs. Methods used in making cast-steel rudders for 8000-ton troopships in shop located more than 350 miles from yard where they were built.

KITCHEN TYPE. Manœuvring and Reversing Rudders. Engr., vol. 129, no. 33-35, Feb. 6, 1920, p. 149, 10 figs. Form evolved by J. G. E. Kitchen of Lancaster, England. Essential parts of rudders consist of two curved deflectors formed as parts of circular cylinder, partly enclosing propeller. Both deflectors are pivoted at top and bottom on common centres, and their opening or closing regulates speed of ship.

SAFETY

DEPARTMENTAL MEETINGS. Safety and Welfare Work in Industrial Plants, H. A. Schultz. Proc. Engrs. Soc. Western Pa., vol. 35, no. 8, Nov. 1919, pp. 395-423 and (discussion) pp. 424-426. Recommends holding departmental safety meetings regularly, conducting safety lectures periodically in training and apprenticeship schools and holding safety rallies occasionally for workmen and their families. Practice of U. S. Steel Corp. is quoted as example.

SCIENTIFIC MANAGEMENT

See Industrial Management; Taylor System; Time Study.

SCREW MACHINES

LARGE FOUR-SPINDLE. Four-Spindle Screw Machines for Large Work. Iron Age, vol. 105, no. 14, April 1; 1920, pp. 935-939, 13 figs. Machines are evolution in development of multiple-spindle screw machines to meet requirements of users for machines for larger diameter work than could be produced on 2¼-in. machines. They are built by National Acme Co., Cleveland.

SCREW THREADS

TIGHT-FITTING. Tight-Fitting Threads for Bolts and Nuts, Chester B. Lord. Mech. Eng., vol. 42, no. 4, Apr. 1920, pp. 222-224 and 259, 5 figs. Conclusions drawn from experimental work are in part: Cause of stripped threads is lack of room into which metal can flow; pitch diameter and lead should be the same in both threads; and thread angle should differ by not more than 10 deg.

SEMI-STEEL

MANUFACTURE. Manufacture of Smi-steel for Shells, Frank E. Hall, Min. & Metallurgy, no. 157, section 15, Jan. 1920, 7 pp. Requirements of U. S. Ordnance Department.

STEAM PIPES

SUPERHEATED-STEAM, INSULATION OF. Losses from Long Superheat Steam Pipes Determined by Means of Curves, Thomas G Estep. Blast Furnace & Steel Plant, vol. 8, no. 4, Apr. 1920, pp. 259-261 and 263, 3 figs. Curves showing (1) most economical thickness of pipe covering for various temperature differences and heat costs, (2) total heat loss per 100 lineal feet of pipe in B.t.u. per hr. when covered with most economical thickness of pipe covering and (3) temperature drop per 100 lineal feet of pipe when covered with most economical thickness of pipe covering.

STEAM POWER PLANTS

STATISTICS FOR COMPARISON. Essential Statistics for General Comparison of Steam Power Plant Performance, W. S. Gorsuch. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 132-134. Method for comparing efficiencies between different plants without going into detailed study of thermal characteristics of plants or introducing power costs. Essential items of steam-power plant performance that should be recorded and uniform method of expressing them are given in tabulated form, with illustration demonstrating advantage of proposed method.

STEAM TURBINES

PUMPING SETS. High Pressure Turbine Pumping Set. Engr., vol. 129, no. 3348, Feb. 27, 1920, pp. 228-229, 5 figs. Set manufactured by Mather and Platt, Limited, Manchester, England. Overall length of complete set is 31 ft. 3½ in. height 5 ft. 5½ in.; overall width, 6 ft. 7½ in. Motor designed for three-phase 50 periods and pressure of 6600 volts.

60,000-KW. Most Powerful Prime Mover in the World. Ry. & Locomotive Eng., vol. 33, no. 1, Jan. 1920, pp. 1-2, 1 fig. Turbine of 60,000 kw. continuous capacity at 74th Street Station of Interborough Rapid Transit Co., New York.

See also Marine Steam Turbines.

STEEL

ALLOY. *See Alloy Steels.*

CRITICAL POINTS. Practical Determination of the Critical Points of Steels by the Differential Method (Sur la détermination pratique des points critiques des aciers par la méthode différentielle), A. Portevin and V. Bernard. Revue de Métallurgie, vol. 16, no. 3, May-June 1919, pp. 175-192, 15 figs. Experience of writers in application of Roberts Austen's differential method. Substitution of Chevenard differential expansimeter in place of Saladin-Le Chatelier double galvanometer has been found by them to increase considerably accuracy of method.

FORGED VS. ROLLED BARS. Rolled and Forged Steel Bars, J. H. Higgins. Jl. Am. Steel Treaters Soc., vol. 2, no. 6, Mar. 1920, pp. 295-298, 12 figs. Results of investigations conducted at works of Camden Forge Co., in which forged bars were found to give better results in natural, annealed and heat-treated state, both physically and micrographically.

HIGH-SPEED. *See Steel High-Speed.*

MANGANESE. *See Steel Manganese.*

MOLYBDENUM. *See Steel Molybdenum.*

PRODUCTION DURING WAR. The Iron and Steel Trades During the War, M. S. Birkett. Iron & Coal Trades Rev., vol. 100, no. 2716, Mar. 19, 1920, pp. 381-384. Tables showing production and exports of iron and steel of each of chief steel-producing countries for 1913, 1918, and 1919. Paper read before Roy. Statistical Soc.

SULPHUR AND PHOSPHORUS, INFLUENCE OF. Contemporary Foreign Opinion on Sulphur and Phosphorus in Steels, Henry S. Rawdon. Chem. & Met. Eng., vol. 22, no. 13, Mar. 31, 1920, pp. 609-611. Result of canvassing opinions at English and French metallurgical centres as to how moderate increases in sulphur and phosphorus would influence laborarory tests and service performance of steels.

STEEL CASTINGS

OPEN-HEARTH VS. ELECTRIC-FURNACE. Melting Changes Bring Lower Costs, Foundry, vol. 48, no. 7, Apr. 1, 1920, pp. 253-258, 9 figs. Experience of Bayonne Steel Castings Co., Bayonne, N. J. Open-hearth displaced electric furnace in steel foundry when power charges became excessive. It is said that open-hearth furnace produces steel which is satisfactory in quality for all requirements and at less cost than was possible with electric furnace.

STEEL, HEAT TREATMENT OF

CARBONIZING, BOXES FOR. Pots and Boxes Used in Carbonizing, H. H. Harris. Iron Age, vol. 105, no. 10, Mar. 4, 1920, pp. 729-731. Comparative value of cast iron, steel and special alloys for pots and boxes used in heat-treating processes. Each material is found to be best suited for certain specific applications, and it is observed that the only true scale of value is that of comparing their life under service conditions with their initial cost and determining how many units of service each renders per dollar investment.

CARBURIZING. Pre-Heating in Carburizing, Theodore G. Selleck. Jl. Am. Steel Treaters Soc., vol. 2, no. 6, Mar. 1920, pp. 288-295, 6 figs. Advantages claimed for pre-heating method of carburizing are greater uniformity of results, speed of operation, economy and convenience as well as, in most cases, greater cleanliness and more comfort for operator.

HARDENING. Hardening Steel Without Distortion, Fred H. Colvin. Am. Mach.; vol. 52, no. 10, Mar. 4, 1920, pp. 489-493, 7 figs. Electric furnace and equipment designed to take into account discrepancies between true temperature of steel at any instant and indications of thermocouple on record.

HIGH STRENGTH FROM. The Elastic Development of Steel, Sidney Cornell. Chem. & Metallurgical Eng., vol. 22, no. 15, Apr. 14, 1920, pp. 677-680, 9 figs. Account of research undertaken by Remington Arms Union Metallic Cartridge Co. to salvage about one million bayonets rejected by inspectors of English Government. Research consisted principally of testing steel heat-treated at various temperatures. It was brought out that unusually high strengths could be produced in medium-and high-carbon steels by high drawing after quenching.

HUMP METHOD. Heat Treating Steel by New Method Claims Valuable Results. Automotive Industries, vol. 42, no. 14, April 1, 1920, pp. 812-815, 6 figs. Hump method. Material is quenched at definite point in heating when temperature rise shows marked decrease and change from previous uniform rate. Advantages claimed are that it results in higher grade and more uniform output and simplifies handling and cleaning.

TRACTOR PARTS. Heat Treating Cast Steel for Tractors, Fred Grotts. Am. Drop Forger, vol. 6, no. 3, Mar. 1920, pp. 123-124, 4 figs. Survey of developments of present practice.

STEEL, HIGH-SPEED

MELTING UP BROKEN TOOLS. Reclaiming and Using Broken High Speed Tools, John A. Hope. Can. Machy., vol. 33, no. 31, Mar. 25, 1920, pp. 312-313, 1 fig. Construction and operation of high-speed steel melting furnace.

STEEL, MANGANESE

ANALYSIS OF. Generalization of Method of Analyzing Manganese in Special Steels by Persulphate in the Presence of Chromium and Tungsten (Généralisation de la méthode du dosage du manganèse dans les aciers spéciaux par le persulfate en présence du chrome et du tungstène), P. Nicolardot and A. Levi. Revue de Métallurgie, vol. 16, no. 3, May-June 1919, pp. 201-216. Rapidity and accuracy between 0.1 and 3 per cent are claimed for this method.

STEEL MANUFACTURE

CHEMICAL REACTIONS IN. Balanced Reactions in Steel Manufacture, Andrew McCance. Chem. & Metallurgical Eng., vol. 22, no. 14, Apr. 7, 1920, pp. 634-638, 1 fig. Argument is advanced that oxidation of iron during melting is by steam, that iron oxide is soluble in molten iron, and that silicon is reduced from acid slag by carbon. Observations on composition of gas in blow-holes and in solution in solid steel. Paper presented before Faraday Society.

ELECTRIC-FURNACE. The Electric Furnace and the Central Station, H. L. Hess. General Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper 14, pp. 207-220. Economic aspect of securing power from central station for manufacturing electric steel is discussed. World's production in 1918 amounted to 1,155,273 tons, the United States leading with 511,364 tons.

See also Rolling Mills.

STEEL, MOLYBDENUM

COMMERCIAL, DATA ON. Commercial Molybdenum Steel Test Data. Raw Material, vol. 2, no. 3, Mar. 1920, pp. 87-91, 6 figs. Test results obtained by Carbon Steel Co., Pittsburgh, Pa., are tabulated and charts are given which indicate influence of heat treatment upon various physical properties of metal.

DETERMINATION OF MOLYBDENUM. Determination of Character and Quantity of Molybdenum in Steel and Iron (Ueber den Art-und Mengennachweis des Molybdäns im Stahl und Eisen), Seigfried Laurens Malowan. Zeitschrift für anorganische und allegameine Chemie, vol. 108, no. 1, Aug. 13, 1919, pp. 73-80, 1 fig. Deals with a color reaction of molybdenum which, it is claimed, has never been used in elementary analysis. Writer, after investigating action of xanthic acid and its salt on molybdenum compounds, seeks to demonstrate their adaptability for a given amount of molybdenum in steel.

STORAGE BATTERIES

STREET RAILWAYS

STRESSES

TANK STEAMERS

10,000-Ton. 10,000-Ton Oil Tank Steamship. Int. Mar. Eng., vol. 25, no. 4, Apr. 1920, pp. 272-274, 8 figs. Dimensions: Length overall, 439 ft. 7 in.; length between perpendiculars, 424 ft.; beam molded, 58 ft.; draft, 25 ft. 5 in.; deadweight tonnage, 10,000 tons; service speed, 10½ knots. Propulsion is by single screw of four-bladed built-up type driven by vertical inverted triple-expansion surface-condensing engine.

TANKS

Oil, Reinforced-Concrete. Large Concrete Oil Tank Built for Panama Canal, R. C. Hardman. Eng. News-Rec., vol. 84, no. 8, Feb. 19, 1920, pp. 380-381, 2 figs. Tank is 115 ft. in diameter and 30 ft. deep. Concrete was approximately 1 :2 :4 mix, proportions used at start of walls being one cement, 2¼ sand and 3¾ crushed stone. Steel stresses of 16,000 lb. per sq. in. were used. Capacity is 55,000 bbl.

TAYLOR SYSTEM

Advantages of. The Taylor System and Its Applications (Le système Taylor et quelques considérations sur son application), R. de Vallière. Bulletin Technique de la Suisse Romande, vol. 46, nos. 5 and 6, Mar. 6 and 20, 1920, pp. 49-53 and 61-63. It is shown how essence of system consists, not in requiring greater exertion of worker, but in regulating his normal exertion in a manner to increase production. Economical advantages of introducing Taylor system in manufacturing establishments are pointed out. It is visualized that principles upon which Taylor system is based could be profitably applied to financial enterprises and governmental departments as well. (Concluded.)

TELEGRAPHY

Multiplex. High-Frequency Multiplex Telephony and Telegraphy (Hochfrequenz-Mehrfachtelephonie und-Telegraphie Längs Leitungen), H. Fassbender and E. Habann. Jahrbuch der drahtlosen Telegraphie und Telephonie, vol. 14, no. 5, Oct. 1919, pp. 451-478, 17 figs. Discussion of development of a wire system completed before armistice and later enlarged upon to meet demands of German postal and railroad administrations. Both military and civil apparatus are described. The multiplex transmission of news is defined as a recent departure in feeble-current technique suggested by the introduction of vacuum tubes in wireless telegraphy.

See also Electric Arc A. C., Speaking.

TELEPHONY

See Telegraphy, Multiplex.

TERMINALS, FREIGHT

Motorization of. *See Motor-Truck Transportation, Cincinnati Freight Terminals.*

TERMINALS, LOCOMOTIVE

Lehigh Valley Railroad. New Engine Terminal for Lehigh Valley Railroad. News-Rec., vol. 84, no. 11, Mar. 11, 1920, pp. 514-516, 7 figs. Details of engine house, coaling station and ashpit.

Rectangular. A Terminal Built for Special Operating Conditions. Ry. Age, vol. 68, no. 13, Mar. 26, 1920, pp. 1025-1030, 10 figs. Special design of yards necessitated in order to serve coal traffic movement westward from Utah coal field. Among distinctive features is rectangular engine terminal, innovation undertaken because of considerable number of Mallet engines which must be accommodated at that terminal and difficulty encountered in keeping turn-table pit clear for operation.

TERMINALS, MARINE

Philadelphia Army Base. Planning and Progress on a Big Construction Job—I, Charles Penrose. Eng. News-Rec., vol. 84, no. 12, Mar. 18, 1920, pp. 554-561, 7 figs. How records were kept at Philadelphia army base in order to plan and schedule work, to follow progress of construction, and to control future operations.

Transit Sheds. Steel Design and Erection on Transit Sheds at Halifax Ocean Terminals, J. Robertson. Contract Rec., vol. 34, no. 12, Mar. 24, 1920, pp. 268-269, 4 figs. Sheds 1210 ft. long and 87 ft. wide containing 3600 tons of steel are said to have been erected in six weeks with twin derrick traveler.

THERMIT WELDING

Railway Repair Shops, In. Where Thermit Means Economy. Ry. Jl., vol. 26, no. 2, Feb. 1920, pp. 14-16, 10 figs. Examples of welding by thermit process at repair shops of various railways.

THERMOELECTRICITY

Voltage Measurement. A Precision Galvanometric Instrument for Measuring Thermoelectric E. M. Fs., T. R. Harrison and Paul D. Foote. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 2, Feb. 1920, pp. 165-176, 11 figs. Scheme is explained whereby ordinary millivoltmeter may be converted into instrument in which usual errors arising from variable line resistance are eliminated. Instrument measures true e. m. f. in simple circuit or if connected across resistance or net-work through which current flows, it indicates potential drop which would have existed if instrument had not been connected.

TIME STUDY

Applications. Time Study in an Engineering Works, W. Symes. Eng. & Indus. Management, vol. 3, no. 10, Mar. 4, 1920, pp. 296-298, 1 fig. Method of time study is outlined and, by way of illustration, its application to various machinery operations is explained.

Economical Advantages. Time and Job Analysis in Management—I, William O. Lichtner. Indus. Management, vol. 59, no. 4, Apr. 1920, pp. 301-306, 4 figs. Economical advantages of introducing time and job analysis and its relation to low costs and the labor question.

TIN DEPOSITS

Tungsten, Association With. Tin and Tungsten Deposits: The Economic Significance of their Relative Temperatures of Formation, William R. Jones. Bul. Instn. Min. & Metallurgy, no. 186, Mar. 1920, pp. 1-27, 28 figs. partly on 9 supp. plates.

TIN MINING

Australia. The Production of Tin in Australia, J. B. Lewis. Chem. Eng. & Min. Rev., vol. 12, no. 136, Jan. 5, 1920, pp. 137-144, 4 figs. Potentialities of large low-grade deposits.

TITANIUM

Alloys, Electrical Properties. Some Electrical Properties of Titanium Alloys, M. A. Hunter and J. W. Bacon. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, no. 28, pp. 391-401, 2 figs.

TRADE UNIONS

Temperament and. Trade Unionism and Temperament, E. E. Southard. Indus. Management, vol. 59, no. 4, Apr. 1920, pp. 265-270. Suggestion is advanced that studies both by psychiatrists and psychologists will contribute much to our understanding of trade unionism which, it is believed, may be manifestation of mass psychology. Paper read before Nat. Committee for Mental Hygiene.

TRANSFORMERS

Insulation of Windings. Insulation Problems for High-Tension Transformers (Isolierprobleme an Transformatoren für hohe Spannungen), J. Müller. Elektrotechnik und Maschinenbau, vol. 37, nos. 37 and 38, Sept. 14 and 21, 1919, pp. 413-416 and 428-433, 24 figs. Notes on designs and insulation of windings for high tensions. Writer observes that every insulation problem requires careful and thorough examination, because in no other field is failure of rigid application of formulæ so complete.

TRESTLES

See Bridges, Railways, Wooden.

TUBES

Brazing. Brazing Steel Tubes and Sheets. Am. Mach., vol. 52, no. 11, Mar. 11, 1920, pp. 543-544. Results of experimental joints made with different brazing metals. Brazing metal containing 83 per cent copper and 17 per cent zinc gave stronger joints. It was also found that joints made with acetylene torch were distinctly stronger than those made in gas flame and that heat-treatment of joints brazed with acetylene gave marked increase in strength.

WELDING

Gas Torch. Modern Welding and Cutting, Ethan Viall. Am. Mach., vol. 52, no. 12, Mar. 18, 1920, pp. 603-609, 33 figs. Examples illustrating possibilities of gas torch as welding tool.

Iron Wire. Welded Line Joints Prove Their Efficiency, B. J. Schwendt. Ry. Signal Engr., vol. 13, no. 3, Mar. 1920, pp. 97-102, 13 figs. Various types of joints are illustrated and characteristics of each are discussed. Statistical data are presented in which comparative figures, based on tests made by Bureau of Standards, Washington, D. C., indicate electrical and mechanical properties of both welded and soldered galvanized iron line wire.

See also Electric Welding, Electric Welding, Arc; Oxy-Acetylene Welding; Thermit Welding.

WELFARE WORK

Co-operative Stores. The Packard Co-operative Store, D. G. Stanbrough. Indus. Management, vol. 59, no. 4, Apr. 1920, pp. 281-283. How movement for purchasing of groceries started in 1917 by 35 employes has grown so rapidly under company's auspices that yearly sales increased from $25,000 in 1917 to $175,000 in 1919.

Restaurant Plan. A Novel Employees' Restaurant Plan, F. L. Prentiss. Iron Age, vol. 105, no. 9, Feb. 26, 1920, pp. 591-592, 3 figs. Serve-self system of operating restaurant has been discarded and waste is avoided by patrons ordering one day what they will eat the next.

WIND TUNNELS

Recording Instruments. Recording Instruments for Use in Wind Tunnels, Albert A. Merrill. Aviation, vol. 8, no. 5, Apr. 1, 1920, pp. 190-191, 5 figs. Attachment to aerodynamical balance employed for experimental work at Throop College, Pasadena, Cal., for recording graphically variation of force in Tunnel.

See also Aeroplane Propellers.

WIRE

See Welding, Iron Wire.

WOOD PRESERVATION

Treating Plants. The Wood-Impregnating Plant of the Royal Swedish State Railway Administration at Pitea. (Die Holzimprägnieranstalt der Kgl schwedischen Staatseisenbahnverwaltung zu Pitea), Friedrich Moll. Zeitschrift des Vereines deutscher Ingenieure, vol. 63, no. 44, Nov. 1, 1919, pp. 1095-1096, 5 figs. Description of plant in which impregnation with fluorine salt mixtures is carried out according to process widely used in Germany. Plant was designed and constructed by a Berlin company.

Zinc Chloride, Treatment. Report of Committee on Wood Preservation. Ry. Age (Daily Edition), vol. 68, no. 11c, Mar. 18, 1920, pp. 924-928. Specification for preservative treatment of wood with zinc chloride. Recommended by Committee of Am. Ry. Eng. Assn.

ZINC

Electrolytic Production. Methods for Analytical Control of Electrolytic Zinc Production, H. F. Bradley. Chem. & Metallurgical Eng., vol. 22, no. 14, Apr. 7, 1920, pp. 651-654, 1 fig. Methods used at laboratory of Judge Mining & Smelting Co., Park City, Utah, for analysis of leach and electrolyte solutions, concentrates, calcines and leach residues, zinc-dust precipitate and anode scale from cells.

ZINC ALLOYS

Zinc-Aluminum-Copper. Zinc Alloys with Aluminum and Copper, Walter Rosenhain, John L. Haughton and Kathleen E. Bingham. Metal Industry (Lond.), vol. 16, no. 14, Apr. 2, 1920, pp. 271-279, 6 figs. Based on tensile and hardness tests and tests to determine heat treatment on mechanical properties conducted at National Physical Laboratory, Teddington, England. In alloys tested copper content was limited to 10 per cent and aluminum to 15 per cent.

ZINC METALLURGY

Electrolytic Plant. Electrolytic Zinc Plant of the Judge Mining & Smelting Co., L. W. Chapman. Chem. & Met. Eng., vol. 22, no. 12, Mar. 24, 1920, pp. 537-540, 5 figs. Plant is designed to treat concentrates obtained from sulphide ore containing zinc, lead and silver.

The Electrolytic Zinc Plant of the Judge Mining & Smelting Co., at Park City, Utah, L. S. Austin. Min. & Sci. Press, vol. 120, no. 12, Mar. 20, 1920, pp. 409-411, 2 figs.

Muffles. The Effect of Pressure in Zinc Muffles on the Extraction of the Metal (Ueber den Einfluss der in den Zinkmuffein herrschenden Spannung auf das Metallausbringen), O. Mühlhaeuser. Metall und Erz, vol. 18, no. 16, Aug. 22, 1919, pp. 363-373, 7 figs. Results of experiments are summarized and presented in tabular form. It is pointed out that imperviousness of muffles is variable and no two vessels seem to be alike. In all cases it is said to be advisable to keep the zinc furnaces at as high pressure as possible.

Engineering Index

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AERONAUTICS

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See also Flight.

AEROPLANE ENGINES

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AIR COMPRESSORS

LUBRICATION OF. Lubrication of Air Compressors, H. V. Conrad. Boiler Maker, vol. 20, no. 4, Apr. 1920, pp. 95-97. Satisfactory lubrication of air-compressor cylinders is said to be attained by securing (1) reduction of friction to a minimum, and (2) elimination of carbonization of oil as far as possible.

AIRCRAFT CONSTRUCTION MATERIALS

TIMBER, X-RAY EXAMINATION OF. The Examination of Aircraft Timber by X-Rays, R. Knox and G. W. C. Kaye. Trans. Faraday Soc., vol. 15, part 2, Feb. 1920, pp. 60-65, 17 figs on 6 supp. plates. Method of examining aeroplane timber parts by X-rays developed by Aeronautical Inspection Department of Royal Air Force, England. It is said that no difficulty is experienced in detecting by that method concealed knots, resin pockets and grub holes, as well as excess or deficiency of glue in glued joints. It is added that in almost all instances fluorescent-screen examination suffices.

AIRSHIPS

RIGID CONSTRUCTION. Rigid Airships and Their Development, Alan Anderson. Aeronautical Jl., vol. 24, no. 112, April 1920, pp. 143-171 and discussion pp. 171-184, 20 figs. Details of construction of British types are outlined and problems of mooring, water recovery, and passenger accommodation are discussed, specially in regard to their bearing on structure and performance. Reliability of airship flying is concluded from official reports stating that during ten months of 1918 prior to armistice, proportion of days upon which airships carried out their flights was 97 per cent. a record which was obtained before the problem of mooring rigid airships has been solved.

Rigid Airship Construction, A. E. Rankin. Flight, vol. 12, no. 16, April 15, 1920, pp. 417-418, 6 figs. Type of bracing is suggested in which only five rivets are used instead of 12 rivets used in conventional type.

See also Aeroplanes, Transoceanic Service.

ALCOHOL

BY-PRODUCT OF COAL DISTILLATION. Alcohol — A New By-Product of Coal Distillation (L'alcool, nouveau sous-produit de distillation de la houille), E. de Loisy. Revue de Métallurgie, vol. 17, no. 2, Feb. 1920, pp. 56-62. Process at Skinningrove Works, England. Cold charcoal absorbs ethylene from gases and gives it off when heated.

Alcohol from By-Product Gas. Gas Age, vol. 45, no. 7, Apr. 10, 1920, pp. 294-295. It is reported that motor fuel prospects in England have been brightened by the Skinningrove experiments converting ethylene into alcohol.

MOTOR FUEL. Alcohol As Fuel—I. Automobile Engr., vol. 10, no. 137, April 1920, pp. 157-160, 5 figs. Survey of chemical and physical properties of alcohol which determine its adaptability as motor fuel.

ALLOY STEELS

COEFFICIENT OF EXPANSION. The Coefficient of Expansion of Alloy Steels, John A. Mathews. Min. & Metallurgy, no. 158, section 8, Feb. 1920, 4 pp. Measurements were effected for various alloy steels at temperature range from 25 to 100 deg. cent. Values obtained ranged from 11.37 to 12.76 parts per million per deg. cent.

See also Steel, High-Speed.

ALLOYS

ELECTRIC PRODUCTION OF. The Electrical Production of Alloys, Ralph M. Major. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 33, pp. 441-447, 2 figs. Account of producing alloys in two Héroult furnaces having different electrode regulating equipment, also discussion of general conditions of electric melting as compared with any other process of producing alloys. Manufacture and properties of Nichrome. Kromore, Mangaloy, Climax and Inbar, are included.

ALUMINUM

BRITISH FOUNDRY PRACTICE. British Aluminum Foundry Practice—II. Metal Industry, (N. Y.), vol. 18, no. 5, May 1920, pp. 221-224. From booklet of British Aluminum Co., Ltd., London.

CASTINGS, HARD SPOTS IN. Investigate Hard Spots in Aluminum, Robert J. Anderson and Julian H. Capps. Foundry, vol. 48, no. 9, May 1, 1920, pp. 337-342, 23 figs. Investigations at Bur. of Mines are said to have disclosed that hard spots in aluminum-alloy sand castings are caused by metallic and non-metallic inclusions. Metallic inclusions are said to be due to admixtures of iron, and non-metallic are attributed to carelessness.

ALUMINUM ALLOYS

UNSOUND CASTINGS. Blowholes, Porosity, and Unsoundness in Aluminum-Alloy Castings, Robert J. Anderson. Dept. Interior, Bur. Mines, no. 241, 34 pp., 16 figs. It is concluded from results of experimental work ,survey of experience of various foundries and examination of current literature, that: (1) Number of blowholes present is directly proportional to pouring temperature, (2) undoundness varies with temperature to which charge is heated, the higher the temperature the more unsound being the resultant castings, and (3) unsoundness is function of length of time of melting, the longer any melt is held in furnace the more unsound being the castings, irrespective of temperature of heating and pouring temperature.

USES. Increasing Use of Alloyed Aluminum as an Engineering Material—I, G. M. Rollason. Indus. Management, vol. 59, no. 5, May 1920, pp. 387-390, 9 figs. Properties of aluminum and aluminum alloys are given, and their recent uses are pointed out, particularly in automobile industry. Paper read before New York Section, Am. Soc. M. E.

AMMONIA

SYNTHESIS OF. Direct Synthesis of Ammonia by Catalysis Under Pressure (Contribution à l'étude de la synthèse directe de l'ammoniaque par catalyse sous pression), Marcel Guichard. Bulletin de la Société d'Encouragement pour l'Industrie Nationale, vol. 132, no. 1, Jan.-Feb. 1920, pp. 71-102, 22 figs. Over 400 catalyzers were experimentally studied. From data obtained and analytical consideration, gaseous cycle is formulated for determining best conditions of industrial synthesis of ammonia.

AMPLIFIERS

THERMIONIC INTER-VALVE RESISTANCE COUPLINGS. An Amplifier Employing Thermionic Inter-Valve Resistance Couplings, John Scott-Taggart. Elec. Rev. (Lond.), vol. 86, no. 2214, Apr. 30, 1920, pp. 549-550, 1 figs. It is proposed to use in place of ordinary conductors of high impedance a conductive path between cathode and anode. Application of arrangement to reception of wireless signals is explained.

APPRENTICES, TRAINING OF

WILLYS-OVERLAND SYSTEM. Successful Substitute for Apprenticeship. Machy. (N. Y.), vol. 26, no. 8, Apr. 1920, pp. 746-748, 3 figs. System of labor-training developed by Willys-Overland Co., Toledo, Ohio, which keeps the "improvers," as men taking course of training are called, engaged upon regular lines of production work. How system is applied.

ARMY SUPPLY BASES

PHILADELPHIA. Equipment of Army Supply Base at Philadelphia. Elec. Rev. (Chicago), vol. 76, no. 18, May 1, 1920, pp. 715-718, 8 figs. Electrical equipment of piers and warehouses to be used at loading station. Includes electrically operated cranes, electric trucks for moving traffic and electrically operated elevators.

ASPHALT

SOURCES OF. The Lake Asphalt Industry, J. Strother Miller. Chem. & Metallurgical Eng., vol. 22, no. 16 Apr. 21, 1920, pp. 749-754, 8 figs. Description of most important sources of natural asphalt, Trinidad Lake and Bermudez Lake; and refining and fluxing. Ultra-microscope is said to show presence of colloidal clay particles. Review of theory of colloidal state.

AUTOMOBILE ENGINES

CYLINDERS. Accelerating Cylinder Production. Foundry, vol. 48, no. 345, Apr. 15, 1920, pp. 311-318, 15 figs. Details of foundry of the Nash Motor Co. in Kenosha, Wis., which, it is said, produces all its own castings. Attention to minute detail and adoption of every mechanical aid to speed and accuracy have, it is claimed, increased output of automobile cylinders in this plant.

Air-Cooled Cylinders for Franklins. Am. Mach., vol. 52, no. 14, April 1, 1920, pp. 705-718, 58 figs. Method of machining engine cylinders for Franklin, Packard, Cadillac, Chandler and Peerless automobiles.

DESIGN. Modern Tendencies in Engine Design, L. H. Pomeroy. Automotive Manufacturer, vol. 62, no. 1, Apr. 1920, pp. 13-16, 1 fig. Summary of attempts made to employ other fuels than gasoline, and of studies undertaken to determine crankcase lubricant dilution by gasoline and best materials for various engine parts. (Concluded.)

PISTONS, MACHINING. Machining Automobile Engine Pistons, Ralph E. Flanders. Machy. (N. Y.), vol. 26, no. 8, Apr., 1920, pp. 710-713, 7 figs. Description of methods and tooling equipments used in quantity production of automobile engine pistons.

Methods of Making the Winton Piston, Fred H. Colvin. Am. Mach., vol. 52, no. 18, April 29, 1920, pp. 927-934, 27 figs. Practice in Winton, Franklin, White and Packard Shops.

Making 21,000 Pistons a Day, Fred H. Colvin. Am. Mach., vol. 52, no. 16, April 15, 1920, pp. 819-828, 31 figs. Practice in Ford, Cadillac and Autocar shops.

TESTING. Organization and Method in the Testing Laboratory, P. S. Tice. Automotive Industries, vol. 42, no. 19, May 6, 1920, pp. 1061-1063. System is suggested which aims at eliminating haphazard running of tests by keeping complete and adequate records. Reference is made to method employed in dynamometer laboratory of carbureter division of Stewart-Warner Speedometer Corp.

See also spark plugs.

AUTOMOBILES

BODY DESIGN. Automobile Body Design, William Brewster. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 215-218, 5 figs. Such considerations are taken up as size of relative positions of seats and doors, position of extra tires, design of windshield and influence of weight upon design.

Fine Coachwork from British Shops in Lanchester. Automotive Manufacturer, vol. 62, no. 1, April 1920, pp. 10-12, 3 figs. Details of vee-fronted sedan called saloon body, on 40-hp. six-cylinder chassis.

DRIVE SHAFTS. Electrically-Heated Tubing for Automobile Drive Shafts. Automotive Manufacturer, vol. 62, no. 1, April 1920, pp. 21-23, 3 figs. Method of heat-treating developed by Snead & Co. Electric current of low voltage and high amperage is employed to heat tubing by its own internal resistance.

BEAMS

BEARINGS

BEARINGS, BALL

BLASTING

BOILER FEEDWATER

BOILER FIRING

BOILER FIRING

BOILER PLATE

BRIDGES SWING

BUSES

See Street Railways, Street Cars vs. Omnibuses.

CABLES, ELECTRIC

CHARACTERISTICS OF. Characteristics of Three-Phase Lines for Harmonics of Third Order (Constantes caractéristiques des lignes triphasées pour les harmoniques 3), R. Swyngedauw. Revue générale de l'Electricité, vol. 7, nos. 15 & 16, April 10 and April 17, 1920, pp. 483-492 and pp. 515-526, 6 figs. Formulæ for electrical characteristics of long armored cables in underground lines. Phenomena in lines not exceeding 20 or 30 km. can well be studied, it is stated, neglecting effective resistance and reactance and taking into consideration only persistance and susceptance. Experimental measurements of reactance, impedance and resistance of cables 4 to 10 km. long.

COMBINED TELEPHONE AND TELEGRAPH. Combined Telephone and Telegraph Cables: Important Trials, A. H. Roberts and W. J. Hilyer. Post Office Elec. Engrs. Jl., vol. 13, part 1, April 1920, pp. 29-48, 13 figs. Tests made on 76-pair 40-lb. balanced telephone cable in order to ascertain practicability of providing combined telephone and telegraph cables between London and Manchester. Over loop circuit 186 miles in length, speed of 150 words per minute duplex was obtained with 40 volts on differential system and 60 volts on bridge system; induction on loaded telephone pairs was less from differential than from bridge Wheatstone working. Other results are mentioned.

CAR WHEELS

CHILLED-IRON, MANUFACTURE. Manufacturing Chilled Iron Car Wheels—II and III, H. E. Diller. Foundry, vol. 48, nos. 345 and 346, April 15 and May 1, 1920, pp. 304-310, 16 figs., and pp. 353-359, 13 figs. Description of cupola practice and methods of core room. Description of molding methods.

CARS, FREIGHT

INSPECTION OF. The Inspection of Freight Equipment, L. K. Sillcox. Ry. Mech. Engr., vol. 94, no. 5, May 1920, pp. 285-288. Air brakes and foundation brake rigging; estimated braking power; defects of arch bars and trucks. Fifth article.

REPAIRING OF. Freight Car Repairs on the E. P. & S. W., A. M. Dow. Ry. Mech. Engr., vol. 94, no. 5, May 1920, pp. 281-284, 11 figs. Outline of policies followed by El Paso & Southwestern Railway.

CAST IRON

IRON CARBIDE IN. The Solubility and Stability of Iron Carbide in Cast Iron, J. A. Holden. Foundry Trade Jl. & Pattern Maker, vol. 22, no. 220, April 1920, pp. 270-271, 3 figs. Experiments are related and it is concluded from them that carbide is stable while it is in solid solution even in presence of considerable percentage of silicon.

CEMENT GUN

APPLICATIONS. Construction Work by Cement Gun Methods, Arthur J. White. Proc. Engrs. Soc. Western Pennsylvania, vol. 36, no. 2, March. 1920, pp. 109-130 and (discussion) pp. 131-144, 13 figs. Examples are presented of structures covered with gunite. Among these are rapid transit bridge, Long Island, N. Y., roof of power plant of Ford Motor Co., Detroit, and tanks of People Gas, Light & Coke Co., Chicago. Advantages of covering steel structures with gunite are enumerated.

CEMENT MANUFACTURE

KILN INSULATION. Cement and Lime Kiln Insulation, K. A. Grogan. Cement, Mill & Quarry, vol. 16, no. 8, April 20 ,1920, pp. 27-32, 16 figs. Advantages of insulating cement and lime kiln are pointed out, and curves are shown comparing amount of heat lost through kiln crown when insulated and uninsulated. Sil-O-Cel insulating brick is recommended as "highly effective for all classes of insulating service.

CENTRAL STATIONS

ELECTRIC-FURNACE LOADS. Electric Furnace Power from the Standpoint of the Central Station, E. A. Wilcox. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 38, pp. 589-609, 2 figs. Questions relative to operation of electric furnaces from central power station are discussed, such as comparison with other kinds of power station loads, methods of charging for power, offpeak service (particularly to steel castings plants), continuous vs. intermittent service, power rate schedules and different systems of furnaces and their demands on power supply.

The Electric-Arc Melting Furnace and the Central Station Electric Company, Augustus C. Smith. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 43, pp. 701-709, 7 figs. Effect electric-arc melting furnace has on power supply, particularly surges on line because of careless handling of furnace during melting-down period. Experience is quoted of abnormal requirements of number of furnaces and it is pointed out how economical operation may be effected by careful working.

LARGE, INDUSTRIAL NEED OF. Urgent Need of Super-Power Developments, C. F. Lacombe. Elec. World, vol. 75, no. 20, May 15, 1920, pp. 1128-1131, 1 fig. It is said that increased industrial production and shortage of power over large manufacturing districts call for immediate development of great power projects and elimination of small steam plants.

CHUCKS

MAGNETIC. The Magnetic Chuck, Its Design and Varied Uses, J. H. Moore. Can. Machy., vol. 23, nos. 16 & 17, April 15 and 22, 1920, pp. 369-372, 10 figs., and pp. 394-399, 12 figs. Fundamental principles of design, together with varied uses of magnetic chuck are discussed.

CIRCUIT BREAKERS

AUTOMATIC. Automatic Circuit-Breakers (Dispositifs automatiques de sectionnement des lignes électriques), P. Charpentier. Revue générale de l'Électricité, vol. 7, no. 15, Apr. 10, 1920, pp. 493-497, 16 figs. Oil three-pole circuit breaker built by Maljournal and Bourron Electric Works.

CITY PLANNING

See Terminals, Railway, Relation to City Plan.

COAL

SPONTANEOUS IGNITION. A Method of Determining the Relative Temperatures of Spontaneous Ignition of Solid Fuels, F. S. Sinnatt and Burrows Moore. Jl. Soc. Chem. Industry, vol. 39, no. 6, March 31, 1920, pp. 72T-78T, 8 figs. Experiments planned (1) to determine relative tendencies to spontaneous ignition in oxygen of certain finely powdered fuels; (2) to examine influence of degree of fineness of particles on temperature recorded; and (3) to examine influence of volatile matter upon temperature recorded. Apparatus consisted of heavy cast-iron vessel in which enclosed nickel crucible could be raised to any desired temperature.

COAL BREAKERS

PENNSYLVANIA. Price-Pancoast Breaker Relies on Gravity to Do Much of the Work, Dever C. Ashmead. Coal Age, vol. 17, no. 18, April 29, 1920, pp. 841-844, 5 figs. Installation of coal company in—Pennsylvania where only two conveyors are installed, one for handling condemned coal and one for handling rock. Coal is conveyed by gravity.

COAL HANDLING

CAR-DUMP COAL PIER. Design and Operation of Modern Car-Dump Coal Pier. Eng. News-Rec., vol. 84, no. 16, April 15, 1920, pp. 759-762, 8 figs. Coal pier of C. R. R. of N. J., at Jersey City terminal, built to handle 400 cars per day, and equipped with two independently operated cardumpers. Reinforced-concrete girder trestles, it is stated, have proved more economical than steel.

LOADING MACHINE. Coal Loader Based on a New Principle. Coal Age, vol. 17, no. 19, May 6, 1920, pp. 900-902, 3 figs. Joy loading machine. Machine is electrically driven and is 29½ ft. long, 5 ft. wide and 5 ft. high. Gathering mechanism consists of pair of gear fingers, the initial movement of which is forward into coal, after which there is raking motion across coal face, then rearward movement toward loading conveyor, then return to starting position.

COAL MINES

EXHAUST-STEAM UTILIZATION IN. Cutting Power Costs at an Anthracite Mine by Utilizing Exhaust Steam, Dever C. Ashmead. Coal Age, vol. 17, no. 20, May 13, 1920, pp. 983-986, 7 figs. Experience of Price-Pancoast Coal Co., Scranton, Pennsylvania, with low-pressure turbines utilizing exhaust steam from several engines.

MANAGEMENT METHODS. Management Methods That Will Secure Results in Mine Construction, Charles Gottschalk. Coal Age, vol. 17, no. 20, May 13, 1920, pp. 987-989. Organization required for simultaneously carrying on various operations involved in constructing surface layout and in developing underground nucleus for coal mine of large capacity.

COAL MINING

COAL-CUTTING EQUIPMENT. Approved Explosion-Proof Coal-Cutting Equipment, L. C. Ilsey and E. J. Gleim. Dept. Interior, Bur. Mines, bulletin 78, 1920, 53 pp., 35 figs. Gives Bureau's schedule and shows its application to testing of commercial apparatus. Describes electrical apparatus that has been tested and approved under this schedule and also tests on which approvals were based.

ELECTRIC POWER IN. Using Electric Power for Mining Coal. Black Diamond, vol. 64, no. 17, April 24, 1920 pp. 462-465, 7 figs. Details of Kentucky and West Virginia Power Company's plant which supplies power to practically all the coal mines in Logan district and to most of those in Mingo County, West Virginia and Pike and Perry Counties, Kentucky.

SHAFT LAYOUT. Mine Layout Arranged for Large Tonnage and Minimum Handling Cost, James R. Elliott. Coal Age, vol. 17, no. 20, May 13, 1920, pp. 978-979, 3 figs. Shaft layout at Mather Collieries, Greene County, Pennsylvania.

COAL STORAGE

ECONOMY AND ADVANTAGES Storage of Coal—An Engineers' Problem. Indus. Management, vol. 59, no. 5, May 1920, pp. 399-408, 3 figs. Symposium by prominent engineers. Economy of coal storage, its use for stabilizing coal industry, and its advantages to the mining industry, are discussed.

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COLUMNS

[illegible]

CONCRETE

[illegible]

CONCRETE CONSTRUCTION

[illegible]

CONCRETE CONSTRUCTION, REINFORCED

[illegible]

CONCRETING

See Cement Gun.

COPPER

[illegible]

CRANES

[illegible]

CUPOLAS

[illegible]

DAMS

[illegible]

HYDRAULIC FILL. Hydraulic Fill Dams for Miami Conservancy District. Public Works, vol. 48, no. 17, May 8, 1920, pp. 301-394, 2 figs. Method of constructing earth dams with core embankments built up between side slopes enclosed by parallel levees, all made of materials excavated by dragline machines, hauled in dump cars, pumped to site and deposited by hydraulic operations.

MOVABLE-CREST. Design and Operation of Movable Crest Dams, Wm. G. Fargo. Mun. & County Eng., vol. 58, no. 4, April 1920, pp. 157-159, 8 figs. Gates and movable weirs are classified and various means for operating gates are illustrated.

WANAQUE, NEW JERSEY. The Wanaque Dam. Public Works, vol. 48, no. 14, Apr. 17, 1920, pp. 324-330, 4 figs. North New Jersey water supply is to be provided by impounding run-off from a 94-sq.mi. water shed in a reservoir of eleven billion gallons capacity, to be built in 3½ years. Details of special construction features involved by the requirements of the rigid specifications for imperviousness of embankment and concrete; extreme depth of core-wall trench, and maintenance during first year of construction operations of continuous flow in this river and water supply to large paper mill that will remain located and operating near center of dam site for months while construction is in progress around it.

DIESEL ENGINES

SKANDIA MARINE. First Large Marine Diesel Engines Complete on Pacific Coast, Frederik Van Rossen Hoogendyk. Pacific Marine Rev., vol. 17, no. 4, Apr., 1920, pp. 107-111, 5 figs. Description of 1100-i.p.h. Diesel engines building at Skandia Pacific Oil Engine Co. under license of Dutch Werkspoor Co. for U. S. Shipping Board Emergency Fleet Corporation. Engines are 4-cycle, single-acting marine crosshead type, 20½-in. bore, 35½-in. stroke and 135 r.p.m.; built-up crankshaft is 12½ in. in diameter.

DITCHES

See Drainage.

DRAINAGE

DITCHES, MAINTENANCE OF. Studies of Maintenance Work on Drainage Ditches, H. M. Lynde. Eng. News-Rec., vol. 84, no. 15, April 8, 1920, pp. 713-715, 2 figs. It is concluded from experiments conducted by Bur. Public Roads that channels of drainage ditches need to be cleaned annually to insure proper flow capacity and sanitary conditions, but that banks need to be cleared only at intervals of from 3 to 5 years.

UNDERGROUND SYSTEMS. The Spacing and Depth of Laterals in Iowa Underdrainage Systems and the Rate of Run off from Them with Data from Investigations, W. J. Schlick. Official Publication Iowa State College of Agriculture & Mechanic Arts, vol. 17, no. 20, Oct. 16, 1918, 119 pp. 70 figs. Investigation undertaken to collect information as to operation of typical and special underdrainage systems with a view to suggesting improvements in underdrainage systems in use.

DRAWING

PNEUMATIC DIE CUSHIONS. Pneumatic Cushions in Metal-Drawing Operations, John Nelson. Machy. (N. Y.), vol. 26, no. 8, Apr., 1920, pp. 726-729, 5 figs. Description of various types of pneumatic die cushions used in connection with punch presses, and methods of installing.

DRILLING

CRADLE FORGINGS. Unusual Methods of Securing Extreme Accuracy—II, A. L. DeLeeuw. Am. Mach., vol. 52, no. 18, April 29, 1920, pp. 937-941, 16 figs. Operations of drilling and boring two main holes in cradle forging are taken up in detail. Methods used, types of tools and working limits are discussed.

DROP FORGING

MINNESOTA PLANT. New Drop Forge Shop Built in Northwest. Am. Drop Forger, vol. 6, no. 4, April 1920, pp. 170-174, 7 figs. Attention is called to arrangement which permits of production to travel one way by electric motors, trucks and cranes.

DRYDOCKS

PHILADELPHIA NAVY YARD. Soft Ground Complicates Dry-Dock Construction, Charles A. Lee. Eng. News-Rec., vol. 84, no. 16, April 15, 1920, pp. 748-752. 7 figs. Account of changes made necessary in construction of graving dock being built at Philadelphia Navy Yard by appearances of water-bearing strata which were not indicated in preliminary borings.

DYESTUFFS

PROPERTIES OF. Chemical and Physical Properties of Dye-Stuffs, J. Traube and F. Koehler. Sci. Am. Monthly, vol. 1, no. 5, May 1920, pp. 408-411. Experimental study of diffusion of acid and basic dyes in gelatin substances. Translated from Internationale Zeitschrift fuer Physikalish-Chemische Biologie.

ELECTRIC CIRCUITS

PROTECTION OF. Switching and Protection of Transmission Circuits, S. Q. Hayes. Elec. Jl., vol. 17, no. 5, May 1920, pp. 178-188, 29 figs. Deals principally with oil circuit breakers, relay equipment, lightning arresters, station layouts and system arrangement. A few high-voltage transformers used on some of larger systems are described. (To be continued.)

ELECTRIC DRIVE

See Paper Mills.

ELECTRIC FURNACES

AJAX-NORTHRUP. The Ajax-Northrup Electric Furnace, Dudley Willcox. Metal Industry (N. Y.), vol. 18, no. 5, May 1920, pp. 213-216, 7 figs. It is said that there is no necessity in this type for interlinkage of magnetic circuit with electric circuit.

CARBON ELECTRODES, MANUFACTURE OF. Manufacture of Carbon Electrodes for Electric Furnace Purposes, Walter L. Morrison. Chem. & Metallurgical Eng., vol. 22, no. 16, Apr. 21, 1920, pp. 741-744. Description of raw materials used and their preparation, calcining furnaces and plant operation in the "rammed process" of manufacturing electrodes for electric furnace purposes, with an outline of practical deductions obtained from experimental data.

INDUCTION. Induction Furnaces and Their Application in Iron and Steel Industries (Les fours à induction et leur application dans l'industrie du fer et de l'acier). Houille Blanche, vol. 19, no. 37-38, Jan.-Feb. 1920, pp. 12-16, 16 figs. Electrical and structural details of following types: Colby, Kjellin, Hjorth, Ferranti, Frick, Schneider, Gin, and Röchling-Rodenhauser. (To be continued.)

METALLURGICAL USES. The Electric Furnace as Applied to Metallurgy, Clarence Jay West. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 35, pp. 461-552. List of magazine references on construction and operation of electric furnace as applied to metallurgy of iron and steel and non-ferrous metals.

The position of the Electric Furnace in Iron and Steel Metallurgy. Lewis B. Lindemuth. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 39, pp. 611-627. Comparison is made between physical and chemical characteristics and phenomena of four steel-making processes, namely, bessemer, open-hearth, crucible and electric furnace. Undue praise and claims for electric furnace method and process is deprecated, but it is claimed that when properly installed and operated it is metallurgically the best and economically the cheapest.

OPERATING COSTS. Electric Melting in an Oil Furnace, William J. Reardon. Metal Industry (N. Y.), vol. 18, no. 5, May 1920, pp. 207-212, 4 figs. Comparative cost data of electric, Schwartz and coke pit furnaces are included.

RESISTOR TYPE. High Temperature Electric Heat-Treating Furnace, Geo. H. Holden. Sci. Am. Monthly, vol. 1, no. 5, May 1920, pp. 440-444, 11 figs. Electric furnaces of resistor type built with approval of Navy Department to fill out their contract requiring delivery of 5,000,000 of 3-in. and 4-in. gun forgings.

TRANSFORMERS FOR. Interlacing Furnace Transformer Busbars, C. B. Gibson, Elec. World, vol. 75, no. 18, May 1, 1920, pp. 991-993, 4 figs. Scheme for interlacing bus bars for three-phase transformer.

See also Alloys, Electric Production of; Steel, High-speed, Electric Furnace Manufacture.

ELECTRIC GENERATORS

See Electrical Machinery, Brushes; Design.

ELECTRIC LOCOMOTIVES

BROWN, BOVERI & CO. The Single-Phase Locomotives of the Gothard Railway, Switzerland, Built by Brown, Boveri & Co. (Les locomotives électriques du Chemin de fer du Gothard (Suisse). Locomotives omnophasées de la Société Brown, Boveri et Cie). Génie Civil, vol. 76, no. 11, Mar. 13, 1920, pp. 265-268, 8 figs., partly on supp. plate. Locomotives operate at 15,000 volts, under frequency of 16⅔ periods, and have four motors, each of 550 hp.

CHICAGO, MILWAUKEE & ST. PAUL. New Electric Locomotives for the C. M. & St. P. Ry. Mech. Engr., vol. 94, no. 5, May 1920, pp. 259-264, 9 figs. Comparative study of two types recently designed for passenger service, one of 3,380 hp. built by General Electric Co., and the other of 4,200 hp. built by Westinghouse Electric & Manufacturing Co.

CRITICAL SPEED. The Critical Speed of the Lötschberg Locomotive, Type 1 E 1, Analytically and Graphically Computed (Die kritische Geschwindigkeit der Lötschberg-Lokomotive, Typ 1 E 1, analytisch und graphisch berechnet), Karl E. Müller. Schweizerische Bauzeitung, vol. 75, no. 10, Mar. 6, 1920, pp. 107-110, 5 figs. Calculation said to prove that theory of the shaking vibration of driving gear is now developed to point where it can be practically applied. Reference is made to investigations and calculating methods of Couwenhoven.

ELECTRIC MEASURING INSTRUMENTS

CALIBRATION OF. New Current Balance for Calibration Work, Otto A. Knopp. Elec. World, vol. 75, no. 18, May 1, 1920, pp. 993-996, 6 figs. Testing device developed by writer and used in electrical laboratory of Pacific Gas & Electric Co. in routine calibration of ammeters and watt-meters.

ELECTRIC MOTORS

RATING. The Ffty Degree Rise Method of Motor Rating, J. M. Hipple. Elec. Jl., vol. 17, no. 5, May, 1920, pp. 203-205. Argument is presented for establishing 50 deg. rise as standard for semi-enclosed general-purpose motors and for open and semi-enclosed short-time rated motors.

See also Electrical Machinery Brushes, Design.

[illegible]

ELECTRIC RAILWAYS, TRACK

[illegible]

ELECTRIC TRANSMISSION LINES

[illegible]

ELECTRIC WELDING, ARC

[illegible]

ELEVATORS

[illegible]

ENAMELLING

[illegible]

COMPENSATION OF. Compensation for Engineers, O. C. Merrill. Professional Engr., vol. 5, no. 5, May 1920, pp. 14-15. Remark of Prof. Irving Fisher before governors and mayors assembled at White House March 3-5, 1919, that the nation is "on a permanently higher price level," is quoted and it is urged that salary scales be revised along sound principles and "in full recognition of present-day conditions." Activities of Engineering Council in the study of situation in this respect of engineers in federal, state and municipal service, are related.

EDUCATION OF. Some Forces in Engineering Education, Homer A. Watt. Eng. News-Rec., vol. 84, no. 16, April 15, 1920, pp. 771-773. It is emphasized that "engineer cannot play his part by the side of educated professional men without a broader training in history, English and the social sciences," and it is therefore stated that "the engineering college which neglects the cultural elements in its curriculum will find itself in a few years, only an industrial school."

INDUSTRIAL RELATIONS. Industrial Relations of Engineers, H. H. Higbie. Michigan Technic, vol. 33, no. 1, March 1920, pp. 23-28. Because the engineer "is usually the connecting link between capital and labor," and because he "has the trained intelligence and innate respect for verities which are essential to correct and lasting solution of the difficult relation of capital and labor," it is concluded that it is distinctly his duty to formulate a solution of social problems "which shall conform just as closely to psychological and normal laws as his usual plans and specifications conform to physical laws."

EXPORT TRADE

PACKING FOR. Packing for Domestic and Export Shipping—II, Harry N. Knowlton. Am. Mach., vol. 52, no. 16, April 15, 1920, pp. 829-832, 3 figs. Types of packages and methods of handling. Definitions and descriptions of different forms of packages used in shipping goods are given, and method of handling and possibilities of damage to improperly packed commodities are taken up.

FACTORY MANAGEMENT

See Industrial Management.

FANS

See Gas Works, Water-Gas Plant.

FATIGUE

PREVENTION OF. Prevention of Fatigue in Industry—V, Reynold A. Spaeth. Indus. Management, vol. 59, no. 5, May 1920, pp. 409-411, 1 fig. Limitations of methods of scientific management are discussed. Claim is made that loyalty and fairness will get results in production without knowledge or use of elementary times. It is suggested that time-study methods should be standardized by a committee of representative industrialists.

FERROCHROME

See Ferrosilicon, Electric-Furnace Manufacture.

FERROSILICON

ELECTRIC-FURNACE, MANUFACTURE. Builds Electric Ferroalloy Plant. Iron Trade Rev., vol. 66, no. 10, Mar. 4, 1920, pp. 706-707, 4 figs. Plant of United States Ferro Alloys Corp., Niagara Falls, N. Y. Principal products are ferrosilicon and ferrochrome.

PROPERTIES OF. Properties of Ferrosilicon, F. A. Raven. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 37, pp. 577-588, 7 figs. Various grades of commercial ferrosilicon are described and their metallography and physical properties discussed. Their production by reduction by carbon in blast furnace is described and also their production in electric furnace. Writer declares that furnaces with high-frequency current (60 cycles), will work just as efficiently and satisfactorily as low-frequency furnaces (25 cycles), if properly designed and operated.

FERROVANADIUM

METALLURGY OF. Development of Ferro-Vanadium Metallurgy, B. D. Saklatwalla. Gen. Meeting Am. Electro-chemical Soc., Apr. 8-10, 1920, paper no. 42, pp. 689-700. General review is given of occurrence of vanadium in nature, its discovery and its restricted utilization as rare and expensive element. Details are included of its modern introduction into large scale metallurgical practice in armor plate and special steels, and of reduction of its compounds to metal by silicon in electric furnace. Alumino-thermic reduction as practiced on a large scale in the United States is explained.

FILES

MICROSCOPIC STRUCTURE. The Microscopic Structure of Files and Chip-Forming Tools in General (Mikroskopische Struktur der Feile und spanbidende Werkzeuge im allgemeinen), W. Scheffer. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 42, no. 51, Dec. 19, 1919, pp. 393-394, 9 figs. Photomicrographs.

FIRE HOSE

ACTION OF WATER UPON. The Action of Water Upon Hose Linings and the Acid Corrosion of Jackets and Couplings, L. B. Buchanan. Nat. Fire Protection Assn., vol. 13, no. 3, Jan. 1920, pp. 263-268. Tests are said to have demonstrated that practically all hose is liable to generate sulphuric acid if left wet inside for any considerable length of time in a warm room, weak acid so generated being capable of concentration to a strength sufficient to destroy fabric and corrode couplings.

FIRE PROTECTION

SPRINKLERS. Unsatisfactory or Serious Fires in Buildings Equipped with Sprinklers. Nat. Fire Protection Assn., vol. 13, no. 3, Jan. 1920, pp. 293-299. Examples are quoted of fires in buildings equipped with sprinklers and reasons are indicated why sprinklers failed to operate satisfactorily.

FLIGHT

HIGH-ALTIDUDE. Flying at Very High Altitudes (La vie et les voyages aux très hautes altitudes), Docteur Guglielmineti. Génie Civil, vol. 76, no. 12, Mar. 20, 1920, pp. 288-292, 7 figs. Physiological effects of altitudes greater than 12,000 meters (39,360 ft.). It is at such altitudes, it is said, that aerial routes for transoceanic service will have to be established in order to attain maximum practicable speed. Structural details of enclosed cabin for maintaining constant air pressure are given.

RECTILINEAR. The Rectilinear Flight of Aeroplanes. A. Rateau. Mech. Eng., vol. 42, no. 5, May 1920, pp. 268-269 and 316, 1 fig. Principles of analytical theory of rectilinear flight of aeroplanes are formulated. Graph is constructed indicating variation of fuel and oil consumption per distance of flight with variation in distance of plane from its ceiling during flight.

SOARING FLIGHT. Soaring in Horizontal Wind of Invariable Speed and Direction (Le vol à voile par vent horizontal de vitesse et de direction invariables), Jean Viley et A. Volmerange. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 14, Apr. 6, 1920, pp. 838-841, 1 fig. Study of forces acting on bird.

FLOOD PREVENTION

WATER FLOW THROUGH CONTRACTED CHANNEL. Experiments on the Flow of Water Through Contractions in an Open Channel, F. W. Lane. Proc. Am. Soc. Civil Engrs., vol. 45, nos. 8-9-10, Oct.-Nov.-Dec., 1919, pp. 717-774, 20 figs. Studies for design of flood prevention works of Miami Conservancy District. Measurements were made of flow through (1) contraction with rounded edges, (2) sharp-edged contraction, (3) short flume with rounded entrance, (4) short flume with sharp corner entrance, and (5) expanding or venturi flume.

FOREMAN

PLACE IN INDUSTRIAL MANAGEMENT. The Foreman, Sanford E. Thompson. Bul. Taylor Soc., vol. 5, no. 1, Feb. 1920, pp. 43-46 and (discussion) pp. 46-48. Scientific management, it is observed, has given a definite place to foreman in industry and has clearly outlined his position with reference to the workman.

FOUNDATIONS

TESTING SUBSOIL. Foundations, Their Selection, Design and Construction. Am. Architect, vol. 117, no. 2314, April 28, 1920, pp. 533-536, 4 figs. Design of platform is suggested for testing soil bearing.

FREIGHT HANDLING

ENGLAND. Freight Handling in England as Applied to Our Home Problem, F. T. Chambers. Pacific Marine Rev., vol. 17, no. 4, Apr. 1920, pp. 53-56 and 104-106, 7 figs. Address delivered before Material Handling Mach. Manufacturers' Assn., with illustrations from author's report published by U. S. Shipping Board.

FUELS

COLLOIDAL. Colloidal Fuel and Its Use—II, Lindon W. Bates. Chem. Engr., vol. 28, no. 4, April 1920, pp. 125-127. Nature of colloidal fuel, its development during war, results by tests, with review of present and future general industrial possibilities.

RESEARCH, BRITISH. Report of the Fuel Research Board for the Years 1918, 1919. Dept. Sci. Indus. Research, Lond., 1920, 57 pp., 5 figs. Account of survey of coals of Great Britain in particular as to suitability of different types of known origin for conversion into gases, fuel oils and coke, and also account of work undertaken with a view to obtaining thermal and economic data in connection with use of peat as fuel. Use of pulverized fuel in operations of various kinds is taken up and records are given of effects of purely meteorological conditions on natural draft of a chimney.

See also Peat; Pulverized Coal.

FURNACES, BOILER

BAGASSE. Bagasse Furnaces, A. G. Budge. Int. Sugar Jl., vol. 22, no. 256, Apr. 1920, pp. 211-214, 4 figs. Types used in factories in Hawaii.

FURNACES, ELECTRIC

See Electric Furnaces.

FURNACES, HEAT-TREATING

See Electric Furnaces, Resistor Type.

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GAGES

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[illegible]

GAS ENGINES

[illegible]

GAS WORKS

[illegible]

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GASOLINE ENGINES

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GEAR CUTTING

[illegible]

GEARS

[illegible]

GIRDERS

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GOLD MINING

[illegible]

GRADE CROSSINGS

[illegible]

GRAVITATION

[illegible]

GRINDING MACHINES

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HEAT TREATMENT

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HEATING

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HEAVY-OIL ENGINES

[illegible]

HELICOPTERS

[illegible]

HOISTS

[illegible]

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HOUSES, CONCRETE

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HYDRAULIC GATES

[illegible]

HYDROELECTRIC PLANTS

[illegible]

FRANCE. Navigation and Harnessing of the Rhine (Le Rhin aux points de vue de la navigation et des forces hydrauliques), B. Seitre. Vie Technique & Industrielle, vol. 1, no. 6, Mar. 1920, pp. 457-462, 4 figs. Hydroelectric installation projected near Mulhouse. (Concluded.)

INDUCTION COILS

RESONANCE. Electric Resonance in a Coil with an Iron Core (Résonnance électrique dans un cricuit dont la self-induction contient du fer), P. Boucherot. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 12, March 22, 1920, pp. 725-728, 2 figs. Formula for determining excess voltage resulting from grounding conductor in long cable.

REMOTELY CONTROLLED. Remotely Controlled Hydroelectric Synchronous Generators, Charles H. Tallant. Jl. Electricity, vol. 44, no. 9, May 1, 1920, pp. 432-433, 3 figs. Automatic installation at Ontario Cal., by Ontario power Co. Equipment consists of one single Pelton impulse turbine, overhung from Westinghouse 500-kva., 50-cycle generator. Plant is controlled with double-throw switch from another plant situated three and one-half miles down canyon.

SWITZERLAND. The Water-Power Plant "Gosgen" on the Aare River (Die Wasserkraftanlage "Gosgen" an der Aare der A. G. Electrizitätswerk Olten-Aarburg). Schweizerische Bauzeitung, vol. 75, nos. 9 and 10, Feb. 28 and Mar. 6, 1920, pp. 93-96 and 110-113, 24 figs. Description and illustrations of the headwater canal, entire length of which is 4.80 km., construction involving approximately excavation of 1,100,000 cu. m. of earth and 250,000 cu. m. of rock. (Continuation of serial.)

INDICATORS

STEAM-ENGINE. High-Speed Indicators, Thomas Midgley, Jr. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 254-257, 11 figs. Classification and description of various types of steam-engine indicators, particularly type developed at Bur. of Standards.

INDUSTRIAL MANAGEMENT

ANALYSIS OF SHOP METHODS. Improving Shop Methods by Analysis—II, L. V. Estes. Indus. Management, vol. 59, no. 5, May 1920, pp. 367-371. It is shown how analysis provides facts upon which shop man can base improvement of his methods.

PURCHASING DATA, RECORDING. Economic Value of Good Buying, Wilfrid G. Astle. Elec. Traction, vol. 16, no. 5, May 1920, pp. 324-326. Emphasizes economy of introducting efficient system of keeping all buying data.

RECORDS, FILING OF. Purchasing Department Records, G. W. Greenwood. Indus. Management, vol. 59, no. 5, May 1920, pp. 383-386, 4 figs. Method is suggested for filing filled purchase orders so that any particular item can be readily located with no other information than name of part in question.

SHIPYARDS. Industrial Engineering Applied to Shipyard Management, Norman Howard. Indus. Management, vol. 59, no. 5, May 1920, pp. 372-376, 4 figs. Work done by Indsutrial Management Section of Emergency Fleet Corporation. (To be continued.)

STORES SYSTEM. Modern Stores System Proves Successful in Strip Mill, H. R. Simonds. Iron Trade Rev., vol. 66, no. 17, Apr. 22, 1920, pp. 1197-1202, 10 figs. Record forms used in stores system of Am. Tube & Stamping Co., Bridgeport, Conn.

See also Coal Mines, Management Methods; Foremen; Foundries, Organization of; Production; Time Study.

INDUSTRIAL RELATIONS

See Engineers, Industrial Relations.

INSULATION

See Walls, Heat Insulation of.

INSULATORS, HEAT

THICKNESS REQUIRED. Heat Insulation. Power Plant Eng., vol. 24, no. 10, May 15, 1920, pp. 514-516, 1 fig. Diagram for finding correct thickness of various insulating materials.

INTERCHANGEABLE MANUFACTURE

EQUIPMENT FOR. Equipment for Interchangeable Manufacturing, Earle Buckingham. Machy. (N. Y.), vol. 26, nos. 8 and 9, Apr. and May 1920, pp. 754-760 and 828-833, 32 figs. Discussion of principles to be considered in selection of machine tools and in designing jigs, fixtures and cutting tools for interchangeable manufacture. Description of jigs used in machining an automobile transmission case, and other examples.

INTERNAL-COMBUSTION ENGINES

LUBRICANTS FOR. Tests of Lubricants for the Internal Combustion Engine, Fred C. Ziesenheim. Automotive Industries, vol. 42, no. 17, April 22, 1920, pp. 960-962, 1 fig. Outline of method of testing engine with different kinds of oil and manner of determining which is best suited for particular conditions under which engine is intended to operate.

TESTING PLANT. A modern Testing Station. Automobile Engr., vol. 10, no. 137, April 1920, pp. 134-138, 14 figs. Research works of Messrs. Ricardo & Co., Engineers, Ltd., England, for internal-combustion engine investigations.

See also Diesel Engines; Gas Engines; Gasoline Engines; Kerosene Engines; Marine Engines; Heavy Oil.

IRRIGATION

PACIFIC NORTHWEST. The Duty of Water in the Pacific Northwest, J. C. Stevens. Proc. Am. Soc. Civil Engrs., vol. 46, no. 3, Mar. 1920, pp. 461-480, 1 fig. By duty of water is meant average percentage of soil mixture that should be maintained for particular soil and crops. Quantity of irrigation water that, with precipitation and unavoidable losses, will maintain required amount of soil mointure in Pacific Northwest region of United States, is investigated.

LABOR

GREAT BRITAIN. The Course of Labor and the Workers' Tendency in Great Britain, Clarence H. Northcott. Automotive Industries, vol. 42, no. 17, April 22, 1920, pp. 970-973. Attitude of labor in regard to increased production. It is said that in spite of placards and notices emphasizing the necessity for increased production in country, "labor is little interested" and "they do not see either the use or necessity of continued toil."

LATHES

DOUBLE-END CENTRE-DRIVE. Greenlee Double-End Centre-Drive Lathe, J. V. Hunter. Am. Mach., vol. 52, no. 16, April 15, 1920, pp. 815-817, 4 figs. Lathe developed by Greenlee Bros. Co., Rockford, Ill., for turning both ends of automobile axle at the same time, and now being applied to bar and shaft work requiring turning only on ends.

TURRET. Turret Lathe Practice. Machy. (Lond.), vol. 16, no. 394, April 15, 1920, pp. 29-35, 16 figs. Methods employed in machining large gas-engine pistons at works of Alfred Herbert, Ltd., England.

LIGHTING

INDUSTRIAL, COST OF. Notes on Industrial Lighting, Otis L. Johnson. Elec. Jl., vol. 17, no. 5, May 1920, pp. 198-201, 9 figs. Cost of efficient industrial lighting is investigated and it is found that good illumination can be installed and operated for less than 1 per cent of average workman's wages.

STREET. Ornamental Street Lighting, L. A. S. Wood. Elec. Jl., vol. 17, no. 5, May 1920, pp. 195-197, 10 figs. Various designs of posts and lanterns are illustrated.

LOCOMOTIVES

BRITISH. British Locomotive Practice: 1914-1919, J. F. Gairns. Bul. Int. Ry. Assn., vol. 2, nos. 1-2-3, Jan.-Feb.-March 1920, pp. 3-16, 6 figs. In regard to cylinder arrangement, reference is made to experiments with uniflow cylinders, which were followed construction of three-cylinder 4-4-2 express locomotive on this principle. Construction of two 4-6-0 four-cylinder locomotives is also reported.

EFFICIENCY, INCREASING. Increasing Locomotive Efficiency and Capacity, B. B. Milner. Ry. Mech. Engr., vol. 94, no. 5, May 1920, pp. 265-268, 5 figs. Improvements suggested include feedwater heating, trailer booster, lighter rods and cut-off regulation. Paper read before New Railroad Club.

Increasing Locomotive Operating Efficiency, R. S. Mounce. Ry. Age, vol. 68, no. 16, Apr. 16, 1920, pp. 1191-1196, 5 figs. Notes on adapting design to service conditions, modernizing, reassigning and accurate train loading.

ELECTRIC. *See Electric Locomotives.*

ENGLISH SUPERHEATER. New Locomotives for the Great Central Railway. Ry. Gaz., vol. 32, no. 15, April 9, 1920, pp. 556-557, 3 figs. Express locomotives of 4-4-0 type. Particulars are: Cylinders, 28-in. diameter by 26-in. stroke; working pressure, 180 lb. per square inch; heating surface, total, 1752 sq. ft.; superheater, inside, 20 sq. ft.

FEEDWATER HEATING. Locomotive Feedwater Heating, Thomas C. McBride. Mech. Eng., 42, no. 5, May 1920, pp. 283-286 and 316, 5 figs. Pump and open type heater manufactured by Worthington Pump and Machinery Corp. are described and results of tests of their operation are presented.

FRENCH. The Evolution of the High-Speed Locomotive in France, Between 1878 and 1914, and the influence of Alsatian Practice, A. Herdner. Bul. Int. Ry. Assn., vol. 2, nos. 1-2-3, Jan.-Feb.-March, 1920, pp. 17-44, 13 figs. Attention is especially directed to development of Mallet compound type, first constructed in 1878 and introduced into many other countries since that time. Comparative economies of various types of locomotives equipped with turbo heaters are discussed.

LOGGING INDUSTRY

See Electric Railways, Logging Indsutry, Use in.

LUBRICATING OILS

CASTOR OIL, MANUFACTURE OF. Operation of the Gainesville Castor Oil Plant, J. H. Shrader and A. C. Goetz. Chem. & Metallurgical Eng., vol. 22, no. 18. May 5, 1920, pp. 833-838, 5 figs. Details of installation and solvent extraction process of obtaining high recovery of oil from castor beans.

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MARINE ENGINES

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MARINE STEAM TURBINES

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METAL WORK

[illegible]

METEOROLOGY

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MINE LOCOMOTIVES

[illegible]

MINERS' LAMPS

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MINES

[illegible]

MINING

[illegible]

MOTOR-TRUCK TRANSPORTATION

ECONOMIC STATUS OF TRUCKS. The Economic Place of the Motor Truck in the Nation's Transportation. Automotive Industries, vol. 42, no. 20, May 13, 1920, pp. 1122-1123. Survey of uses to which motor trucks have been put and visualization of their future expansion.

MOTOR TRUCKS

PNEUMATIC VS. SOLID TIRES. Relation of Solid and Pneumatic Tires to Motor-Truck Efficiency, S. V. Norton. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 208-214. Factors considered are those involved in engineering design and those resulting from practical limitations by reason of requirements of service. Opinion is expressed that in spite of present progress, question of using pneumatic tires on trucks should not overshadow study of other means than tires to develop cushion effects.

SPECIFICATIONS. Motor Truck Specifications. Power Wagon, vol. 24, no. 186, May 1920, pp. 4566. Major specifications of internal-combustion and electric trucks grouped according to load rating and arranged alphabetically according to brand name.

USE IN RAILWAY TERMINALS. Removable Truck Bodies Save Labor, B. F. Fitch. Iron Trade Rev., vol. 66, no. 13, Mar. 25, 1920, pp. 924-925, 3 figs. Experience at Cincinnati Terminal of Big Four railroad.

See also Terminals, Marine, Tractors and Trailers.

MOTORSHIPS

CONVERTED SCHOONER. New Uses for Old Sailing Vessels. Int. Mar. Eng., vol. 25, no. 5, May 1920, pp. 393-394, 1 fig. Former British-built schooner Katherine converted into motor vegetable-oil tanker for American company.

NATURAL GAS

EFFICIENCY IN COOKING. Efficiency of Natural Gas Used in Domestic Service Robert F. Earhart. Mech, Eng., vol. 42, no. 5, May 1920, pp. 287-288 and 316, 4 figs. Results of tests on commercial burners under kitchen conditions, showing effect of gas pressure and distance between burner and vessel on the efficiency.

OIL

FRACTIONATION. Constant-Temperature Still Head for Light-Oil Fractionation, Frederick M. Washburn. Dept. Commerce, Technologic Papers, Bur. Standards, no. 140, Oct. 18, 1919, 12 pp., 4 figs. Types of methods generally in use for fractionation of light oil and determination of benzene, toluene and solvent naphtha are discussed and improvement is suggested of depthlegmator of Wilson and Roberts still.

See also Petroleum.

OIL FIELDS

ALSACE. The Oil Fields of Alsace (Les gisements de pétrole d'Alsace), Paul de Chambrier. Bulletin de la Société d'Encouragement pour l'Industrie Nationale, vol. 132, no. 1, Jan.-Feb. 1920, pp. 45-70, 9 figs. Mining and refining operations.

NORTHWEST GERMANY AND ROUMANIA. The Petroleum Fields of Roumania Compared with Those of Northwest Germany (Die Erdöllagerstätten in Runänien verglichen mit denen in Nordwestdeutschland), G. Guüich. Petroleum, vol. 14, no. 13, Apr. 1, 1919, pp. 597-601, 5 figs. Writer points out dissimilar features of the German and Roumanian oil field, but claims, nevertheless, that a great similarity exists. Notes on the stratigraphy of the Roumanian oil territory and a geological sketch of Roumanian petroleum zone presented by Mrazec in 1907, along with report of investigations at the 3rd Petroleum Congress at Bucharest.

OHIO AND INDIANA. Rise and Decline in Production of Petroleum in Ohio and Indiana, J. A. Bownocker. Min. & Metallurgy, No. 158, Section 22, Feb. 1920, 12 pp., 2 figs. Geology of region and records of wells.

PENNSYLVANIA-NEW YORK. A Résumé of the Pennsylvania-New York Oil Field, Roswell H. Johnson and Stirling Huntley, Min. & Metallurgy, No. 158, Section 23 Feb. 1920, 4 pp. Geological and stratigraphical notes.

OIL FUEL

BURNERS FOR. The Utilization of Oil Fuel in Industrial Furnaces (L'emploie des combustibles liquides dans les foyers industriels), F. Scoumanne. Revue générale de l'Electricité, vol. 7, no. 16, Apr. 17, 1920, pp. 527-536, 3 figs. Comparative study of various types of burners. (Concluded.)

The Wallsend-Howden System of Burning Liquid Fuel. Shipbuilding & Shipping Rec., vol. 15, no. 16, April 15, 1920, pp. 519-520, 5 figs. Liquid fuel is injected into furnaces under pressure through burner, where it is atomized. Burner is designed to force oil into furnace in shape of conical spray of fine particles, which burst into flame at distance of from 6 in. to 8 in. from nozzle.

HANDLING. Handling Heavy Oils at Locomotive Fuel Stations, J. L. Starkie. Ry. Age, vol. 68, no. 15, Apr. 9, 1920, pp. 1147-1148, 4 figs. Points out that tanks and pipe lines must be heated to obtain necessary fluidity in service installations. Describes how turns, bends and expansion joints joints are handled when steam pipes are placed inside oil pipes.

OIL TANKS

PROTECTION AGAINST LIGHTNING. Protecting Oil Storage Tanks Against Lightning, Oliver Lodge. Nat. Fire Protection Assn., vol. 13, no. 3, Jan. 1920, pp. 241-244. Opinion is expressed that metal tanks, not over-elevated and not specially earthed, with good joints and free from leaks, "are as safe as anything can well be, provided the roof and other parts are examined from time to time from the point of view of corrosion." From Petroleum World.

OIL WELLS

PERMITS AND LEASES. Regulations Concerning Oil and Gas Permits and Leases (Including Relief Measures) and Rights of Way for Oil and Gas Pipe Lines, Dept. Interior, Gen. Land Office, no. 672, March 11, 1920, 38 pp. Rules and regulations prescribed for administration of provisions of act of Congress approved Feb. 25, 1920, entitled "An act to promote the mining of coal, phosphate, oil, shale, gas and sodium on the public domain."

OPEN-HEARTH FURNACES

DESIGN. Design of Furnaces and Ovens is Factor in Cutting Costs in New Open-Hearth Plant. Iron Trade Rev., vol. 66, no. 13, Mar. 25, 1920, pp. 915-920, 8 figs. Features of furnaces to which attention is particularly directed are cooling of furnace doors with running water and their operation by compressed air, which is controlled by valve centralized at one station near wall in front of furnace, charge being brought from stock yard in charging boxes carried on flat-bottom cars, and complete record being kept of every heat.

WASTE-HEAT UTILIZATION. Using Waste Heat from Furnaces, B. H. Greene. Iron Trade Rev., vol. 66, no. 15, Apr. 8, 1920, pp. 1065-1068, 3 figs. Installation where steam derived from waste heat is supplemented by coal-fired boilers and used for electric power generation. Paper read before Cleveland Section, Assn. Iron and Steel Elec. Engrs.

OSCILLATIONS

DAMPED. Damped Oscillations in Coupled Circuits, G. Bamwell Ehrenborg. Radio Rev., vol. 1, no. 7, April 1920, pp. 329-336, 6 figs. Mathematical study. (Continuation of serial.)

OXY-ACETYLENE WELDING

LOCOMOTIVE CYLINDERS. Welding a High-Pressure Cylinder, Frank H. Frye. Welding Engr., vol. 5, no. 4, April 1920, pp. 28 and 32, 4 figs. Welding of high-pressure cylinder of Mallet Articulated Class AE Locomotive by Oxweld Acetylene process.

PIPE JOINTS. Oxyacetylene Gas Welding, Alfred S. Kinsey, Gas Age, vol. 45, no. 8, Apr. 26, 1920, pp. 331-335, 10 figs. Laying of pipe line near Philadelphia. Line is of standard 12-in. and 16-in. steel pipe, being double-piped for three miles and single-piped for five miles. Pipe joints were welded by oxyacetylene process.

PAINTING

SPRAY METHOD. Spray Painting, H. A. Gardner. Sci. Am. Monthly, vol. 1, no. 4, April 1920, pp. 335-336, 6 figs. Study of practicability of blowing paint on various surfaces.

PAINTS

THINNERS FOR. Notes on the Standardization of Mineral Spirits, Henry A. Gardner. Paint Manufacturers' Assn. of U. S., circular 94, May 1920, 3 pp. Rules are suggested for standardization of turpentine and other mineral oils used for thinning paints and varnishes.

PATTERN-MAKING

CANAL ZONE SHOPS. The Pattern Shop at Balboa, R. D. Gatewood. Am. Mach., vol. 52, no. 14, April 1, 1920, pp. 723-725, 6 figs. Balboa shops of Panama Canal.

PATTERNS

STORAGE OF. Safe Storage of Patterns, J. V. Hunter. Am. Mach., vol. 52, no. 17, April 22, 1920, pp. 901-902, 5 figs. Experience of Minneapolis Threshing Machine Co., which has built fireproof pattern-storage building to house what is estimated to be one million dollars worth of patterns.

PAPER MILLS

ELECTRIC DRIVE. The Electric Drive in Paper Mills, E. Tanner and C. F. Papworth. Elecn., vol. 84, no. 2184, March 26, 1920, pp. 344-348, 5 figs. Description of paper mill in south of England, having average weekly output of 1500 tons of paper.

100-TON MILL. Large Pulp and Paper Mill Development by International Paper Co. at Three Rivers, Romeo Morrissette. Contract Rec., vol. 34, no. 15, Apr. 14, 1920, pp. 338-340, 3 figs. Description of 100-ton-per-day sulphite mill which is nearly completed. Outline of workmen's dwellings to be built in connection with plant.

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PAVEMENTS, BITUMINOUS

[illegible]

PAVEMENTS, BRICK

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PAVEMENTS, CONCRETE

[illegible]

PAVEMENTS, WOOD-BLOCK

[illegible]

PEAT

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PETROLEUM

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PETROLEUM INDUSTRY

[illegible]

PIPE, CONCRETE

[illegible]

PIPE LINES

[illegible]

PLYWOOD

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PROPELLERS, SHIP

[illegible]

PULVERIZED COAL

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PUMPS

[illegible]

RADIOMETALLOGRAPHY

[illegible]

RAILS

FRACTURE. One of the Causes of Rail Fracture, and a Way of Preventing It, Georges Charpy and Jean Durand. Bul. Int. Ry. Assn., vol. 2, nos. 1-2-3, Jan.-Feb.-March 1920, pp. 45-48, 5 figs. Fine cracks which are formed in course of time on rolling surface of rails are attributed, as result of experimental investigation, to intense crushing to which superficial layer of rail is subjected. This phonomenon is said to be common to other objects, such as chains, bolts, stays, etc. It is said that this effect can be counteracted by annealing treatment applied to surface at suitable intervals. Translated from Comptes rendus des Séances de l'Académie des Sciences.

SPECIFICATIONS. Report of Committee IV—On Rail. Bul. Am. Ry. Eng. Assn., vol. 21, no. 225, March 1920, pp. 225-266, 19 figs. Specifications for carbon-steel rails are formulated. One appendix enumerates results of experiments made to determine nature of defects revealed by deep etching transversely fissured rails, and another discusses brittleness in steel rails.

WEAR. Cause of Undulatory Wear of Rails (Cause de l'usure ondulatoire des rails), Ch. Frémont. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 14, Apr. 6, 1920, pp. 837-838. Explanation given is as follows: When a wheel slides on rail, axle of wheel is strained by resisting torque; when wheel comes to sudden stop energy of torsion in axle is suddenly released and wheel is caused to rotate slightly in opposite direction, thus grinding rail.

RAILWAY OPERATION

AUTOMATIC CONTROL SYSTEMS. Regan Automatic Train Control System C. R. I. & P. Ry. Ry. Rev., vol. 66, no. 18, May 1, 1920, pp. 720-723, 6 figs. System is of intermittent contact type and is designed to carry continuous speed control through caution territory. It embraces both automatic speed control and automatic stop features.

FREIGHT-TRAIN LOADING METHOD. A Practical Freight Train Loading Method, R. S. Mounce. Ry. Mech. Eng., vol. 94, no. 5, May, 1920, pp. 270-274, 5 figs. Method is outlined for finding car factor and equated loading for any given condition. Basis of method is standard loading chart for 10,000-lb. available tractive effort at speeds between 5 and 12 m.p.h. under various weather conditions.

SIGNAL INDICATIONS. Train Operation by Means of Signal Indications, F. H. Bagley. Ry. Signal Engr., vol. 13, no. 5, May, 1920, pp. 208-210, 6 figs. Automatic signals operating an overlap scheme, together with time block and written orders, it is said, have controlled traffic for past eight years over stretch of single track of Louisville & Nashville Railroad.

SINGLE-TRACK. Single Track Operation Without Train Orders, F. H. Bagley. Ry. Age, vol. 68, no. 16, Apr. 16, 1920, pp. 1205-1206, 2 figs. Busy stretch operated by signal indication by installation of traffic locking scheme.

SPEED CONTROL. Rock Island Installs Speed Control and Train Stop. Ry. Signal Engr., vol. 13, no. 5, May, 1920, pp. 204-206, 5 figs. Three-position relay repeats signal indications. Passing of caution signals restricts speed.

See also Snow Plows.

RAILWAY SIGNALING

MELBOURNE. Signaling On Melbourne Electrified Railways, F. M. Calcutt. Ry. Signal Engr., vol. 13, no. 5, May 1920, pp. 184-198, 11 figs. Three-position automatic signaling is used. From Indus. Australian and Min. Standard.

RADIO SIGNALING. Augereau Wireless System of Railway Signaling (Le système Augereau pour la répétition des signaux sur les locomotives), Revue générale de l'Electricité, vol. 7, no. 15, Apr. 10, 1920, pp. 506-507, 3 figs. Apparatus for reproducing in locomotive cab by means of Hertzian waves signals usually indicated along track. This system has been tried successfully, it is said, by French State Railways.

RAILWAY TRACK

CONCRETE ROADBED. Concrete Roadbed for Track, Tunnels and Stations. Eng. News-Rec., vol. 84, no. 17, April 22, 1920, pp. 826-828, 9 figs. Experience of various railways is quoted in securing increased stability and decreased maintenance by using concrete slab base under railway track. From report of Ballast Committee of Am. Ry. Eng. Assn.

MAINTENANCE. Maintenance Cost Reduced by Pneumatic Tie Tampers, W. H. Armstrong. Compressed Air Mag., vol. 25, no. 4, April 1920, pp. 9604-9609, 25 figs. Based on records of performances of tie tamping machines obtained by U. S. Railroad Administration.

STRESSES IN. Second Progress Report of the Special Committee to Report on Stresses in Railroad Track. Proc. Am. Soc. Civil Engrs., vol. 46, no. 2, Feb. 1920, pp. 133-304, 100 figs. Report of joint committee of Am. Soc. of Civil Engrs. with Am. Ry. Eng. Assn. It is concluded from results obtained in numerous tests with different types of engines that action of driving-wheel counterbalance multiplies static load stresses in rail. In some cases excess stress chargeable to unbalance is much more than static rail stress. Nature of service given by tie is defined by measurements of tie bending and distribution of rail load to ballast.

See also Scales, Track.

RAILWAYS, MILITARY

LIGHT RAILWAYS, FRENCH BATTLE FRONT. The "Light Railways" of the Battle Front in France, Frank G. Jonah. Proc. Am. Soc. Civil Engrs., vol. 46, no. 1, Jan. 1920, pp. 81-98, 20 figs. partly on 4 supp. plates. Types of "light railways" built at the front by American, French, English and German troops.

RANGE FINDERS

NAVAL, ACCURACY OF. Range Finders and Range Finding, F. J. Cleary. Jl. Am. Soc. Naval Engrs., vol. 32, no. 1, Feb. 1920, pp. 1-37, 25 figs. Notes on accuracy of range finders employed in naval service and suggestions in regard to care that must be exercised in handling them.

REFRACTORIES

MAGNESITE. Magnesite Refractories, J. Spotts McDowell and Raymond M. Howe. Jl. Am. Ceramic Soc., vol. 3, no. 3, March 1920, pp. 185-246, 5 figs. Survey of development of magnesia refractories in steel making, with notes on crude magnesite and the manufacture of magnesite bricks, as well as enumeration of properties of caustic, dead-burned and fused magnesia. Photomicrographs of magnesia brick are included, and also biography of magnesite and magnesite brick.

RELATIVITY

THEORY OF. Note on the Central Differential Equation in the Relativity Theory of Gravitation, A. R. Forsyth. Proc. Roy. Soc., vol. 97, no. A682, Apr. 1, 1920, pp. 145-151. Equation is integrated, and approximations for solar system are obtained.

RESEARCH

METALLURGICAL, UTAH SCHOOL OF MINES. The Metallurgical Research Department of the Utah State School of Mines, L. W. Chapman. Chem. & Metallurgical Eng., vol. 22, no. 19, May 12, 1920, pp. 877-881, 5 figs. Station is used for general work in ore dressing, and researches of chloride volatilization and oil shales. Equipment is described.

See also Aeronautics, Research; Colloids, Research; Fuels, Research; Radio-Metallography, Research.

ROAD CONSTRUCTION

FEDERAL AID. For What Class of Roads and What Type of Construction Should Federal Aid Funds be Used? Thomas H. MacDonald. Good Roads, vol. 19, no. 15, Apr. 14, 1920, pp. 199-200 and 203. Writer expresses opinion that "federal aid funds should be expended, either for the low-cost types in the building of which machinery is used practically altogether, or for the higher-cost roads, for which machinery, if not already developed, is rapidly being developed."

SPECIFICATIONS FOR ASHOKAN HIGHWAYS. Construction and Maintenance of the Ashokan Highways, George G. Honness. Eng. News-Rec., vol. 84, no. 14, April 1, 1920, pp. 652-657, 4 figs. Specifications for mixed bituminous concrete, vitrified brick on concrete foundation, waterbound macadam, and asphalt block roads within area of Ashokan reservoir, located in foothills of Catskill Mountains, which is principal impounding reservoir for New York's Catskill water supply.

WINCONSIN. Wisconsin Standardizes Highway Cost Estimates. Eng. News-Rec., vol. 84, no. 14, April 1, 1920, pp. 663-664, 1 fig. Standard bidders' estimating form prepared for use of state highway engineers in estimating cost of improvements and for use of contractors in preparing bidding prices for construction.

See also Roads, Macadam, Surfacing.

ROADS

IMPACT TESTS ON. The Present Status of Impact Tests on Roadway Surfaces, A. T. Goldbeck. Public Roads, U. S. Dept. Agriculture, Bur. Public Roads, vol. 2, nos. 18-19, Oct.-Nov. 1919, pp. 19-25, 13 figs. Also Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 265-269, 11 figs. Account of experiments being conducted by Bureau of Public Roads with a view to determining fundamentals affecting road design. Highest value of impact pressure so far measured is 42,000 lb. when weight on rear wheel causing this pressure was only 7750 lb.

ROADS, CONCRETE

DELAWARE. Concrete Road Construction Methods on Contract No. 8 of the Du Pont Highway, Delaware, George A. Sherron. Eng. & Contracting, vol. 53, no. 14, April 7, 1920, pp. 402-404, 5 figs. Construction of road for distance of six and one-half miles. Road is of 1-course cement concrete, mixed in of proportions of 1 part cement, 2 parts fine aggregate and 4 parts coarse aggregate, to which 10 per cent by volume of hydrated lime is added.

DESIGN AND CONSTRUCTION. The Design and Construction of Different Types of Pavements, A. N. Johnson. Good Roads, vol. 19, no. 14, April 7, 1920, pp. 182-186, 2 figs. Construction details of concrete roads including method of testing sand for organic impurities, Abram's table of proportions and quantities for one cubic yard of concrete and suggested specifications for proportions using Abram's table.

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SCALES

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SCIENTIFIC MANAGEMENT

See also Industrial Management.

SEARCHLIGHTS

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SEWAGE TREATMENT

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SHIP DESIGN

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SILVER MINING

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STEAM POWER PLANTS

WESTERN STATES, TENDENCIES IN DESIGN. Steam-Electric Generation in Far West, W. F. Durand and C. H. Delany. Elec. World, vol. 75, no. 20, May 15, 1920, pp. 1123-1127, 10 figs. Survey of present tendency of design. Leaning is said to be toward higher superheat, centrifugal-pump auxiliaries, automatic control and use of recording meters in boiler room.

STEEL

ABSORPTION POWER, TESTING. Testing the Absorption Power of Different Steels Under the X-Rays, Robert Hadfield, S. A. Main, J. Brooksbank. Trans. Faraday Soc., vol. 15, part 2, Feb. 1920, pp. 74-75, 4 figs. on 2 supp. plates. Account of experiments carried out by Hadfield Research Laboratory in Sheffield, England.

COLD-ROLLED STRIP. Cold Rolled Strip Manufacture and Products. Raw Material, vol. 2, no. 4, April 1920, pp. 131, 140, 19 figs. Description of strip steel manufactured into finished products.

ELASTIC STRENGTH. The Relation Between the Elastic Strengths of Steel in Tension, Compression and Shear, Fred B. Seely and William J. Putnam. University of Illinois Bul., vol. 17, no. 11, Nov. 10, 1919, 49 pp., 9 figs. Results of experiments with soft, mild and medium carbon steel, and vanadium, nickel and chrome-nickel alloy steel. It is concluded in part that correct value of elastic shearing strength of steel as measured by proportional limit or useful limit point is from 0.55 to 0.65 of elastic tensile strength, thus disproving maximum shear theory of failure of elastic action of tensile steel, sometimes called Guest's law, which assumes that elastic shearing strength is 0.5 of elastic tensile strength.

EXPORTATION. Exporting Iron and Steel—I and II, V. G. Iden. Iron Trade Rev., vol. 66, nos. 14 and 18, April 1 and April 29, 1920, pp. 987-991 and pp. 1257-1261. World market conditions and problems in foreign trade analyzed. Influence of tariff and quantity production by American industries on foreign trade. Export combinations encouraged.

FERRITE IN. Genesis of Ferrite, Federico Giolitti. Chem. & Metallurgical Eng., vol. 22, no. 16, Apr. 21, 1920, pp. 737-739, 10 figs.

MARKET CONDITIONS, FACTORS AFFECTING. World's Steel Output Below Need, John A. Topping. Iron Trade Rev., vol. 66, no. 19, May 6, 1920, pp. 1321-1322. Underlying factors which offset market and price conditions are pointed out. It is stated that European production is scarcely one-third of pre-war figure. Heavy railroad and agricultural demands are forecast.

MICROSTRUCTURE OF. Microstructure of Iron and Mild Steel at High Temperatures, Henry S. Rawdon. Min. & Metallurgy, No. 158, Section 18, Feb. 1920, 20 pp., 13 figs. Experimental investigation of surface layer during heating in vacuo, and of formation of surface pattern under "heat-relief" etching.

PROPERTIES BELOW CRITICAL RANGE. Physical Changes in Iron and Steel Below the Thermal Critical Range, Zay Jeffries. Min. & Metallurgy, No. 158, Section 20, Feb. 1920, 17 pp. Survey of technical literature and account of experimentation work. Committee report presented to Engineering Division of Nat. Research Council.

SULPHUR IN. Studies Sulphur Problem Abroad, Henry S. Rawdon. Iron Trade Rev., vol. 66, no. 15, Apr. 8, 1920, pp. 1069-1071. Representative of United States Bureau of Standards reports that French and British specifications for steels furnish few data applicable to research on effect of sulphur and phosphorus.

STEEL CASTINGS

FAILURE OF. Using the Microscope to Detect Causes of Failure of Steel Castings, O. A. Knight. Blast Furnace & Steel Plant, vol. 8, no. 5, May 1920, pp. 281-283, 9 figs. It is pointed out how microscope can determine correct heat treatment to give to steel castings. Photomicrographs are presented and interpreted.

MICROSCOPIC EXAMINATION OF. Using the Microscope to Detect Causes of Failure of Steel Castings, O. A. Knight. Am. Drop Forger, vol. 6, no. 4, April 1920, pp. 163-165, 9 figs. Photomicrographs of various specimens are studied and it is pointed out how defects in heat treatment can be determined by means of them.

STEEL, HEAT TREATMENT OF

FURNACES. Furnaces Used in Heat-Treating Steel, S. P. Rockwell. Machy. (N.Y.), vol. 26, no. 8, Apr. 1920, pp. 749-753, 6 figs. Comparison of types of furnaces used in carburizing, hardening and tempering.

REGULATION OF. Important Factors to be Considered in Heating and Cooling Steel, C. B. Barnhardt. Am. Drop Forger, vol. 6, no. 4, April 1920, pp. 189-193, 4 figs. Uniform pyrometer record is said not to be sufficient indication of proper heating or cooling. It is pointed out that temperature, time, surface and mass are the factors which must be considered in heat-treating.

See also Steel Castings, Heat Treatment; Steel, Nickel, Thermal Treatment.

STEEL, HIGH-SPEED

ELECTRIC-FURNACE MANUFACTURE. The Manufacture of High Speed Steel in the Electric Furnace, Roy C. McKenna. Gen. Meeting Am. Electrochemical Soc., Apr. 8-10, 1920, paper no. 31, pp. 417-423. Advantages of electric furnace process over any other way of making high-speed tool steel are pointed out and details of charging, melting, slagging, teeming, forging, heat treatment, etc., are discussed.

TESTS. A Comparative Test Upon High-Speed Steels—I and II, A. J. Langhammer. Chem. & Metallurgical Eng., vol. 22, nos. 18 and 19, May 5 and May 12, 1920, pp. 829-833 and pp. 889-892. Notes on competition of modern high-speed steels conducted for automotive manufacturer. Preliminary observations on current sales practices and general review of various classes, and effect of chemical compositions and heat treatment. Conditions entering into testing of tool for cutting, listed by Taylor, are discussed. Detailed information is given as to method of eliminating most of variables from comparative test for efficiency of several brands of commercial tool steel.

STEEL INDUSTRY

GERMANY. German Steel and Iron in 1920—I, II, III and IV, H. Cole Estep. Iron Trade Rev., vol. 66, nos. 15, 16, 17, 18, April 8, 15, 22, 29, 1920, pp. 1059-1063, 2 figs., pp. 1131-1139, 6 figs., pp. 1189-1193, 4 figs., pp. 1263-1267, 7 figs. Based on writer's personal investigations. Iron and steel industry, it is said, is displaying a certain amount of spirit, energy and valor in its present struggle, but it will be long, if at all, before it can recuperate its former position. Official statistics are quoted which show production has reduced two-thirds since 1913. Labor conditions as affected by food situation. With steel production at low ebb Germany is said to have excess of shop capacity and her shipyards to be nearly idle.

STEEL, MANGANESE

GRINDING. Grinding Manganese Steel, R. M. Johnson. Iron Trade Rev., vol. 66, no. 14, Apr. 1, 1920, pp. 999-1001, 10 figs. Methods employing swing frame grinding machines are illustrated.

STEEL MANUFACTURE

DUPLEXING PROCESS. Develops New Duplexing Process, H. E. Diller. Iron Trade Rev., vol. 66, no. 19, May 6, 1920, pp. 1324-1327, 9 figs. High-carbon steel is melted in electric furnace and trasnferred to converter to be finished. It is said that good grade metal is thus obtained at low cost.

ELECTRIC-FURNACE. Manufacture of Steel in the Electric Furnace (Le four à arc pour la fabrication de l'acier), H. Verdinne. Revue universelle des Mines, vol. 5, no. 1, Apr. 1, 1920, pp. 5-52, 26 figs. Classification and description of principal types of electric furnaces used in steel manufacture. (To be continued.)

ELECTRIC HEATING IN. Electric Heating in Steel Wire Manufacture. Blast Furnace & Steel Plant, vol. 8, no. 5, May 1920, pp. 291-293, 2 figs. Comparative cost statistics taken at plant of Halcomb Steel Co , Syracuse, N. Y., on drying ovens heated electrically and similar ovens using coke and steam. Coke ovens cost $22.289 per net ton, against $12.2926 per net ton for electric.

See also Electric Furnaces, Metallurgical Uses.

STEEL, NICKEL

THERMAL TREATMENT. Critical Ranges of Some Commercial Nickel Steels, Howard Scott. Min. & Metallurgy, No. 158, Section 16, Feb. 1920, 17 pp., 11 figs. Transformation-temperature data secured at Bureau of Standards as basis for standardization and specification of thermal treatments for nickel steels.

STEEL WORKS

ELECTRICITY IN. Electricity in a Large Modern Steel Plant—I, R. B. Gerhardt. Blast Furnace & Steel Plant, vol. 8, no. 5, May 1920, pp. 295-298. Details of electrical apparatus at Maryland plant of Bethlehem Steel Co. Paper read before Philadelphia Section of Assn. of Iron & Steel Elec. Engrs.

Electricity Plays Important Part in Connecticut Steel Foundry. Iron Trade Rev., vol. 66, no. 12, Mar. 18, 1920, pp. 846-849, 5 figs. Electricity is used for melting charge, baking, cores, annealing and heat-treating castings, and in cleaning room.

STOKERS

PERFORMANCE. Exact Data on the Performance of Mechanical Stokers as Applied to "Lancashire" or Other Narrow-Flued Boilers, Favid Brownlie. Jl. Instn. Mech. Engrs., no. 3, Apr. 1920, pp. 263-280. Figures obtained in experimental investigation of 80 typical Lancashire boilers mechanically fired. (To be continued.)

STREET RAILWAYS

CAR MAINTENANCE. Maintenance Practice of the Anglo-Argentine Tramway—II, R. Francisco Apeseche. Elec. Ry. Jl., vol. 55, no. 20, May 15, 1920, pp. 978-982, 7 figs. Classes for inspection and overhauling of cars are described, together with duties of men and types of work performed.

CARS, CONVERTING. Open Trailers Converted into Desirable Closed Cars. Elec. Traction, vol. 16, no. 5, May 1920, pp. 331-332, 3 figs. Old-type open trailers in Memphis converted into closed cars at a cost of about $1500.

CARS, NON-ELECTRIC. Is the Non-Electric Street Railway Car a Serious Possibility? Ferdinand C. Cusani. Elec. Ry. Jl., vol. 55, no. 18, May 1, 1920, pp. 893-895. Writer believes that there is a field for self-propelled safety car, but considers steam power plant to be superior to oil or gas engine for purpose.

STREET RAILWAYS TRACK

STUDS

SUBWAYS

SUPERHEATERS

SURVEYING

SWAGING MACHINES

TELEPHONY

TIME STUDY

TIN

TIN ALLOYS

TOOLS

TRACTORS

USES OF. Increasing the Utility of the Tractor, Arnold P. Yerkes. Jl. Soc. Automotive Engrs., vol. 6, no. 4, April 1920, pp. 226-230. Efforts of manufacturers to secure adaptability of tractors to other uses than plowing are related and it is pointed out that reason why sales of tractors have not been as extensive as manufacturers had anticipated it because of financial inability of farmerss in small farms to invest in a machine from which they cannot derive service in proportion to their investment.

Use of Heavy Tractors for Hauling Elevating Graders and Wagon Trains from Steam Shovel. Eng. & Contracting, vol. 53, no. 16, April 21, 1920, pp. 451-454, 3 figs. Account of work done with three artillery-type tractors designed by War Department for military use, which were employed by U. S. Reclamation Service in construction of Salmon Lake Dam and Conconully dam enlargement of Okanogan Project, Wash.

TRANSFORMERS

STEEL-CLAD. Steel Clad Distribution Transformers, E. G. Reed. Elec. Jl., vol. 17, no. 5, May 1920, pp. 213-218, 22 figs. Process of manufacture at works of Westinghouse Elec. & Mfg. Co.

TRESTLES

See Bridges, Railway, Wooden.

TUBING

COPPER AND BRASS, MANUFACTURE OF. Making Seamless Copper Tubing. Iron Trade Rev., vol. 66, no. 9, Feb. 26, 1920, pp. 638-641, 7 figs. Plant for producing seamless copper or brass tubing, recently placed in operation by United States Copper Products Corp., Cleveland.

LIGHT STEEL, MANUFACTURE. Light Steel Tubing Manufacture and Markets. Raw Material, vol. 2, no. 4, April 1920, pp. 147-150, 5 figs. Manufacturing details of light steel tubing, and methods of welding steel tubing seams.

TUNNELS

LINING OF. Notes on Tunnel Lining, S. Johannesson and B. H. M. Hewett. Proc. Am. Soc. Civil Engrs., vol. 46, no. 3, Mar. 1920, pp. 426-460, 13 figs. Causes for distortion and displacements of tunnel linings are discussed, and modifications of existing practice are suggested for avoiding them.

VEHICULAR, HUDSON RIVER. The World's Greatest Vehicular Tunnel. Robert G. Skerrett, Sci. Am., vol. 122, no. 19, May 8, 1920, pp. 510-528 and 528-529, 4 figs. Structural features of New York, New Jersey project. From report of chief engineer of New York State Bridge and Tunnel Commission and New Jersey interstate Bridge and Tunnel Commission.

WATER, REPAIRING. Method of Repairing Water Tunnel with Cement Gun. Eng. & Contracting, vol. 53, no. 19, May 12, 1920, pp. 534-536, 2 figs. Repairing 120-ft. section of defective pressure tunnel on main supply line of Water Department of Tacoma, Wash., with steel reinforcement and gunite.

VACUUM TUBES

See Thermionic Valves; Triode Valves.

VAPORS

TENSION, MEASUREMENT OF. An Apparatus for Measuring the Vapour Tensions of Volatile Liquids, A. V. C. Fenby. Chem. Age., vol. 2, no. 45, Apr. 24, 1920, pp. 434-435, 1 fig. Apparatus consists of two similar barometer tubes of special construction fixed to suitable stand and connected at their lower ends by thick-walled rubber tubing to mercury reservoir which can be raised or lowered. One of these tubes is used as barometer and the other as vapor tension tube.

VIADUCTS

FLAT-SLAB CONSTRUCTION. An Interesting Type of Flat Slab Construction. Ry. Age, vol. 68, no. 17, April 23, 1920, pp. 1233-1235, 5 figs. Concrete viaduct of flat-slab type reinforced in four directions, being built by Delaware, Lackawanna & Western to carry roadway over tracks, in separation of grades of Newark Turnpike and tracks of Morris & Essex branch.

WARSHIPS

U. S. S. IDAHO. U. S. S. Idaho, Henderson B. Gregory. Jl. Am. Soc. Naval Engrs., vol. 32, no. 1, Feb. 1920, pp. 99-133. Characteristics: Length between perpendiculars, 600 ft.; breadth, molded, 97 ft.; depth, molded, 46 ft. 3½ in.; draught. mean, 30 ft.; displacement, 32,000 tons; main battery, twelve 14-in. guns arranged in four three-gun turrets along centre line of vessel; secondary battery, fourteen 5-in. rapid-fire guns for torpedo defence; torpedo equipment, four 6.8-meter by 21-in. submerged torpedo tubes; propelling machinery. Parsons turbines driving four lines of shafting; speed, 21 knots.

WASTE PREVENTION

WOODWORKING PLANTS. Controlling Wastes in Woodworking Plants, Carle M. Bigelow. Indus. Management, vol. 59, no. 5, May 1920, pp. 377-383, 7 figs. Methods and practice for utilizing large pieces of scrap, economical burning of chips, shavings and the like, and determining percentages of waste.

WATER HAMMER

CALCULATION OF. Calculation of Water Hammer in Conduits Formed of Two or Three Sections of Different Diameters (Calcul du coup de bélier dans les conduites formées de deux ou de trois tronçons de diamètre différents), Ed. Carey. Bulletin Technique de la Suisse Romande, vol. 46, no. 8, Apr. 17, 1920, pp. 85-88, 2 figs. Formula expressing transmission of pressure in case of sudden shut off of valve. (Continuation of serial.)

WATER SOFTENING

HOT PROCESS. The Hot-Process Water Softener, George H. Gibson. Chem. & Metallurgical Eng., vol. 22, no. 19, May 12, 1920, pp. 899-902, 4 figs. Study of rate of sedimentation of lime and magnesia precipitates during softening at low and high temperatures. Plant equipment: reagent proportioner, tanks and filter.

WATER SUPPLY

SUBMERGED PIPE LINE. Repairs to Twelve-Inch Submerged Pipe Line, Patrick Quilty. Fire & Water Eng., vol. 67, no. 16, April 21, 1920, pp. 831-833 and p. 847, 5 figs. Installation of and subsequent repairs to main supplying North Brother Island, New York City.

WATER TANKS

REINFORCED-CONCRETE. Reinforced Concrete in Chile. Concrete & Constructional Eng., vol. 15, no. 4, April 1920, pp. 227-233, 3 figs. Details of reinforced-concrete water tank of 15,000 metric tons capacity.

WATER WORKS

CHICAGO. Plan of Chicago's Water System—1920-1955, P. S. Combs. Eng. World, vol. 16, no. 7, May 1920, pp. 379-387, 6 figs. Intakes in Lake Michigan.

SEDIMENTATION BASINS. New Intake and Sedimentation Basin at Sarnia, F. W. Thorold. Can. Engr., vol. 38, no. 18, Apr. 29, 1920, pp. 413-416, 8 figs. One of nineteen concrete basins is used for screen house and others for sedimentation. Wooden form for intake structure was sunk to depth of 47 ft. and filled with concrete.

WELDING

JIGS AND FIXTURES FOR. Modern Welding and Cutting—XX, Ethan Viall. Am. Mach., vol. 52, no. 13, Mar. 25, 1920, pp. 665-669, 13 figs. Welding jigs and fixtures used for repetition jobs.

See also Electric Welding, Arc; Electric Welding Resistance; Oxy-Acetylene Welding.

LOCOMOTIVE FIREBOXES. Methods of Welding Locomotive Fireboxes, George L. Walker and R. T. Peabody. Boiler Maker, vol. 20, no. 4, Apr. 1920, pp. 99-103, 37 figs. Discusses methods of restoring firebox edges by welding and offers suggestions for facilitating repairs. (Concluded.)

WELFARE WORK

FACTORY DOCTOR. Why a Factory Doctor's Salary Costs Less than Nothing, G. L. Howe. Factory, vol. 24, no. 4, Mar. 1, 1920, pp. 618-621, 2 figs. Writer claims medical supervision is not philanthropy, but a business proposition, and presents figures and facts to bear out his arguments.

WELLS

RECOVERY OF SAND PUMP. Recovering Lost Sand Pump from a Deep City Well, R. A. Campbell. Eng. World, vol. 16, no. 7, May 1920, pp. 416-418, 6 figs. Special hook was developed after taking impression of existing conditions by means of impression tool.

WOOD

See Aircraft Construction Materials, Timber.

WORKMEN'S COMPENSATION

ATTORNEY'S FEES. Notices and Claims Under Compensation Acts—III, Chesla C. Sherlock. Am. Mach., vol. 52, no. 16, April 15, 1920, pp. 844-846. Concerning costs, particularly attorney's fees, in proceedings under Workmen's Compensation acts.

LAWS ON, REVISION OF. The Cost of Industrial Accidents, Royal Meeker. Monthly Labor Rev., vol. 10, no. 4, Apr. 1920, pp. 1-13. Plea is made for revising the compensation laws which have been enacted in the various states. These laws show, it is claimed, lack of uniformity in coverage and inexplicable inequalities in money and medical compensation. It is also urged that accurate and up-to-date statistics of industrial accidents causing physical injuries be kept in all states and territories.

LAWS ON, SCOPE OF. Scope and Operation of the Workmen's Compensation Laws of the United States, Lindley D. Clark. Monthly Labor Rev., vol. 10, no. 4, Apr. 1920, pp. 14-32, 1 fig. on supp. plate. Comparative study of laws of the various states.

X-RAYS

ACTION UPON PLATES. The Behavior of Photographic Plates to X-Rays, O. Bloch and F. F. Renwick. Trans. Faraday Soc., vol. 15, part 2, Feb. 1920, pp. 40-46, 7 figs. Account of work done in Research Laboratories of Ilfrod, Limited, on action of X-Rays upon gelatine dry plates.

TUBES. A Method of Testing an X-Ray Tube for Definition, J. Brooksbank. Trans. Faraday Soc., vol. 15, part 2, Feb. 1920, pp. 66-71, 5 figs. on 4 supp. plates. Method of determining size of focal spot required is suggested which consists in taking series of radiographs of two uniform parallel wires of given thickness and placed definite distance apart.

See also Radiometallography.

Engineering Index

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ABRASIVE WHEELS

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ACCIDENTS

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AERONAUTICS

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AEROPLANE ENGINES

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WING BEAMS. The Strength of One-Piece Solid, Built-Up, and Laminated Wood Airplane Wing Beams, John H. Nelson. Nat. Advisory Committee for Aeronautics, no. 35, 1919, 12 pp. 12 figs. It was found in tests that beams of fir can be produced which, weight for weight, will prove as strong as those made of spruce, but will not, however, show quite same stiffness. Cypress was not found satisfactory substitute for spruce. Beams of laminated construction showed themselves as strong as one-piece solid construction.

WING-FABRIC FASTENINGS. Fabric Fastenings, E. D. Whalen and R. T. Fisher. Aerial Age, vol. 11, no. 14, June 14, 1920, pp. 474-475. It is concluded from tests that (1) unwaxed cotton cords are materially better resistors of abrasion fray than unwaxed linen, (2) waxen linen and cotton have practically the same resistance to abrasion fray, and (3) waxed or unwaxed cotton cords are materially better than waxed or unwaxed linin as a resistor of tension fray.

See also Flying Boats; Parachutes; Wind Tunnels.

AIR COMPRESSORS

ELECTRICALLY DRIVEN. Electrically-Driven Geared Air Compressors. Engr., vol. 129, no. 3343, Jan. 23, 1920, p. 98, 2 figs. Models recently placed on market by Broom and Wade, Ltd., High Wycombe.

AIR FILTERS

NON-FABRIC. Construction of Air Filters without Cotton or Other Fabrics (Stofflose Luftfilter), Drnst Preger. Werkstattstechnik, vol. 14, no. 3, Feb. 1, 1920, pp. 71-73, 16 figs. Types operating according to principle of subjecting the air to a repeated change of direction and thereby causing the dust to settle on walls to which it adheres.

AIRCRAFT CONSTRUCTION MATERIALS

See Steel, Heat Treatment of, Brazed Fittings for Aircraft.

AIRSHIPS

R.33 AND R.34. The Machinery of H. M. Airships R.33 and R.34. Eng., vol. 109, nos. 2831 and 2833, Apr. 2 and 16, 1920, pp. 433-434, 7 figs., and 504-505, 10 figs., partly on supp. plate. Structural details of gondolas. Details of Sunbeam-Coatalen "Maori" engines with which both vessels are fitted.

Rigid Airships and Their Development, J. E. M. Pritchard. Flight, vol. 12, nos. 20, 21, 22 and 23, May 13, 20, 27 and June 3, 1920, pp. 525-528, 4 figs., pp. 554-557, 7 figs., pp. 578-581, 4 figs., pp. 597-600, 8 figs. Accepted functions of both military and commercial rigid airships are outlined and divergence between two types indicated. Structural features of hull, fabric and cars are discussed. Keel, fins and planes. Outer cover requirements to prevent superheating. Comparative study of Zeppelin type and British type of car suspensions. Paper read before Roy. Aeronautical Soc.

SEMI-RIGID. The Italian Semi-Rigid Airship Roma. Aerial Age, vol. 11, no. 14, June 14, 1920, p. 478, 2 figs. Characteristics: Volume, 1,200,000 cu. ft.; total weight, 34 gross tons; length, 125 m.; beam, 25 m.; height, 27.5. m.

See also Hangars.

ALLOYS

ELECTRICAL MELTING. Electrical Melting of Alloys—I, II, III, IV, V, VI, VII and VIII, H. W. Gillett. Foundry, vol. 48, nos. 4, 5, 6, 7, 8, 9, 10, 11 and 12, March 1 and 15, April 1 and 15, May 1 and 15, June 1 and 15, 1920, pp. 177-180, 229-231 and p. 238, 275-281, 319-323, 362-366, 400-406, 445-453 and p. 457, 486-491, 67 figs.

TERNARY, MODEL FOR. A Model for Representing the Constitution of Ternary Alloys, Walter Rosenhain. Eng., vol. 109, no. 2833, Apr. 16, 1920, pp. 527-529, 4 figs. Model constructed of wires of various thicknesses and colors at National Physical Laboratory, England.

ALTERNATORS

See Electric Generators, A. C.

ALUMINUM

AUTOMOBILE USES. The Use of Aluminum in the Present and the Future Motor Car, Ferdinand Jehle. Jl. Soc. Automotive Engrs., vol. 6, no. 6, June, 1920, pp. 367-372, 6 figs. Use of aluminum alloys in pistons, crankcases, cylinder blocks, oil pans, inlet manifolds, bodies, etc. is noted, and it is visualized that wheels, rear-axle housings and similar parts will be aluminized in near future.

CORROSION. Rate of Corrosion of Aluminium, G. H. Bailey. Jl. Soc. Chem. Indus., vol. 39, no. 9, May 15, 1920, pp. 118T-120T, 2 figs.

The Action on Aluminum of Hard Industrial Waters, Richard Seligman and Percy Williams. Eng., vol. 109, no. 2828, Mar. 12, 1920, pp. 362-364.

ALUMINUM ALLOYS

DURALUMIN. Increasing Use of Alloyed Aluminum as an Engineering Material—II, G. M. Rollason. Indus. Management, vol. 59, no. 6, June 1920, pp. 456-461, 10 figs. Composition and physical properties of more important aluminum alloys, particularly duralumin.

IMPACT TESTS. Charpy Impact Test as Applied to Aluminum Alloys, E. H. Dix. Min. & Metallurgy, no. 160, April, 1920, p. 31. It is concluded from results of tests at Lynite Laboratories of Aluminum Manufactures, Inc., that Charpy impact resistance of copper-aluminum alloys decreases with increase of copper content.

AMMONIA COMPRESSORS

DIRECT-CONNECTED. Direct Connected Compressors, C. N. Drake. Ice & Refrigeration, vol. 58, no. 5, May 1920, pp. 267-268. Advantages quoted for direct-connected synchronous motor drive for ammonia compressors are: (1) higher motor efficiency, (2) elimination of belts and transmission losses, (3) high power factor with consequent lower power rates, and (4) saving in floor space.

ARCHES

REINFORCED-CONCRETE. Novel Concrete Arches for Garage Roof Supports, G. E. Warren. Concrete, vol. 16, no. 5, May 1920, pp. 210-212, 7 figs. Span width of each of arches is 103 ft. 7½ in. over all.

AUDIONS

See Radiotelegraphy Audion Connections.

AUTOGENOUS WELDING

FRENCH SYSTEM. A New Method of Welding. Sci. Am. Monthly, vol. 1, no. 6, June 1920, p. 522, 3 figs. French system of holding welding rod to rear of torch. Translated from Revue de la Soudure Autogène.

AUTOMOBILE ENGINES

AIR COOLING OF. The Air Cooling of Petrol Engines, A. H. Gibson. Eng., vol. 109, no. 2824, Feb. 13, 1920, pp. 211-213. Records obtained in experiments with aeroplane engines. Results are, however, presented as useful to design of air-cooled gasoline engine for car work. (To be continued). Paper read before Instn. Automobile Engrs.

CARBURETORS. *See Carburetors.*

CONNECTING RODS. Comparative Methods of Machining Automobile Engine Connecting Rods, Fred H. Colvin. Am. Mach., vol. 52, no. 20, May 13, 1920, pp. 1023-1035, 42 figs. Practices in manufacture of connecting rods for Packard, Cadillac, Peerless, Chandler and Franklin cars.

Producing 17,000 Connecting Rods a Day—I, Fred H. Colvin. Am. Mach., vol. 52, no. 23, June 3, 1920, pp. 1199-1203, 13 figs. Methods used by Ford Motor Co. Rod and cap are forged separately up to final boring, facing and broaching operation.

CRANKSHAFTS. Inertia Torque in Crankshafts, F. A. Stepney Acres. Automobile Engr., vol. 10, no. 138, May, 1920, pp. 208-216, 16 figs. Different crank arrangements are compared from view-point of internal stresses in crankshaft set up by inertia torque.

DIE-CAST BEARINGS. The Manufacture and Use of Die-Cast Engine Bearings, H. C. Skinner. Automotive Industries, vol. 42, no. 21, May 20, 1920, pp. 1160-1162, 7 figs. Experience and present practice of Franklin Die-Casting Corp.

AUTOMOBILE FUELS

NATALITE. Fuel for Internal-Combustion Engine. Eng., vol. 109, no. 2822, Jan. 30, 1920, p. 150. Properties of "Natalite," a fuel manufactured at Natal, South Africa, composed of 54 per cent ethyl alcohol, 45 per cent ether, and 1 per cent trimethylamine.

SPONTANEOUS IGNITION TEMPERATURES. Spontaneous-Ignition Temperatures of Liquid Fuels, Harold Moore. Automobile Engr., vol. 10, no. 138, May 1920, pp. 199-204, 14 figs. Results of experimental measurements of temperatures of spontaneous ignition for kerosene-creosote mixtures, petrol-xylol mixtures, ether-xylol, ether-kerosene mixtures, petrol-benzole mixtures, and cannel oil-creosote mixtures.

See Gasoline.

ELECTRICAL EQUIPMENT. The Electrical Equipment of Motor Cars—I. Engr., vol. 129, no. 3354, Apr. 9, 1920, pp. 366-368, 13 figs. Types exhibited at Olympia automobile show.

LIGHTING AND EQUIPMENT. Lighting and Equipment Laws of Various States. Automotive Industries, vol. 42, no. 21, May 20, 1920, pp. 1164-1165. Tables showing general features of State laws relating to headlights, dimmers, spotlight, turn or stop signals and mirrors for motor vehicles.

PRODUCTION INCREASE. Production Expansion Obtained in the Assembly Track Layout, J. Edward Schipper. Automotive Industries, vol. 42, no. 22, May 27, 1920, pp. 1210-1213, 6 figs. It is said that Hudson Co. has increased its production facilities from 160 to 250 cars daily by rearranging assembly track layout.

REAR AXLES, MANUFACTURE OF. Manufacturing Clark Rear Axles—II, Edward K. Hammond. Machy. (N.Y.), vol. 26, no. 9, May 1920, pp. 801-806, 14 figs. Description of methods used by Clark Equipment Co., Buchanan, Mich., in manufacture of automobile rear axles, including machining operations on dead and live axles, axle housings, brake supports, brake drums and gear cases.

TIRES, MOLDS FOR. Machining Molds and Cores for Auto Tires, W. O. Francis. Am. Mach., vol. 52, no. 21, May 20, 1920, pp. 1099-1102, 17 figs. Methods used by some of the large tire manufacturers.

USES IN WAR. Automotive Vehicles in the Great War, Clarence J. West. Jl. Soc. Automotive Engrs., vol. 6, no. 6, June 1920, pp. 409-416. Bibliography of important articles in technical journals of United States and other countries relating to use of automobiles and motor trucks.

See also Aluminum, Automobile Uses; Steel Manufacture, Automobile Steels.

BRIDGES

STRESS RECORDER FOR. The Fereday-Palmer Stress Recorder. Eng., vol. 109, no. 2822, Jan. 30, 1920, pp. 138-139, 19 figs. Patented machine designed for determining stresses on bridge members.

BRIDGES, CONCRETE

ARCH. Longest Concrete Arch Span Being Built at Minneapolis. Cement & Eng. News, vol. 32, no. 5, May 1920, p. 21, 1 fig. Arch will consist of two separate ribs of 400-ft. span between faces of piers, with rise of 88 ft. above springing line, at high-water level. Main arch is flanked at each end by one arch with clear span of 199 ft. and one of 55½ ft., total length of bridge over abutmnts being 1032 ft.

See also Bridges, Highway, Reinforced-Concrete.

BRIDGES, HIGHWAY

FLOOR JOISTS, LOAD CONCENTRATIONS ON. Load Concentrations on Steel Floor Joists of Wood Floor Highway Bridges, T. R. Agg and C. S. Nichols. Official Publication of Iowa State College of Agriculture & Mechanic Arts, vol. 17, no. 48, April 30, 1919, 31 pp., 24 figs. Investigation undertaken to determine manner in which heavy wheel loads, such as those of traction engines, are distributed to various I-beams and channels in highway-bridge floor system. It was found that concentration on single floor joist, equal to 55 per cent of one wheel load, is possible where single thickness of wood floor is laid on steel floor joists. Effects of loosening ends of plank, placing second layer of floor planks, etc., were also investigated.

REINFORCED-CONCRETE. Reinforced Concrete Highway Bridges, Public Works, vol. 48, no. 19, May 22, 1920, pp. 442-444. Details of design specifications and construction which should be studied with view to developing and standardizing practice in this branch of highway work as proposed by chairman of committee of Am. Concrete Inst.

KENOVA. Kenova Bridge, Channel Span Erection, Public Works, vol. 48, no. 19, May 22, 1920, pp. 437-439, 4 figs. Cantilever erection of 518-ft. centre span outside of old span under traffic. Adjacent anchor spans moved longitudinally and heavy girder ties shortened for erection adjustments. Centre panel erection connections adjusted by jacking up ends of connected spans.

BROACHES

TOOTH SIZES. Graphical Method of Designing Broaches, George C. Hanneman. Machy (N. Y.), vol. 26, no. 9, May 1920, pp. 823-824, 5 figs. Method for determining diameter or size of any tooth of a broach after total amount of stock to be removed has been determined.

BRONZE CASTINGS

ELASTIC PROPERTIES. Elastic Properties of Bronze Castings, George F. Comstock. Chemical & Metallurgical Eng., vol. 22, no. 24, June 16, 1920, pp. 1113-1118, 4 figs. Tests are quoted in which definite proportional limit was easily determined for bronzes, and suggestions is made that this test should replace "yield point" determinations.

BRONZES

SPECIFICATIONS. *See Brasses, Specifications.*

BUILDING CONSTRUCTION

CONCRETE, ADVANTAGES OF. Use of Concrete Increasing in All Permanent Construction. Concrete Products, vol. 18, no. 5, May 1920, pp. 15-17, 4 figs. Types of concrete construction used for building are reviewed. Special attention is given to reinforced-concrete flat slab which is said to be highest type of fire-resistive construction and to possess saving story height amounting to about one story in eight without cutting down usable clear headroom.

COST ESTIMATING. Elements That Must Be Considered in Cost Estimating. Eng. & Contracting, vol. 53, no. 20, May 19, 1920, pp. 567-569. Report of Committee on Cost Estimating of Northwestern Assn. of Gen. Contractors.

OLYMPIA EXHIBITION. The Building Exhibition at Olympia. Eng., vol. 109, no. 2833 and 2834, April 16 and 23, 1920, pp. 518-519 and 556-557, 3 figs. Briquetting press, concrete-title machine and concrete road-making machine.

CABLES, ELECTRIC

ENERGY LOSS IN DIELECTRIC. Energy Loss in the Dielectric of Industrial Cables (Sur la perte d'énergie dans le diélectrique des cables industriels), G. Renneson. Revue générale de l'Electricité, vol. 7, no. 18, May 1, 1920, pp. 579-581, 3 figs. Experimental. It was found that (1) at constant temperature and frequency, losses are proportional to square or power 2.5 of voltage and (2) at constant voltage and frequency, losses diminish at first up to 30 deg., where there is a minimum, and increase to 60 deg., limit to which experiments were carried.

OVERVOLTAGES. Overvoltages in Armored Cables and How to Prevent Their Occurrence (Surtensions par câbles armés et les moyens d'y parer), P. Bougherot. Revue générale de l'Electricité, vol. 7, no. 21, May 22, 1920, pp. 675-689, 7 figs. Computation of overvoltage occurring in long armored cable carrying alternating current when cable becomes grounded at or near the end of the line. Attention is directed to overvoltage produced by magnetic saturation of straining straps.

CAMS

DESIGN. Cam Design and Construction—XI and XII, Franklin DeR. Furman. Am. Mach., vol. 52, nos. 19 and 22, May 6 and 27, 1920, pp. 987-999, 13 figs., and 1129-1135, 16 figs. Elliptical arc for rolling cams. Effect of swinging transmitter arm between ordinary radial cam and follower.

CAR WHEELS

CHILLED-IRON. Manufacturing Chilled Iron-Car Wheels VI, H. E. Diller. Foundry, vol. 48, no. 12, June 15, 1920, pp 481-483, 5 figs Procedure for small wheels.

CARBON BLACK

MANUFACTURE FROM NATURAL GAS. Carbon Black, Roy O. Neal. Natural Gas & Gasoline Jl., vol. 14, no. 5, May 1920, pp. 143-145. Its manufacture from natural gas. Results of investigations by Bur. of Mines.

CARBURETORS

CLAUDEL. The Claudel Carburetor. Aviation, vol. 8, no. 8, May 15, 1920, pp. 342-326, 7 figs. Tube automatic compensating carburetor without moving parts.

METERING CHARACTERISTICS. Metering Characteristics of Carburetors, Percival S. Tice and H. C. Dickinson. Nat. Advisory Committee for Aeronautics, no. 49, 1919, 55 pp., 46 figs. Among results found in experimental tests are: Control of range of mixture ratios delivered by carburetor is obtainable by simple selection of ratio of length to diameter for fuel metering passage; coefficient of discharge has almost constant value for throat velocities greater than 145 ft. per second; effect upon carburetor capacity of usual rates and amplitudes is practically negligible; mixture ratio for maximum power is practically constant at all air densities; and ordinarily employed variations in structure and in method of fuel control in carburetors effect inappreciable modifications of altimetric compensation.

CARS

JOURNAL BOXES. Standard Method of Packing Journal Boxes. Ry. Age, Daily Edition, vol. 68, no. 24, June 15, 1920, pp. 1807-1809, 1 fig. Method recommended by Committee of Am. Railroad Assn., Mech. Section.

OSCILLATIONS ON CURVES. Recommendations for the Mitigation of Detrimental Oscillations of Railroad Cars on Curves (Gedanken und Vorschläge zur Milderung der nachteiligen Schwankungen der Eisenbahnfahrzeuge in den Gleiskrummungen), G. Maas. Annalen für Gewerbe u. Bauwesen, vol. 85, no. 12, Dec. 15, 1919, pp. 97-100, 5 figs. Description and illustrations of a car so constructed that when rounding a curve the axles assume position of radii to the curve.

CARS, FREIGHT

DOUBLE BOLSTER. The Double Bolster Wagon. Ry. Gaz., vol. 32, no. 20, May 14, 1920, pp. 721-722. Type which can be used either as 12-ton ordinary freight car or as double olster.

CEMENT GUN

COVERING MINE BUILDINGS. Gunite Forms an Excellent Material for Covering Mine Buildings. Coal Age, vol. 17, no. 24, June 10, 1910, pp. 1185-1188. Frame buildings with gunite covering it is claimed, are cheaper than cement structures covered with sheathing and clapboards and nearly fireproof, only the trim requiring repainting.

CEMENT, PORTLAND

BLAST-FURNACE SLAG. Iron Portland Cement, with Classification of Cements Made from Blast-Furnace Slag, Edwin H. Lewis. Iron & Steel Inst., Paper 6. Annual Meeting, May 6 and 7, 1920, 10 pp. Cements made from blast-furnace slag are divided into five classes: (1) Blast-furnace slag as cement: (2) slag cements; (3) portland cement; (4) improved slag cement; and (5) iron portland cement. How far iron portland cement can comply with tests required in British standard specification for portland cement is indicated.

CENTRAL STATIONS

ANNUAL LOAD FACTOR. Developing the Electrical Possibilities in Arkansas. Elec. World, vol. 75, no. 22, May 29, 1920, pp. 1265-1267, 6 figs. How combination of seasonal loads and ordinary commercial lighting and power loads gives high annual load factor to Arkansas light & Power Co.

CONNECTIONS. Relative Merits of Connections Employed in High-Voltage Generating Stations, Ernest Pragst. Gen. Elec. Rev., vol. 23, no. 5, May, 1920, pp. 386-391, 8 figs. Suggestions for planning system of connections for central station.

POWER FACTOR. The Power Factor of Central Stations (La question du facteur de puissance), Pierre Dumartin. Revue générale de l'Electricité, vol. 7, no. 20, May 15, 1920, pp. 643-656. Methods of improving power factor are discussed. Judicious combination of synchronous motors and phase compensators installed at places where energy is consumd, is preferred.

SUPERPOWER. Design of a Superpower Station, H. Goodwin, Jr. Gen. Elec. Rev., vol. 23, no. 5, May, 1920, pp. 399-418, 15 figs. Method of designing is exemplified by working out case of steam-turbine generating station of 245-000-kw., 300,000-kva. capacity and 66,000-volt distribution.

CONVERTERS

SYNCHRONOUS. 60-Cycle Converting Apparatus, J. L. Burnham. Gen. Elec. Rev., vol. 23, no. 5, May, 1920, pp. 392-398, 12 figs. Devices which have been developed to prevent flashing of commutator when converters used for voltages of 500 and 600 are subjected to short-circuits or quick changes in load.

COPPER ALLOYS

PHOSPHOROUS-COPPER. Fifteen Per Cent. Phosphor-Copper—New Process for Making, P. E. Dummler. Min. & Metallurgy, no. 162, June 1920, pp. 32-33. Uniform product is obtained, it is said, by passing phosphorus vapor over copper heated to temperature of 400 deg. cent.

COPPER DEPOSITS

JEROME ARIZ. Geology and Ore Deposits of Jerome District, Louis E. Reber. Min. & Metallurgy, no. 161, May 1920, pp. 25-27. Notes on copper deposits of Jerome district of north central Arizona, which ranks sixth among copper camps of United States.

COPPER METALLURGY

SMELTER SLAGS. Copper and Magnetite in Copper Smelter Slags—I, Charles G. Maier and G. D. Van Arsdale Chemical & Metallurgical Eng., vol. 22, no. 24, June 16, 1920, pp. 1101-1107, 30 figs. Chemical and microscopic examination of series of representative slags, showing how copper losses occur, relation of magnetite to copper loss, behavior of converter slags in reverberatory furnaces and suggestions for reducing copper slag losses.

CORONA

LOSS TESTS. Some Corona Loss Tests, W. W. Lewis. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 419-426, 12 figs. Results of tests on 150-mile transmission line at potentials up to about 200,000 volts. Comparison is made between measured and calculated losses.

CORROSION

IRON AND LEAD UNDERGROUND PIPE. Corrosive Action of Soils on Iron and Lead, L. A. Stenger. Chem. & Metallurgical Eng., vol. 22, no. 21, May 26, 1920, pp. 965-968, 1 fig. It is concluded from field and laboratory experiments that electrolysis of underground structures may be caused by definite conditions which are determinable by electrical measurements and study of environments. Method is suggested for prolonging life of iron structures in given soils. Long life of cast iron, it is pointed out, is due to its greater wall thickness.

See also Aluminum, Corrosion; Hot water Supply, Piping, Rust Prevention in.

COST ACCOUNTING

OVERHEAD, DISTRIBUTION OF. Handling "Overhead"—A Plan That Avoids Red Tape, S. P. Keator. Factory, vol. 24, no. 8, May 1, 1920, pp. 1343-1346. It is said that distribution of overhead costs can be greatly simplified if a method and forms are devised to secure simple and accurate expense reports from the shop. Practice of one plant is explained.

COST SYSTEMS

FOUNDRY. Standard Foundry Cost System—III. Foundry, vol. 48, no. 12, June 15, 1920, pp. 474-480. Depreciation rates for buildings and equipment.

COSTS

STEAM POWER. *See Steam Power Plants, Costs.*

WOODWORKING. *See Woodworking Industry, Costs.*

CRANES

TRAVELING. Five-Ton Electric Traveling Crane Moving Structural Steel by Means of Lifting Magnets (Pont roulant électrique de 5 tonnes pour le transport de profilés au moyen d'électro-aimants de levage). Génie Civil, vol. 76, no. 13, March 27, 1920, pp. 314-315, 4 figs., partly on supp. plate. Built at Oerlikon Works.

CUTTING METALS

BARTH SLIDE RULES. Supplement to Frederick W. Taylor's "On the Art of Cutting Metals"—IX, Carl G. Barth. Indus. Management, vol. 59, no. 6, June 1920, pp. 483-486, 8 figs. Construction of machine-tool slide rules for shapers and slotters, including rocker drive shaper, shapers and slotters with Whitworth quick-return motion.

DETECTORS.

See Vacuum Tubes, Uses as Detectors.

DIES

AUTOMOBILE PARTS. Dies for Automobile Oil Filler Cup, J. Bingham. Machy. (Lond.), vol. 16, no. 395, Apr. 22, 1920, pp. 78-79, 5 figs. Description of dies used in manufacture of an oil-filler cup or breathing tube for automobile engine, an illustration of each die in the order in which it is used, and a detail of shell as it appears after each operation.

DIESEL ENGINES

CAMMELLAIRD-FULLAGAR. The Cammellaird-Fullagar Marine Diesel Oil Engine. Eng., vol. 109, no. 2822, Jan. 30, 1920, pp. 144-146, 8 figs., partly on supp. plate. Two-cycle opposed-piston type. It is said that small space occupied by this engine permits its replacing steam engine and boilers of existing steamships without altering shafting or propellers.

UBMARINE. German Submarine Diesel Engines. Eng., vol. 109, no. 2836, May 7, 1920, pp. 613-614. It is stated that four-cycle engine was preferred in Germany for use in submarines because it involved fewer difficulties of construction and as it was more developed it was more reliable. Translated from "Schiffbau."

TREND IN MARINE TYPES. The General Trend of Diesel Marine Machinery. Eng., vol. 109, no. 2836, May 7, 1920, pp. 617-618. Survey of types being built in various countries.

DRAINAGE

ASSESSMENTS FOR. The Assessment of Drainage Districts, Lewis E. Ashbaugh. Iowa State College of Agriculture & Mechanic Arts, vol. 5, no. 2, Nov. 1906, 18 pp., 2 figs. Principles are suggested for governing distribution of expenses over various tracts, and also arithmetical method for computing assessments. Principle followed is that "assessment must be proportionate to the benefits received."

FARM. Recommendations for Farm Drainage, W. J. Schlick. Official Publication of Iowa State College of Agriculture & Mechanic Arts, vol. 17, no. 19, Oct. 9, 1918, 24 pp. Graphs are included for computing capacities of tile drains based on calculations by Kutter's formula with $n — 0.015$.

DROP FORGING

HAMMER LUBRICATION. Hammer Lubrication for Drop Forge Plant, R. V. Harty. Am. Drop Forger, vol. 6, no. 5, May 1920, pp. 244-246, 8 figs. Review of common practices of lubrication by hydrostatic and individual forced-feed systems. Advantages of central forced-feed system are enumerated.

DURALUMIN

See Aluminum Alloys.

ECONOMIZERS

ADVANTAGES. Economizers. W. F. Wurster. Jl. Engrs. Club of Philadelphia, vol. 37-6, no. 187, June, 1920, pp. 323-325, 5 figs. Construction features are explained and advantages pointed out.

ELECTRIC CIRCUITS, A.C.

METER CONNECTIONS. Switchboard Meter Connections for Alternating Current Circuits—VI, J. C. Group. Elec. Jl., vol. 17, no. 6, June 1920, pp. 251-253, 6 figs. Six-phase circuits.

OSCILLATORY. On the Period and Decrement of an Oscillatory Electrical Circuit Provided with a Short-Circuited Secondary, Iolo Jones. Lond., Edinburgh & Dublin Phil. Mag. & Jl. of Science, vol. 39, no. 233, May 1920, pp. 553-565, 8 figs. Mathematical study of effect on period and decrement of oscillation of system, of varying resistance of short-circuited coil.

ELECTRIC CONDUCTORS

RESISTANCE. Section-Length-Resistance Relations of Conductors, E. B. Merrill. Elec. News, vol. 29, no. 10, May 15, 1920, pp. 30-31, 1 fig. Chart showing interrelation of resistance, length and cross-section of various conductors. Arranged for determining resistance of various sizes of wire of principal metals for lengths from 0.01 ft. to 1000 miles.

ELECTRIC DRIVE

See Rolling Mills, Electrically Driven.

ELECTRIC FURNACES

ARC, ELECTRODE CONTROL. Automatic Control of Arc Furnace Electrodes, J. A. Seede. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 593-597, 7 figs. Methods of electrode regulation.

HEAT-TREATING. Metallic Resistor Electric Furnaces for Heat Treating Operations, E. F. Collins. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 433-441, 16 figs. Types are described in which heat element consists of bare exceptionally heavy metallic ribbon uniformly distributed over interior of furnace.

REACTORS FOR. Reactors for Electric Furnace Circuits, Harry A. Winne. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June 1920, pp. 589-592. 8 figs. Methods of introducing reactance into furnace circuits.

RESISTANCE TYPE. Electric Furnaces of the Resistance Type for Heat Treating, T. F. Baily. Elec. Furnace, vol. 1, no. 45, April-May 1920, pp. 3-5 & pp. 18-19, 6 figs. Survey of types which have been built for heat-treating plants. Paper read before Detroit Chapter of Am. Soc. for Steel Treating.

SELF-BAKING ELECTRODES FOR. The Söderberg Self-Baking Electrode, Joseph W. Richards. Iron Age, vol. 105, no. 17, Apr. 22, 1920, pp. 1171-1173, 4 figs. Norwegian invention insuring continuous electrode supply to furnace. Describes how mixture is made and advantage of Söderberg electrode. From paper presented before Am. Electrochemical Soc. of Boston.

MAGNETIC FLUX. A Direct Recording Method of Measuring Magnetic Flux Distribution, F. S. Dellenbaugh, Jr. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 6, June, 1920, pp. 583-587, 2 figs. Revolving search coil fitted with collecting device and operating at high and constant speed.

ELECTROLYSIS

See Corrosion.

ELEVATORS

MECHANICAL INTERLOCKS. Mechanical Elevator Interlocks, Clayton W. Old. Safety Eng., vol. 39, no. 5, May 1920 pp. 243-251, 3 figs. Study of elevator shaft door accidents, their causes and current means of prevention. From Proc. of Am. Soc. of Safety Engrs.

ROPES. Reserve Strength of Elevator Ropes, W. Voigtlander. Safety Eng., vol. 39, no. 4, Apr. 1920, pp. 194-197, 7 figs. Gives results of tests of 6 × 19 ropes showing reserve strength, and illustrates method of socketing wire rope. From Proc. of Am. Soc. of Safety Engrs.

EMPLOYEES' REPRESENTATION

STANDARD OIL COMPANY. Employee Representation on the Job in Standard Oil, Burton Kline. Indus. Management, vol. 59, no. 6, June 1920, pp. 496-501. Experience of Standard Oil Co. during past two years in which conferences between employee representatives and officers have been held periodically at refineries and oil fields.

TREND OF. Trends in Management, William Leavitt Stoddard. Factory, vol. 24, no. 9, May 15, 1920, pp. 1544-1546, 7 figs. Gives charts from which, it is said, progress in employee representation movement may be studied profitably.

ENGINEHOUSES

STANDARD DESIGNS. A Unit Construction Method for Engine Houses. Ry. Age, vol. 65, no. 24, June 11, 1920, pp. 1663-1667, 6 figs. Standard designs developed by Pennsylvania system.

EXPLOSIVES

TESTS. Theoretical Maximum Pressure Developed in Own Volume by Thirteen Military Explosives, J. E. Crawshaw. Jl. of Franklin Inst., vol. 189, no. 5, May 1920, pp. 607-625. Results of tests performed at Explosives Experiment Station of Bur. of Mines.

TNT. TNT as a Blasting Explosive, Charles E. Munroe and Spencer P. Howell. U. S. Dept. of Agriculture, Dept. Circular no. 94, May 1920, 24 pp., 12 figs. Results of investigations conducted at U. S. Bureau of Mines to discover safest and best ways of utilizing TNT for industrial blasting purposes. Physical and chemical properties of different grades of explosives are given, together with precautions to be observed in handling, packing, preparation of cartridges, and charging, and results of field tests in blasting stumps, rocks and other work are presented and compared with similar results obtained from dynamite.

FACTORY MANAGEMENT

See Industrial Management.

FERROALLOYS

ELECTRIC MANUFACTURE. Electric Practice in Making Ferroalloys, W. A. Darrah. Iron Age, vol. 105, nos. 15 and 17, Apr. 8 and 22, 1920, pp. 1019-1021 and 1170. American electric ferromanganese is compared with the blast furnace product. Notes on losses and power consumption, and commercial conditions. Raw materials and operating practice for ferrosilicon.

Manufacture of Electric Ferroalloys, C. B. Gibson. Iron Age, vol. 105, no. 16, Apr. 15, 1920, pp. 1102-1103. Notes on factors affecting success, design of furnace for various alloys, power consumption, and recent improved devices.

PROPERTIES. Variation of Magnetic Properties, Resistivity and Density of Ferroalloys with Their Chemical Composition and Thermal Treatment (Variations des propriétés magnétiques, de la résistivité et de la densité des alliages de fer avec leur composition chimique et leur traitement thermique), E. Gumlich. Revue générale de l'Électricité, vol. 7, no. 18, May 1, 1920, pp. 581-588, 10 figs.

FILTERS

CLEANING. Scientific Control of the Filter Station—III, Arthur Wright. Chemical & Metallurgical Eng., vol. 22, no. 24, June 16, 1920, pp. 1119-1122, 3 figs. Discussion on washing and drying filter cakes, and blowing with air or steam to displace filtrate, wash liquor and water.

MOORE. Vacuum and Compressed Air for Industrial Filtration (L'emploi du vide et de l'air comprimé pour la filtration), Léonce Fabre. Génie Civil, vol. 76, no. 18, May 1, 1920, pp. 405-409, 15 figs. Moore immersion and suction filters.

FLIGHT

PHYSICS OF. The Physics of Flight, David L. Webster. Jl. of Franklin Inst., vol. 189, no. 5, May 1920, pp. 553-580, 8 figs. Laws of aerodynamics are stated and their application to flight of aeroplanes discussed.

FLOATING DOCKS

DESIGN. The Design of Floating Docks. Public Works of the Navy, Under the Cognizance of the Bureau of Yards and Docks and the Corps of Civil Engineers. U. S. Navy, Bul. no. 31, Apr. 1920, pp. 47-83, 12 figs. Maximum moments are calculated for bulkhead, cross girders and side walls. Structure considered consists of single side walls connected by girders which are in turn connected by continuous main bulkhead. Translation of two articles, one published in Zeitschrift für Bauwesen in 1892, and another in Schiffbau of May 8, 1912, latter being amplification and generalization of method outlined in former article.

FLOORS

REINFORCED-CONCRETE. Charts Giving Thickness and Reinforcement of Reinforced-Concrete Floor Slabs (Diagrammes donnant les épaisseurs et les reforcements des dalles de hourdis en béton armé), Henri Kampmann. Génie Civil, vol. 76, no. 13, March 27, 1920, pp. 312-314, 3 figs. One chart gives thickness for slab of known length required to support known load, and another the reinforcement required for slab.

FLOTATION

ABSORPTION CONDITIONS. Flotation from the Standpoint of Colloidal Chemistry (Die Schwimmaufbereitung vom Standpunkt der Kolloidchemie), P. Vageler. Metall u. Erz, vol. 17, no. 5, Mar. 8, 1920, pp. 113-119. Writer maintains that as a purely qualitative method of investigation the flotation method is the most unsuitable; but recommends as promising genuine success in regard to the whole problem, a quantitative, systematic study of the absorption conditions in three-phase and multi-phase systems of the most important ores in connection with the technical reagents. Address delivered before Soc. of German Met. & Min. Engrs.

MACHINES. A New Flotation Machine, A. W. Fahrenwald. Pahasapa Quarterly, vol. 9, no. 3, April 1920, pp. 125-130. Pneumatic machine designed without porous bottoms.

FLOW OF FLUIDS

LAWS. The Laws of Elastico-Viscous Flow—II. Jl. Geology, vol. 28, no. 1, Jan.-Feb. 1920, pp. 18-24. Concerning combination of laws of Larmor and of Maxwell proposed by Harold Jeffreys (see monthly notices of Royal Astronomical Soc., vol. 77, no. 5). First article appeared in Jl. Geology, vol. 25, 1917, pp. 405-410.

FLOW OF WATER

RESERVOIRS. Equilibrium of Water Flowing Into Reservoir (Sur le régime permanent dans les chambres d'eau), M. C. Camichel. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 17, April 26, 1920, pp. 986-988. General formulæ giving distribution of velocities in liquid mass according to three rectangular axes.

FLYING BOATS

HULLS. Flying Boats—The Form and Dimensions of Their Hull, G. S. Baker. Eng., vol. 109, no. 2827, March 5, 1920, pp. 323-327, 6 figs. Dynamics requirements of hull are considered under the several headings of diving at low speed, seaworthiness, and ability to change trim at high speeds. Comparison is made between results obtained in full-scale tests and of similar results deduced from tank experiments.

Notes on Flying Boat Hulls, Linton Hope. Flight, vol. 12, nos. 21, 22 and 23. May 20, 27, and June 3, 1920, pp. 546-548, 5 figs., 569-573, 9 figs., and 590-593, 5 figs. Also Aeronautics, vol. 18, no. 344, May 20, 1920, pp. 396-399. Paper read before Royal Aeronautical Society. Deals with method of designing flying-boat hulls and with estimation of weights and proportions.

FOREMEN

PLACE IN INDUSTRIAL PROGRESS. The Foreman's Place in Industrial Progress. Eng. & Indus. Management, vol. 3, no. 18, Apr. 29, 1920, pp. 557-559. Deals with importance of foreman's part in industrial progress as "link" between manager and workers.

FORTIFICATIONS

GERMAN, IN BELGIUM. The German Defences on the Coast of Belgium, H. W. Miller. Mech. Eng., vol. 42, no. 6, June 1920, pp. 319-333, 28 figs. Description of system of fortification employed, together with particulars regarding guns, fire-control stations, shelters, etc., and details of mechanism of various batteries.

FOUNDATIONS

FOOTINGS. Flat Foundations—Concrete, Reinforced Concrete, Masonry, etc. [Étude sur les fondations par empattements (Béton, béton-armé, maçonneries, etc.)], Aimé Willame and Henri Chenu. Annales des Travaux publics de Belgique, vol. 21, no. 2, feb. 1920, pp. 7-81, 26 figs. Mathematical study of stresses. Stresses developed at bottom of massive base are computed approximately from theory of flexure.

See also Machinery.

Steam Pipes. Heat Insulation Facts, L. B. McMillan. Jl. Am. Soc. Heat & Vent. Engr., vol. 26, no. 4, May, 1920, pp. 387-402, 7 figs. Curves showing rates of heat losses from uninsulated surfaces, chart indicating heat lost by bare steam pipe and saving which may be secured by using good covering graph of variation of heat transmission for various thicknesses of material on flat surfaces, etc.

HEAT TREATING

Plant Layouts. Heat Treating Plant for Traction Parts, Edmund Blasko. Am. Drop Forger, vol. 6, no. 5, May 1920, pp. 222-227, 4 figs. Notes on layout and management.
Layout of Heat Treating Plant for Tools, John J. Jones. Am. Drop Forger, vol. 6, no. 5, May 1920, pp. 228-229, 2 figs. Suggestions in regard to layout, construction and operation.

Plant . General Industrial Heat Treating Plant, William J. Merton. Am. Drop Forger, vol. 6, no. 5, May 1920, pp. 216-221, 5 figs. Analysis of factors to consider in plant.

See also Electric Furnaces, Heat-Treating.

HEATING AND VENTILATION

Health and Humidity. Symposium on Health and Humidity, E. Vernon Hill and J. J. Aeberly. Jl. Am. Soc., Heat & Vent, Engrs., vol. 26, no. 4, May 1920, pp. 471-488, 9 figs. Subjects discussed were relation of death rate to wet-bulb temperature prevailing, and relation of wet-bulb temperature to health.

HEATING

Central-Station. *See Heat Losses, Pipes Buried in Ground.*

HEATING, ELECTRIC

Drying Ovens. Electric Heating in Steel Wire Manufacture, Am. Drop Forger, vol. 6, no. 5, May 1920, pp. 236-238, 2 figs. Comparative cost statistics taken at plant of Halcomb Steel Company on drying ovens heated electrically and similar ovens using coke and steam.

Industrial. Industrial Electric Heating, Wirt S. Scott. Jl. Am. Soc. Heat & Vent. Engrs., vol. 26, no. 4, May 1920, pp. 431-440, 7 figs. Advantages claimed are cleanliness, absence of objectionable gases and of products of combustion, elimination of fire hazard, ease of operation, economy and automatic maintenance of temperature.

HELIUM

U. S. Plant, Fort Worth, Tex. United States Helium-Production Plant, Fort Worth, Tex., Willard A. Pollard. Public Works of the Navy, Under the Cognizance of the Bureau of Yards and Docks and the Corps of Civil Engineers, U. S. Navy, Bul. no. 31, Apr. 1920, pp. 13-46, 10 figs. Helium is extracted from natural gas by compression of incoming gas to high pressure, removal of heat of compression by circulation of cold water, progressive cooling resulting from expansion of highly compressed gas through expansion value to low pressure, and application of cold waste gases and closed external refrigerating cycles of nitrogen and CO_2 as refrigerating media. Capacity of plant is 40,000 cu. ft. of helium per day.

HOT-WATER SUPPLY

Piping, Rust Prevention in. The Prevention of the Red-Water Plague, Wm. H. Walker. New England Water Works Assn., vol. 34, no. 1, March 1920, pp. 33-38 and (discussion) pp. 38-48, 6 figs. System for deactivation of water which has been installed in large apartment house in New York City.

HOUSES, CONCRETE

Block and Tile. Concrete Block and Tile House Construction. Contract Rec., vol. 34, no. 19, May 12, 1920, pp. 441-443. Code of recommended practices for concrete block and tile house construction reported by special committee ot Nat. Conference on Concrete House Constructon.
Recommended Practice for Block and Tile House Construction. Concrete Products, vol. 18, no. 5, May 1920, pp. 19-21, 1 fig. Report of Sub-Committee A of Nat. Conference on Concrete House Construction.

Rapid Construction. Confortable and Permanent Industrial Homes of Concrete. Compressed Air. Mag., vol. 25, no. 5, May 1920, pp. 9649-9650, 2 figs. Industrial housing project sponsored by Ingersoll-Rand Co. of New York for its factory employees at Phillipsburg, N. J.

HOUSING

Eliminating Slums. Eliminating the Slums, Emile G. Perrot. Jl. Engrs. Club of Philadelphia, vol. 37-6, no. 187, June 1920, pp. 235-241, 15 figs. Danger of unfit housing is pointed out as well as economic advantages resulting from erecting sanitary industrial houses. Typical models in industrial villages in England and United States are illustrated.

Industrial. The Financial Problems of Industrial Housing, Leslie H. Allen. Mech. Eng., vol. 43, no. 6, June 1920, pp. 346-348. Housing shortage is said to be due partly to fear of financial panic and partly to fact that, high as rents are, they are not high enough to show adequate return on present-day construction costs. Relation of rents to capital invested, calculation of proper rents, and methods of financing house construction are discussed. A scheme of co-operative housing is suggested as solution of present housing problems.
Your Housing Problem. Factory, vol. 24, no. 8, May 1, 1920, pp. 1317-1323, 10 figs. Ideas for meeting it, drawn from an investigation among 1,000 industrial concerns.

See also Houses, Concrete, Rapid Construction.

HUMIDITY

See Heating and Ventilation.

HYDRAULIC TURBINES

Wear. Wear of Hydraulic Turbines, Its Consequences and the Means of Reducing It (L'usure des turbines hydrauliques, ses conséquences et les moyens d'y parer), Henry Dufour. Bulletin technique de la Suisse romande, vol. 46, no. 9, May 1, 1920, pp. 97-100, 3 figs. Sandsettling basin in hydroelectric plant at Ackersand (Valais). (Continuation of serial.)

HYDROELECTRIC PLANTS

Ontario, Can. The Central Ontario System of Hydro-Electric Power, G. B. Smith. Jl. Eng. Inst. of Canada, vol. 3, no. 6, June 1920, pp. 289-292, 1 fig. System comprises seven power houses operating in parallel and feeding into a system of 370 miles of 44,000-volt transmission lines.

Semi-Protable Machine Shelters. An Alternative for Outdoor Generators, Henry G. Reist. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 360-361. Reference is made to article on Outdoor Generators published in Gen. Elec. Rev., March 1920. It is suggested that in order to overcome difficulties there envisaged arising from sluggishness developed by lubricating oils in cold weather, standard generators be used and housed under inexpensive semi-portable shelters.

INDUSTRIAL MANAGEMENT

Bibliography. A List of Bibliographies on Industrial Engineering and Management. Soc. Indus. Engrs., vol. 3, no. 6, May 1920, 23 pp. Compiled by Committee on Research of Society of Industrial Engineers.

Counsel. Why Industry Seeks Competent Counsel, L. V. Estes. Indus. Management, vol. 59, no. 6, June 1920, pp. 475-480. Significance of competent counsel in improvement and progress of induseries.

Employees, Contentment of. Making Employees Interested in Their Work, Harry Dexter Kitson. Am. Mach., vol. 52, no. 19, May 6, 1920, pp. 983-985. Psychological principles involved in process of arousing interest of employees.

Group Working. Grouping Workers to Get Best Results, Eugene J. Benge. Factory, vol. 24, no. 8, May 1, 1920, pp. 1332-1333, 3 figs. It is claimed if each workman in a group produces about same as his nieghbor, there is likely to be less dissatisfaction and greater total output. Plan is said to be measure of working force's effectiveness.
The Lincoln Motor Production Plan, I. J. Beatty. Factory, vol. 24, nos. 8 and 9, May 1 and 15, 1920, pp. 1328-1332 and 1547-1549, 2 figs. Notes on working; dispatching assemblies and recording operations.

Machine Records. Keeping Tab on Machines That Loaf, A. B. Burgess Factory, vol. 24, no. 8, May 1, 1920, p. 1339, 2 figs. Method of showing management at all times number of machines in operation.

Planning. Output Planning, A. Robert Stelling. Elecn., vol. 84, no. 2189, Apr. 30, 1920, pp. 487-491, 4 figs. Writer contends that planning is a factor in the elimination of waste and should be considered as much a separate function of management as cost accounting and treated as such. Notes on the principles of planning with illustrations of "route sheets" for assembly and machine work.

Production Methods. Increasing Production Without a Bonus—II, Fred H. Colvin. Am. Mach., vol. 52, no. 20, May 13, 1920, pp. 1041-1044. Part played in plan of management of White Motor Co. by monthly publication, The White Book, in which, it is said, all questions are freely and frankly discussed.
Installing Gantt Production Methods, Wallace Clark. Indus. Management, vol. 59, no. 6, June 1920, pp. 443-448. System which permits foremen to fill his orders as rapidly as possible and in proper sequence, and to operate every machine when there is work for it to do.
"Limits" and Their Relation to Increased Production, W. Groocock. Eng. & Indus. Management, vol. 3, no. 17, Apr. 22, 1920, pp. 515-517. The question of mass production of individual commodities is said to be intimately associated with principle of utilizing labor-saving machines for production of numerous articles which are at present employing large amount of manual labor. Discussion of problems of organization and machinery for production of such labor-saving machines.
Mass Production, H. W. Allingham. Elecn., vol. 84, no. 2189, Apr. 30, 1920, pp. 478-479, 3 figs. Writer points out difficulties of mass production in engineering and discusses mass production in a gas-fittings factory, the motor-car industry, etc.
Moderm Production Methods—III, IV, and V, W. R. Basset. Am. Mach., vol. 52, nos. 19, 21 and 23, May 6 and 20 and June 3, 1920, pp. 1003-1008, 7 figs., 1087-1090, 2 figs., and 1177-1182, 11 figs. Need for systematic stock keeping is pointed out and record forms are illustrated, May 20: Organization of engineering department. June 3: Tool-order forms and follow-up cards.
The Manufacture of Houseshold Appliances, J. V. Hunter. Am. Mach., vol. 52, no. 23, June 3, 1920, pp. 1173-1174, 5 figs. Method employed for quantity production by Hurley Machine Co., Chicago.

See also Group Working.

Routing. Routing Gears and Machine Parts Through the Factory, J. A. Urquhart. Am. Mach., vol. 52, no. 24, June 10, 1920, pp. 1231-1236, 11 figs. Method used at plant of Brown & Sharpe Mfg. Co. Paper read before Am. Gear Manufacturers' Assn.

Shipyards. Industrial Organization Applied to Shipyard Management, Norman Howard. Indus. Management, vol. 59, no. 6, June 1920, pp. 492-495, 6 figs. Work of industrial management section of Emergency Fleet Corporation.

See also Cutting Metals; Ship-Building, Production System; Time Study.

IRON

INDIRECT. Illumination of Artistic Interiors Without the Use of Pendant Ceiling Fixtures, Augustus D. Curtis and J. L. Stair. Trans. of Illuminating Eng. Soc., vol. 15, no. 1, Feb. 10, 1920, pp. 61-73 and (discussion) pp. 73-76, 14 figs. Examples of indirect lighting are illustrated, notably in American Theatre of Chicago, National Bank of Commerce, New York, and Hotel Commodore Lobby, New York.

INDUSTRIAL. A Survey of Industrial Lighting in Fifteen States, R. O. Eastman. Trans. of Illuminating Eng. Soc., vol. 15, no. 1, Feb. 10, 1920, pp. 77-93 and (discussion) pp. 93-96, 17 figs. Based on visits to representative plants.

See also Factory.

STREET. Intensive Street Lighting, W. D'Arcy Ryan. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 362-373, 12 figs. Details of "intensive white way" system of illumination installed in principal streets of various cities.

Recent Developments in Gas Street Lighting, F. V. Westermater, Am. City (Town & County Edition), vol. 22, no. 5, May 1920, pp. 490-492, 3 figs. Fixtures are illustrated and a table is given showing illuminating powers of different lamps used.

The Trend of Modern Practice in Street Lighting, W. E. Underwood. Elec. Rev. (Chic.), vol. 76, no. 24, June 12, 1920, pp. 980-983, 4 figs. Practice in connection with transformers, mounting heights, glassware and series and multiple systems.

LIGHTNING ARRESTERS

ALTERNATING-CURRENT. Alternating-Current Lightning Arresters, V. E. Goodwin. Gen. Elec. Rev., vol. 23, no. 5, May 1920, pp. 429-432, 8 figs. Survey of developments with special reference to aluminum cell and oxide-film arrester.

LIGNITE

MINING. *See Excavating Machines, German.*

LOCOMOTIVE BOILERS

COPPER VS. STEEL TUBES. Locomotive Boiler Tubes: Copper v. Steel, Gerard A. Muntz. Ry. Gaz., vol. 32, no. 18, April 30, 1920, pp. 655-656, 1 fig. First cost of steel tubes is said to be nearer one-half than one-third that of copper. Life of steel tubes is given as 120,000 train-miles, whereas life of copper tubes is put at 360,000 train-miles.

LOCOMOTIVES

BRITISH. A British Ten-Wheel-Coupled Locomotive, W. Parker. Ry. & Locomotive Eng., vol. 33, no. 5, May 1920, p. 131, 1 fig. Description of a 4-cylinder 0-10-0 locomotive for banking trains up an incline with gradient of 1 in 37.7 built at Derby Works for the Midland Railway of England.

CYLINDER VALVES. New Application of Piston Valves to Slide Valve Cylinders, J. Snowden Bell. Ry. & Locomotive Eng., vol. 33, no. 5, May 1920, pp. 142-143, 3 figs. Description and illustrations of what is said to be a new and entirely practical method of converting inside steam-pipe slide-valve locomotive cylinders into outside steam-pipe piston-valve cylinders, devised and patented by Patrick Sheedy, superintendent of motive power of Southern Pacific System at Los Angeles, Cal.

EFFICIENCY, INCREASING. How to Increase the Efficiency and Operating Capacity of Steam Locomotives, B. B. Milner. Official Proc. New York Railroad Club, vol. 30, no. 6, April 16, 1920, pp. 6069-6089 and (discussion) pp. 6089-6095, 4 figs. Suggestions in regard to installing feedwater heater and trailer booster and lightening reciprocating and revolving weights by use of alloy steel.

ELECTRIC. *See Electric Locomotives.*

FUEL FOR. *See Coal, Iowa and Illinois.*

OIL-BURNING. Heavy Oil as Locomotive Fuel (Le chauffage aux huiles lourdes appliqué aux locomotives), L. Pierre-Guédon. Génie Civil, vol. 76, no. 14, April 3, 1920, pp. 329-333, 10 figs. Burner for oil residue used in locomotives of Paris, Lyons and Mediterranean Railway.

REPAIRING. Scheduling and Routing Systems for Locomotive Repairs, Ry. Age Daily Edition), vol. 68, no. 24a, June 11, 1920, pp. 1716-1917, 4 figs. Practices of several railroads. Committee report presented at meeting of Mechanical Section, American Railroad Assn.

SPEED INDICATORS. Speed Indicators and Recorders for Application to Locomotives. Ry. Gaz., vol. 32, no. 22, May 28, 1920, pp. 794-795, 4 figs. Description of "Teloc" locomotive speed indicator and recorder, recently put on the market by Hasler Telegraph Works, London.

STEEL FOR. Report on Specifications and Tests for Materials. Ry. Age, Daily Edition, vol. 68, no. 24, June 15, 1920, pp. 1795-1800, 4 figs. Practice recommended by Committee of Am. Railroad Assn., Mech. Section, in regard to method of manufacture and tests of steel for tires of locomotives and cars, boiler and fire box of locomotives, journal bearings, axles, shafts and other forgings.

SUPERHEATER. Cylinders of 0-8-0 Type Superheater Locomotive; North-Eastern Railway. Eng., vol. 109, no. 2824, Feb. 13, 1920, pp. 208-209, 11 figs. Details of cylinders, and records of trials of locomotive.

0-10-0 Type Superheater Locomotive for the Midland Railway. Eng., vol. 109, no. 2827, Mar. 5, 1920, pp. 311 and 314, 15 figs., partly on 2 supp. plates. Data: Cylinders, four, 16¾-in. diameter by 28-in. stroke; valve motion, Walschaerts; wheels, diameter, 4 ft. 7½-in.; total heating surface, 1718.25 sq. ft.; superheater surface, 445 sq. ft.; working boiler pressure, 180 lb. per sq. in.; tractive force at 85 per cent boiler pressure, 43,312 lb.; weight of engine in working order, 72 tons 13 cwt.

Report of Committee on Superheater Locomotives. Ry. Age (Daily Edition), vol. 68, no. 24a, June 11, 1920, pp. 1720-1721. Installation, operation, care, and maintenance of superheater equipment for locomotives. Committee report presented at meeting of Mechanical Section, American Railroad Assn.

TENDER CONNECTIONS. Safety Connections Between Engine and Tender. Ry. Age, (Daily Edition), vol. 68, no. 24a, June 11, 1920, pp. 1707-1711, 6 figs. It is urged that all new locomotives be built with central safety bar located immediately beneath drawbar, and where construction of locomotive and tender prevents this, that two safety bars be applied, one located on each side of drawbar and as near thereto as possible. Committee report presented at meeting of Mechanical Section, American Railroad Assn.

WHEEL-BALANCING MACHINE. Locomotive Wheel Balancing Machine, Engr., vol. 129, no. 3354, Apr. 2, 1920, pp. 354-355, 7 figs. Axle is placed on bearings which are each supported on four springs so arranged that bearings may "float" and "dither" with axle, should wheels when spun be out of strict balance.

MACHINE SCREWS

See Bolts.

MACHINE TOOLS

ADJUSTING STRIPS, SLIDES, ETC. Recent Machine Tool Developments—XI, Joseph Horner. Eng., vol. 109, no. 2833, Apr. 16, 1920, pp. 505-508, 46 figs. Adjusting strips, and lubrication of slides.

MACHINERY

FOUNDATIONS FOR. Fastening Machines to Concrete Floors and Foundations, Arthur F. Owen. Machy. (N.Y.), vol. 26, no. 9, May, 1920, pp. 820-821, 5 figs. Description and illustrations of common methods of fastening machine tools to concrete floors and types of drills employed to drill holes in concrete floors and foundations.

MANGANESE ORE

INDIA, MINING. Manganese-Ore Mining in India, E. N. T. Slater. Eng. & Min. Jl., vol. 109, no. 21, May 22, 1920, pp. 1155-1159, 7 figs. Rich deposits in jungle were worked by open pits, gravity planes being used for collecting ores at loading points. Condition and propects of industry are noted, together with marketing of ores in England.

MARINE ENGINES

See Diesel Engines, Trend in Marine Types; Oil Engines.

MARINE STEAM TURBINES

REDUCTION GEARS. Reduction Gearing on Steamships. Eng., vol. 109, no. 2836, May 7, 1920, pp. 599-601, 6 figs. Notes on their design.

MATERIALS

DUCTILE, RESISTANCE OF. On the Resistance of Ductile Materials to Combined Stresses in Two or Three Directions Perpendicular to One Another, H. M. Westergaard. Jl. of Franklin Inst., vol. 189, no. 5, May 1920, pp. 627-640, 9 figs. Various theories for determining resistance of materials to combined stresses are discussed. In particular stress-solid resulting from application of maximum shear and maximum strain theory is indicated.

MERCHANT MARINE

LABOR PROBLEM. The Labor Problem and its Influence Upon the Merchant Marine of the Future, Waldon Fawcett. Int. Mar. Eng., vol. 25, no. 6, June, 1920, pp. 513-515. Opinion is expressed that one solution for American labor problem in maritime industries and for high costs of operation is to be found in employment of vessels of maximum size.

METALS

See Chemical Analysis, Metals, X-Ray.

METEOROLOGY

FREE-AIR CONDITIONS. Average Free-Air Conditions as Observed by Means of Kites at Drexel Aerological Station, Nebr., During the Period November, 1915, to December, 1918, inclusive, Willis Ray Gregg. Monthly Weather Rev., vol. 48, no. 1, Jan. 1920, pp. 1-11, 8 figs. Tables and figures are given indicating monthly, seasonal and annual values of different elements at various levels up to 5 km. Data are compared with similar data for Mount Weather, Blue Hill and elsewhere, and separate table contains comparative values of air density as determined by different investigators for various parts of the world.

PREDICTING MINIMUM TEMPERATURES. Predicting Minimum Temperatures from Hygrometric Date, J. Warren Smith. Monthly Weather Rev., Supp. no. 16, 76 pp., 57 figs. Application of mathematical methods to forecast minimum temperatures is exemplified.

METRIC SYSTEM

ARGUMENTS AGAINST ADOPTION IN U. S. Adoption of the Metric System Would Do Untold Damage, Henry R. Towne. Indus. Management, vol. 59, no. 6, June, 1920, pp. 473-477. Abandonment of present basic standards would involve, it is claimed, damage beyond easy comprehension, injury to organized industries, injury to commerce and needless inconvenience to the people.

OIL FIELDS

Geology of. Geologic and Economic Features of Oil Structures, Victor Ziegler. Economic Geology, vol. 15, no. 3, April-May, 1920, pp. 247-258. It is claimed that (1) comparatively recent age of formation, (2) slight folding, very closely following period of deposition, and (3) rock originally rich in organic remains, are features favoring maximum accumulation of oil.

Russia. The Oil Fields of Russia, A. Beeby Thompson. Min. & Metallurgy, no. 161, May 1920, pp. 27-29. Notes on Baku oil fields. Operated area of 250 acres is said to have produced over 500,000 bbl. per acre.

OIL FUEL

See Petroleum.

OIL TANKS

Reinforced-Concrete. Concrete Storage Tanks for Fuel Oil Square and Circular, R. E. Parker. Concrete, vol. 16, no. 5, May 1920, pp. 213-217, 11 figs. Two types, one circular and one rectangular, built by Aberthaw Construction Co., are illustrated and described.

Steel. New Design for Oil Tankage, H. T. Carlton. Eng. & Min. Jl., vol. 109, no. 19, May 8, 1920, pp. 1078-1079, 2 figs. Type developed by D. O'Hara and A. L. Shaw, of San Francisco involving suspended steel "arch," which has recently been patented.

OILS

Blended, Viscosity of. The Saybolt Viscosity of Oil Blends, Winslow H. Herschel. Chemical & Metallurgical Eng., vol. 22, no. 24, June 16, 1920, pp. 1109-1112, 3 figs. Charts for determining oil blends of components of known viscosity, including logarithmic rule and correction factors to be applied in calculations, and tables of viscosities of blends containing 25,50 and 75 per cent of heavier oil

OPEN-HEARTH FURNACES

Waste-Heat Utilization. Steel Plant Power Generation from Waste Heat and Coal, B. H. Greene. Assn. of Iron & Steel Elec. Engrs., Jan. 1920, pp. 25-27, 3 figs. Writer presents some practical problems encountered in utilization of waste heat from open-hearth furnaces for generation of power for steel mill use. Description of an installation, wherein steam derived from waste heat was supplemented by coal-fired boilers and used for electric power generation.

OXY-ACETYLENE CUTTING

Manhole-Cutting Machine. Oxy-Acetylene Manhole Cutting Machine. Eng., vol. 109, no. 2836, May 7, 1920, p. 606, 4 figs. Machine constructed by Davis-Bournonville Co., Jersey City, for repetition cutting of manholes to template.

OXY-ACETYLENE WELDING

See Autogenous Welding.

PACKING

See Boxes.

PAPER MANUFACTURE

Pulp-Grinder Speed Control. Increasing Efficiency by Speed Control of Turbine-Driven Pulp Grinders, Adolph F. Meyer. Paper, vol. 26, no. 11, May 19, 1920, pp. 11-19, 14 figs. Method of controlling speed of hydraulic turbines is explained, and tachometer charts are given showing results secured with governor under average conditions.

PARACHUTES

Static Burns. Recent Data on Parachutes, Floyd Smith. Aviation, vol. 8, no. 9, June 1, 1920, pp. 369-370. Experimental study of friction static burns developed in silk parachutes.

PAVEMENTS

Labor Requirements. Method of Estimating Labor Hour Requirements on Paving Work, D. B. Davis. Eng. & Contracting, vol. 53, no. 18, May 5, 1920, pp. 508-509, 7 figs. Writer points out that in making an estimate of certain work a chart showing various conditions relating to work will help to guarantee against omission of important details. Brief study for determining labor-hour requirements for some divisions of work connected with a brick paving job in a city is included.

PAVEMENTS, ASPHALTIC CONCRETE

Types. Asphaltic Concrete Pavement, W. H. Connell. Can. Engr., vol. 38, no. 24, June 10, 1920, pp. 543-544, 559 and 561. Best asphaltic concrete pavements, writer has found in his experience as road builder, is a patented one which specifies 7½ per cent of asphalt 8 to 10 per cent of limestone or Portland cement dust, 50 to 55 or 60 per cent of stone and 25 to 30 per cent of sand.

PAVEMENTS, STONE

Granite-Block. Granite Block on Old Concrete Base. Public Works, vol. 48, no. 19, May 22, 1920, pp. 441-442, 1 fig. Repaving part of Park Avenue, New York, for heavy traffic,with granite blocks replacing asphalt blocks on original base.

PEAT

Pulverized. Pulverized Peat Firing in Sweden (Die Torfstaubfeuerung in Schweden), P. Wangemann. Feuerungstechnik, vol. 8, no. 7, Jan. 1, 1920, pp. 53-58, 16 figs. It is pointed out that in America the difficulty of pulverized coal firing was overcome by increased drying and finer grinding, whereas in Sweden the opposite method was employed of adapting burner to coarser material with greater water content, both methods proving successful. Advantages and disadvantages of both methods are discussed. Results of experiments are said to show that pulverized peat firing results in higher superheat temperature than anthracite firing.

PETROLEUM

Colombian Law. The Colombian Petroleum Law, J. W. Thompson. Eng. & Min. Jl., vol. 109, no. 21, May 22, 1920, pp. 1170-1172. Regulations concerning development and providing royalties to be paid. Foreign companies required to have local representatives. Development or production tax of 8-6-4 per cent, determined by distance from sea coast.

U. S. Supply. Relief from Oil Shortage, Oswald F. Schuette. Gas Age, vol. 45, no. 9, May 10, 1920, pp. 422-423. Proposals under consideration by United States Congress for obtaining fuel oil for United States vessels.

PETROLEUM INDUSTRY

Progress 1916-18. The Petroleum Industry in the Years 1916-1918 (Die Erdölindustrie in den Jahren 1916-1918), Richard Kissling. Chemiker-Zeitung, vol. 43, nos. 153, 154 and 155, Dec. 20, 23 and 25, 1919, pp 897-899, 905-909, and 913-916. A review of production and of literature, patents, processes, etc., from all parts of the world.

PHASE MODIFIERS

Commutator Type. Commutator Phase Shifters (Ueber Kommutator-Phasenschieber), J. Kozisek. Elektrotechnische Zeitschrift, vol. 41, no. 3, Jan. 15, 1920, pp. 52-55, 15 figs. Notes on effect of saturation and extension of compensating field. Other means of extension, such as three-phase regulation of phase shifters, excess compensation at full load, etc., are discussed.

PHOTOMETERS

Photoelectric. A Photoelectric Photomoter, Arthur H. Compton. Trans. of Illuminating Eng. Soc., vol. 15, no. 1, Feb. 10, 1920, pp. 28-33, 1 fig. Use of thermionic amplifier to increase current readings of photoelectric cells is suggested, also filter to reduce proportion of blue light and render indications proportional to photometric value. With such equipment, lamps are compared by varying their distances to cell, until deflection of galvanameter is the same as that given by standard lamp.

Photometric Integrator. A Universal Photonetric Integrator, Frank A. Benford. Trans. of Illuminating Eng. Soc., vol. 15, no. 1, Feb. 10, 1920, pp. 19-27, 12 figs. Apparatus for testing military searchlights. It consists of photometer track 150 ft. long on which rides hemispherical light-collecting shell with small portable-type photometer attached and system of curtains along track to absorb stray light.

PIERS

Design. Pier Design for Ocean and Lake Terminals, H. McL. Harding. Int. Mar. Eng., vol. 25, no. 6, June 1920, pp. 523-528, 11 figs. It is advanced that single-unit piers about 700 ft. long to be used by freight-carrying ships should be 140 ft. to 150 ft. wide, with slips 280 ft. to 300 ft. wide. Suggestions are made in regard to equipment to install.

PIPE LINES

Fuel-Oil. Crude Oil and Kerosene (La mazout et le pétrole lampant), Auguste Pawlowski. Génie Civil, vol. 76, no. 16, Apr. 17, 1920, pp. 365-370, 3 figs. Notes on importation of fuel oil into France, particularly on projected pipe line from Havre to Paris.

PIPE, WROUGHT-IRON

Manufacture. Manufacture of Wrought Iron Pipe, N. Bowland. Machy. (N.Y.), vol. 26, no. 9, May, 1920, pp. 844-849, 20 figs. Description of various steps in production of wrought-iron pipe, beginning with puddling process and ending with inspection.

PIPING

Calculations for. A Graphic Method for the Calculation of Steam and Air Piping (Eine allegemeine graphische Methode, augewendet bei der Berechnung der Dampf- end Luftleitungen), Alexander Fisher. Zeitschrift für das gesamte Turbinenwesen, vol. 16, no. 36, Dec. 30, 1919, pp. 391-393. Description of a general method by means of which it is said to be possible to make calculations of quantities and in which the functional relationship between quantities is given in the form of a diagram or table of figures. In complicated cases in connection with the logarithmographic method of Mehmke it is said to arrive at results rapidly.

Power-Plant. Design and Construction of Power-Plant Piping, John D. Morgan. Power, vol. 51, no. 20, May 18, 1920, pp. 797-799, 2 figs. Suggestions regarding design and construction of piping including materials used, valves, fittings and types of joints of various pressures and temperatures.

RESEARCH

ENGLAND. Report of First Conference of Research Organizations. Department of Scientific and Industrial Research. C. R. O. no. 1, July 29, 1919, 30 pp. Means of co-operating of various research organizations in British industries discussed.

Report of Second Conference of Research Organizations. Department of Scientific and Industrial Research, C. R. O. no. 2, Dec. 12, 1919, 30 pp., 1 fig. Development of research work in British industries.

POST-WAR, STIMULATION OF. The Stimulation of Research After the War, R. A. Harper. Science, vol. 51, no. 1324, May 14, 1920, pp. 473-478. Scientists, it is said, should set an example of discriminating judgment and careful analysis of evidence against "evolutionary theories promulgated by visionary and ill-trained statesmen and politicians, by properly regulating and co-ordinating research so that each problem shall receive its fit proportion of attendance, and making provision in research for "that free and untrammeled environment where personal inclination and initiative are the major factors."

See also Nitrogen, Fixation of.

RESERVOIRS, WATER

MECHANICS OF. Application of the Principles of Images to a Water Reservoir (Application du principe des images aux chambres d'eau), C. Camichel. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 19, May 10, 1920, pp. 1106-1107. Experimental application of Lord Kelvin's principle to the distribution of velocities in a water reservoir.

See also Flow of Water.

RIVERS

IMPROVEMENT. Construction of Lock D, Cumberland River, Rufus W. Pafford. Military Engr., vol. 12, no. 61, Jan.-Feb. 1920, pp. 13-20 and 77 and (discussion) pp. 77-78. Details of design and construction of one of the six locks comprising project for improvement of that part of river from Nashville, Tenn., to mouth, called Lower Cumberland.

MISSISSIPPI, MOUTH OF. An Open Mouth for the Mississippi River, Allen E. Washburn. Proc. Louisiana Eng. Soc., vol. 6, no. 1, Feb. 1920, pp. 17-32 and (discussion) pp. 32-41. Survey of work done to maintain navigable entrance to New Orleans, and visualization of probable future developments.

RIVETED JOINTS

DESIGN. The Design of Riveted Joints, James Montgomerie. Eng. & Indus. Management, vol. 3, no. 18, Apr. 29, 1920, pp. 547-548, 1 fig. Information based on experiments carried out at instance of Committee of Lloyd's Register of Shipping concerning physical qualities of riveted joints. Paper presented before Instn. Engrs. & Shipbuilders in Scotland.

RIVETING

ELECTRIC MACHINE FOR. The "Remca" Electric Riveting Machine. Eng., vol. 109, no. 2836, May 7, 1920, pp. 625-626, 6 figs. Patented machine manufactured by Mada Eng. Co., Ltd., Liverpool.

ROAD CONSTRUCTION

PERSONNEL FOR. Training the Personnel for Highway Construction and Transport, Clyde Jennings. Automotive Industries, vol. 42, no. 21, May 20, 1920, pp. 1145-1147. Opinions expressed at joint educational conference at Washington, May 14 and 15.

ROADS

DESIGN. Traffic Census as Basis for Road Design, W. A. McLean. Contract Rec., vol. 34, no. 23, June 9, 1920, pp. 544-546. Experiences in Ontario and Massachussetts.

MATERIALS, TESTS FOR. Road Materials. Report of Committee D-4 Annual Meeting. Am. Soc. Testing Matls., June 22-25, 1920, 44 pp., 2 figs. Tests are suggested for specific gravity of road oils, road tars, asphalt cements and soft tar pitches and for quantity of clay and silt in gravel for highway construction; also for proportions for concrete for highway construction.

ROADS, BITUMINOUS

SURFACING. Bituminous Surface Treatment, M. C. Welborn. Good Roads, vol. 19, no. 23. June 5, 1920, pp. 287-290. Practice of Texas State Highway Dept.

WARRENITE-BITULITHIC. History of Warrenite-Bitulithic Roads and Some Discoveries in Pavement Construction, George C. Warren. Contract Rec., vol. 34, no. 20, May 19, 1920, pp. 458-460. Notes on asbestos-bitulithic and double re-flushcoating are included.

ROADS, CONCRETE

CONSTRUCTION. Constructing a Concrete Road in Nebraska, A. S. Mirick. Public Works, vol. 48, no. 21, June 5, 1920, pp. 493-494. Round, water-worn gravel of feldspar and quartz, the only material available in the state, was tested for use as the concrete aggregate and was found to make stronger concrete than Potomac River gravel. It is now being used for six miles of the Lincoln Highway.

The Industrial Railway in Road Work. Good Roads, vol. 19, no. 17, Apr. 28, 1920, pp. 217-218, 2 figs. Equipment used by contractors in Illinois and Michigan in construction of concrete roads.

DEVELOPMENTS. Recent Deve ~ ments in Concrete Road Construction, A. N. Johnson. Eng. & Contracting, vol. 53, no. 18, May 5, 1920, pp. 514-518, 2 figs. Notes on subgrade, coarse aggregate tests and tests of sand for organic impurities, consistency, proportions for mixing concrete, etc. Gives Abrams tables of proportions and quantities for 1 cu.yd. of concrete, and instruction for practical application of table, and example of use of table. Abstract of paper presented before Am. Road Builders' Assn.

ROADS, EARTH

MAINTENANCE. How to Improve and Maintain Earth, Clay and Sand Roads, A. R. Hirst. Can. Engr., vol. 38, no. 24, June 10, 1920, pp. 553-556. Experience of writer as highway engineer of state of Wisconsin.

ROCK DRILLS

CARE OF. Care of Rock Drills, Howard R. Drullard. Min. & Metallurgy, no. 162, June 1920, pp. 28-29, 1 fig. Suggestions in regard to lubrication of drills and method of forming drill shank.

ROLLER CHAIN

TRANSMISSION. Roller-Chain for Tractors and Power Transmission. Am. Mach., vol. 52, no. 24, June 10, 1920, pp. 1223-1226, 12 figs. Manufacturing process of Spaulding Chain Co., Bloomfield, N. J.

ROLLING MILLS

ELECTRICALLY DRIVEN. Electric Mill Drives, J. D. Wright. Assn. of Iron & Steel Elec. Engrs., Jan. 1920, pp. 15-24, 6 figs. Discussion of electric mill drives with particular reference to some of factors which influence selection of electric equipment for driving main rolls of various types of mills. Information which is necessary for calculating proper size of motor required to roll any given product.

Electric Drive for Rolling Mill for Lead Sheets. Eng., vol. 109, no. 2824, Feb. 13, 1920, pp. 215 and 218, 4 figs. Equipment consists of 90-hp. mill motor, 75-kw. motor generator set with 2-ton flywheel and Ward-Leonard control gear.

The Largest Rolling Mill in the World. Elecn., vol. 84, no. 2190, May 7, 1920, pp. 519-521, 5 figs. Description and illustrations of a 20,500 hp. electrically-driven British 42-in. plate mill of reversing type, turning out plates at rate of 60 tons per hr. for two hrs. and at rate of 30 tons per hr. for remainder of shift. (To be concluded.)

POWER DRIVES. Power Drives for Rolling Mills, W. O. Rogers. Power, vol. 51, no. 20, May 18, 1920, pp. 800-803, 6 figs. Various types of engine valves are treated as applying to rolling mill units. Reference is made to two large poppet-valve uniflow engines operating a 9- and 12-in. merchant mill. These engines operate with condensers and have disk-driven governors so designed that engine speed can be regulated while engine is in operation.

SCREW-DOWN MOTOR CONTROLLERS. Control of Blooming Mill Tables and Screw-Downs, Walter C. Kennedy. Jl. Engrs. Club of Philadelphia, vol. 37-6, no. 187, June 1920, pp. 227. Design and characteristics of screw-down motor controllers.

SHIP-PLATE. The Dominion Iron and Steel Company's New Ship-Plate Rolling Mill, H. E. Rice. Iron & Steel of Canada, vol. 3, no. 4, May 1920, pp. 116-119, 3 figs. Latest type of mill erected at cost of $5,000,000 and put into operation Feb. 19, 1920.

ROPE DRIVE

COTTON ROPE. Cotton Rope for Power Transmission, J. Melville Alison. Jl. Eng. Inst. of Canada, vol. 3, no. 6, June 1920, pp. 292-298, 10 figs. Discussing comparative advantages of cotton and Manila rope, it is claimed, that although cotton is dearer than Manilla, "its superior resilience, grip and groove impact add so greatly to driving force that up to one-third more horsepower may be transmitted." It is stated that cotton has entirely supplanted any other material for transmission work in England. Table of horsepowers transmitted by three-strand cotton driving rope of various diameters is included.

RUBBER

VULCANIZATION OF. The Acceleration of Vulcanization, D. F. Twiss and S. A. Brazier. Jl. Soc. Chem. Indus., vol. 39, no. 9, May 15, 1920, pp. 125T-132T, 10 figs. Experimental study of three methods: (1) raising temperature, (2) increasing proportion of sulphur relative to rubber, and (3) introducing accelerator.

RUBBER INDUSTRY

ELECTRICITY, APPLICATIONS OF. Electricity in the Rubber Industry, C. W. Drake. Can. Chem. Jl., vol. 4, no. 5, May 1920, pp. 133-135. Discusses high load and power factors for rubber plants.

RUST PREVENTION

See Hot-Water Supply.

SCAFFOLDS

See Ladders.

STEAM

ALIGNMENT DIAGRAM. A Steam Alignment Diagram, D. Halton Thomson. Eng., vol. 109, no. 2827, Mar. 5, 1920, pp. 301-305, 10 figs. Based on equations for properties of steam propounded by Prof. H. L. Callendar.

STEAM POWER PLANTS

AUXILIARIES. Electric Drive for Station Auxiliaries, E. E. George. Elec. World, vol. 75, no. 24, June 12, 1920, pp. 1365-1366. Motors operated with steam diverted from intermediate stage of turbines for feedwater heating are said to be more economical than steam-driven auxiliaries.

COSTS. Power Costs During Years 1914 to 1919, Hubert E. Collins. Indus. Management, vol. 59, no. 6, June 1920, pp. 467-472, 1 fig. Summary of records of 14 representative plants. Conditions that prevailed in plants are surveyed, noting changes in power costs that took place during the years of the war. Tables of costs of heating industrial buildings, distribution of power consumption between various departments of industrial plants, and costs of softening boiler feed water using lime and soda ash, are given.

STEAM TURBINES

GEARED, LUBRICATING SYSTEM FOR. Lubricating System for Geared Turbines, J. Emile Schmeltzer and B. G. Fernald. Int. Mar. Eng., vol. 25, no. 6, June, 1920, pp. 508-510, 1 fig. Standard oiling system developed by Emergency Fleet Corporation for adoption on vessels equipped with geared turbines. Paper read before Soc. of Nav. Architects and Mar. Engrs.

STEEL

GALVANIZED, STRENGTH OF. Metallographical Study on Galvanized Steel, Y. Taji. Eng., vol. 109, no. 2827, Mar. 5, 1920, pp. 327-329, 19 figs. Results of experiments. Of special interest were values found for alternating strength of steel bar both before and after galvanization, which were 25.2 and 24 tons per sq. in. respectively. Paper read before Soc. of Naval Architects, Japan.

NITROGEN IN. Nitrogen in Steel, and the Erosion of Guns, H. E. Wheeler. Min. & Metallurgy, no. 160, April 1920, p. 32. Experiments conducted at testing laboratory of Watertown Arsenal.

SULPHUR AND PHOSPHORUS IN. Sulphur and Phosphorus in Steel, E. E. Thun. Jl. Am. Steel Treaters Soc., vol. 2, no. 8, May 1920, pp. 368-391. Survey of technical literature on effect of sulphur and phosphorus on quality of steel. Outline of tests to be conducted by representative committee appointed upon initiative of Am. Soc. for Testing Materials, U. S. Railroad Administration and Bur. of Standards for investigation of problem.

Metallurgical Theories Conflict. Foundry, vol. 48, no. 12, June 15, 1920, pp. 467-468 and p. 495. Bibliography on effect of phosphorus and sulphur in steel compiled by joint committee of several technical societies.

The Distribution of Phosphorus in Steel Between the Points AC1 and AC3, J. H. Whiteley. Iron & Steel Inst., Paper 9, Annual Meeting, May 6 & 7, 1920, 24 pp. 24 figs. Steels in which phosphorus varied from 0.006 to 0.12 per cent were heated to and maintained at temperatures between critical points Ac1 and Ac3. Part of phosphorus contained in Y-iron diffused into adjacent ferrite. At temperatures below 650 deg. cent. phosphorus diffused extremely slowly in ferrite; above this temperature, velocity gradually increased, and above 800 deg. cent. it was rapid. Velocity of diffusion of phosphorus in Y-iron also increased with temperature.

See also Chromium Steel; Chrome-Nickel Steel; Nickel Steel.

STEEL CASTINGS

DESIGN. Practical Notes on the Design and Treatment of Steel Castings, George F. Preston. Iron & Steel Inst., Paper 7, Annual Meeting, May 6 & 7, 1920, 12 pp., 9 figs. Suggestions to designers of castings.

STEEL, HEAT TREATMENT OF

BALL BEARINGS. The Heat Treatment of Ball Bearing Steel, Carl T. Hewitt. Jl. Am. Steel Treaters Soc., vol. 2, no. 8, May 1920, pp. 395-399, 5 figs. Practice at plant of Fafnir Bearing Co.

BRAZED FITTINGS FOR AIRCRAFT. Heat-Treating of Brazed Fittings for Aircraft, Archibald Black. Am. Mach., vol. 52, no. 23, June 3, 1920, pp. 1184-1186, 4 figs. Includes typical list of steels used in aircraft work with their approximate properties.

QUENCHING BATHS. Fuels, Burners and Quenching Mediums for Heat-Treatment, S. P. Rockwell. Machy. (N. Y.), vol. 26, no. 9, May 1920, pp. 837-840, 5 figs. Points out advantages and disadvantages of different kinds of fuel and types of burners, and gives description of results obtained by various quenching baths.

TOOL HARDENING. Some General Principles of Tool Hardening, A. E. Bellis. Jl. Am. Steel Treaters Soc., vol. 2, no. 8, May 1920, pp. 364-367. Emphasizes that practical means of controlling results from foundry, through rolling annealing, forging, and hardening, is to maintain uniformity of composition and uniformity of heat treatment.

STEEL, HIGH-SPEED

HARDENING AND TEMPERING. Note on the Structural Constitution, Hardening, and Tempering of High-Speed Steel Containing Chromium and Tungsten, Kotaro Honda and Takejior Murakami. Iron & Steel Inst., Paper 15, Annual Meeting, May 6 & 7, 1920, 11 pp. It is concluded from experimental analysis that in annealed state, high-speed steel containing about 5 per cent chromium, 18 per cent tungsten and 0.6 per cent carbon consists of iron dissolving tungstide, free tungstide and carbides, Cr_4C and WC, in free state. Tungstein, it is said, lowers maximum temperature at which, during cooling, self-hardening property of steels begins to take place. Abstract from 32nd Report of Iron & Steel Research Inst. of Japan.

TESTING. A Comparative Test of High-Speed Steels, A. J. Langhammer. Am. Mach., vol. 52, nos. 19, 22 and 24, May 6 and 27 and June 10, 1920, pp. 979-982, 1140-1143, 4 figs, and 1227-1230. Method of procedure in testing sixteen different commercial brands of high-speed tool steel, together with data as to performance of each individual tool, its chemical composition, heat treatment, and hardness.

A Comparative Test Upon High-Speed Steels—IV, A. L. Langhammer. Chem. & Metallurgical Eng., vol. 22, no. 21, May 26, 1920, pp. 969-975, 18 figs. It is concluded from tests that chemical analysis of high-speed steel may be used only as indicator of its possible qualities. It is advised that in conducting a test no less than four specimen tools should be used, and in order to get most efficient results from high-speed steel tools they must be operated under heavy duty.

STEEL MANUFACTURE

AUTOMOBILE STEELS. The Essentials of High-Grade Steel Manufacture, W. R. Shimer. Jl. Soc. Automotive Engrs., vol. 6, no. 6, June 1920, pp. 387-393. Selection of raw materials.

ELECTRIC-FURNACE. The Manufacture of Steel in the Electric Arc Furnace (Le four à arc pour la fabrication de l'acier), H. Verdinne. Revue universelle des Mines, vol. 5, no. 2, April 15, 1920, pp. 107-132. Economical advantages. (Conducted.)

OPEN-HEARTH PROCESS. Notes on Slag Conditions in Open-Hearth Basic Steel-Making Practice, Jno. F. Wilson. Iron & Steel Inst., Paper 10, Annual Meeting, May 6 & 7, 1920, 22 pp., 3 figs. Opinion is expressed that in fluid state, slags cannot contain any "free acids" or "free bases," and can be viewed as solution of different chemical compounds in one another. "Free acids" or "free bases," by themselves, it is said, demand higher temperatures to bring them to a molten condition than is usually attained by steel furnace slag.

The Reduction of Silicon from the Slag in the Acid Open-Hearth Process, B. Yaneske and G. A. Wood. Iron & Steel Inst., Paper 12, Annual Meeting, May 6 & 7, 1920, 20 pp., 2 figs. Five examples of finished steels which were found to contain much higher percentage of silicon than was expected from finishing additions, are described.

STEEL WORKS

ELECTRICALLY DRIVEN. Direct Curernt Compared with Three-Phase Current for Driving Steelworks Plant, C. A. Ablett. Iron & Steel Inst., Paper, Annual Meeting, May 6 & 7, 1920, 17 pp. 2 figs. Direct-current motors are preferred because they are capable of speed variation over wide range without loss of power, while three-phase motors are not capable of such variation without considerable loss of power unless they are of complicated and costly type, "and therefore not well suited to many steel works purposes."

LORRAINE, FRANCE. Lorraine Steel Works in French Hands. Machy. (London), vol. 105, no. 15, April 8, 1920, pp. 1023-1024 and 1039. Abstract of report of trade commissioner J. F. Butler sent from Paris to Bureau of Foreign & Domestic Commerce at Washington, giving account of extent of industry in annexed territory, difficulties with labor under new ownership, etc. Output is said to be only one-third of normal.

MACHINERY, FRENCH WORKS. Machinery at the Steel Works of the Société Normande de Métallurgie, Caen, France. Eng., vol. 109, no. 2826, Feb. 27, 1920, pp. 284 and 293-294, 24 figs. partly on 4 supp. plates. Metal mixer, ladle cranes, soaking pits, and billet-handling cranes. (Concluded.)

REPAIR SHOPS. Steel Mill Electrical Repair Shop Practice, A. J. Standing. Assn. of Iron & Steel Elec. Engrs., April 1920, pp. 19-28 and (discussion) pp. 28-45. Writer claims as most plants are rather spread out, it is necessary to decide on one or two definite policies; first, the use of one large central repair shop to which all damaged apparatus is sent for repairs, or second, the use of a somewhat smaller central repair shop, together with several small local repair shops in isolated parts of mill. Recommends electrical storeroom in conjunction with shop, and discusses correlation between construction and maintenance, etc.

STRIKES

LAW GOVERNING. The Law and the Labor Unions, Kenneth M. Spence. Indus. Management, vol. 59, no. 6, June 1920, pp. 433-438. Exposition of law governing coal, railroad and other strikes. Rights and limitations of employees to strike and of employers to close their plants and cease to do business, are explained. It is demonstrated how certain rights that belong to an individual do not belong to a combination of individuals. Theory is advocated that disputes in industry should be determined on a broader basis than mere law, by applying social and economic principles.

STRUCTURAL STEEL

PRESERVATIVE COATINGS FOR. Report of Committee D-1, Annual Meeting, Am. Soc. Testing Matls., June 22-25, 1920, 32 pp., 4 figs. Theory of preservative coatings for structural materials. Tentative specifications for turpentine.

SUBMARINES

GERMAN. German Submarines, A. W. Johns. Eng., vol. 109, no. 2830, March 26, 1920, pp. 428-432, 9 figs. Information as to types, number, cost and other particulars.

SUGAR

ANALYSIS. The Double-Polarization Method for Estimation of Sucrose and the Evaluation of the Clarget Divisor, Richard F. Jackson and Clara L. Gillis. Dept. of Commerce, Sci. Papers, Bur. of Standards, no. 375, March 30, 1920, pp. 125-194, 2 figs. Velocity of inversion of sucrose was measured at temperatures from 20 to 90 deg. cent. and was found to follow exponential law proposed by Arrhenius. Rates of reaction were measured for three different concentrations of hydrochloric acid. Time required under different conditions to produce 99.99 per cent inversion is computed and tabulated.

TILE

TIMBER

TIME STUDY

VENTILATION

WAGES

France. Excess Wages Paid to Heads of Families (Le sursalaire familial), Paul Razous. Génie Civil, vol. 76, no. 21, May 22, 1920, pp. 475-477. Practices of French companies. One company, for example, gives excess wages of 240 francs a year to employees having one child, 600 francs a year for two children, and 600 francs a year for each child above two.

German Mechanics. The Cost of Labor in Germany. Am. Mach., vol. 52, no. 23, June 3, 1920, pp. 1197-1198. Tables showing minimum wages paid to mechanics in different parts of Germany according to recent wage agreements.

Gradual Rise of. The Evolution of Wage and Price Levels, H. H. Manchester. Am. Mach., vol. 52, no. 22, May 27, 1920, pp. 1123-1127, 2 figs. Historical study of relation between wages and their producing power.

See also Bonus System.

WARSHIPS

Battle Cruiser H. M. S. Hood. H. M. S. Hood, Eustace D'Eyncourt. Eng., vol. 109, no. 2830, Mar. 26, 1920, pp. 423-426, 3 figs. Principal data: Length between perpendiculars, 810 ft.; length overall, 860 ft.; breadth, extreme, 104 ft.; load draught, mean, 28 ft. 6 in.; displacement at load draught, 41,200 tons; speed at load draught, 31 knots; oil fuel capacity, 4,000 tons.

H. M. Battle Cruiser "Hood." Eng., vol. 109, no. 2830, Mar. 26, 1920, pp. 397-399 and 414, 16 figs, partly on 4 supp. plates. Notable departure from existing types is "blister" surrounding main hull of ship as protection against effective attack by torpedo. Propelling machinery consists of four sets of Brown-Curtis turbines driving propeller shafting through single reduction gearing.

Destroyers. Geared Turbines for Torpedo Boat Destroyers. Int. Mar. Eng., vol. 25, no. 6, June 1920, pp. 479-480, 2 figs. Arrangement of engine room in U. S. S. Clemson. Particulars of destroyer are: Displacement, 1200 tons; horsepower, 28,000; speed, 35 knots.

Reduction Gears. Experience and Practice in Mechanical Reduction Gears in Warships, H. B. Tostevin. Eng., vol. 109, no. 2832, April 9, 1920, pp. 474-480 and p. 482, 16 figs. Changes introduced since 1910 in type then first adopted by British Admiralty. Attention is particularly directed to sprayer used for lubricating reduction gears of British torpedo-boat destroyers. Paper read before Instn. Naval Architects.

WASTE ELIMINATION

Industrial Opportunities for. Fields for Investigating Waste Elimination, A. Thau. Iron Age, vol. 105, no. 17, Apr. 22, 1920, pp. 1155-1157. Writer points out that there are a number of works which without their revenue being supplemented by substantial income from their by-product plants would financially be unable to exist and tells how coke-oven by-product recovery began. He adds notes on heat of discharged coke for steam making, putting incandescent coke into blast furnace, a coke-quenching machine in England, and utilizing carbon dioxide from chimneys in a German iron works.

WASTES

Municipal, Disposal of. Disposal of Municipal Wastes, Joseph Goder. Public Works, vol. 48, no. 19, May 22, 1920, pp. 444-446. Writer discusses several methods of disposal, giving his reasons for concluding that incineration is decidedly preferable for some classes of waste in all cases and for all classes in some cases. Interrelation of collection and local characteristics of several classes of waste material with most desirable method of disposal is pointed out.

WATER FILTRATION

Mechanical. Investigations on the Presence of Alumina Hydrate in Mechanically Filtered Water, Norman J. Howard and Frank Hannan. Contract Rec., vol. 34, no. 20, May 19, 1920, pp. 454-455. Work was done at Toronto filtration plant laboratories. Occurrence of aluminum hydrate was noticed in all waters examined. Its presence in Toronto water, however, is believed to be devoid of any sanitary significance.

WATER GAS

Gas-Oil Situation. Gas Oil Situation Analyzed, J. B. Klumpp. Gas Age, vol. 45, no. 11, June 10, 1920, pp. 503-506, 1 fig. Statement prepared by Gas-Oil Committee of Am. Gas Assn. for emergency committee conference.

Production. Addition of Water Gas to City Illuminating Gas (L'introduction du gaz "à l'eau" dans le gaz "de ville"), A. Grebel. Génie Civil, vol. 76, no. 13, March 27, 1920, pp. 305-312, 12 figs. Economics resulting from adding water gas to city illuminating gas are pointed out, and various processes of manufacturing water gas are described, notably Dellwik-Fleischer and Humphreys-Glasgow.

WATER HAMMER

Calculation of. Calculation of Water Hammer in Conduits Formed of Two or Three Sections of Different Diameters (Calcul de coup de bélier dans les conduites formées de deux ou de trois tronçons de diamètres différents), Ed. Carey. Bulletin Technique de la Suisse Romande, vol. 46, no. 10, May 15, 1920, pp. 111-115, 6 figs. Formulæ for various special cases. (Continuation of serial.)

WATER TREATMENT

Chlorination. Chlorination as a Means of Disinfecting Municipal Water Supplies, G. G. Nasmith. Contract Rev., vol. 34, no. 23, June 9, 1920, pp. 532-537. Advantages of method, with notes on amounts of chlorine required by different waters.

Pumps. Modern Pumps for Small Water Works, Creed W. Fulton. New England Water Works Assn., vol. 34, no. 1, March 1920, pp. 1-22 and (discussion) pp. 23-27, 11 figs. Pumps for plants where daily consumption does not exceed 3,000,000 gal.

WATER WORKS

Motor-Driven Pumps. Motor Driven Centrifugal Pumps at Quincy, Ill., W. R. Gelston. Public Works, vol. 48, no. 22, June 12, 1920, pp. 504-507, 1 fig. Both low-lift and high-lift pumps and booster pumps are driven by electricity. Water Department finds these pumps "economical and very reliable and satisfactory," and it is said that reserve steam equipment is seldom used.

Toronto. Growth of New Toronto Waterworks System from Village Supply to Large Plant, E. M. Proctor. Contract Rec., vol. 34, no. 23, June 9, 1920, pp. 518-522, 12 figs. Present average daily pumpage is 2,500,000 gal.

WATTMETERS

Thermal. The Thermal Storage Demand Wattmeter, Paul M. Lincoln. Elec. Jl., vol. 17, no. 6, June 1920, pp. 253-256, 6 figs. Schematic diagram of operation. Reference is made to article in Trans. Am. Inst. Elec. Engs., vol. 37, p. 189, explaining principle of operation of thermal wattmeter.

WELDING

See Autogenous Welding; Electric Welding, Arc.

WIND TUNNELS

Air-Flow Visualization. Study of Flight Vortices, F. W. Caldwell and E. N. Fales. Eng., vol. 109, nos. 2833 and 2834, April 16 and 23, 1920, pp. 501-504, 9 figs., and 534-537, 15 figs. Method of visualizing air flow in wind tunnel by fog condensation of moisture in air is explained and photographs of flight vortices thus obtained are presented.

Model Experiments. Wind Tunnel Studies in Aerodynamic Phenomena at High Speed, F. W. Caldwell and E. N. Fales. Nat. Advisory Committee for Aeronautics, Report No. 83, 1920, 52 pp., 42 figs. Description of model wind-tunnel experiments, McCook Field wind tunnel and of method there employed of visualing flight vortices by condensation of moisture in air, together with account of model tests on propeller aerofoils.

Static Pressure Gradients. Static Pressure Gradients in Wind Tunnel Work, J. G. Coffin. Aviation, vol. 8, no. 8, May 15, 1920, pp. 317-318, 4 figs. Formula for computing tunnel axis force, and method of computing pressure-gradient corrections.

See also Laboratories, Aeronautic.

WIRE ROPE

See Elevators, Ropes.

WOOD

Drying. Phenomena of Drying Wood, Harry D. Tiemann. Jl. of Franklin Inst., vol. 189, no. 5, May 1920, pp. 645-648, 1 fig. Analogistic ex planation of "casehardening" or the relations of "set" and stresses that occur in drying wood.

WOODWORKING INDUSTRY

Costs. Accumulation of Costs in Woodworking, Carle M. Bigelow. Indus. Management, vol. 59, no. 6, June 1920, pp. 480-482. Interpretation of woodworking factory costs.

WORKMEN'S COMPENSATION

Kentucky Coal Mine. Coal-Mine Compensation in Kentucky, Herbert M. Wilson. Coal Age, vol. 17, no. 25, June 17, 1920, pp. 1259-1262. Inspection reports, safety-engineering service, low cost and checking up of experience records are said to be features of system designed to exceed possibilities of mutual or self-insurance.

See also Ladders.

ZINC INDUSTRY

Oklahoma, Missouri and Kansas. The Zinc Industry of the Tri-State Field, Francis Judson Tietsort. Compressed Air Mag., vol. 25, no. 5, May 1920, pp. 9635-9643, 15 figs. Survey of conditions with notes on future production and marketing problems. Work of Am. Zinc. Inst. in developing zinc industry is noted.

Engineering Index

This Index is prepared by the American Society of Mechanical Engineers

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AERIAL PHOTOGRAPHY

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AIRCRAFT CONSTRUCTION MATERIALS

Steel. Steel for the Structural Parts of Aircraft, John L. Harkness. Jl., Am Steel Treaters Soc., vol. 2, no. 9, June 1920, pp. 466-469. For light machines, ordinary commercial cold-rolled steel is believed to be most suitable; for medium-sized machines, either 0.2-0.3 or 0.3-0.4 heat-treated carbon steel; and for large machines either chrome-nickel or chrome-vanadium steel. Tables of physical properties of chrome-nickel, chrome-vanadium, carbon and nickel steels are included.

Wood. Properties of Woods at 10 Per Cent Moisture, Air Service Information Circular, vol. 1, no. 53, May 18, 1920, 7 pp., 1 fig. Data available are said to indicate strongly that following species can be substituted for spruce in highly stressed parts; Port Orford cedar, coast-type Douglas fir, Amabilis, Grand, Noble, and white firs, eastern and western white pine, yellow poplar, cucumber, and magnolia.

See also Aeroplane Engines, Maybach; Hangars.

ALLOY STEELS

Tempering, Effect on Hardness. Effect of Tempering on the Hardness of Alloys (Action systématique de la trempe sur la dureté des alliages), L. Grenet. Technique Moderne, vol. 12, no. 3, Mar. 1920, pp. 107-112, 2 figs. Remarks on internal structure of tempered alloys, particularly alloy steels.

See also Steel, High-Speed, Molybdenum Steel, Nickel-Chrome Steel.

ALLOYS

Cadmium-Arsenic. An Alloy Substitute for Tin and Antimony (Legierung als Zinnbzw. Antimonersatz). Metall-Technik. vol. 46, nos. 5-6, Feb. 3, 1920, patented, cadmium is alloyed with arsenic to form substitute for tin.

ALUMINUM

Foundry Losses. Casting Losses in Aluminum-Foundry Practice in the United States, Robert J. Anderson. Monthly Reports of Investigations. Bur. or Mines, Dept. of Interior, April 1920, 3 pp. Average casting loss, including rejections of all kinds on foundry floor, in inspection department and machine-shop returns, is placed at 10 per cent. Variations in losses range, it is said, from 0 to 75 per cent.

See also Non-Ferrous Metals, Specifications.

ALTERNATORS

See Electric Generators, A. C.

ALUMINUM ALLOYS

Lynite Alloys. Developments in Alloyed Aluminum, R. E. Carpenter, Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 86-88, 5 figs. Production of Lynite alloys is recorded, and table of their physical properties is included.

Nickel Plating. Nickel Plating of Aluminum and Its Alloys (Sur le nickelage de l'aluminum et de ses alliages). Léon Guillet and Maxime Gasnier. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 21, May 25, 1920, pp. 1253-1256. Following procedure is reported to have proved successful: Scraping of metal by sand jet under pressure of 1500 gr. per sq. in. nickel-plating for one-half hours under 0.8 amp. per sq. dm.: copper-plating for 2 hours under 1 amp. per sq. dm.: polishing of copper surpace; nickel plating for 1 hour under 0.5 amp. per sq. dm.: and final polishing of surface.

AMMONIA

Synthesis. Industrial Synthesis of Ammonia by Georges Claude Process (La synthese industrielle de l'ammoniaque par le procédé Georges Claude), Jacques Boyer, La Nature, nos. 2397 and 2398, April 10, 1920, pp. 151-156, 7 figs. Method at Montereau Works, France.

ANEMOMETERS

Electrical Oscillation. Anemometer Operating by Electrical Oscillations (Sur un anémomètre à oscillations électriques), M. E. Rothé. Comptres rendus des Séances de l'Académie des Sciences, vol. 170, no. 20, May 17, 1920, pp. 1197-1198. Fan of anemometer operates as interrupter and at each contact sets electrical vibrator in action.

ARCHES

Concrete. Truss Centering Used for 113-ft. Concrete Arch, C. B. McCullough. Eng. News-Rec., vol. 84, no. 18, Apr. 29, 1920, pp. 851-852, 3 figs. Timber Howe truss adopted instead of falsework because of depth of water in channel of Rogue River Bridge, Oregon.

See also Tunnels, Arches in.

AUTOMOBILE ENGINES

Balancing. Balance of V-Engines with Eight Cylinders Set at 90 Degrees (Equilibrage des moteurs à 8 cylindres en V a 90°), J. Petit. Technique Automobile et Aérienne, vol. 11, no. 1, 1920, pp. 6-9, 4 figs. Diagrams of inertia forces, both horizontal and vertical.

Cams for. Cams for Radial and Rotary Engines. Wm. John Walker. Automobile Engr., vol. 10, no. 139, June 1920, p. 241, 1 fig. Design of multil-lobed cam suitable for operating valves of given multi-cylinder engine of four-stroke type, cam being rotated at certain speed in opposite direction to that of crankshaft.

Fuel Consumption, Reducing. Fuel Economy and Engine Design. H. R. Ricardo. Autocar, vol. 44, no. 1287, June 19, 1920, pp. 1135-1140. Possibilities of improving present designs with a special view to economy of fuel. Factors which are mentioned as having great influence on fuel consumption are : (1) Internal friction and (2) design of combustion head. In this connection side-by-side valves are recommended in preference to overhead valves.

Inertia Forces in. Influence of Inertia Forces Upon Torque Variations of an Automobile Engine (Influence des forces d'inertie sur la variation du couple moteur), H. Petit. Technique Automobile et Aérienne, vol. 11, no. 1, 1920, pp. 9-18, 7 figs. Diagrams of inertia forces and torque diagrams, constructed for six-cylinder, eight-cylinder and twelve-cylinder engines.

Vacuum Fuel-Feed System. LePere Vacum Fuel Feed System for Airplanes. Automotive Industries, vol. 42, no. 26, June 24, 1920, pp. 1450-1451, 5 figs. Investigations of this system, made at McCook Field by Eng. Division of Air Service are said to have established its applicability to motor car. Vacuum of gasolines supply system used on LePere biplane is generated by venturi tube placed in air stream above upper wing. Gasoline is drawn from main supply tank in fuselage to gravity distributing tank in upper wing.

See also Aeroplane Engines, Construction Materials; Carburetors.

AUTOMOBILE FUELS

Efficient Utilization. Report on the Utilization of Present Fuel in Present Engines. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 25-29, 6 figs. Committee report presented at semi-annual meeting of Society of Automotive Engineers. Question of mixture giving best distribution and most complete combustion, design of manifolds, condensation of fuel and application of heat are taken up.

Gasoline Mixture. Meeting the Cumbustion Requirements of Present Fuels. Automotive Industries, vol. 42, no. 26, June 24, 1920, pp. 1445-1447 and p. 1449, 6 figs. Preparation of proper combustible mixtures from less volatile gasolines, with notes on vaporization and distribution. Report of Fuel Committee of Automotive Engrs.

See also Benzol; Gasoline.

AUTOMOBILES

Body Suspension. Notes on the Suspension of Automobile Bodies (Quelques remarques sur la suspension des véhicules automobiles). Technique Automobile et Aerienne, vol. 11, no. 1, 1920, pp. 18-22, 5 figs. Technical study, Special attention is given to influence of size of wheelbase on suspension. It is established that, within certain limits and other things being equal, the smaller the wheelbase, the more effective the suspension mechanism.

Shaft Joints. Flexible Shaft-Joints Progress, Carl A. Schell. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 30-32. It is recommended to make total disk thickness about one-eighth of diameter and center hole of disk about 40 per cent of total diameter.

Steels for Automobile Parts. The Most Suitable Steels for Automobile Parts, W. H. Hartfield. Automobile Engr., vol. 10, no. 139, June 1920, pp. 245-261, 11 figs. Tables are given in which are indicated the various stresses coming upon different automobile parts, the steels being used or which have been used in their construction, and the steels recommended by the writer as a result of tests and analyses of materials.

Wheel Hub Standardization. Hub Standardization Is Getting Under Way, J. Edward Schipper. Automotive Industries, vol. 42, no. 25, June 17, 1920, pp. 1391-1393. Diagram of work to be undertaken by committee of Automotive Metal Wheel Assn.

See also Ferries, Automobile; Industrial Management, Production Systems.

AVIATORS

Oxygen Supply. A Note on Oxygen Supply for Aviators, G. B. Obear. Air Service Information Circular, vol. 1, no. 3, March 15, 1920, pp. 44-57, 12 figs. Description of various types of oxygen-supply apparatus.

Physiology. The Aviator's Heart. Roentgen Ray Studies Under Conditions Simulating High Altitudes, Leon T. LeWald, Guy H. Turrell. Air Service Information Circular, vol. 1, no. 3, March 15, 1920, pp. 3-25, 85 figs., partly on 15 supp. plates. Two series of studies were undertaken one with Henderson rebreather and the other in the low-pressure chamber.

BARGES

Oil-Tank. Oil Barges (Chalands Pétroliers). Bulletin Technique du Bureau Veritas, vol. 2, no. 5, May 1920, pp. 94-98, 4 figs. Designs operating in French and German rivers.

Ore. Design of Ore Fleet for Upper Mississippi, William S. Mitchell, Mech. Eng., vol. 42, no. 7, July 1920, pp. 379-382, 4 figs. Writer describes two experimental trips which were conducted during the war to try out possibilities of such transportation on Mississippi river. Results of these trips are said to have warranted construction of fleet of 24 barges and 4 towboats for traffic of ore and fuel. Particulars are given regarding design and construction of vessels, and terminal facilities projected.

CAMS

DESIGN. Study of Mechanisms Operated by Cams (Etude rationnelle des mécanismes commandés par cames). Octabe LePersonne. Revue universelle des Mines, vol. 3, no. 1, Sept.-Oct. 1919, pp. 73-109, 9 figs., partly on 4 supp. plates. With special reference to design of cams for operating valves of internal-combustion engines. (Concluded.)

CANALS

NEW ORLEANS HARBOR. Unwatering the Lock Site of New Orleans Harbor Canal, George R. Goethals. Eng. News-Rec., vol. 84, no. 20, May 13, 1920, pp. 940-943, 2 figs. Sheet-pile cofferdams, driven in successive rows nearer and nearer to lock, cut off porous underlying quicksand strata which are tapped with flowing wells as dams close in.

CAR WHEELS

CHILLED-IRON. Manufacturing Chilled Iron Car Wheels—IV and V. H. E. Diller. Foundry, vol. 48, nos. 10 and 11, May 15 and June 1, 1920, pp. 389-396, 15 figs., and 429-434, 8 figs. May 15; Different types of chillers; details of methods of annealing. June 1: Inspection and testing in order to assure adherence to standard specifications.

GRINDING, RECLAMATION BY. Economies Possible by Car Wheel Grinding. Ry. Mech. Engr., vol. 94, no. 6, June 1920, pp. 355-358, 3 figs. Practice of various railroads in reclaiming car wheels by grinding, with description of machine developed for grinding mounted car wheels. Cast-iron car wheels with flat spots are reclaimed, it is said, up to 3½ in. long, provided wheel has not made too great a mileage.

INGOTS FOR. Individual Ingots for Tires and Wheels. Iron Age, vol. 105, no. 22, May 27, 1920, pp. 1507-1509, 3 figs. Comparative value of multiple and individual ingots. To secure individual pipeless ingots of uniform composition three conditions are said to be essential: Well-made dead-melted steel, correct ingot-mold proportions, and proper carbonaceous material for ingot top.

CARBURETORS

LOW-GRADE FUEL. Carburetion and Distribution of Low-Grade Fuels, O. H. Ensign. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 19-24 and 50, 11 figs. Carburetor is described which is said to produce a mixture which meets theoretical conditions of operation under throttle control with economy and flexibility. Principle involved for metering fuel and air in carburetor is drop in pressure that occurs at center of whirling mass of fluid.

VARIABLE-AIR-PRESSURE TYPE. Controlling and Atomizing Fuel by Variable Engine Pressures, John G. Willet. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 51-55, 5 figs. Carburetor designed by writer, in which fuel is controlled and atomized by variable air pressure supplied by engine-driven compressor of standard tire-pump dimensions capable of giving maximum pressure of 15 lb. per sq. in.

CASE-HARDENING

RULES FOR. Practical Case hardening, Theodore G. Selleck. Jl. Am. Steel Treaters Soc., vol. 2, no. 9, June 1920, pp. 460-465. It is emphasized that, no matter what method of operation is employed, "the man is more than the method.,,

CEMENT

STORAGE, EFFECT OF. Effect of Storage of Cement, Duff A. Abrams. Structural Materials Research Laboratory, Lewis Inst., Chicago, bul. 6, June 1920, 29 pp. 10 figs. Tests of effect of storage of portland cement in different kinds of packages and under different conditions on its concrete and mortar-making properties. Compression tests of about 1000 6 by 12-in. concrete cylinders of 1-3 standard sand mortar, and about 500 miscellaneous tests, are included. Among results found were that after 3-months' storage in shed in yard cement had 80 per cent of its original strength: after 6-months' storage, 71 per cent; after 1-year, 61 per cent; and after 2-years, 40 per cent.

TESTER, AUTOMATIC. A New Type of Automatic Cement Tester, Thorsten Y. Olsen. Twenty-Third Annual Meeting, Am. Soc. for Testing Matls., June 22-25, 1920, 4 pp. 1 fig. Machine resembles ordinary type of automatic shot cement tester, with the one difference that a liquid is used in place of shot.

CENTRAL STATIONS

CANADA. Central Electric Station Industry in Canada. Can. Engr., vol. 38, no. 26, June 24, 1920, pp. 593-596, 3 figs. Statistics giving number of stations, total revenue from sale of power, total operating expenses, salaries and wages, number of persons employed, etc. On January 1, 1919, there were 795 central stations developing a total of 1,841,114 hp.

INTERCONNECTION WITH INDUSTRIAL PLANTS. Interconnecting Industrial and Central-Station Plants, Cornelius G. Weber. Power, vol. 51, no. 26, June 29, 1920, pp. 1049-1052, 5 figs. With data from a number of individual cases writer gives some indication of large savings in coal, labor and transportation that would be possible from electrical interconnection on a give-and-take basis.

REACTORS, USE OF. Stabilizing Large Generating Systems. Elec. World, vol. 76, no. 1, July 3, 1920, pp. 5-8, 5 figs. Value of feeder reactance in keeping alternators in synchronism i sillustrated by relating instance in which serious breakdown was traced to lack of sufficient protective reactances.

CHARCOAL

ACTIVATION OF. Charcoal Activation, H. H. Sheldon. Proc. Nat. Acad. of Sciences, vol. 6, no. 4, April 1920, pp. 178-182, 4 figs. Results of experiments at University of Chicago on variations due to heat treatment in absorption of gases by charcoal.

CHEMISTRY

RESEARCH IN. A Plan for Incentive to Research in Pure and Applied Chemistry, William J. Hale. Jl. Indus. & Eng. Chem., vol. 12, no. 7, July 1920, pp. 690-696. Plan proposed contemplates providing pecuniary facilities whereby technical men will feel justified to engage their activities in research work. Writer emphasizes that "the best men, the live men, the men who have the mental grasp for bigger things, will not tarry too long where life is difficult and honor shallow."

COAL

COKING VALUE. A New Characteristic For Coal: The Agglutinating Power Curve, F. S. Sinnatt, A. Grounds. Jl. Soc. Chem. Industry, vol. 39, no. 7, April 15, 1920, pp. 83T-86T, 1 fig. Experimental study of influence of degree of fineness of powdered inert matter on caking property of coal. It was found that fundamental property of caking, which varies considerably in different coals, is influenced by degree of fineness of inert substance until, when inert material, finer than 1/90 mesh is taken, caking property of coal may be entirely destroyed by less than its own weight of inert matter.

COKING. Researches on Coal—H. S. Roy Illingworth. Jl. Soc. Chem. Industry, vol. 39, no. 10. May 31, 1920, pp. 133T-138T, 6 figs. Investigations of coking coals. Theory of coking is suggested from results obtained in experiments. Special attention is given to qualities of coke obtained from coking at various temperatures and at different coking times.

FUSAIN IN COAL DUST. Coal Dust and Fusain, F. S. Sinnatt. Lancashire & Cheshire Coal Research Assn., bul. 5, 1920, 19 pp. Research work conducted to determine composition of fusain and amount present in dust produced during working of coal at colliery.

LOW-GRADE, DISTILLATION OF. Sub-Bituminous and Lignite Coals, S. M. Darling. Ry. Rev., vol. 66, no. 26, June 26, 1920, pp. 1096-1098. Economic possibilities of applying distillation methods to large quantities of sub-s an lard fuels, deposited in various parts of United States. Paper read before International Railway Fuel Association.

COAL MINES

CABLE INSTALLATION. The Installation of a Shaft-Cable at Kirkby Colliery. Joseph Bircumshaw. Trans. Instn. Min. Engrs., vol. 59, part 2, May 1920, pp. 109-113, 9 figs. on supp. plate. Method of supporting cable through brickwork walling and through cast-iron tubing illustrated.

FERRIC HYDRATE FROM MINE WATER. Six Tons of Ferric Hydrate Secured Daily from Water at a Connellsville Mine, L. D. Tracy, Coal Age, vol. 18, no. 1, July 1, 1920, pp. 13-16, 2 figs. By treating mine water with finely ground lime, ferric hydrate is said to be obtained which is used in desulphurization of gas and as a pigment for paint. Purified water is used for quenching coke.

VENTILATION. Force and Exhaust Systems of Ventilation, R. Z. Virgin. Coal Industry, vol. 3, no. 6, June 1920, pp. 278-280, 1 fig. Features of each, showing advantages and disadvantages. Reference is made to discrepancies in laws of different states.

COAL MINING

BARRIER PILLARS. What Barrier Coal Has Been and Should Be Left to Protect Anthracite Mines—II, W. B. Richards. Coal Age, vol. 17, no. 23, June 3, 1920, pp. 1135-1140, 10 figs. Survey of formulæ and methods that have been developed for determining size of barrier pillars.

COAL-CUTTING MACHINERY. Economy and Safety are Secured by Use of Alternating-Current Coal Cutters, Charles B. Officer. Coal Age, vol. 17, no. 26, June 24, 1920, pp. 1303-1306, 4 figs. Savings in equipment cost, in power expense and maintenance charges, as well as greater safety are said to accrue from use of alternating instead of direct-current for driving undercutters.

MINERS' NYSTAGMUS. The Economic Aspect of Miners' Mystagmus, T. Lister Llewellyn. Colliery Guardian, vol. 119, no. 3101, June 4, 1920, pp. 1565-1567, 5 figs. It is claimed that nystagmus is due to deficiency light in coal mines, and improvement of illumination underground is urged as preventative.

PNEUMATIC PICKS. The Use of Pneumatic Picks in Coal Mining (L'emploi de marteaux à air comprimé pour l'abatage de la houille). M. A. Dessemond, Bul. et Comptes rendus mensuels de la Société de l'Industrie Minérale, vol. 17, no. 2, March-April 1920, pp. 125-143, 2 figs. Records of service at Saint-Etienne collieries, where 70 per cent of coal produced is mined with pneumatic picks.

POWER REQUIREMENTS. Power Requirements for Coal Mining, Robert Anthony. Elec. World, vol. 76, no. 1, July 3, 1920, pp. 14-15, 6 figs. Energy consumption and minimum demand of bituminous coal mines shown under different mining conditions and with varying output of coal. Suggestions made for successfully changing over old mines.

STRIPPING. Where Stripping is Regarded as a Regular Adjuct to Underground Mining —1. Donald J. Baker. Coal Age, vol. 17, no. 23, June 3, 1920, pp. 1143-1146, 8 figs. Coal is stripped by steam shovel from outcrop to contour, where depth of overburden makes open mining prohibitive. From that line, which is set where cover is 45 ft. deep, to boundary line of property underground mining methods are employed.

See also Education, Technical, Coal Mining.

CONCRETE

CONTRACT WORK

DAMS

CONCRETE. Big Eddy Storage Dam—II. Public Works, vol. 48, no. 23, June 19, 1920, pp. 529-534, 9 figs. Monolithic concrete construction 1100 ft. long and 159 ft high, with gravity cross-section about 100 ft. wide at the base. Attention is directed to special methods of construction necessitated by irregularity of rock bottom which it was necessary first to partially level by submerged drilling, blasting and divers' work before commencing main structure.

EARTH. Repairs to Pavement of the Belle Fourche Dam, B. E. Hayden, Eng. World, vol. 17, no. 1, July 1920, pp. 11-13, 4 figs. Dam is earthen structure 6200 ft. long on top and 122 ft. high above cut-off trench at maximum section. Method of repair followed consisted of refilling breaches with gravel, relaying disturbed blocks 6 to 8 in. below grade, and finishing with continuous layer of concrete to grade.

GRAVITY. Dams for Artificial Lakes Recently Built in Italy (Les digues pour lacs artificiels récomment construites en Italie). Luigi Luiggi, Annales des Ponts et Chausseés, vol. 45, no. 1, Jan.-Feb. 1920, pp. 62-95, 12 figs. partly on supp. plate. Gravity dams.

The St. Maurice River Regulation and the Gouin Dam, Olivier Lefebvre. Jl. Eng. Inst. Can., vol. 3, no. 7, July 1920, pp. 342-348, 3 figs. Gravity dam. 1646 ft. long and 20 ft. wide at crest. Highest section is 90 ft., width at base at that point being 72 ft.

HYDRAULIC-FILL. Hydraulic-Fill Dams (Barrages Hydrauliques). Houille Blanche, vol. 19, no. 39-40, March-April 1920, pp. 41-44, 13 figs. Hubert and Lutz improved bear-trap type. (To be continued.)

Hydraulic-Fill Dams for Miami Conservancy District. Public Works, vol. 48, no. 18, May 15, 1920, pp. 419-422, 7 figs. Method of building up levees, beaches and water-tight core by means of steam shovels window pipes and other contrivances. (Concluded.)

Measuring Internal Pressures in Hydraulic-Fill Cores. Public Works, vol. 48, no. 24, June 26, 1920, pp. 553-555, 3 figs. Earth-pressure cells were varied at different depths in semi-fluid core, where relation between horizontal and vertical pressure indicated rate of solidification of material. Diagrams of pressures obtained are given.

MASONRY. Measuring Upward Pressure Under a Masonry Dam, E. W. Lane and E. L. Chandler, Eng. News-Rec., vol. 81, no. 21, May 20, 1920, pp. 1104-1016, 4 figs. Tests made on Island Park Dam at Dayton, Ohio, to determine extent of under pressure through porous foundations.

DIESEL ENGINES

GERMAN SUBMARINE. The Diesel Engine of the German Submarine U-117 Holbrook C. Gibson, Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 15-18, 1 fig. Engine is of 1200 h.p., six-cylinder type and has air compressor on forward end. Bedplate comes right up, instead of being bolted on flange, and forms housing. Both bedplate and housing are thorougly ribbed. Cylinder jackets comes out in a skirt which gives vertical structure and strength.

HIGH-ALTITUDE OPERATION. Diesel Engines Under High Altitude Conditions, Theodore M. Robie. Eng. & Min. Jl., vol. 109, no. 23, June 5, 1920, p. 260, 1 fig. It is shown analytically how pressure in cylinders may be considerably reduced and still obtain same temperature at end of compression as at sea level.

MARINE. Progress in Marine Diesel-Engine Building at Krupp's During the War, Otto Alt. Motorship, vol. 5, no. 7, July 1920, pp. 604-606, 5 figs. For 1250 shaft h.p., four-cycle type is being constructed; for over 4000 shaft h. p., double-acting port-scavenging two-cycle sets; and for 19,000 shaft h.p., four-cycle sets in 12 cylinders with supercompression. (To be continued.)

SUPERCHARGING. Surcharging Diesel Engines, Cl. Ruegg. Power, vol. 51, no. 18, May 4, 1920, pp. 712-714, 9 figs. Surcharging is said to have proven successful with two-cycle Diesel engine for direct connection to air compressor in plant operated at 6000 ft. above sea level.

DISTILLATION

BROWN'S FORMULA FOR. On Brown's Formula for Distillation, Sydney Young. Sci. Proc. Roy, Dublin Soc., vol. 15, no. 47, Jan. 1920, pp. 667-672. Brown's formula was found to be applicable without serious errors to mixtures of benzene and toluene.

DRAINAGE

CHANNEL WALLS, MAINTENANCE OF. Gunite Maintenance of Chicago's Drainage Channel Walls, W. T. Christine. Eng. World, vol. 16, no. 8, June 1920, pp. 459, 461, 6 figs. Treatment of breaches in wall is illustrated.

DREDGING

CENTRIFUGAL-PUMP. Dredging New Orleans' Inner Harbor Navigation Canal, Walter J. White. Proc. Louisiana Eng. Soc., vol. 6, no. 2, April 1920, pp. 80-102. 12 figs. Performance and tests of centrifugal dredging pumps. Paper presented at joint meeting of Louisiana Eng. Soc. and Local Chapter of Am. Soc. of Mech. Engrs.

DROP FORGING

DIE-BLOCK STANDARDIZATION. Physical Requirements of Die Blocks, W. C. Peterson. Am. Drop Forger, vol. 6, no. 6, June 1920, pp. 297-299. Urges that plan be formulated for correct study of use of die blocks and their attendant failures. Paper read before Am. Drop. Forge Assn.

Reasons for Standardizing of Die Blocks, C. R. Porter. Amer. Drop Forger, vol. 6, no. 6, June 1920, pp. 286-287. Urges necessity of standardizing die blocks with respect to their size, the quality of steel used, the method of forging and annealing and the hardening treatments for safe operation. Paper read before Am. Drop Forge Assn.

EDUCATION, ENGINEERING

PROFESSIONAL SPIRIT IN. The Professional Spirit in Engineering Education, C. R. Mann. Eng. News-Rec., vol. 84, no. 26, June 24, 1920, pp. 1242-1244. Current schooling, it is said, is conspicuously designed to inspire individual to make most of himself for the sake of his own success, while required training must inspire individual to make most of himself for the common good.

EDUCATIONAL, TECHNICAL

COAL MINING. The Training of Students in Coal-Mining, with Special Reference to the Scheme of the Engineering Training Organization. F. W. Hardwick. Trans. North England Inst. Min. & Mech. Engrs., vol. 69, part 2, Feb. 1919, pp. 13-20 and (discussion) pp. 20-28. Engineering Training Organization is a British institution formed to serve as central organization for improvement in and better co-ordination of engineering training.

ELECTRIC CIRCUITS, A. C.

PROTECTION. The Protection of Alternating-Current Systems Without the Use of Special Conductors, Kenelm Edgcumbe. Jl. Instn. Elec. Engrs., vol. 58, no. 291, May 1920, pp. 391-407 and discussion(), pp. 407-416, 30 figs. Possible schemes.

THREE PHASE, UNBALANCED. Unbalanced Three-Phase Circuits. Waldo V. Lyon. Elec. World, vol. 75, no. 23, June 5, 1920, pp. 1304-1308, 9 figs. Analytical and graphical methods of treating problems arising from operation of three-phase apparatus on unbalanced voltages. Examples are given to illustrate theory.

ELECTRIC CONDUCTORS

RESISTANCE AND INDUCTANCE FORMULAE. An Integration Method of Deriving the Alternating-Current Resistance and Inductance of Conductors. Harvey L. Curtis. Sci. Papers, Bur. of Standards, no. 374, April 7, 1920, pp. 93-124, 4 figs. Method consists in dividing conductor into infinitesimal filaments by surfaces which coincide with lines of current flow. Magnetic field at any point is sum of magnetic fields of these filaments. Counter e. m. f. in a filament is determined by rate at which magnetic fields of all other filaments cut this filament.

ELECTRIC CURRENTS

COMPARATOR OF. A Dynamometrical Comparator Edy Velander. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 680-686, 8 figs. Differential dynamometer for accurate comparison of alternating and direct-current strengths.

ELECTRIC CURRENTS, ALTERNATING

BRIDGE MEASUREMENT. Bridge Methods for Alternating-Current Measurements, D. I. Cone, Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 640-647, 18 figs. Résumé of simple methods of utilizing "bridge" networks in alternating-current measurements of impedances and their components of effective resistance, self and mutual inductance and capacitance, and in frequency measurement. Bibliography is appended.

ELECTRIC FURNACES

ELECTRODES. Electrodes for Iron and Steel Furnaces, C. G. Vom Baur. Iron Age, vol. 105, no. 24, June 10, 1920, pp. 1653-1654. Comparison of carbon and graphite. Question of metallic electrodes. Cooling collars and carbon consumption.

GREAVES-ETCHELLS. Electric Steel Furnaces and Electric Steel, F. J. Cleary. Jl. Am. Soc. Naval Engrs., vol. 32, no. 2, May 1920, pp. 242-310, 16 figs. Special reference is made to steel castings and Greaves-Etchells type of electric furnace. Compilation of information which has appeared in technical papers in United States and England.

HEAT-TREATING. A Modern Tool Room Heat Treating Plant, Ry. Mech. Engr., vol. 94, no. 6, June 1920, pp. 389-391, 3 figs. Electric furnaces and pyrometers installed at Ft. Wayne shops of Pennsylvania system.

INDUCTION. Induction Furnaces and Their Appliction in the Iron and Steel Industry (Les fours à induction et leur application dans l'industrie du fer et de l'acier). W. Engelhardt, Houille Blanche, vol. 19, no. 39-40, March-April 1920, pp. 58-61, 6 figs. Kjellin German typs. (Continuation of serial.)

ELECTRIC GENERATORS, A. C.

RADIO-FREQUENCY. Radio Frequency Alternators, Marius Latour Proc. Inst. Radio Engrs., vol. 8, no. 3, June 1920, pp. 220-237, 18 figs. Types of radio-frequency alternators, with special reference to those most used in France at present. Translated from Bul. de la Société Française des Electriciens.

WATERWHEEL-DRIVEN. Vertical-Shaft Waterwheel-Driven Alternators—Brakes, Ventilation and Exciters, S. H. Mortensen. Power vol. 51, no. 24, June 15, 1920, pp. 953-954, 3 figs. Brakes operated by hand and compressed air, ventilation of alternators and excitation with direct-connected and independent exciters.

Vertical-Shaft Waterwheel-Driven Alternators—Mechanical Features, S. H. Mortensen. Power, vol. 51, no. 18, May 4, 1920, pp. 698-700. Structural details of several large units, special 32,500 kva. machine, said to be largest hydro-electric unit in the world.

See also Turbo-Alternators.

EMPLOYMENT MANAGEMENT

Industrial Training and. Employment Management and Industrial Training, Roy W. Kelly. Federal Board for Vocational Education, bul. no. 48, Oct. 1919, 106 pp. Economical and social losses resulting to nation from lack of education or faulty education of wage earners in industry are pointed out, together with more important difficulties to be overcome in preventing them, and practical methods are suggested by which industries and educational institutions may co-operate in industrial training.

Records. Visualizing Employment Records, W. S. Wells. Indus. Management, vol. 60, no. 1, July 1920, pp. 67-70, 6 figs. Method of keeping records at Newburgh Shipyards.

ENGINEERING SOCIETIES

Federated American Engineering Societies. Organizing Conference Plans Federation of Engineering Societies. Mech. Eng., vol. 42, no. 7, July 1920, pp. 422-423. Also in Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 690-692, and Min. and Metallurgy, no. 163, July 1920, pp. 7-13. Account of conference of 71 engineering organizations and allied technical societies, held at Washington on June 3 and 4. A new organization. The Federated American Engineering Societies, was created, which is to represent profession in matters of common concern and in national and state affairs.

Federated American Engineering Societies, L. P. Alford. Indus. Management. vol. 60, no. 1, July 1920, pp. 53-55.

ENGINEERS

National Organization. The Proposed Comprehensive Organization of National, Local, State and Regional Engineering Societies for the Advancement of the Welfare of the Engineers, Edward J. Cattell. Jl. Engrs. Club of Phila., vol. 37-5, no. 186, May 1920, pp. 209-215. Addresses made by President of Am. Soc. of Mech. Engrs., Am. Soc. of Civil Engrs., and Am. Inst. Electrical Engrs. and a Past President of the Am. Inst. of Min. & Metallurgical Engrs.

FACTORY MANAGEMENT

See Industrial Management.

FANS, CENTRIFUGAL

Motors for. Motors for Driving Ventilating Fans, William H. Eastop. Power, vol. 51, no. 19, May 11, 1920, pp. 759-761, 6 figs. Characteristics of motors for fan drives. Comparisons between alternating-current and direct-current motors. Methods of control and formula for calculating horsepower required to drive fans.

FARM MACHINERY

Operating Speeds. The Operating Speeds of Agricultural Implements. Percival White. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 47-50. Opinions of experts are quoted concerning increasing operating speeds of farm machinery, particularly plowing tractor. Majority of them believe that "an acceleration in implement speeds is bound to come, but that its coming will be gradual and slow."

See also Motor Plows.

FATIGUE

Industrial. Studies in Industrial Physiology: Fatigue in Relation to Working Capacity, Joseph Goldmark, Mary D. Hopkins, Philip Sargant Florence and Frederick S. Lee. Treasury Dept., Public Health Bul. no. 106, Feb. 1920, 213 pp., 40 figs. Comparison of an eight-hour plant and a ten-hour plant. Average output per worker, or group of workers, for each hour of day, is given in figures and tables. Conspicuous feature of eight-hour plant is its steady maintenance of output in contrast to fluctuations of output of ten-hour plant.

FILTRATION

Filtrate Classification. Scientific Control of the Filter Station—I, Arthur Wright. Chem. & Metallurgical Eng., vol. 22, no. 22, June 2, 1920, pp. 1015-1017. Discussion on clarification of filtrate. Use of lighter filter cloths made of open woven fabrics advocated. Method of application and use of filter-aids.

Press Operation. Scientific Control of the Filter Station—V, Arthur Wright. Chem. & Metallurgical Eng., vol. 22, no. 26, June 30, 1920. General discussion and summary of features on filter press operation. Types of presses and their application. Materials used in construction of presses, pressure devices, scope of centrifuging, decantation and flotation.

FIREBRICK

Porosity and Volume at Furnace Temperatures. Porosity and Volume Changes of Clay Fire Bricks at Furnace Temperatures, George A. Loomis. Technologic Papers Bur. of Standards, no. 159, April 26, 1920, 29 pp., 3 figs. Experimental investigation. Bricks which were capable of withstanding pressure of 40 lb. per sq. in. at 1350 deg. cent. showed slight changes in volume or porosity when burnt at temperatures up to 1425 deg. cent. Large number of bricks which failed to pass load test showed marked change in volume or in porosity at some temperatures below 1425 deg. cent. Bricks which showed distinct overburning by pronounced expansion at temperatures below 1400 deg. cent. invariably failed in load test.

FLOOD CONTROL

Miami Conservancy District. Effect of Flood on Miami Conservancy Work. Eng. World, vol. 17, no. 1, July 1920, pp. 1-5, 5 figs. Operation and action of hydraulic pump as utilized in outlet works of district dams.

FLOORS

Concrete, Hardeners for. Floor Hardener Tests by Bureau of Standards. Concrete, vol. 16, no. 6, June 1920, pp. 279-280. Service tests of concrete floor hardeners. Types tested were magnesium fluosilicates, varnishes and paints, waxes and various preservatives.

FLYING BOATS

Design. Flying Boats—The Form and Dimensions of Their Hull, G. S. Baker. Shipbuilder, vol. 22, no. 117, May 1920, pp. 345-349, 2 figs. Curves showing effect of hull dimension on power required to overcome water resistance, sketches of typical hulls and efficiency curves for various types.

FORGING

Equipment. Economic Considerations in Regard to the Selection of Forging Equipment (Wirtschaftliche Gesichtspunkte bei der Wahl von Schmiedeaggregaten), H. Schneider. Der praktische Maschinen-Konstrukteur, vol. 53, nos. 2, 4 and 6, Jan. 15, 29 and Feb. 12, 1920, pp. 1-4, 12-15 and 20-24, 11 figs. Description and illustrations of steam hammers, steam hydraulic and pure hydraulic presses, with graphic charts showing kinetic energy stored in a hammer tup, pressure exerted by hammers of different sizes, maximum capacities, and operating costs of presses and hammers. (To be continued.)

FOUNDRIES

Equipment. Many Equipment Features in Hercules Foundry, Gilbert L. Lacher. Iron Age, vol. 106, no. 3, July 15, 1920, pp. 123-130, 15 figs. Plant is equipped with three 96-in. Whiting cupolas with total daily melt of 250 to 300 tons. Buda elevating trucks operated by storage batteries are used to transport cars for pig iron, scrap, coke and facing sand.

Reclaiming Metal from Sand. Reclaiming Metal Parts from Sand, George H. Manlove. Foundry, vol. 48, no. 11, June 1, 1920, pp. 426-428, 2 figs. Thorough screening with suitable magnetic means for removing iron objects from foundry sand is said to have resulted in considerable saving to several large foundries.

See also Cost Accounting, Foundries.

FREIGHT HANDLING

See Terminal, Marine, Freight Handling.

FREQUENCY CHANGERS

Researches. Researches on Frequency Transformers, Tsunetaro Kujirai. Jl. College of Eng., Tokyo Imperial University, vol. 10, no. 5, March 30, 1920, pp. 87-143, 30 figs., partly on 16 supp. plates. Theoretical and experimental investigations of no load cores, and load cores, and of conditions of maximum volt-ampere capacity and maximum efficiency. For a given magnetic induction and current density, volt-ampere capacity is found to be maximum when copper and iron spaces are so proportioned that copper space equals five-fourths of iron space, and under this condition of maximum volt-ampere capacity maximum efficiency is said to occur when iron loss per unit volume equals copper loss per unit volume.

FROZEN-MEAT INDUSTRY

Research in. The Method and Scope of Scientific and Industrial Research, with Special Reference to the Frozen Meat Industry, A. M. Wright. Cold Storage & Ice Assn. Proc., vol. 15, 1918-1919, pp. 147-155 and (discussion) pp. 156-159.

FUELS

Liquid, Ignition Temperatures. Spontaneous Ignition-Temperatures of Liquid Fuels, Harold Moore. Jl. Instn. Petroleum Technologist & Rec. of Trans., vol. 6, no. 22, April 1920, pp. 186-211 and (discussion) pp. 211-223, 28 figs. Fuels measured by different experimenters are compared and results obtained by writer in similar experiments are quoted. Ignition points are listed for different mixtures of hydrocarbons.

FURNACES, ELECTRIC

See Electric Furnaces.

FURNACES, HEAT-TREATING

Rotary Hearth-Type. Rotary Oil-Fired Furnace of New Design. Iron Age, vol. 105, no. 21, May 20, 1920, pp. 1448-1450, 5 figs. Motor-driven hearth-type which makes one revolution for time required for carburizing. Results of trial operations are quoted.

INTERCONNECTION OF. Interconnection in Southern Vermont. Elec. World, vol. 76, no. 1, July 3, 1920, pp. 9-12. Records of savings in fuel and water by interconnection of hydroelectric sources in southern Vermont.

SILT DISPOSAL. Silt Disposal at Tacoma Hydro-Electric Plant, Llewellyn Evans. Power, vol. 51, no. 18, May 4, 1920, pp. 694-697, 6 figs. Development consists of 50-ft. concrete dam diverting water across bend in river with 10-000-ft. tunnel.

See also Reservoirs; Water Power.

ICE PLANTS

CONCRETE FREEZING TANKS. Construction a Concrete Freezing Tank, W. A. Darter. Power Plant Eng., vol. 24, no. 13, July 1, 1920, pp. 665-666, 2 figs. Method of utilizing old steel tanks as forms in making new concrete tanks.

STORAGE CAPACITY. Determining Advantageous Ice Storage Capacity, F. E. Matthews. Am. Soc. Refrig. Engrs. Jl., vol. 6, no. 3, Nov. 1919, pp. 196-200, 2 figs. Construction of graph representing storage and sale for entire year. Paper read before Eastern Ice Manufacturers' Assn.

INDUCTION COILS

AIR-CORE. The Design of Air-Core Inductance Coils of Minimum Weight for a Given Inductance and Resistance, C. O. Gibbon. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 660-665, 2 figs. General outline of theory. It is determined that reluctance of total magnetic path is twice that of portion of path through coil, for maximum efficiency coils.

INDUSTRIAL MANAGEMENT

GREAT BRITAIN. Scientific Management in Great Britain, Clarence H. Northcott. Indus. Management, vol. 60, no. 1, July 1920, pp. 57-58. Experience during eight years of firm of Hans Renold, which was one of first to institute works committees in Great Britain.

Scientific Management: A Solution of the Capital and Labour Problem, J. M. Scott-Maxwell. Jl. Instn. Elec. Engrs., vol. 58, no. 291, May 1920, pp. 329-342 and (discussion), pp. 342-376, 2 figs. It is urged that by generalization of industrial management in industry, progress of reconstruction can be accellerated in England.

PRINCIPLES. The Principles of Industrial Management (Les principes de L'Organisation industrielle), Danty-LaFrance. Vie Technique & Industrielle, vol. 1, no. 3, May 1920, pp. 123-127. Industrial management, it is said, is not a science based upon mathematical principles, but rests upon faithful observations of rules and methods of procedure. Necessity of standardizing conditions of work, writing instructions and other practices is concluded.

PRODUCTION CONTROL. Shop Production-Control and Accounting Systems, A. G. Drefs. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July 1920, pp. 33-38, 3 figs. Graphical method is suggested for securing complete factory costs.

PRODUCTION SYSTEMS, BRITISH. Production Methods in the British Automobile Plants, M. W. Bourdon. Automotive Industries, vol. 42, no. 26, June 24, 1920, pp. 1461-1462. Despite schedules for larger outputs English factories, it is said, generally continue pre-war methods of machining and assembling. There is, however, it is noted, greater accuracy in manufacture and greater tolerance where narrow limits are unnecessary, as for instance, in external finish.

ROUTING. Routing Machine Parts Through the Factory, J. A. Urquhart. Iron Age, vol. 105, no. 20, May 13, 1920, pp. 1375-1379, 9 figs. System covering ordering, planning, scheduling and dispatching in use by Brown & Sharpe Mfg. Co.

SHIPYARDS. Industrial Organization Applied to Shipyard Management, Norman Howard. Indus. Management, vol. 60, no. 1, July 1920, pp. 38-42, 7 figs. Elements worked out as standard practice by Industrial Management Section of Emergency Fleet Corporation.

STOREKEEPING. Scientific Management—XIV, Henry Atkinson. Eng. & Indus. Management, vol. 3, no. 25, June 17, 1920, pp. 771-774, 3 figs. Methods of storekeeping.

See also Time Study.

INLAND WATERWAYS

AUTOMOTIVE SHIPMENTS. Water Borne Transportation for Automotive Shipments. George E. Quisenberry. Automotive Industries. vol. 43, no. 1, July 1, 1920, pp. 28-30, 1 fig. Survey of possibilities of such transportation based upon experience of several companies.

TRANSPORTATION RATES. Influence of Capacity of Ships Upon Transportation Rates in Canals (Influence de la capacité des bateaux sur les frais de transports par canaux), M. Galliot. Annales des Ponts et Chaussées, vol. 54, no. 1, Jan.-Feb. 1920, pp. 39-61. Procedure is suggested for calculating most economical tonnage for ships operating in canal in terms of total cost of construction, operation and maintenance of canal, total traffic it carries, etc.

INSULATORS, ELECTRIC

SUSPENSION. Electrical Characteristics of the Suspension Insulator—II, F. W. Peek, Jr. Jl. Am. Inst. Elec. Engrs., vol. 30, no. 7, July 1920, pp. 623-630, 23 figs. Duties of line insulators at voltages above 100 kv. are reviewed and compared with duties imposed by lower voltages.

Unit Voltage Duties in Long Suspension Insulators, Harris J. Ryan and Henry H. Henline, Jl. Am. Inst. Elec. Engrs., vol. 39, no. 7, July 1920, pp. 631-636, 21 figs. Potentiometer measurements were made of maximum and average voltage duties occurring in strings made up of 10-in. cap and pin type units wherein numbers of units were varied from 2 to 20. It is concluded that suspension insulator units in common use can be satisfactorily employed for make-up of insulators for 250-kv. lines, and that static shields in requisite forms will lower maximum unit voltage duties so as to permit satisfactory insulation of lines for use of voltages far above 150 kv.

IRON-CARBON ALLOYS

GRAPHITIZATION. On the Graphitization in Iron-Carbon Alloys, Kuniichi Tawara and Genshichi Asahara. Jl. College of Eng., Tokio Imperial University, vol. 9, no. 6, Nov. 25, 1918, pp. 197-237, 38 figs, partly on 12 supp. plates. Various alloys with carbon content ranging from 2 to 4 per cent were cast under different conditions. Factors, such as casting temperature, temperature of mold, time and mode of cooling, were found to do nothing more than define solidifying velocity of molten metal and cooling velocity of it after solidification. It is concluded that under the same conditions the higher the temperature of a molten is, the more graphitization occurs. Graphite was produced at temperatures of 1100 deg. cent. and 1000 deg. cent., the former being the more favorable while it was not at temperature of 900 deg. cent.

IRON FOUNDING

INGOT MOLD CASTING. Large Ingot Mold Casting. Iron Age, vol. 105, no. 20. May 13, 1920, pp. 1365-1366, 3 figs. Molding and pouring problems in making 114-ton iron mold.

MODERN PRACTICE. How Machine Castings Are Made. Foundry, vol. 48, no. 10, May 15, 1920, pp. 379-383, 8 figs. Practice of modern foundry company. Mechanical equipment makes it possible, it is said, to produce castings conforming to severe specifications with unskilled labor.

POURING DIRECT FROM BLAST FURNACE. Making Ore Pile Part of Automotive Plant, F. L. Prentiss. Iron Age, vol. 105, no. 19, May 6, 1920, pp. 1295-1302, 14 figs. partly on supp. plate. Plan of Henry Ford to pour castings direct from blast furnace.

KILN DRYING

See Aircraft Construction Materials.

LATHES

INCREASING-LEAD SCREW CUTTING. Screws with an Increasing Lead. Machy. (Lond.), vol. 16, no. 398, May 13, 1920, pp. 173-174. Lathe for machining such screws.

LINE-BEARING AND FLANGE-TURNKNG. Wickes Crankshaft Line-Bearing and Flange-Turning Lathe, J. V. Hunter. Am. Mach., vol. 53, no. 3, July 15, 1920, pp. 99-100, 4 figs. Line of lathes specially adapted to turning line bearings and flanges on automotive crankshafts.

LEAD METALLURGY

ROASTING AND SMELTING. Roasting and Lead-Smelting Practice at the Port Pirie (S. A.), Plant of the Broken Hill Association Smelters Proprietary, Ltd., Gilbert Rigg. Bul. of Insts. of Min. & Metallurgy, no. 188, May 1920, 15 pp. Experiments which led to adoption of double Dwight-Lloyd method.

LIGHTING

FACTORY. High Intensity Factory Illumination, M. A. Smilari. Iron Age, vol. 105, no. 21, May 10, 1920, pp. 1428-1431, 5 figs. Economic and social effects. Specifications for artificial sources of light. Range of intensities for various kinds of work.

ILLUMINATION INTENSITY. Predetermining Foot-Candle Illumination, I. W. Gross. Elec. World, vol. 75, no. 25, June 19, 1920, pp. 1423-1425, 2 figs. Chart for determining vertical illumination on horizontal plane at any distance below center of light from 2 ft. up to 100 ft. and along horizontal plane up to distance of 300 ft. on each side of unit.

LIGNITE

SURFACE MINING. Apparatus for Handling Lignite in Surface Mining (Braunkohlenförderbahnen). W. Metz. Fördertechnik u. Frachtverkehr, vol. 13, no. 1, Jan. 9, 1920, pp. 4-7, 10 figs. Describes improvements in excavating and transporting which have reduced costs of operation.

LOCOMOTIVE BOILERS

SUPERHEATER LOCOMOTIVE. Locomotive Boilers. Ry. Engr., vol. 41, no. 485, June 1920, pp. 254-258, 9 figs. Sectional drawings, etc., of large boilers utilized by Lancashire and Yorkshire Ry. Co. on 0-8-0 type superheater locomotives.

LOCOMOTIVES

AUXILIARIES, AIR CONSUMPTION OF. Air Consumption of Locomotive Auxiliaries. Ry. Mech. Engr., vol. 94, no. 6, June 1920, pp. 395-398, 3 figs. Cost of wasted air shown and condemning limits proposed to raise standard of maintenance. Abstract of committee report and discussion. presented at annual convention of Air Brake Assn.

REBUILDING. A Useful Locomotive Rebuild. Ry. Engr., vol. 41, no. 485, June 1920, pp. 259-262, 7 figs. Illustrated description of rebuilding of class "E" express locomotive on South-Eastern & Chatham Ry., special features being small increase in weight and greatly increased efficiency.

REPAIR COSTS. Reducing Cost of Locomotive Repairs, S. W. Mullinix. Ry. Rev., vol. 66, no. 20, May 15, 1920, pp. 795-797. Rearranging and regrouping machines, dividing shops into separate departments and other means of reducing costs. Paper read before West. Ry. Club.

NICKEL

ROLLED SHAPES. Rolled Products of 99 per cent Nickel, Edwin F. Cone. Iron Age, vol. 105, no. 25, June 17, 1920, pp. 1713-1716, 9 figs. Open-hearth treatment which makes possible rolling of same shapes now produced in mild steel.

NICKEL-CHROME STEEL

BRITTLENESS. Brittleness in Nickel-Chrome and Other Steels.—II, F. Rogers. Annual Meeting, Iron & Steel Inst., May 6 & 7, 1920, 5 pp. 2 figs. Heating and cooling curves constructed from data obtained experimentally. First paper was published in Jl. Iron & Steel Inst., no. 2, 1919, pp. 325-328.

NICKEL PLATING

See Aluminum Alloys, Nickel Plating.

NON-FERROUS METALS

SPECIFICATIONS. Report of Committee B-2 on Non-Ferrous Metals and Alloys. Twenty-Third Annual Meeting, Am. Soc. for Testing Matls., June 22-25, 1920, 33 pp. Revised specifications for copper bars for locomotive staybolts, and for aluminum ingots for remelting and rolling; also revised methods for chemical analysis of alloys of lead, tin, antimony and copper.

OFFICE MANAGEMENT

PRINCIPLES. Getting the Office Work Done—I. Wallace Clark. Indus. Management, vol. 60, no. 1, July 1920, pp. 13-16, 3 figs. Application of principles of industrial management to organization and management of offices.

OIL

See Petroleum.

OIL ENGINES

STEINBECKER SOLID-INJECTION. The Steinbecker Solid-Injection Engine. Motorship, vol. 5, no. 7, July 1920, pp. 625-626, 3 figs. Constant-pressure oil engine, built by German Automobile Construction Co., Ltd., Berlin, and Hanover Machine Co. (To be continued.)

See also Diesel Engines, Heavy-Oil Engines.

OIL FIELDS

VALUATION. The Classification of Undeveloped Oil Lands for Purposes of Valuation, Carl H. Beal. Economic Geology, vol. 55, no. 4, June 1920, pp. 315-327, 1 fig. Based on answers to questionnaire sent to geologists and petroleum engineers requesting their views on tentative definitions.

OIL FUEL

BURNING. Recent Developments in the Design of Oil-Burning Furnaces (Les plus récents procédés de chauffage au mazout). G. Lechartier. Technique Moderne, vol. 12, no. 3, March 1920, pp. 116-123, 25 figs. Attention is directed to adaptation to oil-burning of boilers built to burn coal. One installation in Berlin and another in Rotterdam are described. Results of service tests of various classes of oil fuels conducted at works of Smith Dock Co.,North Shields, England, are quoted.

ECONOMY. Economies Obtained in Burning Oil ,Robert Sibley and C. H. Delany. Elec. World, vol. 75, no. 26, June 26, 1920, pp. 1483-1484. Results obtained at three Arizona plants.

INDUSTRIAL DEMAND. Industrial Demand for Oil as a Fuel, George Otis, Smith. Blast Furnace & Steel Plant, vol. 8, no. 6, June 1920, pp. 365-367. It is stated that first three months of 1920 have established rate of domestic production that if unchecked will reach a total of 415,000,000 barrels. Paper read before Am. Iron & Steel Inst.

OPEN-HEARTH FURNACES

FRANCE. The Tilting Open Hearth's Future in France. Iron Age, vol. 105, no. 22, May 27, 1920, pp. 1499-1500. Superiority of basic open-hearth steel over basic bessemer steel is pointed out and increasingly large demand in Europe for former kind of material is noted. Translated from Revue de Métallurgie.

GAS-FIRED. The Heating of Open-Hearth Furnaces with Lignite Producer Gas (Die Beheizung von Martinöfen mit Braunkohlengeneratorgas), Stahl u. Eisen, vol. 40, no. 17, April 29, 1920, pp. 565-567 and (discussion), pp. 567-568. It is pointed out that in gasification of briquets in producers, special attention should be given to clinker, and addition of steam is necessary to insure good quality of gas and to maintain as even, not too high temperature, which is also necessary for production of tar. Report from steelworks committee of Assn. German Foundrymen.

OSCILLATIONS

See Ionic Valves, Oscillations.

OXY-ACETYLENE CUTTING

DEVELOPMENTS. Recent Developments in Oxygen Cutting, Stuart Plumley and F. J. Napolitan. Iron Age, vol. 105, no. 22, May 27, 1920, pp. 1505-1506, 1 fig. Development quoted as most interesting which has occurred recently is successful cutting of cast iron. Theory and principles of oxy-acetylene cutting of cast iron are discussed.

OXY-ACETYLENE WELDING

PIPE MAINS. Oxy-Acetylene Welding of Pipe Mains. Alfred S. Kinsey. Welding Engr., vol. 5, no. 6, June 1920, pp. 30-32, and p. 38, 4 figs. Method of welding joints on top of ditch and turning pipe to meet convenience of welder is said to be most efficient and economical.

PARACHUTES

STABILITY. Stability of the Parachute and Helicopter, H. Bateman. Nat. Advisory Committee for Aeronautics, report no. 80, 1920, 11 p. Mathematical theory.

PAVEMENTS, ASPHALT

ASPHALT-CEMENT SPECIFICATIONS. Asphalt Cement Qualities and Tests Needed in Specifications for Sheet Asphalt and Asphalt Concrete Pavements, J. W. Howard. Mun. & County Eng., vol. 58, no. 6, June 1920, pp. 236-236. Qualities recommended to be specified include ductility, specific gravity, penetration and freedom from volatile oil.

PAVEMENTS, ASPHALTIC CONCRETE

MERITS OF. The Merits of Asphaltic Concrete Pavements, W. H. Connell. Contract Rec., vol. 34, no. 25, June 23, 1920, pp. 603-605. Importance of properly maintaining asphaltic concrete roads in order to get maximum service from them is pointed out. As instance of successful maintenance, Grand Boulevard and concourse of New York City, built in 1910 and still in perfect condition, is indicated.

PAVEMENTS, BITUMINOUS

CONSTRUCTION METHODS. Bituminous Paving Suggestions, Theodor S. Oxholm. Public Works, vol. 48, no. 18, May 15, 1920, pp. 425-426, 1 ffig. Corrugating base to prevent creeping of asphalt surface, use of old macadam as base, softness of asphalt that gives best results, and laying next to rails.

PETROLEUM

CONSUMPTION IN U. S. The Industrial Demand for Oil and the Available Supply, George Otis Smith. Automotive Industries, vol. 42, no. 25. June 17, 1920, pp. 1419-1421. Warning is issued that rate of consumption of oil in United States exceeds rate of production. Total consumption for year at present rate would be 490,000,000 bbl., while production is expected to be 415,000,000 bbl.

RESOURCES OF U. S. Industry's Need of Oil, George Otis Smith. Iron Age, vol. 105, no. 23, June 3, 1920, pp. 1584-1586. Warning is issued that oil demand in United States is now in excess of supply. First three months of 1920, it is said, have established rate of domestic production that if unchecked will mean 415,000,000 bbl. for year, and rate of consumption that will make year's requirements more than 490,000,000 bbl. Paper read before Am. Iron and Steel Inst.

PETROLEUM INDUSTRY

DETAILS OF. The Petroleum Industry (L'industrie du pétrole), H. Pouleur. Revue universelle des Mines, vol. 3, no. 1, Sept.-Oct. 1919, pp. 1-71, Composition of raw oil is taken up, together with its transportation, its storage, and processes of distillation are classified, and properties and uses of each explained.

PIERS

CONCRETE ROOF TRUSSES. Precast Concrete Roof Trusses in Panama Pier Shed, Guy W. True. Eng. News-Rec., vol. 84, no. 26, June 24, 1920, pp. 1232-1238, 9 figs. Discussion of feasibility of concrete roof trusses with comparisons of cost data between two similar sheds, one with reinforced-concrete roof trusses and one of structural steel.

PILES

SHEET, TESTS OF. Tests of Solid and Laminated Wood Sheetpiles. Eng. News-Rec. vol. 84, no. 25, June 17. 1920, pp. 1201-1202. Tests made at Cornell University on quarter-scale models under bending loads.

PIPE, CONCRETE

CENTRIFUGAL PROCESS. The Manufacture of Concrete Pipes by "Hume" Centrifugal Process. W. Wolstenholme. Jl. South African Instn. Engrs., vol. 18, no. 10, May 1920, pp. 175-181 and (discussion), pp. 181-184, 8 figs. Process at factory of Hume Pipe Co., Germiston, South Africa.

POWER FACTOR

VARIATIONS. Variations of Power Factor in Terms of Variations of Active Compo- [illegible]

RAILWAYS

SOUTH AMERICA. Railway Equipment in South America, J. P. Risque. By Mech. Engr., vol. 94, no. 6, June 1920, pp. 364-368, 13 figs. About 65 per cent of roads are owned and controlled by British capital and operated by British nationals. Equipment used is generally of British type.

TRACTION ON HEAVY GRADIENTS. Traction on Heavy Gradients by Means of Auxiliary Adhesion, Ch. Dantin. Bul. Int. Ry. Assn., vol. 2, no. 5, May 1920, pp. 272-284. 11 figs. Use of Hanscotte system for haulage of artillery trains. Translated from Genie Civil.

RECTIFIERS

MECHANICAL. Mechanical Alternating-Current Rectifiers (Le redressement des courants alternatifs par des appareils mécaniques), Alfred Soulier. Revue générale de l'Électricité, vol. 7, no. 19, May 8, 1920, pp. 619-625, 10 figs. Apparatus designed by writer.

REFRACTORIES

RESEARCH COMMITTEE REPORT. Report of Refractory Materials Research Committee, Gas Jl., vol. 150, no. 2978, June 8, 1920, pp. 576-583, 2 figs. Committee report of Instn. of Gas Engrs. Experiments are described which were performed to ascertain conditions required for successful casting of refractory ware containing high percentage of grog. Comparative tests were also reported of machine made and hand-made silica bricks. Measured specific heats of various refractory materials at high temperatures are included.

REFRIGERATING PLANTS

AMMONIA-COMPRESSION. Two Indirect Methods of Finding the Weight of Ammonia in Circulation in Compression Refrigeration, J. W. Gavett. Jr. Power, vol. 51, no. 26, June 29, 1920, pp. 1042-1045, 6 figs. Non-mechanical methods of computing weight of ammonia by means of pressure-volume charts and temperature-entropy charts of ammonia cycle.

AMMONIA LEAKS. Testing for Ammonia Leaks in Refrigerating Plants, B. E. Hill. Power, vol. 51, no. 24, June 15, 1920, pp. 955-956. Directions for testing for ammonia leaks with phenolphthalein and sulphur sticks.

REFRIGERATION

ETHYL CHLORIDE. Properties of Ethyl Chloride, G. C. Hodgson and Albert Henning. Refrig. World, vol. 55, no. 6, June 1920, pp. 16-18 and p. 26. Table giving results of two-ton Clothel refrigerating machine is included.

RESEARCH IN. Education and Research in the Refrigerating Industry, J. Wemyss Anderson. Proc. Cold Storage & Ice Assn., vol. 14, 1917, pp. 5-15 and (discussion), pp. 16-30. Suggests that Cold Storage & Ice Assn. petition Government to subsidize Association Internationale du Froid, foster research and approve formation of Schools of Refrigeration.

RESEARCH

BRIQUETTING PLANT. Experimental Briquetting Plant, Albert L. Stillman. Chem. & Metallurgical Eng., vol. 22, no. 22, June 2, 1920, pp. 1035-1038, 4 figs. Outline of briquetting research work in General Briquetting Co.'s experimental plant.

GOVERNMENTAL CO-OPERATION IN. The Economic Importance of the Scientific Work of the Government, E. B. Rosa. Jl. Washington Acad. of Science, vol. 10, no. 12, June 19, 1920, pp. 341-382, 3 figs. Benefits resulting to the public from governmental co-operation in industrial research are pointed out. Reasonablesness of Government assisting and leading in research work is determined from analysis of present national budget, in which only one per cent of total is dedicated to research, education and development of municipal work. Government, it is concluded, should co-operate with industries in peace as earnestly and as effectively as industries co-operated with it in war.

PHOTOBIBLIOGRAPHIC METHODS. Photobibliographic Research Methods—The Compilation of Technical Data with the Aid of Photography, Arthur Worischek. Jl. Indus. & Eng. Chem., vol. 12, no. 7, July 1920, pp. 679-682, 2 figs. Need for portable and cheaply operated photographic device for copying illustrations and articles on file in reference libraries is pointed out. It is believed that a device combining operating principles of existing bromide paper copying machines and self-illuminated meter-reading cameras would prove to be valuable aid in data compilation and simple enough in operation for use by non-technical clerical assistants.

TABLES, PREPARATION OF. The Rapid Preparation of Tables, J. C. Witt, Jl. Indus. & Eng. Chem., vol. 12, no. 6, June 1920, pp. 591-592. Illustrates simplification of computation of results obtained in laboratory tests by constructing expression indicating progressional value of series.

See also Chemistry, Research in: Electrical Engineering, Research Problems; Frozen-Meat Industry, Research in; Gas, Research; Gas Industry, Coal Research Work; Heating and Ventilation, Research; Hydraulics, Research; Refrigeration, Research in.

RESERVOIRS

NORTH CAROLINA. Master Storage Reservoir for Southern Power Company's System. W. S. Lee and Richard Pfaehler. Elec. World, vol. 75, no. 23, June 5, 1920, pp. 1299-1303, 10 figs. Features of Bridgewater reservoir which provides storage for seven hydroelectric plants of Southern Power Co. and detail of 25,000 kva. Bridgewater Station at this reservoir.

ROADS, CONCRETE

CALIFORNIA. Reinforcing Concrete Pavements on California Highways. Eng. News-Rec., vol. 84, no. 26, June 24, 1920, p. 1255, 1 fig. Transverse bars used to prevent cracks from widening and to maintain surface continuity.

PROPORTIONING AGGREGATES. New Ideas Applied to Cement Concrete Roads, W. P. Near. Contract Rec., vol. 34, no. 25, June 23 1920, pp. 605-608. Abrams' table of proportions and quantities for one cubic yard of concrete, based on laboratory investigations. Suggestions in regard to specification for consistency. Paper read before Canadian Good Roads Congress.

RIVETED JOINTS

TESTS. Experiments on Riveted Joints, James Montgomerie, Shipbuilder, vol. 22, no. 117, May 1920, pp. 335-338. Experiments undertaken at Proving House in Glasgow at instance of Committee of Lloyd's Register of Shipping.

ROAD CONSTRUCTION

GEORGIA CONTRACT FORM. Georgia's New Road Contract, Public Works, vol. 48, no. 23, June 19, 1920, pp. 534-536. Form which State Highway Department is intending to try out, involving estimate by contractor and fee or profit varying inversely as actual cost.

ROAD MATERIALS

OILS, ASPHALT CONTENT OF. The So-Called Asphalt Content of Road Oils, B. A. Anderton and D. G. Taylor. Twenty-Third Annual Meeting, Am. Soc. for Testing Matls., June 22-25, 1920, 7 pp. 1 fig. Investigation of Bur. of Public Roads of value of determining asphalt of 100 penetration in road oils in differentiating between various types and consistencies of oils. As a general conclusion, it is believed that percentage of asphalt gives no information on suitability of a road oil for a given purpose that is not adequately indicated by other well standardized tests.

ROCK

DEVAL ABRASION TEST. The Standard Deval Abrasion Test for Rock, F. H. Jackson. Twenty-Third Annual Meeting, Am. Soc. for Testing Matls., June 22-25, 1920, 14 pp. 6 figs. Results of tests made in laboratory of Bur. of Public Roads in connection with proposed changes in Deval abrasion test for rock. It is concluded that results of standard Deval abrasion test as conducted in usual way are accurate to within one per cent.

ROCK DRILLS

HAMMER, HOSE FITTINGS FOR. Standardization of Hose Fittings for Hammer Rock Drills, George H. Gilman. Eng. & Min. Jl., vol. 109, no. 23, June 5, 1920, pp. 1252-1255, 18 figs. Conical joint, standard pipe threads, and use of beat-treated steel are suggested.

ROLLING MILLS

POWER DRIVES. Power Drives for Rolling Mills, W. O. Rogers. Power ,vol. 51, no. 24, June 15, 1920, pp. 962-966, 5 figs. Several types of mills are described, together with details regarding process in rolling steel into various products, from ingot into slabs, billets., skepl, plates and pipes.

SHEET. Bethlehem's Sheet and Tin Plate Mills. Iron Age, vol. 105, no. 21, May 20, 1920, pp. 1433-1435, 1 fig. Description of arrangement and equipment of sheet mills, together with account of enlarged tin plate department of Maryland plant.

Wider Sheet Bars Advocated. Clement F. Poppleton. Iron Age, vol. 105, no. 20, May 13, 1920, pp. 1359-1363, 4 figs. Matter of balanced rigging in stands. Economics calculated and two layouts shown by way of illustrations.

SHIP-PLATE. The Dominion Iron and Steel Company's New Ship-Plate Rolling Mill. H. E. Rice. Can. Min. Inst. Bul., no. 97, May 1920, pp. 367-377, 5 figs. Mill is a 110-in. x 36-in. three-high plate mill of Lauth type. It consists of one stand of rolls served by tilting tables and is driven by 4000 h.p. 82-r.p.m. motor through set of cut herringbone pinions.

ROOF TRUSSES

See Piers, Concrete Roof Trusses.

RUBBER

ANALYSIS. A Direct Method for the Determination of Rubber Hydrocarbon in Raw and Vulcanized Rubber, W. K. Lewis and W. H. McAdams. Jl. Indus. & Eng. Chem., vol. 12, no. 7, July 1920, pp. 673-676, 1 fig. Working with filtered carbon tetrachloride solution of acetone-extracted plantation pale crêpe, it is said to have been shown by a volumetric method involving a double titration that bromide consumption, corrected for observed substitution, is true measure of pure rubber hydrocarbon present.

STRESS-STRAIN CURVE. Some Aspects of the Rubber Stress-Strain Curve, William B. Wiegand. Can. Chem. Jl., vol. 4, no. 6, June 1920, pp. 160-170, 21 figs. Survey of researches made by various investigators.

SEWAGE DISPOSAL

SHIP CONSTRUCTION

SHIP DESIGN

SHIPS, CONCRETE

SHOP COMMITTEES

STEEL

STEEL, HEAT TREATMENT OF

CONTROL. Relationship Between Dendritic Structure and Ferrite Mesh, Federico Giolitti. Chem. & Metallurgical Eng., vol. 22, no. 20, May 19, 1920, pp. 921-929, 42 figs. It was found in experimental researches in steel metallurgy that fir-tree crystals do not influence directly location of ferrite shells either in ingot structure or after drastic heat treatments, while physical properties of normalized castings depends primarily on an improvement of pearlitic kernels by gradual diffusion of segregates. From studies On the Control of the Preliminary Heat Treatment of Steel in Large Masses, published in Metallurgia Italiana, 1913.

HIGH-CHROMIUM STEEL. The Heat-Treatment of a High-Chromium Steel, H. J. French. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July, 1920, pp. 103-109, 10 figs. Experimental determination of effect of various heat-treatments on tensile properties of steel containing about 11 to 15 per cent of chromium and from 0.20 to 0.40 per cent of carbon (stainless steel). With increasing quenching temperature hardness as measured by Brinell and Shore instruments increased until temperature of about 19.50 deg. fahr. was reached. Quenching from about 1750 deg. fahr. developed best combination of strength and ductility, which was not coincident with range of maximum hardness. Ductility as measured by elongation and reduction in area was very low in samples quenched from 1850 deg. fahr. or above.

LOCOMOTIVE FORGINGS. Notes on the Heat Treatment of Locomotive Forgings and Similar Parts, Lawford H. Fry. Jl. Am. Steel Treaters Soc., vol. 2, no. 9, June 1920, pp. 435-441, 1 fig. Tables of quenching speeds and resulting physical properties.

MICROSCOPIC STUDY. The Microscope and the Heat Treatment of Steel, Albert Sauveur. Iron Age, vol. 105, nos. 23 and 25 (Discussion), June 3 and 17, 1920, pp. 1586-1589, 10 figs. and 1717-1720, 8 figs. Photomicrographs illustrating various transformations in structure and properties under thermal conditions. Paper read before Am. Iron and Steel Inst.

PARTIAL CEMENTATION. Partial Cementation of Steel by Means of Solid Cements, Gordon A. Webb. Jl. Am. Steel Treaters Soc., vol. 2, no. 9, June 1920, pp. 442-450. Properties acquired by steels of different composition by carburization.

PLANT. Heat Treatment for Continuous Operation, L. W. Heiser and J. L. M'Cloud. Am. Drop Forger, vol. 6, no. 6, June 1920, pp. 272-274, 2 figs. Proposed heat-treating plant, designed to treat 100,000 lb. of work, in which the operation is continuous.

STEEL, HIGH-SPEED

TESTS. A Comparative Test Upon High-Speed Steels—III, A. J. Langhammer. Chem. & Metallurgical Eng., vol. 22, no. 20, May 19, 1920, pp. 939-942, 2 figs. Detailed description of method of procedure in testing 16 different commercial brands of high-steel tool steel, together with data as to performance of each individual tool, its chemical composition, heat treatment, and hardness.

STEEL INDUSTRY

OUTLOOK. What the Outlook is for Iron and Steel, John A. Topping. Iron Age, vol. 105, no. 19, May 6, 1920, pp. 1307-1308. Supply is said not to have caught up with demand, but prices are not considered to be relatively high.

STEEL MANUFACTURE

ACID OPEN-HEARTH PROCESS. The Acid Open Hearth Process, B. E. L. DeMaré. Iron Age, vol. 105, no. 23, June 3, 1920, pp. 1589-1593, 1 fig. Practice as carried out in open-hearth department of Nicetown Plant of Midvale Steel and Ordnance Co., Philadelphia. Paper read before Am. Iron and Steel Inst.

BETHLEHEM STEEL CO. Features of a Modern Steel Plant. Iron Age, vol. 105, no. 24, June 10, 1920, pp. 1657-1660. Steps in manufacture of steel products from raw material at Maryland plant of Bethlehem Steel Corporation.

OPEN-HEARTH PROCESS. Notes on the Acid Open Hearth Process, B. De Mare. Blast Furnace & Steel Plant, vol. 8, no. 6, June 1920, pp. 318-324 and p. 385, 3 figs. Discussion of practice as carried out in open hearth department of Nicetown plant of Midvale Steel & Ordnance Co.

See also Rails, Pipeless Electric Furnaces, Induction; Open-Hearth Furnaces, Gas-Fired.

STEEL MILLS

ELECTRIC REPAIR-SHOP PRACTICE. Steel Mill Electric Repair Shop Practice, A. J. Standing. Jl. Engrs. Club of Phila., vol. 37-5, no. 186, May 1920, pp. 215-218. Practice of Bethlehem Steel Co., Bethlehem, Pa.

ELECTRICALLY DRIVEN. Electrically Driven Steel Reversing Mills, Fraser Jeffrey. Power, vol. 51, no. 26, June 29, 1920, pp. 1030-1033, 5 figs. Tonnage output per cost of operation and maintenance rather than first cost, it is said, is basis on which electricity is efficiently replacing steam as a mill drive. An installation is described in which a reversing motor and its necessary complements replaced an engine unit.

See also Signaling, Acoustic.

STOKERS

TESTS. Mechanical Stoker Tests. Jl. Instn. Mech. Engrs., no. 4, May 1920, pp. 281-313 and (discussion) pp. 314-428. Details of performance of 80 typical mechanically fired "Lancashire" steam boiler plants in Great Britain. (Concluded.)

STREET CLEANING

SWEEPING COSTS. Forms for Motor Sweeper Cost Keeping, John Townshend Child. Public Works, vol. 38, no. 18, May 15, 1920, pp. 417-419, 2 figs. Methods and forms devised in Rochester, N.Y., for keeping cost records of street sweepers for aid in controlling work, making budget estimates, comparing and purchasing equipment, and determining special assessments.

STREET RAILWAYS

CAR MATERIALS. Railway Car Materials—Steel II, Norman Litchfield. Elec. Ry. Jl., vol. 55, no. 25, June 19, 1920, pp. 1247-1250, 3 figs. Discussion of physical and chemical properties necessary and their relation to strength and durability.

IMPROVING SERVICE. Merchandising Transportation, F. G. Buffe. Elec. Ry. Jl., vol. 55, no. 25, June 19, 1920, pp. 1251-1254. Various methods of disposing "of street car rights by merchandising methods" are discussed, including means for improving service, publicity of improvements and securing co-operation of trainmen.

SUBMARINES

EUROPEAN TYPES. Submarines (Les sous-marins), A. M. Laubeuf. Revue de l'Ingénieur et Index Technique, vol. 26, no. 5, May 1920, pp. 491-521, 21 figs. Description of French, English and German types. (Continuation of serial.)

GERMAN. German Submarines, A. W. Johns. Shipbuilder, vol. 22, no. 117, May 1920, pp. 298-302, 7 figs. Information as to types, number, cost and other particulars.

SURVEYING

RECTANGULAR CO-ORDINATE. Rectangular-Co-ordinates Used in Surveys and Maps, H. A. Foster. Eng. News-Rec., vol. 84, no. 20, May 13, 1920, pp. 962-963, 1 fig. Grid system based on Lambert projection, employed by armies in France, is recommended for civilian practice.

TAR

See Wood, Tar Distillation.

TELEPHONY

See Phototelephony; Radiotelephony.

TELLURIUM

See Selenium.

TEMPERATURE CONTROL

Automatic Control of High Temperatures. Iron Age, vol. 105, no. 22, May 27, 1920, pp. 1516-1517, 2 figs. Automatic recording controller manufactured by Leeds & Northrup Co., Philadelphia.

TERMINALS, MARINE

FREIGHT HANDLING. Freight Handling at Marine Terminals, A. K. West. Int. Mar. Eng., vol. 25, no. 7, July, 1920, pp. 598-600, 4 figs. Methods at Boston Army Supply Base.

TIDAL POWER

UTILIZATION. Coupling of Electric Plants Utilizing Tidal Power (Couplage d'usines électriques utilisant la force des marées), Georges Mangin. Revue générale de l'Électricité, vol. 7, no. 19, May 8, 1920, pp. 626-631, 6 figs. If plants are built at two different points, so situated that high tide in the one corresponds to low tide in the other, and vice versa, coupling of these two plants, it is observed, will secure continuous supply of power. Construction and coupling of such plants at St. Malo and Brest is studied.

Utilization of Tidal Energy at the Mouth of Rivers (Utilisation de l'énergie de l'embouchure des fleuves), Ch. Andry-Bourgeois. Électricien, vol. 35, no. 1253, June 1, 1920, pp. 217-219, 1 fig. Scheme suggested consists in building canal at estuary of river. Turbines placed at middle of canal are operated continuously by flux and reflux of water.

TIME

MEASUREMENT OF. Representation and Measurement of Time (Représentation et mesure du temps), Édouard Guillaume. Archives des Sciences physiques et naturelles, vol. 2, Mar.-Apr. 1920, pp. 125-146. Kant's axiom, different times cannot be simultaneous, is applied to Lorentz' transformation. Investigation is carried in light of principles of theory of relativity.

TIME STUDY

DETAILS OF. Time and Job Analysis in Management—IV, William O. Litchner. Indus. Management, vol. 60, no. 1, July 1920, pp. 28-34, 7 figs. Details and technique of taking time studies.

TUNNELS

TURBO-ALTERNATORS

VACUUM TUBES

WATER

WATER PURIFICATION

WATER HAMMER

WATER MAINS

WATER POWER

WATER SOFTENING

Hot Process. Development of Hot Process Water Softener, George Gibson. Blast Furnace & Steel Plant, vol. 8, no. 6, June 1920, pp. 325-326, 3 figs. Sorge-Cochrane softener.

WATER SUPPLY

Booster Station. Combined Gas and Motor-Driven Pressure Booster Station, A. E. Walden. Power, vol. 51, no. 24, June 15, 1920, pp. 950-952, 5 figs. Details of two pressure booster stations, consisting of combination gas-engine and motor-driven centrifugal pump units of 75 and 150-h.p. capacity, each with pumping capacity of 2,000,000 gal. of water daily, at 55 ft. to 115 ft. and 231 ft. head respectively.

Montreal. The Municipal Water Supply of Montreal, T. W. Lesage. Can. Engr., vol. 38, no. 26, June 24, 1920, pp. 584-587, 1 fig. Water is sterilized by hypochlorite. Average daily consumption for 1919 was 65,046,000 imp. gal. Paper read before American Water Works Association.

WATER TREATMENT

Clay and Silica Removal. The Removal of Clay and Silica From Water, Otto M. Smith. Jl. Am. Water Works Assn., vol. 7, no. 3, May 1920, pp. 302-314, 10 figs. List of electrolytes is given arranged in the order of their efficiencies as coagulants, and results of tests with these electrolytes are presented in diagrammatic forms.

Rainfall and High Bacterial Count. An Inquiry Into the Effect of Meteorological Conditions Upon the Efficiency of Storage, Filtration and Chlorination, Based Upon a Study of the Hagerstown Water Supply, Abel Wolman. Jl. Am. Water Works Assn., vol. 7, no. 3, May 1920, pp. 352-363. Fundamental cause producing excessive bacteria counts in tap water was found to be excessive rainfall.

WATER WORKS

Centrifugal Pumps in. The Use of Centrifugal Pumps in Municipal Water Plants, Russell A. Murdoch. Mun. & County Eng., vol. 58, no. 6, June 1920, pp. 253-255 and p. 258, 3 figs. Performance curve of centrifugal pump operating against constant head.

Construction. Cost-Plus Contracts for Water Works Construction, George W. Fuller. Can. Engr., vol. 38, no. 26, June 24, 1920, pp. 599-601. Comparative advantages and disadvantages of cost-plus and lump-sum contracts.

Electrically Driven. The Application of Electric Motive Power to Small Waterworks Plants in Indiana, D. D. Ewing, and G. C. Blalock. Purdue University, Publications of Eng. Departments, vol. 3, no. 3, Dec. 1919, 100 p. 47 figs. Survey of plants. Electrically driven pumps, it is said, have proven highly satisfactory. It is added: that no troubles were found which were directly chargeable to mode of operation. It is also mentioned that first cost of an electrically operated pumping plant is from 25,000 of that of a steam pumping plant. Bibliography on electrification of pumping stations is appended.

WATTMETERS

Reactive Volt-Ampere Measurements. Reactive Volt-Ampere Indicators, H. C. Yeaton. Elec. World, vol. 75, no. 26, June 26, 1920, pp. 1476-1479, 10 figs. It is shown how standard indicating wattmeters may be applied to measurement.

Water, Power from. An Experimental Determination and Utilization of Wave Power. College of Eng., Tokyo Imperial University, vol. 10, no. 1, June 30, 1919, pp. 21-36, 6 figs. partly on supp. plate. Describes apparatus for measuring wave power consisting of float board weighted with stones making large pendulum, which is allowed to swing freely under stroke of waves. Amplitude of motion of pendulum measured at each stroke gives amount of available energy. Apparatus is also described for compressing air in container by exposing grated opening of large pipe to alternate action of wave.

WAVES

Force of, Estimating. On a Method of Estimating the Force of Waves, I. Hiroi. Jl. College of Eng., Tokyo Imperial University, vol. 10, no. 1, June 30, 1919, pp. 1-19, 9 figs. partly on supp. plate. It is concluded from study of empirical formulæ and results of experiments that greatest intensity of wave pressure is found near water surface, acting on comparatively small area. It is believed that mean intensity of pressure on large area is hardly capable of direct measurement, and use of reliable formula is considered as only practical method for estimating probable mean wave pressure in any given locality.

WELDING

Automobile Repair Work. Welding and Its Relation to the Repair Industry, Lord Campbell, Jr. Jl. Soc. Automotive Engrs., vol. 7, no. 1, July, 1920, pp. 42-46, 4 figs. Welding is classified into four general headings: Forging, oxy-acetylene or other gas processes, electric arc and thermit methods. Field of each one of these is pointed out with special reference to automobile repair work.

See also Electric Welding; oxy-acetylene welding.

WELFARE WORK

Store Departments. Advantage of a Company Store to a Plant, E. E. Adams. Am. Drop Forger, vol. 6, no. 6, June 1920, pp. 288-290. Experience of forge-plant superintendent who conducted company store in connection with supply department, in which, it is said, he saved his workmen 20 per cent. Paper read before Am. Drop. Forge Assn.

WIND TUNNELS

Design. The Design of Wind Tunnels and Wind Tunnel Propellers, Edward P. Warner, F. H. Norton and C. M. Hebbert. Nat. Advisory Committee for Aeronautics, report no. 73, 1919, 24 pp. 16 figs. Application of Dryewiecki theory.

WIRE ROPE

Care of. Suggestions for Care of Wire Rope, James F. Howe. Eng. World, vol. 17, no. 1, July, 1920, pp. 36-37. Directions for attaching sockets to wire rope are included.

WOOD

Tar Distillation. Tar-Still Operation in Hardwood Distillation Plants, L. F. Hawley and H. N. Calderwood, Jr. Jl. Indus. & Eng. Chem., vol. 12, no. 7, July, 1920, pp. 684-685. Tests made to determine effects of speed and steam pressure. Directions for tar-still operation are suggested.

See also Aircraft Construction Materials, Wood.

Engineering Index

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ROLLS-ROYCE. The Rolls-Royce Aircraft Engines Described and Illustrated. Automotive Industries, vol. 43, nos. 5, 6 and 7, July 29, and Aug. 5 and 12, 1920, pp. 210-214, 18 figs., 261-265, 12 figs., 316-320, 11 figs. Detailed description of larger size of Eagle type Rolls-Royce engine; 12-cylinder "V" type, with a bore of 114 and a stroke of 165 mm., output 352 hp., and 1,650 to 1,800 r.p.m. Translated from Der Motorwagen.

SUPERCHARGED AND OVER-DIMENSIONED. The Design of Supercharged and Over-Dimensioned Aircraft Motors. Aeronautics, vol. 19, no. 355, Aug. 5, 1920, pp. 118-119, 3 figs. Method of calculating dimensions of an over-dimensioned and supercharged motor. Translated from Technische Berichte.

SUPERCHARGERS. Superchargers for Airplane Engines, Sanford A. Moss. Am. Mach., vol. 53, no. 8, Aug. 19, 1920, pp. 345-348. Treats of aeroplane-engine development showing value of supercharger for high altitude flying.

See also Aeroplanes, International Exhibition.

AEROPLANE PROPELLERS

DESIGN. Approximating Bending Moments in Air Propellers, Edward P. Warner. Aviation, vol. 8, no. 11, July 1, 1920, pp. 430-431, 2 figs. Describes method which, it is claimed, has been found to give results of quite surprising accuracy. In order to permit analytical determination of bending moments, load-grading curve was assumed to be made up of three straight lines and parabola.

PITCH AND CLIMBING CAPACITY. The Aeroplane in Diagram (Das Flugzeug in Diagramm), H. Schuster, Luftfahrt, vol. 24, nos. 3 and 4, March and April 1920, pp. 41-43 and 60-61, 2 figs. Points out influence of propeller pitch on climbing capacity of aeroplane. Shows by diagram that propeller with large pitch is favorable for speed, and one with small pitch for climbing capacity of machine and that choice of pitch must be made accordingly.

THEORY OF. New Theory of the Screw Propeller, M. A. S. Riach. Aeronautics, vol. 19, no. 354, July 29, 1920, pp. 98-100, 1 fig. Theory refers to "static" case of V-O.

AEROPLANES

ALL-METAL. Experiences in the Construction of Metal Aeroplanes (Eigene Arbeiten auf dem Gebiete Metall-Flugzeughaues), H. Junkers. Zeitschrift für Flugtechnik u. Motorluftschiffahrt., vol. 11, no. 3, Feb. 14, 1920, pp. 35-37, 7 figs. Writer explains why metal was employed for construction of the Junkers aeroplanes and gives reasons why it is perhaps advisable to employ metal in place of wood.

BRITISH. The Air Ministry Competition at Martlesham. Flight, vol. 12, no. 32, Aug. 5, 1920, pp. 855-861, 13 figs. Mechanical details of machines entered.

DAYTON-WRIGHT. Report of Static Test on DH-4 (Dayton-Wright) Tail Surfaces. Air Service Information Circular, vol. 1, no. 23, March 31, 1920, 7 pp., 4 figs. Elevator, stabilizer and rudder satisfactory. Fin not tested but held on previous tests and is regarded safe.

Report of Static Test of the Fuselage of the D.H.-4 (Dayton-Wright). Air Service Information Circular, Eng. Div., Air Service, vol. 1, no. 34, May 8, 1920, 1 p., 6 figs. Test showed fuselage to be satisfactory, holding a load factor of 5.

DESIGN. The Structural Analysis and Design of the Aeroplane, B. C. Boulton. Aerial Age, vol. 11, nos. 22 and 23, Aug., 9 and 16, 1920, pp. 742-744, 10 figs., and 775-777, 4 figs. Calculations of internal stresses in members of structure. Formulæ for designing structural members made of wood and steel in combinations. (Continuation of serial.)

DETECTION OF. Seeing in the Dark. Sci. Am., vol. 123, no. 7, Aug. 14, 1920, pp. 154 and 166-168, 5 figs. Thermopiles and holders for detecting aeroplanes in the dark.

GALLAUDET. The Gallaudet C-3 Liberty Tourist Plane. Aerial Age, vol. 11, no. 23, Aug. 16, 1920, p. 771, 3 figs. Dimensions: Length overall, 29 ft. 5 in.; wing span, 44 ft.; height, 10 ft. 3 in.; wing area 48 sq. ft.; weight loaded, 3,800 lb.; cruising radius, 500 miles; ceiling, 18,000 ft.; maximum speed, 125 m.p.h. Built by Gallaudet Aircraft Corporation, East Greenwich, R.I.

INTERNAIONAL EXHIBITION. The International Aero Exhibition. Eng., vol. 110, nos. 2846 and 2848, July 16 and 30, 1920, pp. 74-79 and p. 82, 12 figs., and 137-142, 8 figs. Details of models exhibited and of Clergat and Zeitlin engines.

LINCOLN STANDARD SPEEDSTER. The Lincoln Standard Speedster. Aerial Age, vol. 11, no. 22, Aug. 9, 1920. pp. 740-741, 5 figs. Characteristics; Length overall, 25 ft. 8 in.; height overall, 10 ft.; span, 32 ft.; chord, 6 ft.; weight loaded, 2,150; hp. 150 or 180 Hispano-Suiza; climb loaded, 5,000 ft. in 10 min.; Speed maximum 107 m.p.h.

PROFILE FOR GIVEN LIFT. Theory of the Lift of Supporting Planes (Zur Theorie des Tragflächenauftriebes), R. I. Mises. Zeitschrift (für Flugtechnik u. Motorluftschiffahrt. vol. 11, nos. 5 and 6, March 15 and 31, 1920, pp. 68-73 and 87-89, 14 figs. Writer seeks to find suitable profile forms for given lift conditions. Notes on size and position of lifting force, parameter of profile and the Joukowski form of profile. It is concluded that the reduction of camber as well as increase of thickness and of edge angle have a favorable effect on movement of pressure centre. Examples of profiles with pressure centres are given.

RIB CONSTRUCTION. Tests with a Special Rib Construction (Versuche mit einer besonderen Holmkonstruktion). Karl Balaban. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 13, no. 6, March 31. 1920, pp. 81-84, 8 figs. Describes a tongued-and-grooved joint used and gives results of experiments with ribs so constructed.

STALLINGOF. The Dangers and Effect of Construction on Stalling (Der uberzogene Flug, seine Gefahren und seine Beeinflussung durch die Konstruktion), H. Hopf. Zeitschrift für Flugtechnik u. Motorluftschiffahrt, vol. 11, no. 4, Feb. 28, 1920, pp. 52-54, 4 figs. Construction of plane is said to affect stalling in two ways: (1) An aeroplane becomes more readily stalled as difference becomes less between its usual speed and speed at which equilibrium of vertical force is no longer possible: (2) aeroplane comes more readily out of stalling as turning in space becomes easier and the more it is possible to check turning of flight path.

STRUTS. Effect of Surface Quality of Struts on Aeroplane Resistance (Der Einfluss der Oberflachenbeschaffenheit auf den Widerstand, untersucht an Streben). C. Wieslsberger. Zeitschrift für Flugtechnik u. Motorluftschiffahrt. vol. 11, no. 4, Feb. 28, 1920, pp. 54-57, 8 figs. Curves are given showing results of tests on thick struts covered with linen and with a single coat of varnish. Third report from the Göttingen Model Experimental Station for Aerodynamics.

The Efficiency of Airplane Struts, Wallace F. Wiley, Aviation, vol. 8, no. 12, July 15, 1920, pp. 477-478, 3 figs. General equation for power absorbed by a strut of any material, section, length and strength at any velocity. Application of equation exemplified.

WINGS. Report of Static Test of D.H. 4 (P. 34) Wing Cellule. Aid Service Information Circular, Eng. Div., Air Service, vol. 1, no. 36, May 8, 1920, 2 pp., 5 figs. Test showed that with proper maintenance and repair of damage, strength of the wing structure will not be materially reduced by long service.

The "Alula" Wing. Flight, vol. 12, no. 32, Aug. 5, 1920, pp. 862-863, 2 figs. Wing is characterized by very high maximum lift with maximum *L/D* of about 22.9. Design with such wing and intended for carrying heavy loads at moderate speeds is suggested.

See also Aeronautics; Aircraft, Undercarriages; Aviation; Flying Boats; Seaplanes.

AIRCRAFT

UNDERCARRIAGES. Aircraft Undercarriages. John D. North. Aeronautical Jl., vol. 24, no. 110, Feb., 1920, pp. 39-73 and (discussion) 73-84, 39 figs. Some of points indicated are: Wheel "strain energy" is negligible: shock absorbing capacity increases with rate of loading; energy dissipated (hysteresis) increases with rate of loading, etc.; solid or cushion tires may be used with advantage to reduce oscillations; even tensioning and consistent quality of material are important, and individual rings seem to give best promise of fulfilling these requirements; shock absorbing capacity remains constant with varying rate of loading, and energy dissipated diminishes with rate of loading.

AIRSHIPS

CHALAIS-MEUDON. The Chalais-Meudon Airship C. M. 5. Automotive Industries, vol. 43, no. 5, July 29, 1920, p. 219, 1 fig. Description of airship built by French Government for U. S. Navy, now purchased by Goodyear Tire and Rubber Co.

R. 80 H. M. Airship "R. 80." Eng., vol. 110, no. 2848, July 30, 1920, pp. 142. 145 and p. 150, 27 figs, partly on 4 supp. plates. Dimensions: Overall length of hull, 529 ft. without mooring attachment; gas capacity, 1,250,000 cu. ft., giving gross displacement of 38.25 tons of which 17.8 tons is disposable lift. Section of hull is uniform polygon having 21 sides. and diameter of circumscribing circle at largest part is 70 ft. 7½ in. Overall height of ship from bottom of bumping bags on cars to top of hull is 86 ft. 5 in. when axis is horizontal. Ship is propelled at maximum speed of 65 m.p.h. by four engines carried in three cars suspended from hull structure and developing 1,000 h.p. at full power. Range at full power is 3,900 miles and at normal power 4,500 miles.

SCHUTTE-LANZ. The Importance of the Schütte-Lanz Dirigibles (Die Bedeutung der Schüfte-Lanz-Luftschiffe). D. Rühl. Luftfahrt, vol. 24, no. 3, March 4, 1920, 38-40, 6 figs. Details of various models and table giving most important data of the characteristics of Schütte-Lanz dirigibles. Attributes present-day high efficiency and degree of perfection of rigid type of dirigible to adoption of form of minimum air resistance, to simple steering gear, elastic suspension of nacelle, etc.

ALLOYS

ELECTRICAL MELTING. Electrical Melting of Alloys—XI and XII. H. W. Gillett. Foundry, vol. 48, nos. 15 and 16, Aug. 1 and 15, 1920, pp. 612-614 and 656-658. Aug. 1. It is observed that essential points which influence efficiency of operations require installation of electric furnaces under expert supervision. Refractories are discussed. Aug. 15. It is pointed out that efficient operation is measured by continuity of output, as more power is needed per ton melted when furnace cools between heats. It is also noted that cost per kilowatt hour is lower in large installations.

IMPACT TESTS. Study of Impact Tests on Alloys, Austin B. Wilson. Foundry, vol. 48, no. 352, Aug. 1, 1920, pp. 616-617 and 622, 3 figs. Tests made on impact-shear machines and on alternating impact testers indicated relative value of various alloys. Machining of bars found to be unnecessary for impact-shear test.

NON-FERROUS, STANDARDS FOR. New Standards for Metals. Metal Industry (N.Y.), vol. 18, no. 8, Aug. 1920, pp. 349-350. Reports on composition and nomenclature of non-ferrous alloys at 1920 meeting of Am. Soc. for Testing Matls.

ALUMINUM

INDUSTRY, GERMANY. The Aluminum Industry in Germany During and After the War (L'industrie de l'aluminium en Allemagne pendant et après la guerre), M. L. Descroix. Revue de Métallurgie, vol. 17, no. 4, April 1920, pp. 275-285. Economical study based on data published in German periodicals.

WELDING OF. Autogenous Welding of Aluminum (Autogene Aluminiumschweissung), H. Pradel. Elektrotechnischer Anzeiger, vol. 37, no. 30, Feb. 21, 1920, p. 139. Describes process developed by the Griesheim-Elektron chemical factory in Frankfurt, according to which aluminum can be welded in any form as casting, plate or wire with the aid of a liquid for dissolving the aluminum oxide layer.

AUTOMOBILE ENGINES

AUTOMOBILE FUELS

AUTOMOBILES

B

BOILER FEEDWATER

TREATMENT. Progress in the Purification of Boiler Feedwaters (Fortschritte in der Reinigung von Kesselspeisewassern). D. B. Preu. Zeitschrift für angewandte Chemie, vol. 33, nos. 2 and 24-25, March 16 and 26, 1920, pp. 61-63 and 70-72, 1 fig. Discusses various purification methods and apparatus and points out their defects, many of which, it is claimed, are eliminated by application of the Neckar water-purification process with use of apparatus constructed by P. Müller Co., Ltd., Stuttgart, consisting of a purification tank with built-in drop pipe, filter and sludge collector with sludge-discharging device, which is connected with a second tank for refiltration provided with similar equipment.

BOILER FIRING

See Oil Firing, White System.

BOILER OPERATION

COMBUSTION CONTROL. Combustion-Control Apparatus for the Boiler Room(Verbrennungs-Kontrollapparate für das Kesselhaus). Der Praktische Maschinen-Konstrukteur, vol. 53, no. 11, Mar. 18, 1920, pp. 91-96, 9 figs. Details of the Ados apparatus which is claimed to so record CO_2 percentage content of combustion gases that with the use of a table it is possible to determine extent of fuel loss; and the Mono combustion-control apparatus, designed by H. Maihak Co., Inc., Hamburg, consisting of an absorption apparatus and recording instrument enclosed in a dust-proof cast-iron case, the door of which has a glass pane at the top through which the record of previous ten hours is visible, and which even in case of 50 analyses per hr. is said to give perfect result.s

EFFICIENCIES AT HIGH AND LOW RATINGS. Developing High Overload Capacities. Power House, vol. 13, no. 15, Aug. 5, 1920, pp. 356-357 and p. 350, 4 figs. Particulars of tests run on water-tube boiler with horizontal baffling to determine efficiencies at high and low ratings.

BOILERS

AIR LEAKAGE THROUGH SETTINGS. CO_2 Exploration to Detect Air Leakage, A. E. Grunert. Power, vol. 52, no. 2, July 13, 1920, pp. 54-56, 3 figs. Method of exploration for detecting air leakage and giving CO_2 conditions throughout boiler setting is presented. Its use in cases cited so reduced air infiltration that final overall efficiencies of 81 to 83 per cent were obtained.

CORROSION. Corrosion in Locomobile Boilers and Its Prevention (Anfressungen an Lokomobilkesseln und ihre Behämpfung). H. Reichelt. Zeitschrift für Dampfkessel u. Maschinenbetrieb, vol. 43, nos. 11 and 12-13, Mar. 12 and 26, 1920, pp. 81-82 and 90-92, 12 figs. Describes typical corrosions occurring in boilers with suspended fireboxes after prolonged operation and careless attendance; and in boilers with cylindrical fireboxes and removable pipe system. A graphite-tar coating is recommended for outside of smokebox tube wall and for firebox base in boilers with suspended firebox.

ELECTRICALLY-HEATED. Electrically Heated Steam Boilers and Heat-Storage Tanks (Ueber elektrisch geheizte Dampfkessel und Wärmespeicher), E. Höhn, Zeitschrift des Bayerischen Revisions-Vereins, vol. 24, nos. 6 and 7, March 31 and April 15, 1920, pp. 44-46 and 50-52, 13 figs. Discussion of electrode boilers and hot-water storage for generation of steam. Description of heat storage by means of oil, by concrete and hot water with heat transmission by oil, and with tube evaporators. Notes on hot-water heating, and economic problems in connection with conversion of electric current into heat. Address before Swiss Soc. of Steam Boiler Masters. (Concluded).)

HORIZONTAL BAFFLING. Boiler Plant Practice. Refrigerating World, vol. 55, no. 7, July 1920, pp. 21-23, 4 figs. Texts conducted on one unit of installation of boiler plant to ascertain whether arrangement of horizontal baffling suitable for attaining high capacities would prejudice efficiencies obtainable at lower ratings.

Tests on Large Horizontally Baffled Boiler. Textile World Jl., vol. 58, no. 6, Aug. 7, 1920, pp. 115-117, 4 figs. Tests conducted on boiler unit to ascertain whether arrangements of horizontal baffling suitable for attaining high capacities would prejudice efficiencies obtainable at lower ratings. High overload capacities were obtained with type of boiler and arrangement of baffles used.

See also Steam Generators.

BOILERS, WATER-TUBE

VERTICAL. Investigations of Vertical Water-Tube Boilers (Untersuchungen an Steilrohrkesseln). Friedrich Münzinger. Zeitschrift des Vereines deustcher Ingenieure, vol. 64, nos. 21-22, 23-24 and 25, May 29, June 12 and 19, 1920, pp. 393-398, 432-433 and 453-457, 24 figs. Based on investigation of the seven types installed at the Golpa central power station, certain ideas for construction of large steam boilers for low-grade lignite are developed, followed by discussion of a mothed for calculation of the water circulation in double-headed and vertical water-tube boilers.

BORING MILLS

VERTICAL. A New Vertical Boring and Turning Mill, Eng. Production, vol. 1, no. 7, July 1920, p. 258, 2 figs. Details of latest Wilkinson 20-in. duplex vertical boring and turning mill with gear-box drive, which is said to permit rapid handling of medium-sized jobs.

BRAKES

PNEUMATIC VS. ELECTRIC. Pneumatic and Electric Brakes (Druckluftbremse und elektrische Bremse), H. Sauveur. Verkehrstechnik, vol. 37, no. 9, March 25, 1920, pp. 126-130, 5 figs. Comparison of their relative merits, from which it is concluded that none of the electric brakes possesses the safety of operation of the air brake. Results of tests to determine operation movements in the handling of brakes are shown in illustrations.

PNEUMATIC VS. SUCTION. Freight Train Brakes (Zur Bremsüng der Güterzüge). E. Cimonetti. Zeitung des Vereins deutscher Eisenhahnverwallungen, vol. 60, no. 5, Jan. 21, 1920, pp. 53-55. Discussion of the relative merits of the pneumatic and suction air brakes.

BRIDGE DESIGN

TRUSSES, RIVETED JOINTS IN. Detail Design of Riveted Joints of Bridge Trusses, W. M. Wilson. Eng. News-Rec., vol. 85, no. 6, Aug. 5, 1920, pp. 259-260, 2 figs. Riveting determined by study of paths of forces connected. Two examples.

BRIDGES, RAILWAY

ARSTA BAY, SWEDEN. International Competitive Designs for a Railroad Bridge over Arsta Bay Near Stockholm (Wettbewerb zu einer Eisenbahnbrücke über die Arsta-Bucht bei Stockholm), Zentralblatt der Bauverwaltung, vol. 40, nos. 20 and 21, March 10 and 13, 1920, pp. 125-127 and 130-136, 35 figs. Plans call for moveable bridge, 600 m. long, opening to width of 24 m. for passage of high-masted ships, with superstructure of iron or concrete, or both. Details and illustrations of the three prize-winning designs and the four designs bought by railroad administration. (Continuation of serial.)

FLOORS FOR. Floor for Railway Under-Bridges. Engr., vol. 129, nos. 3355 and 3356, April 16 and 23, 1920, pp. 391-394, 11 figs., and 416-418, 8 figs. Following types are described: single line, double line, and double line with centre girder, longitudinal and concrete.

BRIDGES, STEEL

DESIGN. Stability of Compression Members of Steel Bridges (La stabilité des membrures comprimées des ponts métalliques), M. Keelhoff. Annales des Ponts et Chaussées, vol. 55, no. 2, March-April 1920, pp. 193-231. 27 figs., partly on supp. plate. Suggestions in regard to design of cross bracings. Cases in which they are indispensable.

RAPID ERECTION. The First Bridge to be Constructed on the Roth Waagner System (Die erstmalige Anwendung der Roth-Waagner-Brücke), R. Feindler. Eisenbau, vol. 11, no. 8, April 23, 1920, pp. 151-156, 8 figs. Details of 470-m. street truss bridge over Save River, Belgrade, Servia, built according to system developed by Roth & Waagner, Vienna-Budapest, which permits of extremely rapid erection.

RECONSTRUCTION. The Reconstruction of the Bridge over the Narew River Near Modlin (Nowo Georgiewsk), Poland (Die Wiederherstellung der Brücke über den Narew bei Modlin). Eissenbau, vol. 11, no. 9, May 4, 1920, pp. 161-185, 36 figs. Three new large superstructures were built in place of old ones with same span of 76.86 m., according to system of parallel beam with alternating rising and falling diagonals and intermediate verticals: height of system, 7.15 m., bay width, 7.32 m.; width of roadway, 5m.with 1.78-m. sidewalks on either side; weight of steel construction, over 2,000 tons. Details of equipment used.

RESTORATION. Restoration of the Cernavoda-Danube Bridge. Eng., vol. 109, no. 2842, June 18, 1920, pp. 837-840, 19 figs. Restoration by Germans of bridge and viaduct destroyed by Rumanians and Russians.

SOLID WEB TRUSSES. The Calculation of the Statically Indeterminate Solid Web Trusses with the Aid of Displacement Diagrams (Zur Berechnung statisch unbestimmter Vollwandbinder mit Hilfe von Verschiebungsplänen), E. Kammer, Eisenbau, vol. 11, no. 5, March 9, 1920, pp. 117-128, 31 figs. Calculation of displacements in bar tensions by determination of vertical and horizontal components. Investigation of frequently occurring special conditions whereby area of influence for statically indeterminate quantity of system is a parabola. Formulae for calculation of horizontal components of displacements given for the case where the equation of the truss of header axis and equation of vertical displacements are known.

BRIDGES, SUSPENSION

DEFLECTION, REDUCTION OF. The Suspension Bridge over the Rio Sapucahy (Brazil) and General Considerations of Suspension Bridge Deflections (Die Hängebrucke brücke uber den Rio Sapucahy nebst einigen allgemeinen Remerkungen über die Durchbiegung von Hangebrücken), A. Müllenhoff. Eisenbau, vol. 11, no. 6, March 23, 1920, pp. 129-137, 9 figs. Account of a statically indeterminate steel cable bridge of 90 m. span with 4.24 m. distance between main girders which are 2.19 m. high. Numerical tables are given for use of designing engineers, as well as general formulæ relating to reduction of deflection.

BUSES

ELECTRIC RAILWAYS, VS. The Place of the Bus—VI. Walter Jackson. Elec. Ry. Jl., vol. 56, no. 5, July 31, 1920, pp. 209.218. Opinion is expressed that at present costs the bus may supplement but cannot, from an economical point of view, supplant the electric railway upon the basis of equal fare and responsibilities.

C

DISTILLATION OF. The Distillation of Coal in Rotating Furnaces (Die Entgasung der Kohle im Drehofen), E. Roser. Stahl u. Eisen, vol. 40, no. 22, June 3, 1920, pp. 741-747, 5 figs. Summarisez results obtained by separation of distillation from gasification in gas-producer operation with recovery of by-products. It is claimed that by extensive recovery of by-products from coal, shales, etc., a great part of heating and lubricating oils used in Germany will, in a few years, be produced from her own coal supplies.

SAMPLING. Shipping American Coals to Switzerland, with Sampling Methods in Use Joseph D. Davis. Coal Age, vol. 18, no. 7, Aug. 12, 1920, pp. 334-338, 10 figs. Methods of sampling here and abroad, with information regarding Swiss requirements. Description of handling of coal by Northern, or German, route to Switzerland. Why American coals have difficulty in finding welcome equal to that given to known European fuels.

SPONTANEOUS-COMBUSTION. The Constitution of Coal in Relation to its Spontaneous Combustion, F. V. Tideswell. Proc. South Wales Inst. of Engr., vol. 36, no. 1. July 16, 1920, pp. 183-258, 4 figs. Survey of experimental results found by various investigators. Bibliography of articles on the subject is appended.

COAL GAS

EFFICIENCIES IN USE OF DIFFERENT GRADES. Efficiencies in Use of Different Grades of Gas. Gas World, vol. 72, no. 1872, June 5, 1920, pp. 488-492. Report of Research Committee of Gas Investigations Committee, Instn. of Gas Engrs. It deals with illuminating power and thermal efficiency attainable with low-pressure upright incandescent burner and different grades of gas.

COAL HANDLING

RETARDING CONVEYORS. Lowering Lump Coal Down a Steep Mountain on a Moving Bed of Slack, Donald J. Baker. Coal Age, vol. 18, no. 2, July 8, 1920, pp. 53-58, 10 figs. Describes what are probably two longest retarding conveyors in the world, at Beard's Fork mine in Fayette County, W. Va.; machines require power to start them, but one, when started, is self-actuating and other approaches that point; save coal from breakage and act as picking tables.

COAL MINING

STRIPPING. Stripping 85-ft. Cover from an Anthracite Bed with a Dragline Excavator. Coal Age, vol. 18, no. 2, July 8, 1920, pp. 63-66, 12 figs. Large tonnage will be mined on surface and passed down battery breasts, which will be driven from mine below; coal is to be hauled underground to a breaker for preparation.

COAL TAR

INDUSTRIAL TECHNOLOGY. Medern Technology of the Coal Tar Industry—XI (La technique moderne de l'industrie des goudrons de houille), M. C. Berthelot, Revue de Métallurgie, vol. 17, no. 4, April 1920, pp. 252-261, 11 figs. Survey of processes for continuous distillation of tar. Processes for the complete transformation of tar into rosin. (Continuation of serial.)

COKE

QUALITY, CRITERIA OF. Carbon Blisters and Carbon Threads are said to be Evidence of Good Coke. Coal Age, vol. 18, no. 4, July 22, 1920, pp. 173-174, 1 fig. Undecomposed hydrocarbons at bottom of oven rise into fierce glow of upper part of charge, where they split, leaving pure carbon on coke faces.

COKE MANUFACTURE

FOUNDRY COKE. Manufacture of Foundry Coke, Edward H. Bauer. Gas Rec., vol. 18, nos. 1 and 2, July 14 and 28, 1920, pp. 15-21. 12 figs., and 21-24 and 46, 10 figs. Method used by Providence Gas Co. in making high-grade fuel, together with details of coke-over plant. Effect of various coal mixtures and quenching upon quality of metallurgical coke produced.

COKE PLANTS

BY-PRODUCT. Condensation in Coke Plants (Sur la condensation dans les cokeries), E. Orè. Technique Moderne, vol. 12, no. 1, Jan. 1920, pp. 7-11, 21 figs. Comparative value of industrial by-product distillation processes.

Making By-product Foundry Coke in New England, H. R. Simonds. Iron Trade Rev., vol. 66, no. 21, May 20, 1920, pp. 1467-1471, 9 figs. Isolated gas and coke-making plant in Rhode Island devotes attention to cupola fuel. By-product coke used more generally in New England because of restrictions on transportation of beehive oven fuel. Relation of low and high-volatile coals in coke-making.

COLUMNS

REINFORCED-CONCRETE. Experiments with Spirally Reinforced Concrete Columns With and Without Stone Cores at the Technical High School of Vienna (Versuche mit umschnürten Betonsäulen mit und ohne Steinkernen an der Technischen Hochschule Wien). Beton u. Eisen, vol. 19, nos. 1 and 4.5- Jan. 8 and March 4, 1920, pp. 10-13 and 44-46, 8 figs. Results of tests with two kinds of concrete, showing that with the richer mixture the utilization of core and influence of reinforcing decrease, in spite of which total strength increases.

COMPRESSED AIR

HYDROELECTRIC PLANTS. San Joaquin Light and Power Corporation's Kerckhoff Power Project, W. C. Collyer. Compressed Air Mag., vol. 25, no. 8, Aug. 1920, pp. 9757-9758, 3 figs. Compressed-air equipment at hydroelectric power development to utilize water of San Joaquin River at Auberry, Cal.

RAILWAY TERMINALS. St. Paul's New Union Depot Serving Ten Railroads, Francis Judson Tietsort. Compressed Air Mag., vol. 25, no. 8, Aug. 1920, pp. 9759-9761, 7 figs. Uses of compressed air in building structure and for testing air brakes for repair tools and for enginehouse requirements.

CONCRETE

COMPRESSIVE STRENGTH. Compressive Strength of Concrete in Flexure, W. A. Slater and R. R. Zipprodt. Can. Engr., vol. 39, no. 2, July 8, 1920, pp. 123-127, 8 figs. Description of special tests conducted at Lehigh University and Lafayette College, from which it is concluded that 45 per cent of the compressive strength of the concrete may be used as a working stress.

CURING OF. Soaking Concrete in $MgSiF_2$ and $Na_2Si_4O_2$, Solutions. Concrete, vol. 17, no. 1, July 1920, pp. 28-29, 6 figs. Tests indicated that the 1 :1 :2 concrete cured in $MgSiF_6$ solutions was improved in strength for three out of four different curing conditions.

ELECTRIC RESISTANCE OF. Concrete in Connection with Electrical Accidents (Beton und elektrischer Unfall), Stefan Jellinek. Beton u. Eisen, vol. 19, nos. 2-3 and 4-5, Feb. 4 and March 4, 1920, pp. 27-29 and 47-49. Results of investigations carried out at different times and places of electrical resistance of concrete and the changes in concrete caused by electricity, based on works by Berndt and his collaborators.

PROPORTIONING. Volume-Moisture Relation in Sand and a Method of Determining Surface Area Based Thereon, R. B. Young, and W. D. Walcott. Eng. and Contracting, vol. 54, no. 4, July 28, 1920, pp. 91-94, 6 figs. It is concluded from tests that surface area must be taken into account in any method of proportioning concrete mixtures.

STRENGTH, INFLUENCE OF JARRING ON. Influence of Jarring on the Strength of Concrete (Der Einfluss von Erschütterungen auf die Festigkeit des Betons), Hans Schäfer. Prometheus, vol. 31, no. 18, Jan. 31, 1920, pp. 140-142. Results of experiments carried out in the Saxon Mech-Technical Experimental Inst., Dresden, are said to show that a slight jarring before setting begins will have a favorable effect on strength of concrete; during setting period its influence varies and precautions should be taken; after cement is hardened no apparent effect is noted.

WATERTIGHT. Watertight Concrete. Nat. Lime Assn., bul. no. 301, 1920, 20 pp., 12 figs. Summary of facts concerning effects of hydrated lime in improving structure of reinforced concrete and rendering it impermeable to water, together with comments and field data concerning beneficial effects resulting from its use.

CONCRETE, REINFORCED

FLAT SLABS, DESIGN OF. New York City Regulations for Design of Reinforced Concrete Flat Slabs. Eng. and Contracting, vol. 54, no. 4, July 28, 1920, pp. 89-91. Rules adopted by Board of Standards and Appeals governing design of reinforced-concrete flat slabs.

CONDENSERS, STEAM

CIRCULATING-WATER STRAINERS. The Straining of Circulating Water. Eng., vol. 109, no. 2388, May 21, 1920, p. 679, 4 figs. Patented scheme in which straining surface is outside of perforated drum built up of gun-metal plates on cast-iron spiders, one end of drum being closed and the other open to outlet for strained water.

CONVERTERS

ROTARY. Phasing-Out Rotary Converters, K. A. Reed. Power, Vol. 52, no. 2, July 13, 1920, pp. 51-53, 6 figs. Method is outlined which required no other equipment than a number of lamps and special brushes.

CONVEYORS

APRON-TYPE. Kinlok Mine of the Valley Camp Coal Co., J. W. Marshall, Coal Industry, vol. 3, no. 7, July 1920, pp. 307-310, 3 figs. Description and operation of apron-type conveyor said to be largest now being used in U. S.

BELT, WOODEN-LINK. The Kaul Wooden Conveyor Belt (Das Holzglieder-Förderband (System Kaul)). Heinz Gante. Fördertechnik u. Frachtverkehr, vol. 13, no. 4, Feb. 20, 1920, pp. 41-42, 1 fig. Describes belt consisting of wooden links, 50x50x 20 mm. jointed together horizontally with Mannesmann tubes, which is said to have been used successfully in anthracite, lignite, cement, food-products and chemical industries as well as for coaling plants.

BELT, WOODEN-SLAT. The Killewald Wooden Conveyor Belt (Das Holzgliedforderhand "System Killewald"), Fördertechnik u. Frachtverkehr, vol. 13, no. 5, March 5, 1920, pp. 56-57, 2 figs. Describes conveyor exhibited at the Leipzig Exposition by the Bernburg Potash Works, consisting of two parallel wire ropes to which narrow wooden slats are clamped to form the conveying surface, original feature of which lies in the arrangement and fastening of the bars on the wire ropes.

COPPER ALLOYS

PHOSPHOR-COPPER. New Process for Making Fifteen Per Cent Phosphor-Copper, P. E. Demmler, Metal Industry (New York), vol. 18, no. 7, July, 1920. pp. 314-315, 1 fig. Gives particulars of experiments of authors showing that a uniform 15 per cent phosphor-copper can be produced by passing phosphorus vapor over heated copper, and that most satisfactory temperature of copper is 400 deg cent. Paper to be presented in Oct. before Inst. Metals Division of Am. Inst. Min. & Met. Engrs.

D

E

ELECTRIC CURRENTS, ALTERNATING

Rectification by Galena. Two Ways of Rectification of Currents by Galena (Sur deux modes de rectification des courants par les galènes), Paule Collet. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 25, June 21, 1920, pp. 1489-1491. Writer claims to have observed in experiments (1) that when a small electric current traverses lead sulphite ore introduced in a metallic circuit, there is a positive flow from ore to metal, and (2) that when current is large there is a negative flow.

ELECTRIC FURNACES

Non-Ferrous Work. Electric Furnaces, J. H. Stansbie. Metal Industry (London), vol. 14, no. 24, June 13, 1919, pp. 483-487, 2 figs. Prominence given to use of electric furnaces for non-ferrous work is noted and information presented as to great possibilities of zirconium as refractory for furnace lining. Report of joint meeting of Birmingham Branch of British Foundrymen's Assn. and Birmingham Metallurgical Soc. and Staffordshire Iron & Steel Ist. (To be concluded.)

ELECTRIC GENERATORS, A. C.

Field Excitation. Connected Load Versus Generator Capacity, Fraser Jeffrey. Power, vol. 52, no. 5, Aug. 3, 1920, pp. 162-164, 5 figs. Limitations to field excitation are discussed, with special reference to starting periods of squirel-cage indution motors.

See also Turbo-Generators.

ELECTRIC LAMPS, INCANDESCENT

Luminous Efficiency. Luminous Efficiency of Incandescent Bodies (Etude du rendement lumineux des corps incandescents), R. Painvin. Revue générale de l'Electricité, vol. 7, no. 24, June 12, 1920, pp. 787-791. Formula is established for calculating, in terms of temperature, luminous efficiency of carbon and tungtsen filaments of incandescent lamps.

ELECTRIC LOCOMOTIVES

Citroen-Geared. Citröen Gear for Electric Locomotives. Eng., vol. 109, no. 2839, May 28, 1920. pp. 712-715, 8 figs. Power transmitted by gearing is 1,000 b.hp. on speeds of 550 r.p.m. and 169 r.p.m., corresponding to traveling speed of 26 m.p.h., with wheels 4 ft. 3½ in. in diameter, maximum speed being 920 r.p.m. at motor and 43.5 m.p.h. on track.

Swiss Railways. Swiss Federal Railways Buy New Electric Locomotives. Elec. Ry. Jl., vol. 56, no. 6, Aug. 7, 1920, pp. 256-260, 10 figs. Single-phase freight locomotives manufactured by Oerlikon Co. Data: height, 12 ft. 5 in.; total length, 63 ft. 6 in.; gage 4 ft. 8½ in.; diameter, 53¼ in.; crankpin stroke, 23⅝ in.; transmission ratio, 43.03; total weight, 256,000 lb.; adhesive weight, 208,000 lb.

ELECTRIC MOTORS, A. C.

Induction. How to Calculate a New Winding for an Inductor-Motor Stator Core. A. M. Dudley. Power, vol. 52, no. 1, July 16, 1920, pp. 13-18, 5 figs. Six factors that require consideration in figuring new winding for induction motor to operate under new conditions of speed, horsepower, voltage, phase or frequency are enumerated, then problem is worked out to show how each is determined.

ELECTRIC PLANTS

Commonwealth Edition Co., Chicago. Service Work for 1919 Below Pre-War Cost, D. W. Roper. Elec. World, vol. 76, no. 6, Aug. 7, 1920, pp. 273-276, 7 figs. Operating records of Commonwealth Edison Co., Chicago. It is said that in spite of increased wages and inroads of war and industry on ranks of trained workers, careful engineeing has succeeded in reducing cost. Factors that have played a part in bringing this about are enumerated.

Parallel Operation. Governor Adjustment for Efficient Parallel Operation. F. Oppenheimer. Elec. World, vol. 76, no. 5, July 31, 1920, pp. 239-240, 9 figs. Principles of operating steam and hydroelectric plants in parallel and methods of changing governor regulations while running.

ELECTRIC RAILWAY SIGNALS

Dual Control. Dual Control Signals on the Pacific Electric, Clifford A. Elliott. Elec. Ry. Jl., vol. 56, no. 7, Aug. 14, 1920, pp. 321-322, 4 figs. Improved type of signal-light circuit adopted for single-track line to minimize hazardous operating conditions.

ELECTRIC RAILWAYS

Supplying Parts to Repair Shops. Supplying Repair Parts to Shops, W. G. Murrin. Elec. Ry. Jl., vol. 56, no. 2, July 10, 1920, pp. 85-86, 1 fig. Canadian company replaces worn-out supply car with auto truck; sends salvage car monthly over interurban division. Advantage of plan is that in enables foreman in each repair shop to accumulate pieces for repair until a man or machine can do the work in quantities and so reduce unit cost.

ELECTRIC RAILWAYS TRACK

Current Losses. Current Losses in Electric Railway Tracks (Sur les pertes de courant qui se produisent le long des voies de tramways), G. Girousse. Revue générale de l'Electricité, vol. 8, no. 1, July 3, 1920, pp. 837-844, 10 figs. Simplifications of usual formula are suggested.

ELECTRIC TRANSMISSION LINES

Construction Costs. Interconnecting Small Cities. Elec. World, vol. 76, no. 7, Aug. 14, 1920, pp. 321-324, 7 figs. Data on costs of present-day line construction, together with methods of emergency operation, collected from Indiana central-station companies serving 21 communities.

Feeder Voltage Regulation. Calculation of Feeder Voltage Regulation, W. C. Chappell. Elec. World, vol. 76, no. 2, July 10, 1920, pp. 73-74, 1 fig. Chart for computing voltage regulation of given feeder for any load and power factor.

Protection. Protection of Transmission Systems—1, Emil Alm. Elec. World, vol. 76, no. 6, Aug. 7, 1920, pp. 277-278, 2 figs. Analysis of abnormal voltages on transmission systems and methods adopted by company in Sweden to protect station apparatus from insulation breakdown.

ELECTRIC UNITS

Data on. Electric Units and Standards. Circular of Bur. of Standards, no. 60 March 12, 1920, 68 pp. Notes on systems of units, including units in general, electrostatic and electromagnetic systems, and international electric units; evolution of present system of concrete standards; units and standards of principal electric quantities—resistance, current, electromotive force, quantity of electricity, capacity, inductance, power and energy, and resistivity; magnetic units. Appendices on conversion factors, legislation on electric units giving laws of various countries, and bibliography.

ELECTRIC WELDING, ARC

Machines. Automatic Electric Arc Welding Machine, H. L. Unland. Welding Engr., vol. 5, no. 7, July 1920, pp. 26-28, and 32, 14 figs. Automatic are welder is a device for automatically feeding metallic electrode wire into welding are at rate required to hold a constant arc length. Article describes investigation to determine controlling feed of electrode to electric arc in a metallic-electrode welding circuit.

Electric Welding Machines—Direct-Current Constant-Potential Types, L. W. Webb. Power, vol. 52, no. 6, Aug. 10, 1920, pp. 210-212, 4 figs. Operation of different makes of welding machines of constant-potential type.

Metal Deposition in. Metal Deposition in Arc Welding—II, O. H. Escholz. Elec. World, vol. 76, no. 3, July 17, 1920, pp. 118-121, 11 figs. Mechanism of metal transfer from electrode to plate is explained by the aid of photography. Evidence indicates that 85 fer cent of the metal is carried across arc in liquid form by molecular forces.

ELECTRICITY

Atmospheric, Utilization of. A New Source of Energy and Its Useful Possibilities (Eine neue Energiequelle und deren Verwendungsmöglichkeiten für die chemische Industrie), Hermann Plauson. Chemiker-Zeitung, vol. 44, no. 34-35, March 23, 1920, pp. 229-231. Notes on recovery and utilization of atmospheric electricity, which, it is claimed, can be utilized in a practical manner and which offers the prospect of a working capacity of 200 hp. in form of electric energy for every sq. km. of soil. Some of its uses in chemical and electrochemical industries are pointed out.

Price per Kw-Hr. Alignment Charts for the Graphical Computation of Rates of Electricity (Abaques à alignement pour le calcul graphique des tarifs d'électricité), R. Courau. Revue générale de l'Electricité, vol. 7, no. 24, June 12, 1920, pp. 801-807, 4 figs. Graphs constructed from formulæ for determining price of kw-hr.

ELECTROLYSIS

Electric Waves, Influence of. The influence of Electric Waves on Electrolysis (Einfluss elektrischer Wellen auf die Elektrolyse), Franz Grünwald. Elektrotechnischer Anzeiger, vol. 37, no. 36, March 3, 1920, p. 170, 1 fig. It is stated that North German Refinery uses for gold refining direct current with superimposed unsymmetrical alternating current of 50 periods per sec., according to Wohlwill process.

ELECTROMAGNETISM

Galvanomagnetic Effects. Analysis of Three Galvanomagnetic Effects. Confirmation of a New Effect (Analyse de trois effets galvanomagnétiques. Confirmation d'un nouvel effet), A. Sellerio. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 26, June 28. 1920, pp. 1570-1573, 2 figs. Experimental study claimed to have confirmed that when a plate is traversed by an electric current perpendicular to a magnetic field, the field causes flow of current along lines of magnetic force.

ELEVATORS

Worm Gears. Electric-Elevator Machinery. Worm Gears and Their Lubrication, M. A. Meyers. Power, vol. 52, no. 4, July 27, 1920, pp. 136-138, 6 figs. How to remove worm gear from elevator reduction gear is explained. Castor oil is recommended as best for lubrication of these gears.

EMPLOYEES' REPRESENTATION

Advantages. Letting Your Employees do the Hiring. Factory, vol. 25, no. 1, July 1, 1920, pp. 41-44, 1 fig. Method of employee representation lowers labor turnover, assures adequate supply of labor and builds up in the minds of the workers feeling that they are part of the institution, writer believes.

ENGRAVING MACHINES

FORGING

Progress Since 1912. Progress in Forging Practice During Recent Years (Ueber die Fortschritte auf dem Gebiet der Eisenhuttenkunde in den letzten Jahren), K. Dornhecker. Zeitschrift fur angewandte Chemie, vol. 33, nos. 32 and 36, Apr. 20 and May 4, 1920, pp. 96-100 and 106-111, 10 figs. Description of the most important foreign and domestic processes and inventions since 1912.

FOUNDATIONS

Underpinning Methods. Underpinning and Foundations of Heavy Buildings—I, Engr., vol. 129, no. 3365, June 25, 1920, pp. 639-642, 12 figs. Methods of underpinning walls used at various New York and Chicago buildings.

Uniform Pressure on Beds. Uniform Pressure on Building Foundation Beds, R. Fleming. Eng. News-Rec., vol. 85, no. 5, July 29, 1920, pp. 219-223. Review of practice and code provisions, with numerical comparisons for typical office buildings, followed by recommended specification.

FOUNDRIES

Continuous. Continuous Shop is Highly Efficient, Pat Dwyer. Foundry, vol. 48, no. 16, Aug. 15, 1920, pp. 625-630, 9 figs. Among advantages claimed to be derived from continuous foundries are increased tonnage from given floor space and limited flask equipment. Operation of continuous foundry of Air Brake Company. Wlimerding, Pa., for last 30 years is quoted as example.

Design. Toledo Company Building New Plant. Iron Age, vol. 106, no. 8, Aug. 19, 1920, pp. 439-442, 6 figs. Particulars of design of foundry intended for castings ranging in weight from a few ounces to 50 tons.

Increasing Output. Innovations Increase Unit Output—I. Foundry, vol. 48, no. 352, Aug. 1, 1920, pp. 599-607, 11 figs. General features of Saginaw Malleable Iron Co., discussed, and some examples of molding and coremaking procedure presented. (To be continued.)

FOUNDRY EQUIPMENT

Flasks, Steel. Fabricating Steel Foundry Flasks, J. D. Knox. Foundry, vol. 48, no. 16, Aug. 15, 1920, pp. 631-634, 15 figs. Rigidity is obtained by forming ribs on 3-inch centers. Bottom half of each rib is made shallow to provide shoulder upon which sand rests. Diversified uses of flasks.

FUELS

Coal, Oil and Sawmill Refuse. Sawmill Refuse, Powdered Coal, and Oil Fuels, Darrah Corbet. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 8, August 1920, pp. 715-732, 2 figs. It is said that "it will be necessary to curtail some of the further development in the use of oil fuel." Advantages of burning pulverized coal and possibilities of using sawmill refuse, are pointed out.

Heating Value. Heating Value of Fuels (Sur la valeur d'usage des combustibles), Emilio Damour. Comptes rendus des Séances de l'Académie des Sciences, vol. 170, no. 26, June 28, 1920, pp. 1578-1581. Heating value is expressed as reciprocal of weights of two fuels which could produce the same thermal effect in a given furnace. A method is outlined for comparing effectiveness of various fuels in any case by means of that definition for heating value.

See also Oil Fuel; Pulverized Coal.

FURNACES, ANNEALING

Chantraine. The chantraine Rotary Flame Pot Annealing Furnace. Eng., vol. 109, no. 2840, June 4, 1920, p. 754, 4 figs. Type of furnace which has been largely taken up in Belgium and is being introduced in several plants in England.

FURNACES, BOILER

Air-Cooled Scraper Grate. Experiments with an Air-Cooled Scraper Grate (Versuche mit einem luftkekühlten Staurost), H. Kreyssig. Feuerungstechnik, vol. 8, no. 8, Jan. 15, 1920, pp. 69-71, 3 figs. Gives results of experiments with device installed at the discharge end of the Week traveling grates under the Stirling boilers of the Municipal Elec. Works of Reichenbach, showing its value when lignite briquets are employed as fuel.

Low-Grade Fuels. Boiler Furnaces for Economical Utilization of Low-Grade Fuels (Feuerungsanlagen für Wärmesparwirtschaft bei Verwendung minderwertiger Brennstoffe). Der praktische Maschinen-Konstrukteur, vol. 53, no. 11, Mar. 18, 1920, pp. 83-90, 13 figs. Details of under-graduate blower arrangement for furnace with automatically stoked internally fired boiler, constructed by Germania Machine Factory, Chemnitz; the Topf self-feeding furnace for burning lignite; and traveling grates developed by the firm of C. H. Week & Co., Dölau for use of low-grade fuels.

FURNACES, HEATING

Revergen. The "Revergen" Forging Furnace. Eng. Production, vol. 1, no. 7, July, 1920, pp. 262, 2 figs. Describes improved regenerative system of gas firing, developed by The Davis Fuel Co., London, Eng., with which, it is claimed, considerable fuel economies are effected. Consists of an outer casing of sheet steel, bound by channels, tie rods, and thrust plates, body of furnace being composed of Scotch firebrick of extra thickness.

G

GAGES

Thread. The Hardening of Screw-Gages with the Least Distortion in Pitch, Wilfrid J. Lineham. Instn. of Mech. Engrs., Jl., no. 5, June 1920, pp. 451-487 and (discussion) 478-529, 40 figs. Paper in two parts, one devoted to water hardening and the other to oil hardening. Object of paper is to prove that quenching, while crossing an arrest or recalescence point, produces the least amount of distortion, and to give the results of the writer's tests. It is also shown that hardening screw gages in oil, after casing in cyanide, can be performed with less distortion than if water is the quenching medium.

Tool-Setting. Precision Type of Planer Tool-Setting Gage, Gustave Youngquist. Machy. (N. Y.), vol. 26, no. 12, Aug. 1920, pp. 1121-1122, 4 figs. Tool-setting gage provided with vernier for obtaining direct readings and with means for securing quick and accurate adjustments.

Whitworth Thread. Making Whitworth Thread Gages, C. Edgar Allen. Machy. (N. Y.), vol. 26, no. 12, Aug. 1920, pp. 1157-1160, 5 figs. Method which utilizes disintegration of grinding wheel during grinding operation to produce final thread form.

See also Interchangeable Manufacture, Gages for.

GAS ENGINES

Korting. Determination of the Degree of Irregularity of a Single-Cylinder Körting Gas Engine and Construction of Curve of Angular Deviations (Ermittlung des Ungleichformigkietsgrades eines einzylindrigen Körtingsten Gasmotors und Aufzeichnung der Kurve der Winkelabweichungen), O. Bauer. Der praktische Maschinen-Konstrukteur, vol. 53, no. 9, Mar. 4, 1920, pp. 66-72, 4 figs. Gives graphical method and results of investigations which are believed should be of influence in the constructive development of the gas engine.

GAS MAINS

Corrosion. Internal Corrosion of Mains, Services and Meters, J. G. Taplay. Gas World, vol. 72, no. 1872, June 5, 1920, pp. 481-485. Report of life of Gas Meters Joint Committee of Instn. of Gas Engers. Findings based on examination of 26 corrosion deposits and liquors contributed by engineers from different parts of England. Preliminary conclusions are given having reference to destructive influence of hydrocyanic acid, salts produced by interaction of ammonia and carbon bi-sulphide, oxygen and carbon dioxide.

GAS MANUFACTURE

Economies of Production. Tests on Carbonization at Uddingston. Gas World, vol. 72, no. 1872, June 5, 1920, pp. 492-504, 2 figs. Report of Research Committee of Instn. of Gas Engrs., giving account of first stage of investigation into comparative economies of production, from thermal and chemical standpoints, of different grades of gas. Appendices give in detail method of calibration and analyses employed in research.

Horizontal Retort Installations. Carbonization. Gas World, vol. 72, no. 1872, June 5, 1920, pp. 505-510. Descriptions of various English horizontal carbonization plants illustrating efforts which have been made to satisfy present-day requirements. Paper presented before Instn. of Gas Engrs.

Retort Discharger. The Resnard Retort Discharger. Gas Jl., vol. 151, no. 2968, Aug. 4, 1920, p. 240, 4 figs. Patented apparatus consisting of rake so mounted on end of a horizontal iron tube that it can be extended in horizontal position or brough down at right angles by its own weight and by operation of carrier tube.

GAS PRODUCERS

Marine. Producer Gas for Marine Power. Gas & Oil Power, vol. 15, no. 179, Aug. 5, 1920, pp. 175-178, 3 figs. Report of trials of gas producers patented by D. J. Smith. Consumption trials were carried out on gasoline at various speeds and then at the same speeds on producer gas. Consumption of gasoline and coal for same work was relatively equal.

GAS TURBINES

Holzwarth. The Holzwarth Gas Turbine. Gas & Oil Power, vol. 15, no. 177, June 3, 1920, pp. 145-147, 5 figs. Account of progress made in Germany since 1914 in development of Holzwarth type of gas turbine, extracted from article in Jl. Assn. German Engrs. Zeitschrift des Vereines deutscher Ingenieure, Feb. 28, 1920).

GAS WORKS

Sulphate Making. The "Direct" Process of Sulphate making in Gas-Works. Gas Jl., vol. 151, no. 2986, Aug. 4, 1920, pp. 234-237. Tables giving comparative cost figures of materials and labor of manufacture of sulphate by ordinary distillation and "direct" processes.

GEAR CUTTING

Gear Shaper. Machining the Gear-Shaper Saddle, Douglas T. Hamilton. Am. Mach., vol. 53, no. 7, Aug. 12, 1920, pp. 293-295, 18 figs. Practice of Fellows Gear Shaper Co., Springfield, Vt.

GEARS

Automobile. Automobile Gear Making Centralized. Iron Age, vol. 106, no. 5, July 29, 1920, pp. 245-250, 10 figs. New works of General Motors Corporation. Well-lighted, single-room machine shop half acre in size and complete heat-treating plant with efficient routing of work.

H

HEAVY-OIL ENGINES

ENGLISH TYPES. Some Lincolnshire Oil Engines, F. H. Livens. Eng., vol. 110, no. 2848, July 30, 1920, pp. 159-162, 13 figs. Description of various types of heavy-oil engines, indicating developments in design from 1891 to 1919. Paper read before Instn. Mech. Engrs.

HOISTING MACHINERY

EFFICIENCY. The Efficiency of Hoisting Machinery When Lowering the Load (Der Wirkungsgrad von Lasthebemaschinen beim Senken der Last). Leopold Feigl. Fördertechnik u. Frachtverkehr, vol. 13, nos. 6 and 7, Mar. 19 and April 2, 1920, pp. 61-62 and 70-72. Points out that in hoisting machinery without warm gears the lowering capacity is not quite 1 per cent under hoisting capacity, or so slight as to be negligible. Account of experiments carried out to confirm calcutaled results. Basic conditions for the derived equations are given.

STANDARDIZATION. Important Considerations in Regard to Standardization (Wichtige Gesichtspunkte bei Normalisierungen), R. P. Schröder. Fördertechnik u. Frachtverkehr, vol. 13, no. 5, March 5, 1920, pp. 50-52. Notes on basic principle of standardization of parts, with examples demonstrating suitable and tested applications; investigation of standards presented by German Engrs.; and suggestions for improvement of method now in use.

HOISTS

ELECTRIC. Modern Electric Hoists (Neuzeilitliche Motorflaschenzüge). Ernst. Blau. Fördertechnik u. Franchtverkehr, vool. 13, no. 5, March 5, 1920, pp. 54-56, 2 figs. States their advantages and describes spur-gear electric hoist of the German Machine Works Corp. (Demag) in Duisburg, built for loads up to 5 tons.

MINE. A New Depth Indicator for Mine Hoists (Ein neuer Teufenzeiger für Fordermaschinen), Wilh. Weber. Fördertechnik u. Frachtverkehr, vol. 13, no. 4, Feb. 20, 1920, pp. 40-41, 1 fig. Device constructed by W. Weber & Co., Wiesbaden, for indicating exact position of cage, etc.

HOSE

FLEXIBLE-METAL. The Manufacture and Uses of Flexible Metal Hose (Der Metallschlauch, seine Herstellung und Verwendung,) Metall-Technik, vol. 46, nos. 11-12, March 18, 1920, pp. 42-43, 10 figs. Usually made in lengths of 4 to 42 m. and up to 50 em. diam. Suggestions for joining sections together, for protection against destruction and repair. Used for conveying coal, grain, ashes, etc.; distributing water, oil, gas, steam, etc.; for fire-extinguishing, suction dust collecting purposes, etc.

HOUSING

BRITISH GOVERNMENT'S SCHEME. The British Government's Huge Housing Scheme, E. J. Mehren. Eng. News-Rec., vol. 85, no. 5, July 29, 1920, pp. 217-218. Means being taken by British Government to promote and subsidize housing enterprises.

INDUSTRIAL. Manufacturers' Housing Problems, Harold R. Watson. Can. Manufacturer, vol. 40, no. 8, Aug. 1920, pp. 47-52, 6 figs. Housing problem developed by Borders Housing Co., Canada.

HYDRAULIC TURBINES

BUCKETS. Increasing the Life of Turbine Buckets (Erhöhung der Lebensdauer von Turbinenschaufein), Hans Schneider, Zeitschrift für das gesamte Turbinenwesen, vol. 17, no. 1, Jan. 10, pp. 8-9, 2 figs. Quotes suggestion of Schoop that metal-spraying process developed by him be applied to turbine buckets to increase their durability.

PELTON TYPE. Pelton Wheel Reconstruction, Percy Pitman. Eng., vol. 109, no. 2843, June 25, 1920, pp. 851-853, 13 figs. Reconstruction carried out at large ammunition works during war period to replace defective and broken buckets and to economize in water by fitting on buckets of more modern and efficient type.

WEAR OF. Wear of Hydraulic Turbines, its Consequences, and the Methods of Reducing It (L'usure des turbines hydrauliques, ses conséquences et les moyens d'y parer), Henri Dufour, Bulletin Technique de la Suisse Romande, vol. 46, no. 12, June 12, 1920, pp. 133-140, 8 figs. Records of operation of sand settling basin in Switzerland. (Concluded.)

HYDROELECTRIC PLANTS

EFFICIENT OPERATION. Effecting Efficient Operating Methods in Hydro-Electric Plants, L. W. Wyss. Power, vol. 52, no. 3, July 20, 1920, pp. 217-219. Based on experience in number of different hydro-electric stations located in various parts of the country.

NIAGARA FALLS. Developing Niagara Falls Without Marring Its Beauty, J. G. Warren. Elec. World, vol. 76, no. 7, Aug. 14, 1920, pp. 329-331. Seven months of utilizing additional diversion of 20,000 sec.-ft., showing comparative costs, 573,000 hp. to 787,000 hp. can be developed under these plans. Submerged weirs are proposed.

REGULATING PRIME MOVERS. Regulating Hydro-Electric Prime Movers, C. F. Mosher. Elec. World, vol. 76, no. 6, Aug. 7, 1920, pp. 280-281. Ability to hold constant speed, inherent regulation and momentary changes of speed are discussed in detail. Conditions upon which speed changes are based. From paper read before System Operators of New England.

RHONE-RHINE POSSIBILITIES. The Swiss Rhone-Rhine Navigation—V. A. Wharton Metcalfe, Engr., vol. 120, no. 3355, April 16, 1920, pp. 389-390, 2 figs. Hydro-electric aspect. Water power and generating stations. (Concluded.)

SWITZERLAND. The Water-Power Plant on the Aar River (Die Wasserkraftanlage "Gösgen" an der Aare der A.-G. (Elektrizitätswerk Olten-Aarburg). Schweizische Bauzeitung, vol. 75, nos. 23 and 24, June 5 and 12, 1920, pp. 249-254 and 263-266, 16 figs. Details of turbine installation, generators and exciters, transformers (including technical data for the two transformer types), and water supply of plant. (Continuation of serial.)

See also Compressed Air, Hydroelectric Plants.

HYDROGEN

ELECTROLYTIC PRODUCTION. Electrolytic Production of Hydrogen and Oxygen by the British Armies (La production de l'hydrogène et de l'oxygène par électrolyse aux armées britanniques); T. A. Ross. Revenue générale de l'Electricité, vol. 7, no. 24, June 12 1920, pp. 795-801, 19 figs. Details of installation near Rouen.

I

ICE PLANTS

ECONOMICAL OPERATION. Economy at the Finney Avenue Ice Plant, St. Louis, C. Wilkie. Power, vol. 51, no. 25, June 22, 1920, pp. 990-994, 12 figs. Plant 14 years old, with mediocre equipment, is said to be operating at 58.6 per cent over its rated capacity and to be delivering average of 8.5 tons of ice per ton of 10,000-B.t.u. coal. Such performance is attributed to ingenuity of management, co-operation of operating force and careful manipulation of equipment.

INDUSTRIAL MANAGEMENT

FARMING. Notes on Power Farming, R. W. Lohman. Jl. Soc. Automotive Engrs., vol. 7, no. 2, Aug. 1920, pp. 160-174 and 185, 36 figs. Paper discusses laying out of a production program, transportation of men and supplies, special implements for raw land preparation, tractor dynamometers, large tractors, special plowing and tilling implements, four-wheel-drive tractors and road haulage.

PRODUCTION CONTROL. Production Control Through a Routing Department, Norman G. Shidle. Automotive Industries, vol. 43, no. 7, Aug. 12, 1920, pp. 322-325, 6 figs. Operation of production control board and pneumatic-tube system by means of which, it is said, large machine-tool concern is keeping all its machines running efficiently.

PRODUCTION SYSTEMS. Modern Production Methods, W. R. Basset. Am. Mach., vol. 53, nos. 1 and 5, July 1 and 29, 1920, pp. 17-20, 5 figs., and 215-219, 9 figs. Take up planning of production so that all necessary parts of machine reach assembly floor at the same time. Discusses control of work in shop and describes "booth" system.

Organizing for Production—I. Eng. Production, vol. 1, no. 8, Aug. 1920, pp. 289-292, 4 figs. Procedure in American works manufacturing automobile carburetors.

Production Board at Marchant Calculating Machine Company. Metal Trades, vol. 11, no. 8, Aug. 1920, pp. 333-336, 6 figs. Production board devised to route work in such a way as to make it possible to determine at any time present status of any job in the factory, and to permit checking of costs at any time.

Production Planning and Tracing System. Iron Age, vol. 106, no. 4, July 22, 1920, pp. 183-185, 4 figs. System installed in Moreland Motor Truck Co.'s plant at Los Angeles, Cal., Following-up record forms are illustrated.

The Lincoln Motor Production Plan—X. Methods of Receiving and Storing Material, I. J. Beatty. Factory, vol. 25, no. 1, July 1, 1920, pp. 38-41, 6 figs. How plant handles receiving and storing raw materials and completed parts so that production shcedule is not held back.

RECORD SHEETS. Piecework System by Which Clerical Work is Done Almost Entirely by Office Machine (Akkordsystem mit fast ausschliesslich durch Büromaschinen verrichtbaren Schreibund Rechenarbeiten), Carl Rüsch. Werkstattstechnik, vol. 14, no. 6, March 15, 1920, pp. 164-170, 12 figs. Gives illustrations of the various record sheets and describes system employed by machine-tool concern with 650 workmen, which manufacturers tools used in all the other work-shops of a large plant.

TOOLROOM ORGANIZATION. Toolroom System, E. E. Hirschhauter. Am. Mach., vol. 53, no. 8, Aug. 19, 1920, pp. 358-360, 9 figs. System said to have been in successful use for last five years in large gas-engine shop.

See also Taylor System, Time Study.

INDUSTRY

SOCIALIZATION OF. A German Industrialist's Views on Socialisation, Felix Deutsch. Eng., vol. 109, nos. 2838 and 2839, May 21 and 28, 1920, pp. 703-704 and 734-735. Facts and figures are presented which, it is claimed, demonstrate "that exaggerated demands by employees and workmen cannot bring them any benefit, but may in a measurable distance of time bring our (German) industry to a standstill, and themselves to unemployment.

INDUSTRIAL ORGANIZATION

ENGLISH WORKS. The Organization of a Modern Engineering Works, with Some Observations Upon the Construction of Special Machinery, the Science of Production, the Training of Pupils and Trade Apprentices, and "Welfare," Richard W. Allen. Proc. South Wales Inst. of Engrs., vol. 36, no. 1, July 16, 1920, pp. 91-118. Based on organization of Messrs. W. H. Allen Sons & Co., Queen's Engineering Works, Bedford, England.

INLAND WATERWAYS

SIZE OF, DETERMINATION. Determination of the Dimensions of Large Ships Intended for Inland Navigation, and of the Size to be given to Inland Waterways (Détermination des dimensions des bateaux de navigation intérieure de fort tonnage, et du gabarit des voies navigables). Annales des Ponts et Chaussées, vol. 55, no. 2, March-April 1920, pp. 169-192. Study of comparative-economy of carrying traffic in large ships and in barges. It is found that larger ships and waterways are more economical when traffic is in excess of 3,000,000 tons per year. Memoir prepared by Committee appointed by French Ministry of Public Works.

K

L

OIL VS. COAL-BURNING. Santa Fe Locomotive Oil Burning Practice and Fuel Performance. Walter Bohnstengel. Ry. Mech. Engr., vol. 94, no. 7, July 1920, pp. 449-450 Santa Fe System has approximately 3160 locomotives, of which two-thirds use coal and one-third use oil as fuel. Tests show evaporate efficiency of oil is about 25 per cent more than coal for hand-fired and 40 per cent more than coal for stoker-fired locomotives. Also showed that installation and maintenance of brick arch cannot be justified in oil-burning locomotives. From paper read before Railway Fuel Association.

STEAM SEPARATORS FOR. Purification of Steam for Locomotives (Reinigung des Dampfes fur Lokomotiven und deren Wirtschaft), Ewald Mees. Organ für die Fortschritte des Eisenbahnwesens, vol. 57, no. 5, March 1, 1920, pp. 68-71, 2 figs. Points out defects in devices such as the Kappe's baffle use on the Prussian and Hessian railroads, and describes centrifugal steam separator patented by author and constructed for locomotives and stationary boilers, consisting of a cylindrical vessel in which steam enters and is conducted through a spiral-shaped conduit until it reaches outlet in the center.

LUBRICANTS

STANDARD. Government Standards for Oils and Greases. Power, vol. 52, no. 3, July 20, 1920, pp. 99-103, 1 fig. Abstract of report of United States Government's committee on Standardization of Lubricants.

LUBRICATING OILS

SPECIFICATIONS. Writing Specifications for Lubricating Oils and Greases, A. A. Potter and A. J. Mack. Elec. World, vol. 76, no. 6, Aug. 7, 1920, pp. 281-282. General properties of oils which have bearing on specifications. Typical specifications for turbine, dynamo and other oils.

VOLTOL. Friction in Journal Bearings When Lubricated by Mineral Oil to which Voltol Has Been Added and under Variation of Speed and Temperature (Die Reibung in Gleitlagern bei Zusatz von Voltol-Oel zu Mineralöl und bei Veränderung der Umlaufzahl und der Temperatur). C. Biel. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, nos. 25 and 26, June 19 and 26, 1920, pp. 449-452 and 483-485, 9 figs. It is demonstrated by a number of tests carried out in 1915 at the Technical High School, Carlsruhe, that a mixture of mineral oil and "voltol" acts differently from pure mineral oil of the same viscosity and reasons therefor are given. Gives some new expressions for dependence of friction on speed, temperature and viscosity, which are said to agree with those of former researches.

LUBRICATION

GERM PROCESS. The Germ Process of Lubrication, Henry M. Wells and James Ed. Southcombe. Ry. Rev., vol. 67, no. 2, July 10, 1920, pp. 45-48. It is demonstrated by laboratory processes that increased value of compounded oils is due to presence in them of fatty acids introduced as impurities with vegetable or animal oils added to mineral oil as per formula or specification. By addition of fatty acids, it is said, authors have been able to duplicate and even improve on results yielded by compounded oils and with a degree of economy measured by cost of vegetable and animal oils formerly employed. From paper read at Nat. Petroleum Assn.

M

MACHINE SHOPS

ENGLISH. The Works of Messrs. Clayton and Shuttleworth, Ltd., at Lincoln. Eng., vol. 109, nos. 2840 and 2841, June 4 and 11, 1920, pp. 741-747, 30 figs., and 778-801, 11 figs. Steam and electric road tractors, railway rolling stock, drop stampings and steel forgings are manufactured in works.

The Works of Messrs. Marshall, Sons and Co., Ltd., Gainsborough. Eng., vol. 109, nos. 2837 and 2838, May 14 and 21, 1920, pp. 635-641 and p. 652, 24 figs., and 670-675 and 686, 20 figs., partly on 3 supp. plates. Historical account of development. Works manufacture portable engines, road rollers, traction engines, locomobiles, fixed engines, etc.

The Works of Messrs. William Foster and Co., Ltd., Lincoln. Eng., vol. 109, no. 2843, June 25, 1920, pp. 847-850, 15 figs. partly on 4 supp. plates. Tractors, road locomotives, threshing machines and other farm machinery are constructed. War tanks were developed in these shops.

MACHINE TOOLS

HERRINGBONE FOR GEARS. Herringbone Gears for Machine Tools, Nikola Trbojevich. Machy, (N.Y.), vol. 26, no. 12, Aug. 1920, pp. 1164-1169, 6 figs. Advantages gained by use of herringbone gears and methods employed in cutting them.

PROVISION FOR REPAIRS. A Plea for Better Harmony Between Theory and Practice—III. Machy. (London), vol. 16, no. 410, Aug. 1920, pp. 546-548, 5 figs. Examples of faulty designs of machine tools lacking accessibility for making repairs.

SPINDLES AND BEARINGS. Recent Machine Tool Developments—XIII. Joseph Horner. Eng., vol. 109, no. 2839, May 28, 1920, pp. 707-710, 19 figs. Spindles and bearings of machine tools.

MAGNESIUM ALLOYS

DOW METAL. The New Alloy of Magnesium, E. J. Jenkins, Iron Age, vol. 106, no. 4, July 22, 1920, pp. 193-194, 3 figs. Dow metal manufactured by Dow Chemical Co., Midland, Mich., said to be lightest metal known which is adapted to commercial uses. Alloy is said to be manufactured electrolytically from magnesium chloride.

MAGNETOS

FRENCH MACHINES. Magneto Industry in France (L'industrie de la magnéto d'allumage en France), H. W. Porret. Technique Moderne, vol. 12, no. 1, Jan. 1920, pp. 25-28, 17 figs. High-tension machines. (Continuation of serial.)

WYCO TYPE. Two Types of Magneto that Employ the Magnetic Bridge Principle. Automotive Industries, vol. 43, no. 6, Aug. 5, 1920, pp. 256-257, 4 figs. Wyco magnetos. One has reciprocating armature and in the other armature is on periphery of flywheel.

MALLEABLE CASTINGS

ANNEALING. Annealing Mallable in Tunnel Kiln, H. E. Diller. Foundry, vol. 48, no. 16, Aug. 15, 1920, pp. 638-644, 11 figs. Kiln of tunnel type used for continuous annealing at plant of Saginaw Malleable Iron Co.

MARINE ENGINES

FORCED LUBRICATION. Forced Lubrication for Marine Engines, W. C. Owen. Int. Marine Eng., vol. 25, no. 8, Aug. 1920, pp. 662-664, 2 figs. Application of forced lubrication to reciprocating engines; arrangement for oiling main bearing, crank pins and crossheads.

STILL VS. SULZER TYPES. "Still" and "Sulzer" Marine Engines, William Denny. Eng., vol. 110, no. 2846, July 16, 1920, pp. 98-100, 8 figs. Comparative trials of Still and Sulzer engines under actual working conditions on board ship. Paper read before Inst. Naval Architects.

See also Diesel Engines, Kerosene Engines.

MARINE FITTINGS

CHARACTERISTICS. Marine Brass Goods and Fittings, Peter W. Blair. Metal Industry (N.Y.), vol. 18, no. 8, Aug. 1920, pp. 351-352, 6 figs. Cahracteristics of marine fixtures as distinguished from standard lines.

MEASURING MACHINES

UNIVERSAL. Universal Measuring Machine. Engr., vol. 129, no. 3358, May 7, 1920, pp. 472-473, and p. 476, 9 figs. partly on 2 supp. plates. Type designed by Société Genevoise d'Instruments Physique of Geneva, which is said to enable absolute measurement to be made with accuracy of 0.00005 in.

METAL SPRAYING

METHODS. Metal-Spraying Methods in Art and Industry (Die Megallspritzverfahren in Kunt und Industrie). Der praktische Maschinen-Konstrukteur, vol. 53, nos. 7 and 9, Feb. 19 and March. 4 1920, pp. 27-30 and 36-38, 3 figs. Deals with Schoop metal-spraying process and the various discoveries of Thurston, Morf, and others.

METALS

TESTING. Mechanical Testing of Mêtals (La pratique des essais méchaniques des métaux), Jean Durand. Génie Civil, vol. 77, no. 1, July 3, 1920, pp. 8-11, 4 figs. Rules defining testing practice, formulated by Commission permanente de Standardization.

X-RAY STUDIES. Some Studies of Metals by Means of X-Rays, S. Nishikawa and G. Asahara. Physical Rev., vol. 15, no. 1, sec. series, Jan. 1920, pp. 38-45, 18 figs. on 3 supp. plates. By passing a narrow beam of heterogeneous rays through a thin sheet of metal, a pattern may be photographically recorded which depends on crystalline structure of metal. Authors have used this phenomenon to study effect of rolling and subsequent annealing on various metals, and results are given in the case of various metals. It was shown that the various metals differ greatly in their response to annealing.

METALLURGY

OXYGEN, USES IN. The Future of Oxygen Enrichment of Air in Metallurgical Operations, F. G. Cottrell. Chem. & Met. Eng., vol. 23, no. 2, July 14, 1920, pp. 53-56. Discusses apparent possibilities of applying cheap oxygen to various standardized metallurgical operations, permitting closer economy of blast-furnace fuel, reducing atmospheres in the open-hearth, and low-silicon iron to converters. Paper presented before Am. Iron & Steel Inst.

METEOROLOGY

AERONAUTICS, RELATION TO. Meteorology and Aeronautics. Air Service Information Circular, vol. 1, no. 77, May 12, 1920, 8 pp., 2 figs. Location and layout of flying fields, exploration of upper air, forecasts, light charts and magnetic charts.

MILLING

POWER CONSUMED IN. Power Consumed in Milling, Fred A. Parsons. Am. March., vol. 53, no. 7, Aug. 12, 1920, pp. 315-316, 1 fig. Investigation of variables affecting power consumed in milling was undertaken for purpose of constructing slide rule which would indicate for various cuts power required, and therefore, machine best adapted for job. Data were obtained in tests made by Kempsmith Manufacturing Co. on various Kempsmith millers.

N

NOZZLES

De Laval. The Determination of Temperature of Rapidly Flowing Gases or Vapors by Expansion in a de Laval Nozzle (Ueber die Ermittlung des Temperaturverlaufes von schnellströmenden Gasen oder Dampfen bei expansion in einer Laval-Düse), Friedrich Maller. Zeitschrift fur das gesamte Turbinenwesen, vol. 17, nos. 6, 7, 8 and 9, Feb. 29, March 10, 20 and 30, 1920, pp. 61-65, 76-80, 87-90 and 100-106, 26 figs. Results of experiments show agreement with Batho that temperatures of wet vapors flowing in a nozzle are properly measured with thermocouples, and accord with Nusselt that in temperature measurement of dry and superheated steam, the use of thermocouples must be avoided, and contrast of the contradictory results explained. It is said that a final solution can probably be achieved only with aid of a more precise testing device.

O

OFFICE MANAGEMENT

Stenographic Department. Getting the Office Work Done—II, Wallace Clark. Indus. Management, vol. 60, no. 2, Aug. 1920, pp. 116-121, 6 figs. How to organize stenographic department.

OIL ENGINES

Ingersoll-Rand. Many New Ideas in Ingersoll-Rand P-R Oil Engine. Automotive Manufacturer, vol. 62, no. 3, June 1920, pp. 7-12, 6 figs. New type of engine said to possess many novel features and to produce high unit power output and low fuel consumption, as well as remarkably slow speed.

Solid-Injection. The Lincoln Works of Messrs Ruston and Hornsby, Limited. Eng., vol. 110, no. 2844, July 2, 1920, pp. 4-10, 24 figs, partly on 2 supp. plates. Among principal products manufactured are solid-injection crude-oil engines which are built of single-cylinder type in 11 sizes ranging from 15 b.hp. to 170 b.hp. and double-cylinder type in 5 sizes from 100 b.hp to 340 b.hp. Engine of latter type developing 260 b.hp. is described and illustrated. (To be continued.)

See also Diesel Engines; Heavy-Oil Engines; Kerosene Engines.

OIL FIELDS

British Empire. The Oil Resources of the British Empire, John Cadman. Jl. Royal Soc. of Arts, vol. 68, no. 3532, July 30, 1920, pp. 584-596 and (discussion) pp. 596-600. Statistics of production with comparative analyses of various kinds of oil.

New Mexico. Probable Oil Resources of New Mexico, John K. Knox. Eng. & Min. Jl., vol. 110, no. 2, July 10, 1920, pp. 69-74. Summary of stratigraphic and structural geology of state, with particular reference to possible sources of petroleum; some oil has been discovered, and a few localities are promising. Paper read in more extended form before Am. Assn. Petroleum Geologists.

Persia and Near East. Petroleum in Persia and the Near East, Edmund M. Spieker. Eng. & Min. Jl., vol. 110, no. 7, Aug. 14,, 1920, pp. 316-323, 1 fig. Area is said to comprise richest and most extensive oil-bearing region of the world. Geological characteristics, commercial possibilities and potentialities of future development are indicated.

Relationship with Gas Fields. Experimental Studies of Subsurface Relationships in Oil and Gas Fields, R. Van. A Mills. Economic Geology, vol. 15, no. 5, July-Aug. 1920, pp. 398-421, 10 figs. Apparatus and methods developed by writer for laboratory study of subsurface relationships of oil and gas fields.

OIL FUEL

White System. The White Oil-Fuel System. Eng., vol. 10, no. 2844, July 2, 1920, pp. 23-24, 16 figs. partly on 2 supp. plates. Oil is forced into burners at pressure of from 60 to 90 lb. per square inch, and sprayed by mechanical action only. This system has been used in oil-fuel installations recently completed on Cunard liner Aquitania and Whie Star liner Olympic.

OVENS

Electrically Heated. Experience with Electric Core Baking, Alan D. Dauch. Elec. World, vol. 76, no. 4, July 24, 1920, pp. 168-170, 4 figs. Reduction of baking time, greater uniformity of product, improved washing conditions and decreased labor cost shown in changing from gas to electric ovens.

OXY-ACETYLENE CUTTING

Iron and Steel. Metallography of Iron and Steel as Related to Cutting with Oxygen, F. J. Mapolitan. Metal Trades, vol. 11, no. 8, Aug. 1920, pp. 325-326. Account of experience in cutting iron and steel of different carbon compositions at Eng. & Research Laboratory of Davis-Bournonville Co.

Under Water. Autogenous Cutting Under Water (Autogenschneiden under Wasser). Autogene Metalbearbeitung, vol. 13, no. 5, Marsh 1, 1920, pp. 54-58, 8 figs. States that the Larsen sheet piling and a described method of cutting under water can be used wherever large cofferdams are required instead of the costly double-wall wooden cofferdams.

OXY-ACETYLENE WELDING

Applications. The Rapid Repair of Machinery Equipment by the Autogenous Cutting and Welding Process (Beschleunigte Ausbesserungen von maschinellen Einrichtungen durch das autogene Schneid und Schweissverfahren). A. Nolte. Stahl u. Eisen, vol. 40, no. 21, May 27, pp. 713-717, 17 figs. Writer gives examples of practical application of this process in works under his superintendence.

Safety Devices. Safety Devices for Use in Autogenous Metalworking (Sicherungen bei der fautogenen Metallbearbeitung). P. Max Grenpe. Der praktische Maschinen-Konstrukteur, vol. 53, nos. 11 and 13, March 8 and April 1, 1920, pp. 45-47 and 52-54, 4 figs. States safety regulations and describes arrangements for prevention of accidents used in the works of German General Elec. Co., including device for preventing standing steel bottles from falling over, carts for transporting them, etc.

P

PAPER MANUFACTURE

Research. Research Problems of the Pulp and Paper Industry, D. C. Everest. Paper, vol. 26, no. 22, Aug. 4, 1920, pp. 11-14 and p. 30, 2 figs. Survey of work of Forest Products Laboratory.

PAVEMENTS, CONCRETE

Construction. Concrete Pavements and Walks. Tyrrell B. Shnertzer. Nat. Lime Assn., no. 3, 7 pp. 1 fig. Directions for putting in sub-base and for proportioning and mixing concrete base and top course.

PIERS

Staten Island. New Steamship Piers on Staten Island are Too Narrow, John Meigs, William S. Wilgus, Frank G. White, Fay, Spofford & Thorndike, Frederick W. Cowie and George F. Nicholson. Eng. News-Rec., vol. 85, no. 4, July 22, 1920, pp. 160-165. Opinions of leading port and terminal engineers.

PIPE, CAST IRON

Cement Joints for. Cement Joints for Cast Iron Water Pipe, George W. Pracy. Jl. of Am. Water Works Assn., vol. 7, no. 4, July 1920, pp. 436-439. It is pointed out that cement joints increase electric resistance of pipe, a feature of particular importance in larger cities where electrolytic action does considerable damage. Other advantages lead writer to believe cement joint has come to stay.

PIPE LINES

Natural Gas Transportation. Pipe Lines for Transporting Natural Gas, Clifford E. Brock. Mech. Engr., vol. 42, no. 8, Aug. 1920, pp. 445-447, 4 figs. Construction, repair and operation of jointed and welded lines, including particulars regarding couplings used, pipe-laying machines, strength of welded pipe, pressure regulation, etc.

PIPE, STEEL

Spirally Ribbed. The Manufacture of Pipes with Spiral Ribs and of Pipes for Exchange of Heat from Rolled Sections (Herstellung von Rohren mit Spiralförmig verlaufenden Rippen und von Wärmeaustauschrohren aus Walzprofilen). Autogene Metallbearbeitung, vol. 13, nos. 3 and 10, Feb. 1 and May 15, 1920, pp. 33-34 and 107-109, 10 figs. Feb. 1. Describes process in which they are made by winding a special T section around a mandrel and welding together the contiguous spirals. May 15. Describes construction of similar pipes patented by Chief Engineer Wiss of the Griesheim-Electron Chem. Factory.

PORTS

Facilities for Handling Traffic. Port Facilities, Charles Evan Fowler. Freight Handling & Terminal Eng., vol. 6, no. 7, July 1920, pp. 265-268. Discussion of types of docks and piers and port equipment best suited for rapid handling of traffic. Paper read before Great Lakes-Tidewater Congress.

PRESS WORK

Stamping Electric-Fan Base. Making a Pressed-Steel Base for Electric Fan, H. Jay. Am. Mech., vol. 53, no. 8, Aug. 19, 1920, pp. 361-362, 9 figs. Stamping process for producing base of an electric fan, method being different from that usually employed for making such parts.

PROFIT SHARING

Co-operation and. Co-operation and Profit Sharing. Monthly Labor Rev., vol. 10, no. 6, June 1920, pp. 117-145. Discussion of aims and possibilities of the Consumers' co-operative movement; Russian co-operative movement; progress of co-operation in various countries, including Denmark, Germany, India, Italy, Netherlands, Norway, Roumania and Sweden; profit sharing and labor copartnership in the United Kingdom.

PROPELLERS, SHIP

Four-Blades vs. Three-Blade. Model Experiments for a Double-Screw Tug Boat of 1,400 Hp. (Modellversuche für einen Doppelschrauben-Schlepper von 1,400 PSi), K. Schaffran. Schiffbau, vol. 21, no. 31, June 23, 1920, pp. 851-856, 8 figs. Results of tests to determine influence of number of blades on towing efficiency showed efficiency of 4-blade propellers tested to be 4 per cent higher than that of the 3-blade propellers.

R

TIME VS. SPACE INTERVALS. The Use of Signals for Better Train Operation—I, Henry M Sperry. Ry Signal Engr, vol 13, no. 7, July 1920, pp. 270-275, 5 figs. Comparison of time-interval and space interval methods leads to the conclusion that delays and hazards are reduced to the minimum by latter and that maximum track capacity is also possible under this method. (To be continued.)

RAILWAY TRACK

CONSTRUCTION. A Short Cut in Estimating Track Materials, H. M. Booth, Jr., Ry. Maintenance Engr., vol. 16, no. 8, Aug. 1920, pp. 314-315, 1 fig. Chart for estimating amount of materials that enter into construction of industrial track and sidings.

SWITCHES. Swtiches with Curved Crossings (Weichen mit gekrummten Herzstücken), H. Schwartz. Zentralblatt der Bauverwaltung, vol. 40, no. 19, Mar. 6, 1920, pp. 119-123, 19 figs. Describes new switches, some of advantages of which are said to be: With 190-m. radius switch, a 1:6 set of points can be obtained without changing the tongue arrangement and the 1:9 radius of switch; the 1:7 switch can be dispensed with; number of required switches and accessory parts is diminished, etc.

TIE-PLATE CORROSION. Copper Reduces Corrosion in Tie Plates. Ry. Maintenance Engr., vol. 16, no. 7, July 1920, pp. 255-256, 2 figs. New York Central experiments showed that introduction of small percentage in steel made marked difference in corrosion of tie plates.

RAILWAYS

CZECHO-SLOVAKIA. The Railways of Czecho-Slovakia. Vladimir A. Geringer. Ry. Rev., vol. 67, no. 2, July 10, 1920, pp. 48-51. Data abstracted from report by U. S. Trade Commissioner at Prague, embodying official statement by Dr. Franke, Minister of Railways of Czecho-Slovak Republic.

REFRIGERATING MACHINES

TESTS. Experiments with a Large Ammonia Refrigerating Machine (Versuche an einer grossen Ammoniak-Kältemaschine), Martin Krause. Zeischrift für die gesamte Kälte-Industrie, vol. 27, no. 4, Apr. 1920, pp. 35-38, 1 fig. Results of various experiments are given in tabular form. (Concluded.)

REFRIGERATING PLANTS

TROUBLES. Trouble-Hunting in Refrigerating Plants, J. C. Moran. Power, vol. 52, nos. 3 and 5, July 20 and Aug. 3, 1920, pp. 87-89, 2 figs., and 168-170, 2 figs., July 20: One installation of two 100-ton single-acting twin-cylinder machines, two double-pipe condensers, and direct-expansion coils was giving one-half of normal capacity only. How plant was brought back to normal production without introducing new machinery is related. Aug. 3: How a faulty gate valve in brine-circulating system caused freeze-up of nearly the entire system.

UNION STOCK YARDS, CHICAGO. Large Freezer Plant at Union Stock Yards, Chicago. Ice and Refrigeration, vol. 59, no. 2, Aug. 1920, pp. 37-40, 5 figs. Ten-story building erected at cost of about $2,000,000 with capacity for freezing approximately 50,000,000 lb. of meat and meat products.

RESEARCH

ALLOYS. Thermo-Electromotive Force and Alloy Research, John L. Haughton. Eug., vol. 109, no. 2841, June 11, 1920, pp. 803-807, 8 figs. Study of thermal electromotive force as aid to investigation on constitution of alloy systems, with appendix on Peltier and other effects. Paper read before Inst. of Metals.

GOVERNMENT-CONDUCTED. The Economic Importance of the Scientific Work of the Government, Edward B. Rosa. Sci. Monthly, vol. 11, no. 1, July 1920. pp. 5-24, 6 figs. Address before Washington Acad. of Sci. (To be concluded.)

OBESRVATIONS, ADJUSTMENT OF. The Adjustment of Observations, R. Meldrum Stewart. London Edinburgh & Dublin Philosophical Mag. & Jl. of Science, vol. 40, nu. 236, Aug. 1920, pp. 217-227. Criticism of method of deduction on observations offered as substitute for method of least squares by Dr. Norman Campbell in Philosophical Mag., Feb. 1920, p. 177.

ORGANIZATION OF. The Organization of Research, James R. Angell. Sci. Monthly, vol. 11, no. 1, July 1920, pp. 25-42. Notes on conception and distribution of research functions, personnel, organization and co-operation and organization of Nat. Research Council for mobilization of the scientific resources of the country to permit their most effective use continously in times of peace as well as war.

PLACE IN INDUSTRY. The Art of Systematic Inquiry (Research), Its Place in Industry, H. E. Armstrong, Eng., vol. 109, no. 2839, May 28, 1920, pp. 735-737. Lecture delivered before Ceramic Soc.

See also Paper Manufacture.

RIVERS

LEVEE CONSTRUCTION, DAYTON, O. High-Speed Block-Laying on Miami River Leeves. Eng. News-Rec., vol. 85, no. 6, Aug. 5, 1920, pp. 248-249, 1 fig. Flexible concrete mattress construction by stringing precast concrete blocks on steel cable being done in improving channel of Miami River at Dayton, Ohio.

REGULATION. Improvement Work on River Murray in South Australia, Robert C. Cutting. Eng. News-Rec., vol. 85, no. 6, Aug. 5, 1920, pp. 244-246, 6 figs. Regulation of longest river on island for navigation by locks and dams.

ROAD CONSTRUCTION

WINTER CONSTRUCTION. Winter Road Work in the Dakotas, Minnesota, and Wisconsin a Success, E. G. Edwards. Public Roads, vol. 3, no. 25, May 1920, pp. 7-10, 5 figs. Advantages claimed for building roads in winter are (1) greater accessibility of pits, (2) larger number of teams available and (3) lengthening of construction period.

ROAD MATERIALS

STANDARD SPECIFICATIONS. Proposed Standard Specifications for Road Building Materials. Rock Products, vol. 23, no. 15, July 17, 1920, pp. 31-33. Proposed methods for testing quantity of clay and silt in sand and gravel; standard sizes of crushed stone, sand and gravel; methods for sampling crushed stone, sand, gravel and slag; and specifications for crusher-run slag for macadam roads. Specifications proposed at convention of the Am. Soc. for Testing Materials.

TESTING. Testing of Roads and Road Materials. Quarry, vol. 25, no. 282, Aug. 1920, pp. 213-215, 4 figs. Procedure in laboratories of Road Testing Dept. at Nat. Physical Laboratory, Teddington, England.

ROADS

SURFACING. Semi-Portable Oil Heating Plant for Surfacing Roads. Eng., News-Rec., vol. 85, no. 6, Aug. 5, 1920, pp. 250-251. Scheme devised by California Highway Commission.

ROADS, GRAVEL

NEW HAMPSHIRE. The Construction of Crushed Gravel Roads in New Hampshire, Frederic E. Everett. Municipal and County Eng., vol. 59, no. 1, July 1920, pp. 5-6. It requires approximately 145 cu. yd. of covering per mile of 16-ft. road to make two applications. There are about 100 miles of crushed gravel road in N. H. some sections of which have been laid as long as 15 yr.

ROADS, MACADAM

BITUMINOUS SURFACED. Bituminous Surface Treated Macadam and Gravel Roads, J. F. Witt. Public Roads, vol. 3, no. 25, May 1920, pp. 3-6, 2 figs. It is claimed that water-bound macadam has been a failure in United States. Practice of writer of treating water-bound macadam with bituminous material is described.

ROCK

DEVAL TEST. A Study of the Standard Deval Test for Rock. Eng. & Contracting, vol. 54, no. 5, Aug. 4, 1920, pp. 113-114, 1 fig. Experiments made to determine how variations in results of tests due to laboratory manipulating might be reduced, and comparative range in values obtained with and without "dust cushion." Paper read before Am. Soc. for Testing Malts.

ROCK CRUSHING

PROGERSS SINCE 1910. Progress in the Fine Crushing of Hard Material (Neuerungen der Hartzerkleinerung), Carl Naske. Zeitschrift des Vereines deutscher Ingenieure, vol. 64, no. 26, June 26, 1920, pp. 469-475, 30 figs. Account of developments during last ten years, with description of simple toggle lever, pendulum roll and gyratory crushers; crushing and grinding in one machine and one operation; machines with separate screening of material to be ground, improvements of Griffin mills; screenless ball mills; combination of ball and tube mills, etc.

ROCK DRILLS

DRILL STEEL. Handling and Treatment of Rock-Drill Steel at Copper Range Mines, H. T. Mercer and A. C. Paulson. Min. & Metallurgy, no. 164, Aug. 1920, pp. 20-21, 1 fig. Reports of each drill machine are made daily by shop and mine, and tables compiled from these reports show footage drilled, steel broken, drills received and sent out of shop, drills sharpened and bits cut off. Dimensions of drill adopted are given and reasons for their adoption explained. (Abstract.)

ROLLING MILLS

DEFORMATION WORK IN ROLLING. The Numerical Determination of the Deformation Work in Rolling, Forging, etc. (Zur rechnerischen Ermittlung der reinen Umformungsarbeit beim Walzen. Schmieden usw.), H. Preussler. Stahl u, Eisen, vol. 40, no. 19, May 13, 1920, pp. 641-649, 7 figs. Derives expression, based on mathematical-mechanical principle for theoretical minimum power required for deformation of a plastic material, which covers every change in form with regard to stretching, expanding and shaping.

DESIGN. Design of Experimental Rolling Mills—II and III, W. B. Skinkle. Blast Furnace and Steel Plant, vol. 8, nos. 7 and 8, July and Aug. 1920, pp. 404-407 and 454-457, 16 figs. Details of design of experimental mill of the Bureau of Rolling Mill Research. General features of different types of mills when they are assembled.

ELECTRICALLY-DRIVEN. Columbia Steel Company's New Plant. Blast Furnace and Steel Plant, vol. 8, no. 7, July 1920, pp. 401-403, 4 figs. Description of electrically driven merchant mills for production of bars and shapes.

Power Drives for Rolling Mills, W. O. Rogers. Power, vol. 52, nos. 1, 3 and 5, July 6, 20 and Aug. 3, 1920, pp. 9-12, 90-93 and 171-176, 28 figs. Several types of shears are illustrated; plate and job mills, structural, sheet and tin-plate mills, also wire-rod mills are briefly described. Experience with induction motors driving plate mill. Direct-current reversible motors of 5000 to 15,000-hp. capacity used to run reversing blooming mills.

S

STEAM ENGINES

ROBEY COMPOUND SUPERHEAETR ENGINE. The Works of Messrs. Robey and Co., Limited, of Lincoln. Eng., vol. 110, no. 2847, July 23, 1920, pp. 104-106, 16 figs., partly on supp. plates. Details of Robey compound superheater engine. (Concluded).

UNIFLOW. The Uniflow Steam Engine, F. B. Perry. Eng., vol. 110, no. 2848, July 30, 1920, pp. 162-164, 6 figs. Principle of operation and details of construction. Paper read before Instn. Mech. Engrs.

See also Locomobiles.

STEAM GENERATORS

ELECTRICALLY OPERATED. Electrically-Operated Steam Generators, F. G. Constam-Gull. Can. Engr., vol. 39, no. 7, Aug. 12, 1920, pp. 231-234, 4 figs. Results obtained in official tests of steam generators electrically operated which are being used in hydroelectric installation in Switzerland. High efficiency attained corresponds to evaporation of 2.9 lb. of so-called standard steam per kilowatt-hour. Steam produced had content of water of only about 3 per cent. compared with steam of 5 to 10 per cent humidity produced by ordinary fired boilers.

STEAM POWER PLANTS

DESIGN. Power Station Design in Relation to Thermal Efficiency, I. V. Robinson. Engr., vol. 129, no. 3365, June 25, 1920, pp. 655-656. Developments in power-station design leading to greater thermal efficiency are classified into (1), increase in range of working temperatures of steam, (2), saving of low-grade heat, and (3) increase in size of generating sets. Paper read before Incorporated Minicipal Elec. Assn. Convention.

RECONSTRUCTION. Reconstruction of a Power Plant Under Operation, Thorleif Fliflet. Power, vol. 52, no. 3, July 20, 1920, pp. 82-84, 3 figs. Power production is said to have maintained at normal in plant of Surpass Leather Co., Philadelphia, Pa., over entire period during which battery of seven old return-tubular boilers was replaced, two at a time, by three water-tube stoker-fired boilers.

STEAM REGENERATORS

REQUIREMENTS OF. Steam Regenerators Reduce Coal Consumption, W. H. Schackt. Min. & Metallurgy, no. 164, Aug. 1920, pp. 32-33. Method for regulating regenerator requirements. (Abstract.)

STEAM TURBINES

CALCULATIONS. The Application of the v^2-Method in the Calculation of Steam Turbines (Ueber die Verwendung der v^2-Methode bei der Berechnung von Dampfturbinen), R. Fichtner. Zeitschrift für das gesamte Turbinenwesen, vol. 17, no. 9, Mar. 20, 1920, pp. 97-100, 6 figs. In the usual v^2-method with charging of the v^2-against the heat content, a change is made by charging against the adiabatic drop and use of velocity coefficients; it is shown by examples that both methods agree fundamentally and differ only in velocity of efflux.

OPERATION AND ADJUSTMENT. Operation and Adjustment of Turbine Machinery—I, II and III, Eustis H. Thompson. Power, vol. 52, nos. 1, 3 and 5, July 6, 20 and Aug. 3, 1920, pp. 2-4, 85-87 and 181-183, 6 figs. Concerning leveling of turbines, assembly of casting, and aligning of bearing pedestals. Inspecting machine before setting it in motion. Examining and starting large turbines after their erection.

STEEL

COLD-ROLLING. Study Stresses in Cold Rolling, Henry M. Howe and E. C. Groesbeck. Iron Trade Rev., vol. 66, no. 26, June 24, 1920, pp. 1824-1825, 6 figs. Investigation indicated that internal stress increases with amont of reduction per pass due to skin friction of rolls, and that elongation is independent of number of passes. Paper read before Am. Soc. Testing Materials.

SURFACE CHANGES WHEN HEATED IN VACUO. Surface Changes of Carbon Steels Heated in Vacuo, E. Heaton Himingway and George R. Ensminger. Min. & Metallurgy, no. 164, Aug. 1920, p. 24. Three types of markings were observed when samples of steel were held at 1000 deg. cent, in vacuo for a few hours: (1) Deeply marked polyhedral structure which represented final gamma boundaries; (2) fine clean-cut structure representing alpha boundaries; and (3) indefinite, and often partly obliterated structure representing boundaries of former gamma crystals that had been absorbed by crystalline growth. (Abstract.)

See also Chrome-Nickel Steel; Nickel Steel: Structural steel.

STEEL MANUFACTURE

CASTING AND MOLDING INGOTS. Casting and Molding Steel Ingots, Emil Gathmann. Min. & Metallurgy, no. 164, Aug. 1920, pp. 29-31. Best results as to freedon from surface blowholes, snakes, etc., in evolution steels are said to be obtained when ingots are bottom cast. Method by which similar results were obtained with other steels is described which consisted of employing special teeming or pouring nozzle whereby pressure and velocity of liquid steel as it entered mold was greatly reduced, without, however reducing quantity or volume per minute of steel teemed. (Abstract.)

TILTING FURNACES. Tilting Furnaces Used for Steel Manufacture (L'emploi des fours oscillants pour la fabrication de l'acier). Génie Civil, vol. 76, no. 25, June 19, 1920, pp. 545-548, 4 figs. Wellman steel works in Staffordshire, England.

STOKERS

See Furnaces Boiler, Air-Cooled Scraper Grate.

STORAGE BATTERIES

NON-LIQUID. Non-Liquid Storage Battery of Durable Construction. Automotive Industries, vol. 42, no. 4, July 22, 1920, pp. 157. Storage battery without a liquid electrolyte and with many of the features of a primary cell.

STORM WATER

RUN-OFF. Storm Water Run-Off Diagram for Rational Method, George C. D. Lenth. Eng. News-Rec., vol. 85, no. 4, July 22, 1920, pp. 151-152, 1 fig. Diagram made to give run-off on given area in second-feet, when time of concentration, area, and ratio of run-off to rainfall has been determined.

STREET CLEANING

METHODS. Report on Investigation and Study of Methods of Street Cleaning, Collecting and Disposal of Municipal Waste in Other Cities—Recommendation and Plan of Procedure for Philadelphia, J. H. Neeson. Jl. Engrs. Club of Phila., vol. 37-8, no. 188, Aug. 1920, pp. 336-340. It is recommended that service of cleaning of streets, collecting ashes, rubbish and garbage should be given to the public at cost by municipal forces.

Report on the Study of the Methods of Street Cleaning and Collection and Disposal of Municipal Wastes, E. B. Morden, J. F. Follin and J. H. Neeson. Jl. Engrs. Club of Phila., vols. 37-8, no. 188. Aug. 1920, pp. 326-336. Data collected in inspection tour of 15 of principal cities of United States.

STREET RAILWAYS

CARS, SAFETY. Battery Cars Changed to Safety Cars, R. H. Parsons. Elec. Ry. Jl., vol. 56, no. 7, Aug. 14, 1920, pp. 311-314, 10 figs. Details of conversion of 50 storage-battery cars to safety cars for one and two-man operation by Third Avenue Railway, New York, for use in outlying districts.

The Safety Car, W. D. Bearce. Gen. Elec. Rev., vol. 23, no. 7, July 1920, pp. 597-6-5, 13 figs. Operating figures from various parts of the country.

FREIGHT CARS FOR. Four-Axled Cars for Freight Transportation on Street Railway Tracks (Vierachsige Wagen für Güterbeförderung auf Strassenbahnen), H. Otto. Verkehrstechnik, vol. 37, no. 5, Feb. 15, 1920, pp. 66.67, 2 figs. Description of 5-ton metergage car constructed by firm of Krupp and now in operation. Dimensions: Maximum length above buffer head, 10,120 mm.; maximum width 2,000 mm.; height, 1,200 mm.

STREETS

DOUBLE DECK. Chicago Double Deck Street for Congested District. Eng. News-Rec., vol. 85, no. 4, July 22, 1920, pp. 173-175, 4 figs. Traffic separation is main purpose. Automobile parking space, wharfage and freight house facilities included.

STRUCTURAL STEEL

STANDARD SHAPES. Proposed Standards for Shapes. Iron Trade Rev., vol. 67, no. 1, July 1, 1920, pp. 43-44, 3 figs. Section Committee of Am. Standards Committee formulates basis for Anglo-American standards for structural shapes. British bulb angle sections and new channel and beam sections are recommended.

WIDE-FLANGE BEAMS. Wide Flange Beams by the Sack Method. Iron Age, vol. 106, no. 8, Aug. 19, 1920, pp. 448-449, 8 figs. Results of German practice in producing shapes like those of Bethlehem mill. Roll design and theory of process. (To be concluded.) Translated from Stahl und Eisen.

SUBMARINE CABLES

TESTS. Induction Disturbances in the Anglo-German Telegraph Cables and Their Elimination. (Induktionsstörungen in den deutsch-englischen Telegraphenkabeln und Ihre Beseitigung.) A. Kunert. Telegraphen u. Fernsprech-Technik, vol. 8, no. 12, March 1920, pp. 202-216, 21 figs. Results of tests with the double-line operation show that the two cable loops by double Baudot ensure an entirely reliable operation, and with adequate improvement of the artificial lines they permit a triple and probably quadruple Baudot. Double-line operation is shown to be the best and simplest means of overcoming induction disturbances.

Measurements on Guttapercha Telegraph Cables with Single Conductors by Means of Alternating Currents of Low Frequency. (Messungen an Guttapercha-Telegraphenkabeln mit Einzeladern mittels Wechselströmen niederer Frequenz), A. Kunert. Telegraphen- u. Fernsprech-Technik, vol. 8, no. 12, March 1920, pp. 189-198, 13 figs. Results of measurements show among other things that a noticeable influence of insulation of adjoining conductors in the case of multi-conductor cables is first apparent at a higher frequency than 100; the so-called conductivity constants are not constants; increase of copper resistance with increasing frequency is much greater than was to be expected from theory, etc. (Concluded.)

SUBMARINE WARFARE

EXPERIMENTS. Model Experiments in Connection with Submarine Warfare, G. S. Baker. Eng., vol. 109, no. 2840, June 4, 1920, pp. 770-773, 5 figs. Work done at the Tank, England. Paper read before Instn. Naval Architects.

T

V

VENTILATION

Synthetic Air Chart. The New Measure of Ventilation, E. Vernon Hill. Heat & Vent. Mag., vol. 17, no. 8, Aug. 1920, pp. 27-29, 2 figs. Instructions for using synthetic air chart recently adopted by Soc. of Heat & Vent. Engrs. Chart is designed as means of accuralety measuring air conditions maintained in any given room.

VACUUM

High. *See Pumps, Vacuum.*

W

WAGES

Extra Pay for Families. Extra Pay for Families. Iron Age, vol. 106, no. 5, July 29, 1920, p. 277. System of allowances in French metal-working industries.

Hours of Labor and. Wages and Hours of Labor. Monthly Labor Rev., vol. 10, no. 6, June 1920, pp. 82-115. Tables presenting a summary report on industries, including manufacture of machinery, machine tools, and typewriters, automobiles, cars, electrical apparatus and foundry industry. Wages and hours of labor in anthracite and bituminous coal mines, rise of wages in British industries, etc.

Minimum. Minimum Quantity Budget Necessary to Maintain a Worker's Family of Five in Health and Decency. Monthly Labor Rev., vol. 10, no. 6, June 1920, pp. 1-18. Prepared by Bur. of Labor Statistics.

Payments, Systems of. Wage Payment Administration and Its Relation to Production Control, Paul Faltin and Leon Blog. Indus. Management, vol. 60, no. 2, Aug. 1920, pp. 139-142, 2 figs. Piece-work method of payment is advocated as more efficient than day-work method. It is urged, however, that in computing rate difference should be recognized between cases where output is primarily controlled by machines and cases where it depends almost wholly upon human element. Example are given.

Production Basis for. The Human Element in Production, A. F. Knobloch. Jl. Soc. Automotive Engrs., vol. 7, no 2, Aug. 1920, pp. 137-139. Writer believes that workman must be paid in the ratio of production secured from him, and that without endangering his future. Describe how one plant has solved the problem.

U. S. Government's Policy. The Government's Wage Policy During the Last Quarter Century, Mary Conyngton. Monthly Labor Rev., vol. 10, no. 6, June 1920, pp. 19-35, 2 figs. Gives tables based on figures furnished to Commission on Reclassification by various bureaus, divisions and groups concerned, and used by Commission as a basis of a series of charts prepared under direction of Bur. of Education.

WASTE HEAT

Utilization of. Waste-Heat Utilization in Steel Works. (Abfallwirtschaft in Eisenhüttenwerken), H. Hermanns. Verhandlungen des Vereins zur Beförderung des Gowerbfleisses, no. 1, Jan. 1920, pp. 6-14 and (discussion) pp. 14-16. Recommends a better utilization of the available fuels by extended use of waste fuels and of gas, which is all the more important because of recovery of low-temperature tar: economic utilization of energy content in exhaust gases, reserving high-grade gases for such heat processes where they can be most advantageously employed: utilizing waste heat from smelting, heating and annealing furnaces for generation of steam, waste heat from steam engines for heating purposes, utilization of natural heat of producer gas, and of clinker heat for generation of steam, etc.

WATER FILTRATION

Testing Station Results. Milwaukee Testing Station Results on Filtration of Water. Eng. News-Rec., vol. 85, no. 6, Aug. 5, 1920, pp. 257-259. Hydraulic pump has been found to make excellent coagulant mixer, slat underdrains are proven effective, but cost of ozone treatment has been found to be too high.

WATER MAINS

Jointing Compounds. The Efficiency of Pipe Jointing Compounds as Compared with Lead, Fred O. Stevens. N. E. Water Works Assn., Jl., vol. 34, no. 2, June 1920, pp. 102-104 and (discussion) 105-113. Eriter urges that water-works managers and engineers try out the value of substitutes. Gives tests to show satisfactory use of several compounds.

WATER POWER

Federal Act. Provisions of the Federal Water-Power Act. Eng. News-Rec., vol. 85, no. 5, July 29, 1920, pp. 204-208. Abstract of law creating federal power commission and permitting long-time use of water on government lands and navigable streams.

Utilization, Recent Advance. Recent Advances in Utilization of Water Power, Eric M. Bergstrom. Jl. Instn. Mech. Engrs., nos. 1 and 2, Féb. and March 1920, pp. 55-128, 129-151, and (discussion) 152-158, 51 figs. Also Eng., vol. 109, no. 2822, no. 2823, no. 2824, Jan. 30, 1920, Feb. 6, 1920, Feb. 13, 1920, pp. 140-143, 191-197 and pp. 227-232, 50 figs. Outstanding developments enumerated are: Exclusive use of Francis reaction turbines for low and medium heads and Pelton impulse wheels for high heads; extension of use of Francis turbines under heads approaching 800 ft., and Pelton wheels in single stage up to 5,500 ft.; exclusive adoption of balanced wicket gates for regulation of Francis turbines and circular nozzle with combined deflector and needle regulation for Pelton wheels; standardization of turbine runners and increased specific speed; increase of output per unit, maximum output at present being 31,200 b.hp.; increase of overall efficiency; exclusive use of oil-pressure governors; efficient regulation by means of differential surge tanks of turbines using long pipe lines; and employment of large diameter pipe lines under high heads.

WATER SUPPLY

Conduit Capacity and Storage. Estimation of Conduit Capacity in Relation to Storage, Frederic H. Hapgood. Eng. News-Rec., vol. 85, no. 4, July 22, 1920, pp. 153-154, 1 fig. Calculations made in connection with studies for new water supply for New Britain, Conn. Problem was finding most economical combination of capacities of retarding reservoir and pipe line to provide sufficiently complete development of drainage area selected.

Pumping by Hydraulic Power. Pumping Croton Water by Hydraulic Power: Water Supply of New York, Winfred D. Hubbard. Jl. of Am. Water Works Assn., vol. 7, no. 4, July 1920, pp. 461-470, 2 figs. Only approximately 50 per cent of Croton has been in use because of low service. It is planned to use centrifugal pumps which would take Croton water from low-service mains and deliver it to intermediate service, which is much more in demand.

Waste Control. Water Waste Control. Jl. of Am. Water Works Assn., vol. 7, no. 4, July 1920, pp. 488-515, 2 figs. Informal discussion by New York Section of Assn. Deals with conditions in New York City and vicinity and in Buffalo, N.Y.

WATER WORKS

Appliances, Standardization of. Standardization of Water Works Appliances. Adolph Mueller. Contract Rec., vol. 34, no. 28, July 14, 1920, pp. 668-669. As an example of unnecessary number of appliances, it is stated that 128 cities use 332 styles of corporation cocks where three patterns in seven sizes would answer.

See also Pumping Stations.

WELDING

Eye Protection. Eye Protection in Welding Operations, R. R. Butler. Eng., vol. 109, no. 2842, June 18, 1920, pp. 823-826, 7 figs. Reasons why protection is needed for the eye and properties of glasses for protecting eyes from injurious radiations. Paper read before British Acetylene & Welding Assn.

High-Pressure Cylinders. Proposed French Regulations for High Pressure Cylinders. Welding Engr., vol. 5, no. 7, July 1920, pp. 34, 36 and 42. Proposed regulations for metallic containers for compressed, liquified and dissolved gases.

See also Aluminum,, Welding of: Electric Welding; Electric Welding, Arc; oxy-acetylene welding.

WELFARE WORK

Mines. Welfare Work at the Homestake Mine, B. C. Yates. Eng. and Min. Jl., vol. 110, no. 5, July 31, 1920, pp. 198-203, 7 figs. Avoidance of paternalism, a lively interest in clean amusement, and development of the community spirit, it is said, have been the guiding Influences in shaping the human engineering plan followed by the Homestake Mining Co., Lead, S. D.

Shop Papers. Human Interest in the Employees' Magazine, John T. Bartlett, Indus. Management, vol. 60, no. 2, Aug. 1920, pp. 112-115. Editorial attitude to assume in shop papers. Examples of articles published in shop papers which have developed interest among employees.

Steel Industry. How Corporation Aids Workers, C. L. Close. Iron Trade Rev., vol. 66, no. 24, June 10, 1920, pp. 1685-1690, 5 figs. Welfare work, accident prevention, stock subscription for employees and pension funds have entailed expenditure of $71,651,731 since 1912. Multiplicity of interests of U. S. Steel Corp., described by department manager. Paper read before Am. Iron and Steel Inst.

WIRE DRAWING

Steel, Theory of. Steel Wire and Wire Drawing, E. A. Atkins, Eng., vol. 109, nos. 2839 and 2840. May 28 and June 4, 1920, pp. 731-734, 19 figs., and 749-752, 15 figs. Theory of wire drawing, with photomicrographs showing deformation of crystals during flow of steel and stress-strain diagrams of various alloy steels. Impurities in steel as they affect wiredrawing. Paper read before Liverpool Eng. Soc.

WOODWORKING INDUSTRY

Need of Engineering Skill in. The Engineer and the Woodworking Industry, Thomas D. Perry. Mech. Eng., vol. 42, no. 8, Aug. 1920, pp. 448-450, 3 figs. Scope of woodworking field is outlined and engineering problems involved are presented. It is said there exists an urgent need of engineering skill in woodworking industry.

Engineering Index

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A

TORPEDOPLANES. German Torpedoplanes (Deutsche Torpedoflugzeuge), Werner v. Langsdorff. Schiffbau, vol. 21, no 32, June 30, 1920, pp. 873-874. Account of types used successfully during war, designed by K. Roesner of the Gotha car shops, developed from the double-engine giant aeroplane Gotha, which is also constructed as a seaplane. Also used as observation planes and for transportation of troops in rapid occupation of small islands, etc.

WINGS. Preliminary Choice of a Wing Section, W. F. Gerhardt, B. C. Boulton and L. V. Kerber. Aerial Age, vol. 11, no. 25, Aug. 30, 1920, pp. 839-841 and 849. Analytical tests are suggested for preliminary evaluation of aerofoils best adapted for given conditions of aeroplane design.
The Alula High-Lift Wing. Aerial Age, vol. 11, no. 25, Aug. 30, 1920, pp. 836-838, 3 figs. Data on wing recently developed in England.

AIR PUMPS

RADOJET. The Radojet Air Pump, M. C. Stuart and Arthur H. Senner. Jl. Am. Soc. Naval Engrs., vol. 32, no. 3, Aug. 1920, pp. 347-471, 32 figs., partly on 9 supp. plates. Results of tests made at U. S. Naval Eng. Experiment Station, Annapolis, Md. on two Radojet air pumps manufactured by C. H. Wheeler Manufacturing Co.

AIRCRAFT CONSTRUCTION MATERIALS

MCCABE SLEEVE. The McCabe Sleeve, I. E. McCabe. Aviation, vol. 9, no. 2, Aug. 15, 1920, pp. 60-62, 2 figs. McCabe sleeve is a wire-rope fastener applied by use of mechanical means only and has been developed chiefly for use on aircraft. Method of forming it is explaned.

See also Wood, Moisture-Resistant Finishes.

DETERMINATION OF RESISTANCE. Determination of the Resistance of Airship Models, R. H. Smith, Aviation, vol. 9, no. 2, Aug. 15, 1920, pp. 44-47. Comparative value of Eiffel and bell-crank aerodynamic balances.

AIRSHIPS

NON-RIGID. Model Test for Strength and Deformation of Non-Rigid Airship Hulls, J. C. Hunsaker. Aviation, vol. 9, no. 2, Aug. 15, 1920, pp. 53-54, 3 figs. Aircraft Technical Note, Bureau of Construction and Repair, Navy Dept.

ALCOHOL

SYNTHETIC. Synthesis of Alcohol by Loisy Process (L'alcool de synthèse par le procédé de Loisy). Journal des Usines à Gaz, vol. 44, no. 13, July 5, 1920, pp. 193-195. Reaction consists of absorption of ethylene by concentrated sulphuric acid with formation of sulphovinic acid, saponification of this by water, with regeneration of dilute sulphuric acid and production of alcohol.

ALLOY STEELS

HEAT TREATMENTS FOR. Some Commercial Heat Treatments for Alloy Steels, A. H. Miller. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 506-508, 11 figs. Deals with heat treatment of alloy steels used for structural purposes, specially of nickel and nickel-chrome steel, and described series of tests which were conducted to determine effect of various heat treatments on samples of same chemical composition, results being illustrated by series of photomicrographs showing effect of different adjustments of temperature, time and rate of cooling of heat treatment.

IMPACT TENSILE TESTS. Impact Tensile Tests with Alloy Steel (Schlagzugversuche mit Sonderstählen), A. Gessner. Stahl u. Eisen, vol. 40, no. 23, June 10, 1920, pp. 781-783, 1 fig, Results of impact tests show that alloy steels of pronounced tenacity, even up to a tensile strength of 100 kg. per sq. mm. and in spite of the extremely short duration of the impact stress—0.003 to 0.005 sec.—give higher values for elongation, construction and resilience than those with steady stress in the static tests.

MANUFACTURE. The Production of Tool Steel, Fred. R. Daniels. Machy. (N.Y.), vol. 27, no. 1, Sept. 1920, pp. 42-46, 8 figs. Processes employed in steel mill of Ludium Steel Co., Watervliet, N.Y., which is engaged exclusively in manufacture of tool and special alloy steels.

ALLOYS

DEVELOPMENTS. Alloys of the Past and Present, Colin G. Fink. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 471-473, 2 figs. Review of recent developments in production of pure metals, ferroalloys, bronzes and brasses and of increasing uses for less common metals and their alloys. Research suggestions for production of special alloys.

ELECTRICAL MELTING. Electrical Melting of Alloys—XIII, H. W. Gillett. Foundry, vol. 48, no. 354, Sept. 1, 1920, pp. 693-695. Future of electric furnace in alloy industry is considered as a whole and in reference to different types of furnaces and possibilities of each class.

ALUMINUM

NICKEL PLATING. Nickel Plating of Aluminum (Nickelage de l'aluminium), Léon Guillet and M. Gasnier. Revue de Métallurgie, vol. 17, no. 5, May 1920, pp. 351-359, 10 figs. Results obtained by first roughening surface of aluminum with sand blast, also with preliminary copper plating before plating with nickel.

WIRE JOINTS. Investigations of the Size and Durability of Wire Joints with Special Regard to Aluminum (Untersuchungen über die Grösse und Beständigkeit von Kontaktverbindungen unter besonderer Berücksichtigung des Aluminums), Rudolf Richter. Elektrotechnische Zeitschrift, vol. 41, nos. 18, 19, 20, 21, 22 and 23, May 6, 13, 20, 27, June 10, 1920, pp. 345-351, 367-370, 386-392, 409-413, 433-435 and 448-452, 19 figs. Results of investigations extending over 3½ years of 421 screwed, riveted, soldered and twisted joints of aluminum and other metallic wires showed that in every respect satisfactory screw and solder joints between aluminum and other metals are possible; twisted and riveted joints with aluminum are unreliable; position of metals to be joined in the electric contact series has no important bearing on size and durability of the joints.

ALUMINUM ALLOYS

ALUMINUM-COPPER. Some Theoretical Principles of Alloying, Robert J. Anderson. Chem. & Metallurgical Eng., vol. 23, no. 9, Aug. 25, 1920, pp. 317-320, 6 figs. Discussion of possible applications of such general concepts as may be drawn from equilibrium diagram, heat of alloy formation, thermit reaction, diffusion and solution to problems connected with production of aluminum-copper alloys in the foundry.

INDUSTRIAL USES. Alloyed Aluminum as an Engineering Material, G. M. Rollason. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 495-500, 11 figs. Traces improvement in development of commercial alloys, presenting in connection therewith photomicrographs on alloys commonly used, discusses subject of casting of aluminum as well as methods employed in both cold and hot rolling of metal, and visualizes possible future uses of aluminum and its various alloys.

USES IN AUTOMOTIVE INDUSTRY. Aluminum Alloys, Zay Jeffries. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 295-299 and p. 305, 14 figs. Effect of aluminum alloying on its physical properties, and uses of aluminum alloys in automotive industry.

See also Duralumin.

AMMONIA

SYNTHETIC. The Direct Synthetic Ammonia Process, R. S. Tour. Jl. Indus. & Eng. Chem., vol. 12, no. 9, Sept. 1920, pp. 844-852, 7 figs. General outline of process as developed by Fritz Haber, of Karlsruhe, Germany, and C. Bosch, of Hadische Anilin und Soda Fabrick of Ludwingshafen, Germany.

APPRENTICES, TRAINING OF

FORD MOTOR CO. Training 300 Apprentice Die-Makers with One Instructor, Norman G. Shidle. Automotive Industries, vol. 43, no. 10, Sept. 2, 1920, pp. 472-475, 6 figs. Course given at plant of Ford Motor Co.

AQUEDUCTS

REINFORCED-CONCRETE. The Construction of the Pouilles Aqueduct (L'achèvement de l'aqueduc des Pouilles). Génie Civil, vol. 77, no. 6, Aug. 7, 1920, pp. 105-109, 13 figs. Details of reinforced-concrete siphones. (Concluded.)

AUTOMOBILE ENGINES

ALUMINUM IN. The Status of Aluminum in the Automobile Engine, J. Edward Schipper. Automotive Industries, vol. 43, no. 10, Sept. 2, 1920, pp. 468-470, 6 figs. After five years of development, engineers are unable to agree as to future of lighter metal. Most of those who are using it for pistons are firm believers, but there seems to be limit in size. It is popular for crankcase housings, but has not been adaptable for axle manufacture.

CONNECTING RODS. Seventy-Five Operations Give Accuracy in Connecting Rod Production, J. Edward Schipper. Automotive Industries, vol. 43, no. 11, Sept. 9, 1920, pp. 522-526, 14 figs. Production methods for manufacturing connecting rods used on Marmon cars.

OFF-SET. The Off-Set Motor (Les Moteurs désaxés), H. Petit. Vie Automobile, vol. 16, no. 711, Aug. 10, 1920, pp. 293-295, 9 figs. Graphs showing comparative lateral pressures in cylinder for ordinary type and off-set type. In off-set motor center of crank does not lie in projection of axis of cylinder.

PISTONS. Cast-Iron and Aluminum Piston, Fred H. Colvin. Am. Mach., vol. 53, no. 9, Aug. 26, 1920, pp. 416-421, 18 figs. Methods used by builders of Studebaker and Oakland cars in machining their pistons.
New Type Aluminum Piston in Cole. Motor Age, vol. 38, no. 9, Aug. 26, 1920, pp. 13 and 29. It is said that an aluminum piston that will not "slap" or stick has been developed by Cole engineers. Such piston is claimed to have worked satisfactorily in trials at Indianapolis motor speedway under A. A. A. suction. No details of piston are given.

RADIATORS. Special Methods for Making Radiators, Fred H. Colvin. Am. Mach., vol. 53, no. 4, July 22, 1920, pp. 176-177, 5 figs. Methods of assembling soldering and testing radiators.

SLEEVE-VALVE. A New Sleeve-Valve Motor: The Serex. Auto, vol. 25, no. 35, Aug. 26, 1920, pp. 896-897, 3 figs. Original features are that main inlet and exhaust ports are differently located from either Argyll or Knight, that it possesses separate fuel admission, and that although it is a four-stroke motor, piston co-operates with sleeve to determine opening and closing of inlet, exhaust and fuel admission ports.

STARTER RING GEAR. Flywheel Starter Ring Gears, Fred H. Colvin. Am. Mach., vol. 53, no. 11, Sept. 9, 1920, pp. 513-515, 1 fig. Manufacture by Ford Motor Co. of steel ring gear that bolts to flyweel and which obviates broken teeth as well as undue wear.

See Igniton; Research, Industrial Laboratories.

AUTOMOBILE FUELS

COMBUSTION OF, REGULATION. Combination of Fuels in Internal-Combustion Engines C. F. Kettering. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 224-227. Regulating combustion by addition of chemicals to fuels. It is visualized that if, for example, automotive industry could get chemical industry to increase coal-tar production of country, enabling aniline to be sold at $2 per gal., and automotive industry would use 1 per cent, then compression of automobile engines could be raised to 100 lb. and thus efficiency of normal running almost doubled.

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BEARINGS, BALL

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BLAST-FURNACE GAS

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BLAST FURNACES

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Heating. [illegible] vol. 130, nos. 3372 and 3373, Aug. 13 and 20, 1930 pp. 150-152 [illegible]

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Porous Concrete Slabs. New Material Used in Manufacturing Building at Newark, N. J. Am. Architect, vol. 118, no. 2331, Aug. 25, 1920, pp. 255-260, 15 figs. Poroux-concrete slabs. Mechanically produced pellets of neutral wax-like material are added to concrete. After slab is formed pellets are removed by application of heat.

Statistics of New Construction Throughout United States. Public Rebels Against Closed Shop System. Iron Trade Rev., vol. 67, no. 8, Aug. 19, 1920, pp. 505-508, 1 fig. While building permits in United States show increase in recent months, it is generally estimated that twice as much construction would be undertaken as at present if labor conditions were more stable.

C

CABLES, ELECTRIC

Underground. Underground Electric Cables (Câbles souterrains d'alimentation), L. Sekutowiez. Industrie des Tramways et Chemins de Fer, vol. 14, nos. 161-162, May-June 1920, pp. 85-100, 14 figs. Technical conditions with which armored cables must comply. Aluminum as conductor. Data on direction of underground cables. (Concluded.) Report prepared for presentation to the International Congress which was to be held at Budapest in 1914.

Unipolar. Unipolar Cables with Lead Sheathing (Câbles unipolaires sous enveloppe de plomb), P. Capdeville. Revue générale de l'Électricité, vol. 8, no. 6, Aug. 7, 1920, pp. 177-181, 8 figs. Formulæ for calculating, for a given network, currents and voltages induced in lead and their influence on the characteristics of copper conductor.

CABLEWAYS

Timber Transportation. Ropeways for the Transport of Timber, P. Stephan. Eng. Progress, vol. 1, no. 9, Sept. 1920, pp. 279-281, 10 figs. Transport upon wooden runners and by means of field railways; ropeways for wide spans. Details of construction and economy.

CAMS

Design of. Rational Study of Mechanisms Operated by Cams (Etude rationnelle des méchanismes commandés par cames), Octave Lepersonne. Revue universelle des Mines, vol. 6, no. 2, July 15, 1920, pp. 122-126. Formula for dimensions for cam in terms of those of return springs.

CANALS

Electric Traction on. Electric Traction on Canals (La traction électrique sur les canaux), M. Tumerelle. Bulletin de la Société française des Electriciens, vol. 10, no. 89, May 1920, pp. 187-198, 1 fig. Economical study based on results of operating various canals electrically in France.

Great Lakes-Atlantic Ocean. The St. Lawrence Route and Welland Ship Canal, Alex. J. Grant. Jl. Eng. Inst. of Canada, vol. 3, no. 9, Sept. 1920, pp. 425-434, 11 figs. Origin, development and construction of canals that form navigation system connecting Great Lakes with Atlantic Ocean via St. Lawrence Route.

Locks. The Lock Foundation, Inner Harbor Navigation Canal, New Orleans, La—The Problem and the Solution, Geo. R. Goathals. Proc. La. Eng. Soc., vol. 6, no. 3, June 1920, pp. 134-158, 8 figs. Lock is located 2000 ft. measured along canal channel, from river. Canal prism between river and lock will be 125 ft. wide, with 30 ft. minimum depth; and between lock and lake, bottom width of 150 ft. and minimum depth of 30 ft. will be provided. Unique feature is that high-level pool may be either on river side or on lake side.

Welland Ship. Progress on New Welland Ship Canal. Can. Eng., vol. 39, no. 11, Sept. 9, 1920, pp. 319-330, 24 figs., partly on supp. plate. Estimated quantities of excavation, concrete and embankments. Review of canal's history, purpose, design and construction, with special reference to 1919 and 1920 work. Program for 1921.

CARBURETORS

Kerosene. A New Kerosene Carburetor. Automotive Industries, vol. 43, no. 12, Sept. 16, 1920, p. 561, 1 fig. Kjellberg carburetor. Kerosene is mixed with portion of air required for combustion and mixture heated by exhaust heat. Further on toward inlet valves extra air is added.

CARS

Pipe Connectors, Automatic. The Beahm Automatic Connector for Train Pipes. Ry. Age, vol. 69, no. 11, Sept. 10, 1920, pp. 451-453, 5 figs. Connector differs from other types in gathering arrangement, in method of attachment to coupler and in means employed for coupling to cars not equipped with connectors.

CARS, FREIGHT

Draft Gears. Draft Gear Tests, U. S. R. A.—Design, Nature and Scope. Ry. Rev., vol. 67, nos. 11 and 17, Sept. 11 and 18, 1920, pp. 383-396 and 425-429, 3 figs. Action and comparative merits of various gears from viewpoint of impact and buffing. Discussion of developments noted in rivet shearing and impact tests. (To be continued.)

CARS, REFRIGERATOR

Gas-Eliminating System. Refrigerator Car Gas Eliminating System. Ry. Mech. Engr., vol. 94, no. 8, Aug. 1920, pp. 545-546, 1 fig. Function of system is to remove from atmosphere of refrigerator the gases produced by bacterial action in breaking down of tissues of product under refrigeration, and it is designed for use with any cooling system. System has been developed and is now controlled by Acme Refrigerator Corporation, Chicago.

CASE-HARDENING

Gas Furnace for. City Gas as a Case-hardening Agent, H. M. Crawford. Metal Trades, vol. 11, no. 9, Sept. 1920, pp. 386-388, 3 figs. Results of carburizing low-carbon steel for seven hours in illuminating gas at various temperatures. Sketch of gas-carburizing furnace.

CELLULOSE

Acetate, Manufacture of. Manufacture of Cellulose Acetate, Maurice Deschiens. Chem. & Metallurgical Eng., vol. 23, no. 11, Sept. 15, 1920, pp. 533-536, 1 fig. Generalities on cellulose acetates. Esterification, Operating conditions, Industrial manufacture by acetylation of modified or natural cellulose with or without solution of cellulose in esterifying bath.

CEMENT GUN

Uses. Cement Gun and Its Uses (Le cement-gun et ses applications générales), M. Bousquet. Vie Technique et Industrielle, vol. 1, nos. 10 and 11, July and Aug. 1920, pp. 294-296 and 399-402, 9 figs. Results of experiments made at experimental laboratory of the Conservatoire national des Arts et Métiers, Paris, France.

CEMENT MANUFACTURE

State-Owned Plant. Should the State Own and Operate a Plant for the Manufacture of Portland Cement? J. C. Nagle. Good Roads, vol. 20, no. 8, Aug. 25, 1920, pp. 92 and 94-95. State-owned plant, it is claimed, would stabilize market prices and reduce fluctuations.

CENTRAL STATIONS

California. The Industrial Load in California. Elec. World, vol. 76, no. 9, Aug. 28, 1920, pp. 428-430, 2 figs. Central station figures for first quarter of year indicate large increases in industrial load.

Expansion in 1920. Central-Station Expansion in 1920. Elec. World, vol. 76, no. 11, Sept. 11, 1920, pp. 518-520. Analysis of returns received indicates that about 1,500,000 kw. will be added to generating capacity of central stations in 1920.

U. S. Census of 1917. U. S. Census of Central Stations 1917. Elec. World, vol. 76, no. 10, Sept. 4, 1920, pp. 476-477, 1 fig. Census indicates 6542 central stations, with installed rating of 8,994,407 kw. and total output of 31,044,049,234 kw-hr. Stationary motors served number 555,924, with continued rating of 9,216,330 hp.

CERAMIC MIXTURES

Colors Produced by Nickel Oxide. A Glaze Study Involving Some Interesting Colors Produced by Nickel Oxide, J. D. Whitmer. Jl. Am. Ceramic Soc., vol. 3, no. 8, Aug. 1920, pp. 663-670. Grays were obtained in tests from oxide of nickel in presence of magnesium oxide.

CHIMNEYS

Concrete. New Concrete Chimney System. Concrete, vol. 17, no. 1, July 1920, pp. 33-34, 4 figs. Coniform design in which monolith is strengthened with series of vertical and integral ribs, half round in section, extending from bottom to top and terminating at base of ornamental top.

CHROME STEEL

Welding. Welding Heat-Treated Chrome Alloy Steel, J. Churchward. Iron Age, vol. 106, no. 11, Sept. 9, 1920, pp. 641-642, 7 figs. How controlling welding heat insured minimum of injury to original structure. Special welding machine employed. Saving defective forgings.

CHROME-NICKEL STEEL

Torsion Elasticity. Torsion Elasticity of Nickel Steels with High Chromium Content (Étude de l'élasticité de torsion des aciers au nickel à haute teneur en chrome), P. Chevenard. Comptes rendus des Séances de l'Académie de Sciences, vol. 171, no. 2, July 12, 1920, pp. 93-96, 3 figs. Charts giving experimentally measured moduli of torsion of various nickel steels containing from 10 to 100 per cent chromium.

Uses in Automotive Industry. Some Applications of Alloy Steels in the Automotive Industry, H. J. French. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 501-505 and p. 547, 9 figs. Reference is made to uses of steel containing 1 per cent nickel and 1 per cent chromium and also 3 per cent nickel and 3 per cent chromium. Data are given for these two steels showing tensile properties and hardness developed in small-size rounds subjected to varying heat treatments. Mention is made of nickel-chromium steels and treatments used for gears and airplane-engine crankshafts. "Streaks" and "temper-brittleness," both encountered in use of nickel-chromium steels are discussed and curves showing tensile properties and hardness of "strainless steel" under varying oil-quenching and tempering treatments are presented, and also results of cutting tests made with cast high-speed steel milling cutters and comparison is given with high-speed cutters made by present-day ordinary methods.

CHUTES

Design. The Design of Chutes and Ore Bins, John S. Watts. Iron & Steel of Canada, vol. 3, no. 8, Sept. 1920, pp. 244-246. Slope to give for different materials. Advantages of making chute in two sections.

COAL DISTILLATION

COAL MINES

COAL MINING

COKE OVENS

Beams, Diagonal Tension in. Reinforcement for Diagonal Tension in Reinforced Concrete Beams, Edward Godfrey. Concrete, vol. 17, no. 1, July 1920, pp. 15-20, 12 figs. It is claimed that in customary designs of reinforced concrete beams, reinforcement is not placed in a position to take care of diagonal tension. A system of bending reinforcing bars diagonally in direction in which diagonal tension is said to take place is offered.

Flat Slabs. New York City Concrete Flat-Slab Regulations. Eng. News-Rec., vol. 85, no. 7, Aug. 12, 1920, pp. 300-302, 2 figs. Standards adopted by Board of Standards and Appeals for uniform use of all boroughs of city.

CONDENSERS, ELECTRIC

Capacities of. Capacities and Condensers (Capacités et condensateurs), P. Bunet. Revue générale de l'Électricité, vol. 8, no. 8, Aug. 21, 1920, pp. 237-250, 11 figs. Comparative study of capacities of various forms of condensers. Examples are worked out of determination of capacities of electric circuits by means of their self-inductance. Opinion is expressed that it is possible to design high-powered condensers, which would be capable of being branched in derivation on high-tension high-power distribution systems.

CONDUITS

Air Chambers in. Researches on Conduits with Air Chambers (Recherches sur les conduites possédant des réservoirs d'air), C. Camichel. Houille Blanche, vol. 19, nos. 41-42, May-June 1920, pp. 111-113, 6 figs. Experiments at Institut Electrotechnique de Toulouse to study behavior of conduits provided with devices for relief of water hammer.

Concrete. Excavation below Arch Bridge Foundations. Public Works, vol. 49, no. 10, Sept. 4, 1920, pp. 205-208, 4 figs. Concrete conduits 25 ft. wide constructed on opposite sides of railroad bridge pier and carried down 12 ft. below pier footings on gravel retained by steel sheet piles.

Method of Building Concrete Tailrace below Stone Arch Bridge Foundation Level. Eng. and Contracting, vol. 54, no. 7, Aug. 18, 1920, pp. 155-157, 5 figs. To keep gravel under grillages from caving in, line of interlocking steel sheet piling was driven on each side of excavation, and as material was dug out, bracing timbers were introduced between two rows of piling.

Reinforced Concrete Conduit under Pressure at the Rioupéroux Hydro-electric Plant (Conduite forcée en béton armé des usines hydro-électriques de Rioupéroux), A. Waechter, Schweizerische Bauzeitung, vol. 76, no. 6, Aug. 7, 1920, pp. 59-61, 6 figs. Diameter of conduit is 8¼ ft. Length is 2017 ft.

CONNECTING RODS

Machining. Connecting Rods for the Fordson Tractor, Fred H. Colvin. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, pp. 273-277, 17 figs. Attention is directed to three-point suspension method of holding and locating connecting rods during various machining operations.

CONVEYORS

Steel-Belt. The Sandvik Steel Conveyor Belt (Stahlförderband System Sandviken), S. Michelson. Fordertöchnik u. Frachtverkehr, vol. 13, no 11, May 28, 1920, pp. 104-105, 4 figs. Describes a Swedish type of steel belt manufactured entirely in one piece in length up to 90 m., which is pliable, of small weight, russ-proof, is durable and easily connected and repaired.

COPPER

Cold-Rolling. The Influence of Cold Rolling on the Physical Properties of Copper, F. Johnson. Eng., vol. 110, no. 2851, Aug. 20, 1920, pp. 257-260, 9 figs. Experimental studies of critical ranges on deformation. Examination of theories which have been advanced to explain existence of critical ranges in cold-worked metals, that is, allotropic theory and recrystallization theory. Paper read before Inst. of Metals.

Extruded Rods. Extruding Brass and Copper Rods, Edward K. Hammond. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 1-4, 7 figs. Methods and equipment employed by Rome Brass & Copper Co., Rome, New York, in production of brass and copper rods by extrusion process.

Leaching. Leaching and Concentrating Mixed Copper Ores, Arthur Crowfoot and Kenneth H. Donaldson. Eng. & Min. Jl., vol. 110, no. 10, Sept. 4, 1920, pp. 471-474, 5 figs. Method used at experimental plant of Arizona Copper Co., which consists in regrinding, dissolution of oxidized copper in weak sulphuric acid and flotation of sulphide slimes.

COPPER METALLURGY

Refineries, Power Problems of. The Power Problem in a Copper Refinery, Lawrence Addicks. Chem. & Metallurgical Eng., vol. 23, no. 7, Aug. 18, 1920, pp. 275-278, 4 figs. Outline of steam recovery possible with waste-heat boilers and steam demand for heating electrolyte, with discussion of bearing of these factors upon problem of choice of prime mover.

Smelter Slag. Selecting a Slag and Apportioning Slag Losses, C. A. Grabill. Eng. & Min. Jl., vol. 110, no. 12, Sept. 18, 1920, pp. 569-572, 2 figs. Details method of calculating slag and matte composition from given charge. Various means of charging for copper loss. Advantages of basing it on iron contents of slag. Second of series of three articles.

CORONA

High-Voltage. The High Voltage Corona in Air, J. B. Whitehead. Proc. Am. Phil. Soc., vol. 59, no. 4, 1920, pp. 245-260, 8 figs. Experimental testing of empirical formulæ for computing losses due to corona discharges. Construction and operation of corona voltmeter for measuring high voltage.

COSTS

England. Engineering Costs, Frank Walker. Eng. & Indus. Management, vol. 4, no. 8, Aug. 19, 1920, pp. 227-232, 3 figs. Statement of costs of labor and materials from July 1914 to June 1920, given in official organ of British Elec. & Allied Manufacturers' Assn.

CRANES

Traveling. Overhead Traveling Crane with Telescopic Cage. Engr., vol. 130, no. 3368, July 16, 1920, pp. 66-67, 2 figs. Crane is capable of lifting 120 tons and is fitted with electric turning gear at hook to facilitate manipulation of work at press and with releasing gear to prevent damage by overloads produced by action of press on work.

Traveling Crane with Lifting Magnet for the Transportation of Long Rolled Steel Sections (Laufkran mit Lasthebemagneten für den Transport von langen Walzeisen), W. Druey. Schweizerische Bauzeitung, vol. 76, no. 6, Aug. 7, 1920, pp. 64-65, 3 figs. Described plant constructed by the Oerlikon Machine Works, consisting of a traveling crane of 5000 kg. carrying capacity and 25 m. span; two lifting magnets are suspended from each end of the 10-m. long runway, with which ten or twelve rail section 15 of 20 m. long can be lifted and transported.

Wooden-Jib. 135-Ft. Wooden Derrick Crane Jib. Eng., vol. 110, no. 2850, Aug. 13, 1920, pp. 206-207, 6 figs. Constructed by Imber Court Engineering Works, Thames Ditton, Surrey, for British Admiralty during war. Working conditions to be fulfilled were that crane with post 50 ft. high was to lift 3-ton load up to platform 100 ft. high. Wooden construction was adopted in perference to steel in order to save weight.

CUTTING TOOLS

Barth Slide Rules. Supplement of Frederick W. Taylor's "On the Art of Cutting Metals"—XI, Carl G. Barth. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 218-225, 6 figs. Presentation of basic formulæ and construction of slide rules for milling and gear cutting.

D

DAMS

Concrete. Light Concretes and the Height of Dams (Les bétons légers et les records de hauteur des barrages), Charles Rabut. Houille Blanche, vol. 19, nos. 41-42, May-June 1920, pp. 85-87, 2 figs. Formulæ for maximum height of dam in terms of specific gravity and ultimate strength of concrete.

Curved. Gravity and Arch Action in Curved Dams, Fred. A. Noetzli. Proc. Am. Soc. of Civil Engrs., vol. 46, no. 6, Aug. 1920, pp. 950-951. Methods for determining for arch dam, proportion of load carried either by gravity, that is, vertical cantilever action, or by horizontal arching. Accuracy of method is believed to compare favorably with that obtained by purely mathematical solution of problem of arched dams. (Abstract.)

Earth. Building the Earth Dams at the Bridge-water Project, Richard Pfaehler. Eng. News-Rec., vol. 85, no. 7, Aug. 12, 1920, pp. 306-309, 5 figs. Three closures of large storage reservoirs built by sluicing earth fill into pool from dumped embankments.

Flood-Check. Flood-Check Dams Formed by Fill behind Wire Frame. Eng. News-Rec., vol. 85, no. 11, Sept. 9, 1920, pp. 506-507, 3 figs. New type of California dam automatically fills with flood debris which causes barrier.

Hydraulic. Hydraulic Dams (Barrages hydrauliques). Houille Blanche, vol. 19, nos. 41-42, May-June 1920, pp. 81-85, 11 figs. Particulars of various structures. (Concluded.)

Hydraulic-Fill. Hydraulic Fill at the Miami Conservancy Dams, C. S. Hill. Eng. News-Rec., vol. 85, nos. 11 and 12, Sept. 9, and 16, 1920, pp. 486-490 and 547-550, 10 figs. Developments which have resulted from study of experiments applied to hydraulic-fill operations of Miami Conservancy District. Among these are included manganese-steel centrifugal pump which, compared with cast iron has doubled output life of pump shells and increased nearly tenfold output life of pump runners, and a new design of pump shell in white iron that has exhibited resistance to wear which indicates output life of 400,000 cu. yd. of heavy gravel and sand fill. Improved sump and pump layout reduces losses of head at suction. Manganese steel doubles and white iron quardruples pump output life.

DIE BLOCKS

Chemical Analyses. Analyses Die Block Requirements, W. C. Peterson. Iron Trade Rev., vol. 67, no. 8, Aug. 19, 1920, pp. 517-519. Standardization of chemical analyses is urged. Squeezing die blocks is considered superior to hammering. Paper read before Am. Drop Forge Assn.

DITCHES

DRAINAGE

DRILLING MACHINES

DURALUMIN

E

EARTH

EDUCATION, ENGINEERING

ELECTRIC LOCOMOTIVES

British. British Electric Locomotives for Freight Service. Ry. Engr., vol. 41, no. 488, Sept. 1920, pp. 368-378, 12 figs. partly on supp. plate. Dimensions: Total weight, 74 tons 8 cwt.; length over buffers, 39 ft. 4 in.; height from rail to center of buffers, 3 ft. 5 in.; height of cab roof from rail, 11 ft. 6 ¾ in.; width of cab, 7 ft. 6 ¼ in.; total wheelbase, 27 ft.; diameter of wheels, 24 ft.; motor equipment of each locomotive consists of four totally enclosed motors, each driving axle through single-reduction twin gearing.

Italian State Railways. A Powerful Three-Phase Locomotive. Elecn., vol. 85, no. 2205, Aug. 20, 1920, pp. 204-206, 5 figs. Line voltage, 3000 to 3700; frequency, 15 to 17; number of traction motors, 2; number of driving wheels, coupled, 6; number of bogie wheels, 8; diameter of driving wheels, 1630 mm.; diameter of bogie wheel, 960 mm.; tractive effort 9000 kg.; power 1670 hp,; synchronous speed, 50 km.-hr.

ELECTRIC MOTORS, A. C.

Synchronous. Influence of Saturation on the Operation of Synchronous Machines (Influence de la saturation sur le fonctionnement des machines synchrones), G. H. Perrin. Revue générale de l'Électricité, vol. 8, no. 3, July 17, 1920, pp. 67-73, 11 figs. Study based on Potier's diagram.

ELECTRIC RAILWAYS

Federal Commission Report. Federal Commission Report. Elec. Ry. Jl., vol. 56, no. 9, Aug. 28, 1920, pp. 398-411. Full text of report. Scope of inquiry was to ascertain actual financial and service condition of electric railways of United States at present, causes which have contributed to such conditions, what readjustments of relations between electric railways and communities which they serve must be brought about in order to restore confidence of public and to put companies upon such financial basis for future as will enable them to render continuous and efficient service to their respective communities.

ELECTRIC RAILWAYS, TRACK

Rail Joints. Progress in Rail Joint Construction, R. C. Cram. Elec. Ry. Jl., vol. 56, no. 9, Aug. 28, 1920, pp. 415-419. Opposite vs. staggered joints. Strength of electric bar-weld joints. Essentials for success of arc-weld type of joint.

ELECTRIC SWITCHES

Oil. Maljournal-Bourron Compression Chamber Oil Interrupter (Disjoncteur Maljournal et Bourron à chambres de compression), P. Charpentier. Revue générale de l'Électricité, vol. 8, no. 7, Aug. 14, 1920, pp. 211-215, 5 figs. Combination of compression chamber and mechanism providing rapid opening of circuit.

ELECTRIC TRANSMISSION LINES

Accounting. Utility Construction Accounting. Elec. World, vol. 76, no. 12, Sept. 18, 1920, pp. 574-575, 1 fig. Urges using accounting system on construction of transmission and distribution lines and similar undertakings.

Calculation of. Modern Methods of Designing and Operating High-Tension Electric Transmission Lines (Sur les méthodes modernes de calcul et sur le régime de fonctionnement des lignes de transmission d'énergie à haute tension), A. Blondel. Revue générale de l'Électricité, vol. 8, no. 6, Aug. 7, 1920, pp. 163-174, 8 figs. Graphs for simplifying calculations involving hyperbolic functions. (Continuation of serial.)

"Half-Wave" Lines. "Half-Wave" Electric Transmission Lines (Sur les lignes de transport d'énergie demi-onde), M. E. Brylinski. Bulletin de la Société française des Électriciens, vol. 10, no. 89, May 1920, pp. 169-185. Comparative value of "half-wave" and "quarter-wave" lines for transmission of electric power at great distances.

High-Tension. Arcing Grounds on High-Tension Lines. W. D. A. Peaslee. Elec World, vol. 76, no. 9, Aug. 28, 1920, pp. 424-427, 6 figs. Experimental investigation of the voltage stress on insulators and connected apparatus on high-tension transmission lines due to normal-frequency voltage and the high-frequency surges caused by arcing grounds.

ELECTRIC TRANSMISSION LINES

High-Tension. Design and Operation of High-Tension Electric Transmission Lines (Sur les méthodes modernes de calcul et sur le régime de fonctionnement des lignes de transmission d'énergie à haute tension), A. Blondel. Revue générale de l'Électricité, vol. 8, nos. 5, 7 and 8, July 31, Aug. 14 and 21, 1920, pp. 131-141, 195-206 and 227-236, 16 figs. Technical and graphical study. Graphical method of computing characteristics. Suggested generalization of Brown diagram. Maximum power transmissible and maximum efficiency attainable.

Induction Coefficients. Induction Coefficients of Electric Transmission Lines (Coefficients d'induction des lignes électriques), P. Capdeville. Revue générale de l'Électricité, vol. 8, no. 5, July 31, 1920, pp. 152-156, 6 figs. Process for computing coefficients by introducing return conductor necessary to consideration of flux, but limiting its position in finite space.

110,000-Volt. Transportation of Electrical Energy at 110,000 Volts between Gösgen, Switzerland, and Pouxeux, Vosges, France (Transport d'énergie électrique à 110,000 volts entre Gösgen (Suisse) et Pouxeux (Vosges), P. Caufourier. Génie Civil, vol. 77, no. 4, July 24, 1920, pp. 65-69, 13 figs. Total length of line is 115 miles. Power transmitted is 15,000 kw.

Protection of. Current-Balance Relay Protection, E. R. Stauffacher. Elec. World, vol. 76, no. 10, Sept. 4, 1920, pp. 465-467, 3 figs. Necessity for development of new system of relay protection where duplicate parallel lines are operated is met by current-balance relay.

Protection of Transmission Systems—II, Emil Alm. Elec. World, vol. 76, no. 8, Aug. 21, 1920, pp. 377-380, 3 figs. Analysis of abnormal voltages which may occur on transmission systems and methods adopted by company in Sweden to protect station apparatus from insulation breakdown.

Stresses Due to Rupture of a Span. Elastic Equilibrium of an Aerial Line of an Indefinite Number of Spans When One Span Fails (Sur l'équilibre élastique d'une ligne aérienne formée d'un nombre indéfini de travées identiques, quand les fils d'une travée sont rompus), E. Batilce. Revue générale de l'Électricité, vol. 8, no. 4, July 24, 1920, pp. 100-102. It is assumed that the number of supports on either side of failing span is large enough to permit normal tension to exist at certain distances from failure. Equations are derived and applied to numerical case.

Tension and Sag Calculations. Charts Show Tension and Sag for Transmission Lines. Elec. World, vol. 76, no. 11, 1920, pp. 529-530, 3 figs. Charts for finding proper sag and tension when given a line to string, so that allowable stress will not be exceeded in cold or windy weather, and also to determine what sag will correspond to any given tension under present conditions.

ELECTRIC WELDING

Machines. Electric Welding Machines—Factors Influencing Their Operation, L. W. Webb. Power, vol. 52, no. 9, Aug. 31, 1920, pp. 337-338, 2 figs. Curves showing amount of reactance required in welding circuit for different values of current.

ELECTRIC WELDING, ARC

Automatic Machines. Automatic Electric Arc Welding Machine, H. L. Unland. Am. Mach., vol. 53, no. 9, Aug. 26, 1920, pp. 403-406, 8 figs. Types built by General Elec. Co. Paper read before Am. Welding Soc.

Cast Iron. Welding Cast Iron with the Electric Arc, Robert E. Kinkead. Welding Engr., vol. 5, no. 8, Aug. 1920, pp. 23-24. Comparative advantages of oxy-acetylene and electric processes for welding cast iron. Paper read before American Welding Society.

ELECTRICAL APPARATUS

Testing. Polyphase Experimental and Instrument-Testing Table, H. P. Sparkes. Elec. World, vol. 76, no. 8, Aug. 21, 1920, pp. 380-381, 2 figs. Switchboard used in testing laboratory of Westinghouse Electric & Manufacturing Company for polyphase experiment tests.

ELECTROLYTIC CELLS

Cylindrical. The Cylindrical Electrolytic Cell, L. D. Vorce. Chem. Age, vol. 28, no. 8, Aug. 1920, pp. 279-281, 2 figs. Comparison of cylindrical and box-shaped cells. Paper read before Am. Inst. Chem. Engrs.

EMPLOYMENT MANAGEMENT

Automobile Plants. Employment Department Increases Efficiency of Office Personnel, Norman G. Shidle. Automotive Industries, vol. 43, no. 12, Sept. 16, 1920, pp. 576-578, 9 figs. Results obtained by applying effective personnel methods in office work at large automobile plant.

Development of Department. How an Effective Employment Department Is Being Developed, Norman G. Shidle. Automotive Industries, vol. 43, no. 8, Aug. 19, 1920, pp. 370-373, 7 figs. It is said that large expenditures and elaborate equipment are not essential to successful operation of employment department, and that intelligent vision and progressive development are of more importance. System of records in use in employment department of Detroit automobile manufacturer is explained.

Record Forms. Aids for the New Employment Manager, F. Morgan Keyser. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 245-247, 2 figs. Suggested forms for recording term of service and for showing total separations by periods.

Vocational Tests. Psycho-Technics in Germany, Alfred Gradenwitz. Am. Mach., vol. 53, no. 9, Aug. 26, 1920, pp. 407-408, 6 figs. Apparatus used in German laboratory to pick out right man for job.

ENGINEERING SOCIETIES

Federated Engineering Societies. Federated Engineering Societies of America, Arthur P. Davis. Eng. World, vol. 17, no. 3, Sept. 1920, pp. 198-201. Reasons for establishing Federated Engineering Societies. Work Federation will accomplish. Why this work cannot be accomplished by any other society.

ENGINEERS

Licensing. Legislation Governing Practice of Engineers. Contract Rec., vol. 34, no. 33, Aug. 18, 1920, pp. 784-787. Act recently passed in Nova Scotia.

ETHYLENE

Recovery from Coal. Recovery of Ethylene from Coal. Colliery Guardian, vol. 120, no. 3112, Aug. 20, 1920, p. 533, 1 fig. Process for treatment of gaseous products from coke ovens, patented jointly by Ernest Bury and Skinningrove Iron Co., Ltd.

F

COMPARATIVE COST. Comparative Cost of Fuels, M. Kinoshita. Dom. Eng. (Lond.), vol. 40, no. 20, Aug 1920, pp. 123-124, 1 fig. Alignment chart indicating actual cost of obtaining 100,000 B.t.u. and 1 hp-hr. as mechanical energy from solid, liquid and gaseous fuel, and also electric energy, for given price, calorific value and efficiency.

ECONOMY. Fuel Economy. Engr., vol. 130, no. 3374, Aug 27, 1920, pp. 196 and 198. Report of committee appointed for investigation of fuel economy, utilization of coal and smoke prevention, presented at meeting of Chemistry section, British Assn. for Advancement of Science. Among subjects discussed are future standards of gas supplies and alcohol from coke oven gas.

LIQUID. Calorific Power of Liquid Fuels (Pouvoir calorifique des combustibles liquides), H. Décluy. Journal des Usines à Gaz, vol. 44, no. 13, July 5, 1920, pp. 195-196. Table of equivalents with coal.

See also Coal; Lignite; Pulverized Coal.

FURNACES, ANNEALING

STOKER-FIRED TANDEM. Sheet, Pair and Annealing Furnaces—I, C. F. Poppleton. Iron Age, vol. 106, no. 12, Sept. 16, 1920, pp. 714-717, 2 figs. Typical tandem combination sheet and pair furnaces originally designed for use of producer gas and later changed with specially corrugated tiles. It is arranged with two doors and pairs are charged to back and front of hearth alternately. Stoker is placed centrally on longitudinal center line of sheet and pair furnace with its combustion grates on either side of feeding worm. (To be continued.)

FURNACES, BOILER

TWO-STAGE. Two-Stage Combustion (La combustion en deux temps), Henry Dieterlen. Chaleur et Industrie, no. 4, July 1920, pp. 206-214, 17 figs. Boiler furnace said to have been developed from results obtained in extensive experimental researches of combustion. Furnace consists of four parts: Continuous furnace with mechanism for regulating proportions of fuel and air; first boiler element intended to cool gases to temperature near minimum at which they can be reignited; mechanism for thoroughly mixing cooled gases; second boiler element where exchange of heat takes place. Furnace is said to be capable of application to any type of boiler and for burning any fuel.

FURNACES, HEAT-TREATING

NEW TYPE. New-Heat Treating Furnace. Iron Age, vol. 106, no. 11, Sept. 9, 1920, p. 644, 2 figs. Similar to pusher type. It has no skid rails or other metal in floor, all beams being covered with fire tile. Manufactured by Advance Furnace & Eng. Co., Springfield, Mass.

FURNACES, HEATING

ROLLING MILLS. Experimental Study of Reheating of Metallic Pieces in Forging Furnaces (Études expérimentales sur le réchauffage des pièces métalliques dans les fours de forge), Félix Verdeaux. Revue de Métallurgie, vol. 17, no. 5, May 1920, pp. 312-334, 23 figs. Experiments with continuous and non-continuous furnaces with automatic and non-automatic grates, of type usually employed in rolling-mills.

G

GAGES

INTERCHANGEABLE MANUFACTURE. Gages in Interchangeable Manufacturing—I and II, Earle Buckingham. Machy. (Lond.), vol. 16, nos. 411 and 413, Aug. 12 and 26, pp. 576-582 and 637-642, 39 figs. Types of gages and gaging devices employed in manufacturing interchangeable parts.

LAPPING. Accurate Lapping, L. J. Vorhees. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, pp. 263-265, 3 figs. Instructions for gage lapping and for making laps.

LIMIT PLUG. Quantity Production of Combination Limit Plug Gages. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 59-61, 4 figs. Description of new system of limit plug gages developed by Taft-Pierce Mfg. Co., and methods employed in their manufacture on quantity production plan. Limit plug gage made to this system consists of (1) gage handle, (2) "go" plug gage unit, (3) "not go" plug gage unit, (4) and (5) screws for holding gage units to handle. Principle advantage is possibility of interchanging gage units according to actual limits required in any one case.

MANUFACTURE. Elements of Gage Making—IX and X, C. A. Macready. Am. Mach., vol. 53, nos. 4 and 6, July 22 and Aug. 5, 1920, pp. 167-169 and 253-255, 11 figs. Fixtures for grinding of radii to points of tangency. Use of sine bar as means to obtain greater degree of accuracy.

PLANER-TOOL-SETTING. Precision Type of Planer-Tool-Setting Gage. Machy. (Lond.), vol. 16, no. 414, Sept. 2, 1920, pp. 681-683, 4 figs. Tool-setting gage provided with Vernier for obtaining direct readings and with means for securing quick and accurate adjustments.

SCREW, HARDENING OF. The Hardening of Screw Gages with the Least Distortion in Pitch, Wilfrid J. Lineham. Am. Mach., vol. 53, no. 12, Sept. 16, 1920, pp. 547-551, 14 figs. Hardening of screw gages at Goldsmith's college to find means of quenching steel after heating so that distortion along pitch line should be reduced to minimum. Paper read before Instn. Mech. Engrs.

TOLERANCES. Chart for Determining Fit Allowances, J. B. Conway. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, p. 17. Chart for determining tolerances and limits to be allowed for various classes of fits.

See also Screw Threads, National Screw Thread Commission.

GAS ENGINES

BLAST-FURNACE-GAS OPERATED. Gas Blowing Engines at Jarrow. Iron & Coal Trades Rev., vol. 101, no. 2739, Aug. 27, 1920, pp. 260-262, 5 figs. Notable feature is casting of cylinder body in two halves, each half being cast with valve portion at bottom and with large head of metal above central flange. Two halves are hydraulically forced over liner. Pistons, built according to Galloways' patent, are water-cooled.

MODERN TYPES. Modern Large Gas Engines, H. Dubbel. Eng. Progress, vol. 1, no. 9, Sept. 1920, pp. 282-286, 12 figs. Details of Nürnberg, Körting and other types.

GAS MANUFACTURE

LIGNITE GAS. Lignite for Gas Making, W. D. Wilcox. Gas Rec., vol. 18, no. 4, Aug. 25, 1920, pp. 11-14. Tests. Gas from sub-bituminous coal had heat value of about 550 B.t.u.: lignite gave gas slightly better than 450 B.t.u. before purification.

See also Water Gas.

GASES

COMPRESSED, CONTAINERS FOR. High-Pressure Seamless Steel Cylinders. Iron Age, vol. 106, no. 7, Aug. 12, 1920, pp. 377-379, 12 figs. How containers for gases are made from tubes by piercing process and from flat plates by cupping process.

GASOLINE

DISTILLATION. Durability of Electric Heaters for Gasoline Distillation, W. A. Jacobs and E. W. Dean. Chem. & Metallurgical Eng., vol. 23, no. 8, Aug. 25, 1920, pp. 343-344. Bureau of Mines electric gasoline distillation heater and commercial device sold for same use were subjected to life tests at maximum current load. Each failed at end of approximately 500 hr. Bureau heater through deterioration of resistance wire, and commercial heater through disintegration of block of insulating material holding resistance wire. From reports of Investigations, U. S. Bureau of Mines.

PRODUCTION FROM HEAVY OIL HYDROCARBONS. Production of Motor Gasoline from Heavy Oil Hydrocarbons, Fred W. Padgett. Chem. & Metallurgical Eng., vol. 23, no. 11, Sept. 15, 1920, pp. 521-525, 3 figs. Study of possible reactions taking place in cracking pehnomena, noting particularly action of catalysts upon heating and composition and refining of pyrolytic distillates.

QUALITY. Motor Gasoline Survey of Bureau of Mines. Automotive Industries, vol. 43, no. 12, Sept. 16, 1920, pp. 575 and 583, 1 fig. Tests of samples taken in various large cities of country during latter part of July compared with similar tests made in January last. Increase in average boiling point regarded as seasonal change.

SUBSTITUTES. Alternatives to Motor Spirit. Petroleum Times, vol. 4, no. 82, July 31, 1920, pp. 131-132. Report of British Fuel Research Board.

SURVEY IN U. S. Internal-Combustion Engine Gasoline Survey, N. A. C. Smith. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 300-301. Curves showing how average distillation of gasoline samples secured from principal cities in U. S. in Bur. of Mines surveys compares with Government specification.

GASOLINE ENGINES

TOLPUTT SLIDE-VALVE. The Tolputt Slide-Valve Engine. Autocar, vol. 45, no. 1297, Aug. 28, 1920, pp. 371-372, 2 figs. Cylinder block with slide valve gear, intended to take place of ordinary poppet-valve cylinders on crankcase of existing engine.

GEAR CUTTING

SHARPENING CUTTERS. Sharpening Hobs and Cutters. Carl G. Olson. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 11-13, 14 figs. Points to be considered in obtaining good results in cutting of gears.

SPUR-GEAR MACHINE. New Spur Gear Generating Machine. Machy. (Lond.), vol. 16, no. 414, Sept. 2, 1920, pp. 684-685, 4 figs. Massive puncher slotting machines, in which bed and head are cast together to insure rigidity designed and constructed by William Muir & Co., Ltd., Manchester, England.

See also Hobbing Machines.

GEARS

ELLIPTIC. The Manufacture of Elliptic Gears (Construction des engrenages elliptiques), P. Massot. Ouvrier Moderne, vol. 3, no. 1, April 1920, pp. 1-5, 4 figs. Milling method.

HORSEPOWER CHARTS. A Horsepower and Torque Chart, John S. Watts. Am. Mach., vol. 53, no. 4, July 22, 1920, p. 191, 1 fig. Chart for determining sizes of gears or pulleys required to transmit given horsepower at speed given in revolutions per minute.

Horsepower Chart for Gear Teeth, William W. Gaylord. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 62-63, 1 fig. Chart from which horsepower transmitted by gear can be read when load is known.

INTERMITTENT-MOTION. A Mutilated Gear Feed, William Gumprich. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, pp. 250-252, 3 figs. Modification of Geneva stop.

INVOLUTE. The Involute Gear, Francis W. Shaw. Machy. (Lond.), vol. 16, no. 412, Aug. 19, 1920, pp. 630-632. Argument against contention of A. Fisher (see Machy. pp. 388 and 517) that Fisher gear reduces pressure.

H

HOBBING MACHINES

HOISTING

River-Flow Measurements. Measuring River Flow for Hydro-Electric Plant Operation, R. D. DeWolf. Power, vol. 52, no. 10, Sept. 7, 1920, pp. 361-363, 4 figs. Chart for estimating pond capacity, river flow, and period that given load can be carried with pond at given level.

Queenston-Chippawa Development. Electrical Features—Queenston-Chippawa Development, E. T. J. Brandon. Jl. Eng. Inst. of Canada, vol. 3, no. 9, Sept. 1920, p. 445. Vertical shaft generators of 45,000 kva. capacity operating at 12,000 volts, 25 cycles, 187½ r.p.m., with thrust bearings designed to carry load of about 100,000,000 lb.

Hydraulic Installation of the Queenston-Chippawa Development, M. V. Sauer. Jl. Eng. Inst. of Canada, vol. 3, no. 9, Sept. 1920, pp. 440-444, 5 figs. Features described are canal control gate, ice chutes, screens, removable gates, penstocks, Johnson valves, turbines, governor system, control pedestals and service units.

The Design of the Queenston-Chippawa Power Canal, T. H. Hogg. Jl. Eng. Inst. of Canada, vol. 3, no. 9, Sept. 1920, pp. 435-439, 6 figs. General description of economics and hydraulics of canal, together with details of methods of design.

The General and Economic Features of the Queenston-Chippawa Development, H. G. Acres. Jl. Eng. Inst. of Canada, vol. 3, no. 9, Sept. 1920, pp. 446-452, 9 figs. Development of plant designed with aggregate of 500,000 hp. capacity.

HYSTERESIS

Measurement of. Measurement of Hysteresis Values from High Magnetizing Forces, W. L. Cheney. Scientific Paper of Bur. of Standards, Dept. of Commerce, no. 383, June 19, 1920, pp. 281-289, 3 figs. Apparatus for measuring hysteresis by a modification of "isthmus method." Graphs showing coercive force and residual induction from successively higher maximum magnetizing forces plotted against latter as independent variable up to field of $H = 2500$ gausses.

I

IGNITION

Magneto, Advantages of. Advantages of Magneto Ignition, A. D. T. Libby. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 277-287 and (discussion) pp. 287-290, 15 figs. Advantages claimed are that magneto does not depend upon battery and generator for starting and running, that with it safer starting is assured, that it gives more power with less oil and fuel, cooler and smoother running engines and cleaner spark-plugs and that it does not deteriorate rapidly with age.

INDUSTRIAL MANAGEMENT

Engineering Students, Training in. The Training of Engineering Students in Industrial Management, Bruce W. Benedict. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 492-494, 1 fig. How University of Illinois has organized its school shops upon commercial basis. Plan is based upon recognition of fact that "engineering is primarily manager of human enterprises rather than a technician making plans for others to execute."

Fixing Responsibility. Arranging Functions to Fix Responsibility, A. Whitehead. Eng., vol. 110, nos. 2849, 2850 and 2851, Aug. 6, 13 and 20, 1920, pp. 172-174, 204-206 and 236-237. Organization of shop with a view to avoiding repetition of work by various persons and establishing definite relationships between different departments.

German Engineers and. What Engineers Are Doing in Germany, E. J. Mehren. Eng. News-Rec., vol. 85, no. 12, Sept. 16, 1920, pp. 562-565. Work on standardization and progress in industrial management.

Inspection. Inspection: The Control of Quality—I, George S. Radford. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 169-172. Relation of quality to quantity, cost and marketing.

Production Systems. How Can We Increase Production? Sidney J. Williams. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, pp. 270-272. Address before Eng. Section, Nat. Safety Council.

Interdepartment Production Contest, R. R. Potter. Jl. Soc. of Automotive Engrs., vol. 7, no. 3, Sept. 1920, pp. 258-262, 4 figs. Experience at plant of Fuller & Sons Mfg. Co., Kalamazoo, Mich.

Job Analysis Aid to Production, J. D. Hackett. Iron Trade Rev., vol. 67, no. 11, Sept. 9, 1920, pp. 722-724, 1 fig. Suggested forms of job specification to bring qualifications of worker and requirements of job together.

Shipyards. Results Obtained by Applying Scientific Management in a French Ship Yard, M. Lavallée. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 240-244, 1 fig. Results obtained in application of principles of industrial management in shipyard employing 3000 men. Translated from paper presented before Société d'Encouragement pour l'Industrie Nationale.

Store Keeping. Company Stores—Do They Pay? E. E. Adams. Iron Trade Rev., vol. 67, no. 6, Aug. 5, 1920, pp. 374-377, 4 figs. Writer believes industrial stores do not aid employers in securing labor, but he adds that as buying agencies they are justified by surprising results. Paper read before Am. Drop Forge Assn.

How Do You Regulate Materials?—III, Henry H. Farquhar. Am. Mach., vol. 53, no. 4, July 22, 1920, pp. 151-152, 1 fig. Considerations in regard to issuing goods from storeroom, and classification of materials. Principles to be kept in mind in arranging inter-relationships between various officials entrusted with maintaining material control.

Putting a Store in Your Factory. Leon I. Thomas. Factory, vol. 25, no. 5, Sept. 1, 1920, pp. 687-690. Replies from 120 plants to inquiry concerning their experience with co-operative stores.

See also Interchangeable Manufacture; Taylor System; Time Study.

INDUSTRIAL RELATIONS

Adjustment of Disputes. Adjustment of Labor Disputes in Packing House Industries. Monthly Labor Rev., vol. 11, no. 1, July 1920, pp. 101-105. From seven pamphlets issued by U. S. Administration for Adjustment of Labor Questions arising in certain packing-house industries.

Australia. Development of the Labor Situation in Australia. Monthly Labor Rev., vol. 11, no. 1, July 1920, pp. 59-66. Two systems are in operation in Australia for regulation of wages, hours and general conditions of labor; "wages board" system general aim of which is prevention of disputes by regulation of wages, hours and by special board appointed for specific industry on application or petition; and "industrial arbitration court" system, under which industry does not ordinarily come under review until dispute had actually arisen. Neither operates satisfactorily.

Employers' Association. Association Lessens Labor Difficulties, Gerard Frazar. Iron Age, vol. 106, no. 11, Sept. 9, 1920, pp. 654-657, 5 figs. Industrial situation stabilized in Hartford County, Conn., by co-operative organization of 160 manufacturers.

Justice in. Industry's One Law "Be Square with Your Men," Ernest E. Bell. Iron Trade Rev., vol. 67, no. 3, July 15, 1920, pp. 169-172 and p. 177. Emphasizes that lasting success is only attained by understanding and utilizing human element in accordance with principles of justice.

Open Shop. Detroit Vindicates Open Shop, A. J. Hain. Iron Trade Rev., vol. 67, no. 9, Aug. 26, 1920, pp. 571-574. Fourth city has attained its greatest growth under policy of freedom in industrial employment relations.

Open Shop Gaining in South, Harold F. Podhaski. Iron Trade Rev., vol. 67, no. 12, Sept. 16, 1920, pp. 787-789, 2 figs. Predicts 90 per cent of industries will soon be operating under this plan. Text of open-shop platform adopted by New Orleans Board of Trade and Association of Commerce is included.

See also Shop Committees.

INFLAMMABLE MATERIALS

Liquids Storing of. A Method for Storing and Handling Inflammable Liquids (Ein neues Lagerund Förderverfahren für feuergefährliche Flüssigkeiten), Georg Urff. Automobil-Rundschau, vol. 19, no. 11-12, June 1920, pp. 113-115, 2 figs. Describes apparatus with motor-drum pump for the continuous supply of a given quantity of liquid. (Concluded.)

INSULATORS, ELECTRIC

Suspension. The Designing and Testing of Suspension Insulators. A New Type of Insulator (Sulle caratteristiche e sulle prove degl isolatori sospesi. Nuovo tipo di isolatore), P. G. Venturini. Elettrotecnica, vol. 7, no. 11, Apr. 15, 1920, pp. 174-178, 10 figs. Porcelain insulator developed by writer from technical study of characteristics of such insulators, and from results of experimental work. Insulator is manufactured by Società Ceramica Richard-Ginori.

INSULATORS, HEAT

Form vs. Heat Transfer. The Effect of Geometrical Form upon the Heat Transfer through Insulation, C. E. Rose. Ice & Refrigeration, vol. 59, no. 3, Sept. 1920, pp. 82-84, 4 figs. Analytical methods for computing insulation in three cases, (1) cork board on plain surface, (2) circular pipe insulated with cylinder of insulation, and (3) circular pipe enclosed in square of insulation.

INTERCHANGEABLE MANUFACTURE

Inspection and Testing. Inspection and Testing in Interchangeable Manufacture, Earle Buckingham. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 52-54. Principles involved in inspection of interchangeable parts and duties of inspection department.

See also Gages, Interchangeable Manufacture.

INTERNAL-COMBUSTION ENGINES

Combustion Phenomena. Combustion Phenomena in Internal-Combustion Engines (Die Verbrennungsvorgänge im Explosionsmotor), F. Wirth. Automobil-Rundschau, vol. 19, nos. 11-12 and 13-14, June and July 1920, pp. 104-108 and 126-130. Gives formulæ and methods for calculating loss of heat in engine through exhaust gases, sensible heat of exhaust gases, etc. Notes on combustion temperature and speed; suggestions for improvements of combustion engines; bibliography. (Concluded.)

Fan Brakes for Testing. Fan Brakes for Automobile, Boat and Other Small Engines (Bremsflügel für Automobil-, Boots- und andere Kleinmotoren), Fritz Müller. Motorwagen, vol. 23, no. 12, Apr. 30, 1920, pp. 193-195, 5 figs. Describes fan brakes used during war for the quick measurement of capacity of aerial motors, pointing out that smaller brakes of same type can be used advantageously for the brake testing of automobile, boat and other small engines.

Fuel-Consumption Measurement. A New Type of Fuel- and Oil-Consumption Measurement (Eine neuartige Brennstoff- und Oelverbrauchsmessung), K. Fr. Nägele. Oel- u. Gasmaschine, vol. 17, no. 7, July 1920, pp. 99-102, 8 figs. Details of the Seppeler sampling apparatus by use of which it is possible from samples to determine quickly, simply and accurately amount of fuel consumed.

German Submarines. The Motors of the German Submarines (Les moteurs des sous-marins allemands), H. Tastet and F. Bégue. Technique Moderne, vol. 12, no. 5, May 1920, pp. 204-212, 16 figs. Characteristics: Number of cylinders, 6; dimensions of cylinders, 500 mm. stroke by 450 mm. diameter; total power 1650 hp.; total length of machine, 11 meters; width, 1.074 meters; height 2,407 meters. Built by Germania-Krupp Works.

K

L

LOCOMOTIVE BOILERS

Flue-Tube Joints. Tensile Strength of Various Types of Flue-Tube Joints (Essais à la traction de joints de tuyauterie à lentille et à collerette et de joints mandrinés), M. Bonnin. Revue générale des Chemins de Fer, vol. 39, no. 6, June 1920, pp. 389-393, 6 figs. Tests conducted by Northern Ry. of France.

LOCOMOTIVES

Booster for. The Locomotive Booster. Ry. & Locomotive Eng., vol. 33, no. 9, Sept. 1920, pp. 266-267, 11 figs. Simple two-cylinder steam engine applied to tralling wheels at starting and when going up hill.

British. 2-8-9 Type Superheater Locomotive for the Ministry of Munitions. Eng., vol. 110, no. 2849, Aug. 6, 1920, pp. 176-177, 7 figs., partly on supp. plate. Dimensions; cylinder, 21-in.diameter by 25$\frac{1}{16}$ in. stroke; driving wheels, diameter, 4 ft. 6¼ in.; leading wheels, diameter, 3 ft. 1½ in.; total heating surface, 1715 sq. ft.; superheater surface, 308 sq. ft.; working pressure 135 lb. per sq. in.; length of engine, 38 ft. 9⅝ in.; weight of engine in working order, 71.4 tons.

LOCOMOTIVES

Front-End Air Leaks. How Front-End Air Leaks Can Be Prevented. Ry. Mech. Engr., vol. 94, no. 8, Aug. 1920, pp. 515-516, 5 figs. Account of tests made by Fuel Conservation Section of Railroad Administration to determine exact effect of reducing nozzles and disarranging front end to overcome effects of front-end air leaks.

Valve Gears, Young. Actuating Mechanism of the Steam Locomotive, Ry. & Locomotive Eng., vol. 33, no. 9, Sept. 1920, pp. 260-263, 5 figs. Pistontype valve invented by O. W. Young.

Water-Indicating Devices. Improved Water Indicating Devices Necessary. Ry. Age, vol. 69, no. 9, Aug. 27, 1920, pp. 359-362, 4 figs. Account of recent government tests. It was found that gage cocks screwed directly in boiler do not correctly indicate general water level. Water column that is able to afford safest and most practical method for accurately indicating general water level in boiler under all conditions of service is worked out.

Urgent Need of Improved Water Gage Appliance. Ry. & Locomotive Eng., vol. 33, no. 9, Sept. 1920, pp. 272-278, 11 figs. Tests conducted by Bur. of Locomotive Inspection, Interstate Commerce Commission.

Works. Beardmore's Locomotive Works. Engr., vol. 130, no. 3372, Aug. 13, 1920, pp. 149-150, 11 figs., partly on 2 supp. plates. Reconstruction for locomotive manufacture of works building large gun mounting during war.

Worthington Feedwater Heater. Worthington Open Time Locomotive Feedwater (Réchauffeuralimentateur pour locomotives type "Ouvert," système Worthington), Génie Civil, vol. 77, no. 3, July 17, 1920, pp. 51-53, 7 figs. Heater, feeder, automatic regulator of water level and two pumps, one for cold and one hot water, operated by same steam piston, combined in one unit. Record of tests.

See also Electric Locomotives; Mine Locomotives.

M

MAGNETOS

Ignition. A Gaging Fixture for the Relation of the Cams to Keyway. Automotive Industries, vol. 43, no. 10, Sept. 2, 1920, p. 257, 1 fig. Device for measuring angular relation of breaking point on cam and keyway on shaft of ignition magnetos.

MACHINE SHOPS

College. The Loughborough Technical College. Eng., vol. 110, nos. 2850 and 2851, Aug. 13 and 20, 1920, pp. 199-202, 19 figs., partly on 2 supp. plates, and 232-236, 12 figs. Instrutional factory organized throughout as far as possible as commercial firm.

MACHINE-TOOLS INDUSTRY

Automobile Factories. Labour-Saving Devices in a Motor Car Works. Eng., vol. 130, no. 2273, Aug. 20, 1920, pp. 132-133 and p. 136, 9 figs. Machine tools at works of Vulcan Motor and Engineering Co., Ltd., Crossens, Southport, England.

British. The British Machine Tool Industry. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 23-24. Industry is rapidly reaching more normal conditions although it is not quite up to pre-war standards. New developments are being constantly introduced. Concentration on minimum of varieties is being substituted for pre-war tendencies on part of many firms to undertake any type of tool for which inquiry was received.

German. The German Machine Tool Industry. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, p. 21. Output since 1914 has increased considerably, and export of twist drills and other metal-working tools as well as of precision measuring instruments assumed large proportions during past year.

International Exposition. The Machine Tool and Engineering Exhibition. Eng. Production, vol. 1, no. 9, Sept. 1920, pp. 324-354, 58 figs. Models exhibited.

The Second International Machine Tool and Engineering Exhibition. Machy. (Lond.), vol. 16, nos. 413 and 414, Aug. 26 and Sept. 2, 1920, pp. 655-661 and 687-694, 12 figs. Review of exhibits, including Smith & Coventry spiral-bevel-gear planer; Archdale automatic manufacturing milling machine; Herbert 4-ft. radial drilling machine; Asquith universal portable radial drilling machine.

MACHINERIES

Foundations. New Process of Fixing a Machine on Its Concrete Foundation (Un nouveau procédé de fixation sur les maçonneries), Ouvrier Moderne, vol. 3, no. 1, April, 1920, pp. 18-20, 11 figs. Bolt with cylindrical elements which press against sides of hole in masonry as nut fastening the machine is driven on bolt.

Properties. Variables Bias Malleable Tests, H. A. Schwartz. Iron Trade Rev., vol. 67, no. 6, Aug. 5, 1920, pp. 371-373, 5 figs. Relation between tensile strength and percentage of elongation and diameter of rough and machined specimens is shown in graphically expressed data. Paper read before Am. Soc. for Testing Materials.

MANAGEMENT

Statistics Value of. Commercial Statistics and Their Value to the Executive, G. P. Baldwin. Gen. Elec. Rev., vol. 23, no. 8, Aug. 1920, pp. 648-652, 7 figs. Graphical methods are suggested for preparing statistics for number or orders taken, amount of sales made, and expense incurred by sales office.

MARINE ENGINES

See Diesel Engines.

MARINE STEAM TURBINES

Reproduction-Geared. Geared Turbines with Double Reduction Gear. Eng., vol. 110, no. 2850, Aug. 13, 1920, pp. 211-212 and p. 214, 9 figs., partly on 2 suppl. plates. Turbines are designed to develop aggregate of 3000 hp. Three are ahead turbines arranged in series and two astern turbines fitted, respectively, within low-pressure and intermediate pressure casings. High-pressure and intermediate turbines both gear with one wheel. Low-pressure gears with second wheel on opposite side of propeller shaft. Installation was constructed by the Parsons Marine Steam Turbine Co., Ltd., for S. S. "Corrientes."

Vibration in. Vibration in Ship Turbines (Schwingungen bei Schiffsturbinen), Ingenieure, vol. 64, no. 31, July 31, 1920, pp. 603-605, 4 figs. Frequent turbine disturbances which occurred on a torpedo boat could only be attributed to vibrations of the turbine rotor. Investigation by means of pallographs could not be completed. Opinions of several authorities in regard to case are recorded.

See also Reduction Gears.

MATERIALS

Properties at High Temperatures. The Effect of Temperature on Some of the Properties of Materials, F. C. Lea. Eng., vol. 110, no. 2852, Aug. 27, 1920, pp. 293-298, 31 figs. Results of experiments with aluminum alloys, alloy steels, and concrete cylinders. It was found, for example, for mild steel that maximum strength is passed at 235 deg. cent. At temperatures beyond 300 deg. cent. strength diminished very rapidly and at temperatures from 615 to 640 deg. cent. breaking strength was less than 7 tons per sq. in. Paper read before Eng. Section, British Assn. for Advancement of Science.

Repeated-Stress Safety Factors. Repeated-Stress Safety Factors Quickly Determined, J. B. Kommers. Eng. News-Rec., vol. 85, no. 9, Aug. 26, 1920, pp 393-394. Table of factors based on unit stress and on repetition. Goodman' diagram and recent test date used.

Strength and Suitability. The Strength and Suitability of Engineering Materials C. F. Jenkin. Engr., vol. 130, no. 3374, Aug. 27, 1920, pp. 200-201. Presidential address to Eng. Section, British Assn. for Advancement of Science.

METALLOGRAPHY

Non-Ferrous Castings. Metallography in the Detection of a Substituted Test Coupon, D. J. McAdam, Jr., and Gilbert E. Doan. Jl. Am. Soc. Naval Engrs., vol. 32, no. 3, Aug. 1920, pp. 481-487, 13 figs. Experience in application of matallography to inspection of non-ferrous castings. It was desired to determine history of castings by metallographic analysis.

METRIC SYSTEM

Argument against Adoption in U. S. Report of the Cleveland Chamber of Commerce on the Metric System. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, pp. 283-287, 1 fig. Committee "is not able to believe that the adoption of the metric system will promote....standards and interchangeability."

Why the Westinghouse Company Does Not Use the Metric System. Machy. (N. Y.), vol. 27, no. 1, Sept. 1920, pp. 22. Metric measurements are claimed to complicate shop work because they cannot, as English, be halved and quartered without introducing complicating fractions.

MILLING MACHINES

Crankshaft. Stamets Crankshaft Milling Machine, Ethan Vial. Am. Mach., vol. 53, no. 6, Aug. 5, 1920, pp. 245-248, 7 figs. Construction and operation of machines for quantity milling of odd-shaped crankshaft.

Parkinson. Recent Machine Tool Developments—XV, Joseph Horner. Eng., vol. 110, no. 2852, Aug. 27, 1920, pp. 268-270, 9 figs. Parkinson universal milling machines. (Continuation of serial.)

MINE HAULAGE

Acceleration, Measurement of. Measurement of Acceleration of Haulage Plants (Zur Messung der Beschleunigung auf Förderanlagen), E. Jahnke and C. Keinath. Dingler's polytechnisches Jl., vol. 305, no. 11, May 29, 1920, pp. 119-125, 16 figs. Results of experiments carried out in haulage plants of a number of mines with a described registering acceleration meter constructed by Siemens & Halske.

MINING

NATURAL GAS

Gasoline Content. Factors in Determining the Gasoline Content in Natural Gas by the Absorption Method, D. B. Dow. Reports of Investigations, Bur. of Mines, serial no. 2157, Aug. 1920, 9 pp., 4 figs. Factors which should be considered in making absorption tests using "mineral seal oil" as absorbent.

NAVIGATION

Shoal-Water Warning. The Sperry Ship's Log, R. E. Kortepeter. Sperryscope, vol. 1, no. 12, Apr. 1920, pp. 1-4 and 15, 7 figs. Speed and distance indicating instrument that gives shoal-water warning.

See also Submarine Signals.

NICKEL ALLOYS

Copper-Nickel, Magnetic Properties. The Magnetic Properties of Nickel-Copper Alloys (Die magnetischen Eigenschaften von Nickel-Kupfer-Legierungen), R. Gans and A. Fonseca. Annalen der Physik, vol. 61, no. 8, May 4, 1920, pp. 742-752, 5 figs. In opposition to the Tammann rule, it is concluded that ferromagnetic crystals dissolved in unmagnetic crystals can form ferromagnetic alloys. Results obtained coincide with the behavior of the Co-Cu alloys with single exception that the break in the series of the mixed crystals is considerably greater in these. Report from Physical Inst. of La Plata, Argentine.

NICKEL PLATING

See Aluminum Nickel-Plating.

NON-FERROUS METALS

Researches. A Study of Researches into Metallic Alloys, C. T. Heycock. Chem. Age (Lond.), vol. 3, no. 63, Aug. 28, 1920, pp. 229-232. Also in Nature (Lond.), vol. 106, no. 2654, Sept. 9, 1920, pp. 60-62. Presidential address in Chemical Section British Association for Advancement of Science.

NUTS

Manufacture. Making 30,000 Nuts in 9 Hours on One Machine, J. H. Moore. Can. Machy., vol. 24, no. 11, Sept. 9, 1920, pp. 243-245, 5 figs. Nut and Bolt Dept. of plant of International Harvester Co., Ltd., Hamilton, Canada.

O

OFFICES

Equipment. Getting the Office Work Done—III, Wallace Clark. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 189-194, 4 figs. Suggestions in regard to furnishing and equipping an office.

OIL ENGINES

Air Injection for. Air-Injection for High-Pressure Oil-Engines—III, J. L. Chaloner. Motorship, vol. 5, no. 9, Sept. 1920, pp. 806-810, 11 figs. Records of ratio of fuel to injection-air obtained in tests on a number of four-stroke engines of varying power.

High-Compression. The High Compression Oil Engine, J. L. Chaloner. Gas & Oil Power, vol. 15, no. 180, Sept. 2, 1920, pp. 193-198, 11 figs. Steinbecker four-stroke type.

OIL FUEL

Burning of. The Science of Burning Liquid Fuel, W. N. Best. Am. Drop Forger, vol. 6, no. 8, Aug. 1920, pp. 368-373, 7 figs. Date obtained from tests covering 33 years experience in burning of different fuels in various types of furnaces.

Kermode's Pressure-Jet System. Self-Contained Pressure-Jet Oil Fuel Plant. Eng., vol. 110, no. 2849, Aug. 6, 1920, pp. 180-181, 5 figs. Kermode's pressure-jet oil fuel system. Oil is atomized in special burner which uses neither steam nor pressure air, but to which oil is supplied under pressure. Various ships have been fitted with this type of plant.

See also Fuels, Coal vs. Oil; Liquid.

OIL INDUSTRY

Conditions in 1920. The Trend of the Oil Industry during First Half of 1920, Joseph E. Pogue. Automotive Industries, vol. 43, no. 10, Sept. 2, 1920, pp. 451-456, 4 figs. Review as to stocks, exports and production compared with conditions in 1919.

OILS

Mineral, Specific Heats. The Determination of the Specific Heat of Heavy Mineral Oils, Herbert S. Bailey and Carlton B. Edwards. Jl. Indus. & Eng. Chem., vol. 12, no. 9, Sept. 1920, pp. 891-894, 1 fig. Method is outlined which is believed to be especially adaptable to plant control work and to laboratory investigations where rapid work and fair degree of accuracy are required.

OPEN-HEARTH FURNACES

Design. Design of Open-Hearth Furnaces, A. D. Williams. Iron Age, vol. 105, no. 18 and vol. 106, no. 6, Apr. 29 and Aug. 5, 1920, pp. 1225-1226 and 319-321, 3 figs. Apr. 29. Heat-capacity curves of producer gas, various air supplies and their products of combustion, together with curves indicating calorific intensity as affected by various degrees of preheating of air, gas, and of both air and gas. Aug. 5. Waste heat boiler installations. Calculations involved and questions of setting and draft. Records of tests.

ORE BINS

See Chutes, Design.

ORE HANDLING

Automatic Unloader. Improvements in Bulk Cargo Handling. Iron Age, vol. 106, no. 7, Aug. 12, 1920, pp. 385-387, 3 figs. Fifteen-ton bucket automatic ore unloader and 100-ton car dumper for Atlantic Coast.

OXY-ACETYLENE WELDING

Accident Prevention. Hazards in Gas Welding and Cutting. Power Plant Eng., vol. 24, no. 18, Sept. 15, 1920, pp. 892-895, 4 figs. Prepared by Eng. Dept. of Nat. Safety Council.

Cast Iron. Gas Welding of Cast Iron, C. K. Bryce. Welding Engr., vol. 5, no. 8, Aug. 1920, pp. 25-27. Precautions to be taken for securing good welds. Paper read before American Welding Society.

P

PAPER

Thread, Manufacture of. Manufacture of Paper Threads, J. G. Varlot. Paper, vol. 26, no. 26, Sept. 1, 1920, pp. 15-18 and p. 29, 5 figs. Machines developed in Europe, principally Germany. Translated from La Papeterie.

PAPER MANUFACTURE

Bleach Consumption. Curtailing Bleach Consumption by Adding Sulphur to Digested Liquor, George K. Spence. Paper, vol. 26, no. 27, Sept. 8, 1920, pp. 19-21. Tables giving results of experiments performed with and without sulphur.

PAVEMENTS

Philadelphia. Street Paving in Philadelphia. Public Works, vol. 49, no. 10, Sept. 4, 1920, pp. 208-210, 2 figs. Nearly $8,000,000 of work being executed this year on 1800 miles of streets and roads, League Island Park and Roosevelt Boulevard. Concrete delivered by auto truck service from central mixing plant.

Specifications. Paving for Cities of the Fourth Class, George M. Shepard. Bul. Affiliated Eng. Soc., Minn., vol. 5, no. 7, July 1920, pp. 17-28, 1 fig. Specifications drawn up for pavements constructed during 1919 by St. Paul, Minn., firm of consulting engineers.

PETROLEUM

Great Britain. Britain and Colonial Petroleum Resources, Henry B. Milner. Can. Min. Jl., vol. 41, no. 35, Sept. 3, 1920, pp. 716-721, 1 fig. Review of oil situation.

Ontario. Future Prospects for Oil and Gas Production in Ontario, M. U. Williams. Can. Chem. Jl., vol. 4, no. 7, Sept. 1920, pp. 246-248. Extent to which various geological formations have been searched for oil and results obtained. Paper read before Can. Min. Inst.

See also Oils, Mineral.

PHOTOGRAPHY

Color. The Prospects for Color Photography (Die Aussichten der Farbenphotographie), Felix Formstecher. Deutsche Optische Wochenschrift, nos. 15-16 and 19-20, Apr. 15 and May 11, 1920, pp. 131-132 and 162-165. Deals with color photographs in which the color values are positively established by the process of production, from the so-called photographs in natural colors.

PIERS

New York City. $50,000,000 Pier Improvement Will Give New York 18 Modern Piers. Mar. News, vol. 7, no. 4, Sept. 1920, pp. 112-114, 2 figs. Plans approved by Sinking Fund Commission. Plans provide for building of 18 piers from 950 to 1025 ft. in length along North River between Vesey and Perry streets, replacing 32 erected in 1871. Work is expected to be started in spring of 1921.

PILE DRIVERS

Steam Hammers. A New Method of Driving Piles. Public Works, vol. 49, no. 6, Aug. 1, 1920, pp. 136-138, 3 figs. Account of driving reinforced-concrete piles 44 ft. long and 16 in. square by doubleacting no. O "Union" steam hammer making 110 strokes per minute and operated by three-drum, three-spool 60-hp. Lidgerwood steam hoisting engine on platform of special steel tower.

R

RAILWAY SHOPS

HYDRAULIC PRESSWORK. Norfolk & Western Railroad Shop Kinks. Ry. & Locomotive Eng., vol. 33, no. 9, Sept. 1920, pp. 256-257, 5 figs. Method of rolling cooper bushing in hydraulic press.

RAILWAY SIGNALING

INTERLOCKING MACHINES. A Unique Crossing Gate Arrangement, Paul F. Bunker. Ry. Signal Engr., vol. 13, no. 9, Sept. 1920, p. 363, 1 fig. Apparatus and circuits for gate control from electro-pneumatic interlocking machine.

Electro-Mechanical Interlocking at Sunbury, Pa., John Moore. Ry. Signal Engr., vol. 13, no. 9, Sept. 1920, pp. 371-373, 3 figs. A. c. power is used for electric functions except signal control relays and locks on machine.

OVERLAP vs. A. P. B. Overlap vs. A. P. B. Signaling Single Track. Ry. Age, vol. 69, no. 11, Sept. 10, 1920, pp. 439-441. Comparative merits from operating standpoint. Opinions expressed by signal engineers at meeting of St. Louis Sectional Committee of Signal Division, Am. R. R. Assn.

SYSTEMS. What Scheme of Signaling Is Most Desirable? Ry. Signal Engr., vol. 13, no. 9, Sept. 1920, pp. 356-359, 3 figs. Comparative value of schemes. Abstracts of papers presented at meeting of St. Louis Sectional Committee of Am. Railroad Assn. Titles discussed were: Absolute Permissive Block Signaling, A. R. Fugina, Straight Automatic Blocking on the U. P. System, A. H. McKeen, and S. P. Single Track Signaling ,E. E. Worthing.

RAILWAY TRACK

TIE PLATES. Principles to Be Followed in Tie Plate Design, Howard H. George. Elec. Ry. Jl., vol. 56, no. 8, Aug. 21, 1920, pp. 359-361, 2 figs. Specifications for steel tie plates. Results of tests carried out by New York Central Railroad.

TRANSITION CURVES. New Transition Curve Based upon the Lemniscate, J. E. Williams. Eng. News-Rec., vol. 85, no. 9, Aug. 26, 1920, pp. 406-407, 3 figs. Method of locating points of curve.

The True Transition Curve for Railway Problems, George Paaswell. Eng. News-Rec., vol. 85, no. 9, Aug. 26, 1920, pp. 407-409, 4 figs. Suggested simplification on mathematical work. Functions of true transition curve, with tables for supplying curve in practice.

RAILWAYS

BAGHDAD. The Baghdad Railway. Eng., vol. 110, no. 2849, Aug. 6, 1920, pp. 174-175 and p. 184, 8 figs. Notes on construction and equipment.

SNOW-FIGHTING EQUIPMENT. Snow Fighting Equipment, W. H. Winterrowd. Can. Ry. & Marine World, no. 271, Sept. 1920, pp. 469-475, 16 figs. Survey of types developed with special reference to those recently operated by Canadian Pacific Railway.

RECTIFIERS

MERCURY-VAPOR. The Mercury Vapor-Arc Rectifier in Its Present Development (Der Quecksiberdampf-Gleichrichter in seiner jetzigen Eutwicklung), H. Wintermeyer. Elektrotechnischer Anzeiger, vol. 37, nos. 98 and 99, June 19 and 23, 1920, pp. 443-444 and 449, 6 figs. Describes theoretical basic principles of these rectifiers and gives constructional details of latest standard models of Brown, Boveri & Co. and Gen. Elec. Co.

REDUCTION GEARS

DESIGN. Reduction Gears for Marine Turbines (Réducteurs de vitesse à engrenages pour turbines marines), M. Vasset. Bulletin technique du Bureau Veritas, vol. 2, nos. 7 and 8, July and Aug., 1920, pp. 134-138 and 161-164, 11 figs. Technical notes on helicoidal gears. Materials employed in construction of gears.

RELFECTORS

PARABOLIC. The Electrolytic Manufacture of Parabolic Reflectors, Samuel Wein. Brass World, vol. 16, no. 8, Aug. 1920, pp. 218-220. Summary of patents and recent improvements in manufacturing process.

REFRACTORIES

PHYSICAL PROPERTIES. Physical Characteristics of Specialized Refractories, M. L. Hartmann, A. P. Sullivan and D. E. Allen. Thirty-eighth General Meeting of Am. Electrochemical Soc., Sept. 30 to Oct. 2, 1920, paper no. 1, pp. 1-15, 10 figs. Tests of electrical resistivities of nine commercially used refractory materials at temperatures up to 1500 deg. cent. Measurements were taken while heating up slowly and while cooling down slowly, thermocouple measuring temperature being outside specimens.

RESERVOIRS

WATER LEVEL, MEASUREMENT OF. The Pneumercator. Elec. Times, vol. 58, no. 1504, Aug. 12, 1920, pp. 128-129, 3 figs. Apparatus for measuring height of water in reservoirs. Also applicable to any other liquid. Device is used in U. S. Navy for oil-tank readings.

RESEARCH

COAL. Research upon the Chemistry of Coal and Combustion, William A. Bone. Combustion, vol. 3, no. 3, Sept. 1920, pp. 24-25. Urges establishment of national policy with regard to research upon chemistry of coal and combustion and points out how such policy could be carried out in best interests both of progress in science and economic development of coal fields.

Researches on Coal and Gases Obtained by Its Distillation (Recherches sur la houille et les gaz provenant de la distillation), Leo Vignon. Annales de Chimie, vol. 13, no. 9, May-June, 1920, pp. 284-301. Studies comprise (1) coal solvent, (2) composition of gases obtained by distillation of coal at different temperatures, (3) influence of composition of coal on proportions of carbon oxide and carbonic acid present in coal gas, and (4) elimination of carbon oxide from coal gas.

CONCRETE. Recent Advances in Concrete Practice. Ry. Maintenance Engr., vol. 16, no. 9, Sept. 1920, pp. 334-336. Summary of work undertaken at Structural Malts. Research Laboratory established in 1914 at Lewis Inst., Chicago.

EXPLOSIVES. The Research Department, Woolwich, Robert Robertson. Nature (Lond.), vol. 105, no. 2649, Aug. 5, 1920, pp. 710-712, 3 figs. Work done with regard to explosives, particularly TNT. (To be continued.)

GLASS INDUSTRY. Putting the Glass Industry on a Scientific Basis, E. Ward Tillotson. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 461-465, 4 figs. Role of modern science in ancient art of glassmaking. Developments due to engineering. Refractories and raw materials. Accomplishments of chemist.

GOVERNMENT-CONDUCTED. The Economic Importance of the Scientific Work of the Government—III, Edward B. Rosa. Sci. Monthly, vol. 11, no. 3, Sept. 1920, pp. 246-253. It is argued that "government should be constructive and helpful to the people and to business wherever possible," that "government would spend less for its purchases if it sent more in standardizing products purchased and in testing deliveries systematically," and principally "that research and development work by the government develop wealth and the burdening of taxations is thereby lightened."

GREAT BRITAIN. The Excess Profits Duty and Scientific Research. Jl. Soc. Chem. Industry, vol. 39, no. 15, Aug. 16, 1920, p. 265R. Comments on clause of British Finance Bill by which contributions made for charitable, educational and scientific (research) objects are to be allowed as deductions in computing excess profits duty.

INDUSTRIAL. The Need of Research in the Industrial Field, P. F. Walker. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 487-491. Discussion of problems which await engineer in field of industry. Emphasis is laid upon study of economics upon location of industry, pointing out unfortunate conditions which now exist in Kansas and neighboring states solely because this problem is as yet unsolved. It is said that problem is distinctly an engineering one. An abstract of report prepared by Research Committee of Mid-Continent Section of Am. Soc., Mech. Engre. is included.

INDUSTRIAL LABORATORIES. A Novel Laboratory for Industrial Research. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 496-498, 3 figs. Description of research laboratory organized to study and develop new and economical problems relating to chemical and metallurgical processes and equipment, with enumeration of some problems which are being studied.

Experimental and Research Laboratory of the Hall-Scott Motor Car Company, Richard Vosbrink. Metal Trades, vol. 11, no. 9, Sept. 1920, pp. 370-372, Equipment for testing automobile engines.

LEATHER INDUSTRY. The Leather Industry. John Arthur Wilson. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 457-460, 4 figs. Points out that many problems awaiting solution in such phases of leather manufacture as unhairing, deliming, bating, tanning, suffing and dyeing involve fundamental scientific principles which can best be studied through co-operation between university and tannery chemists.

METALLURGICAL. The Research Department, Woolwich—II, Robert Robertson. Nature (Lond.), vol. 105, no. 2650, Aug. 12, 1920, pp. 743-745, 3 figs. Metallurgical studies.

OIL-SHALE INDUSTRY. The Necessity for Research in the Oil-Shale Industry, Martin J. Gavin. Chem. & Metallurgical Eng., vol 23, no. 10, Sept. 8, 1920, pp. 489-495, 4 figs. Account of shale oil industry as developed in Scotland. Steam-regulated pyrolytic distillation. Quality and quantity of oil yields.

PULP AND PAPER INDUSTRY. The Future of Chemical and Engineering Research in the Pulp and Paper Industry, John Stevens, 3d. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 451-453, 3 figs. Prospectus on pulp and paper research. By-product possibilities and reduction of wastes. Less liquor dilution by more efficient washing. Fuel and power costs reduced by use of vacuum drying and better designed beaters.

REFRACTORIES. Extend Facilities for Refractories Testing. Brick & Clay Rec., vol. 56, no. 12, June 1, 1920, pp. 1100-1101. It is announced that facilities of followship endowed by Refractories Manufacturers' Assn. at Mellon Inst. of Indus. Research of University of Pittsburgh are now open to individual firms and corporations not manufacturers of refractories, according to resolution adopted on April 20 by Assn.

ROLLING MILLS. The Bureau of Rolling-Mill Research, W. B. Skinkle. Proc. Engrs. Soc. Western Pa., vol. 36, no. 5, June 1920, pp. 295-328 and (discussion) pp. 329-344, 42 figs. Plans for research mill which is to be built at Carnegie Inst. of Technology by organization of steel and equipment manufacturers and engineers.

RUBBER. Future Rubber Research, Andrew H. King. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 449-450. Appeal for more and improved methods of testing rubber and its products as guide to compounding. Need for study of fabric and design of products. Continuous vulcanizing and temperature control essential.

See also Colloids, Research.

ROLLING MILLS

S

SHIP DESIGN

Hull Resistance. Note on Resistance of Hull, Influence of Trim of Ship (Note sur les résistances de carène. Influence de l'assiette du navire), C. H. Holst. Bulletin Technique de Bureau Veritas, vol. 2, no. 8, Aug. 1920, pp. 157-161, 7 figs. Technical study. Graphs indicating normal resistances.

SHIP PROPULSION

Efficiency. The Efficiency of Propulsion of Full-Sized Ships, C. Frodsham. Eng., vol. 110, no. 2849, Aug. 6, 1920, pp. 193-196, 10 figs. It is contented that propulsive coefficient derived synthetically from model experiments is not realized in actual ship. Values of propeller efficiency, wake factor, or hull efficiency in model and actual ships are compared. Suggestions in design of ships are formulated from study of test data obtained in trials of various ships. Paper read before Instn. Naval Architects.

SHIPS

Cargo Motorships vs. Steamships. Cargo Motorships vs. Steamships, Charles E. Lucke. Int. Mar. Eng., vol. 25, no. 9 Sept. 1920, pp. 759-763. Comparative calculations of expenses and earnings for operation of steam and motor ships. (To be concluded.)

Ice Breakers. Ice-Breakers, John Flodin. Int. Mar. Eng., vol. 25, no. 9, Sept. 1920, pp. 707-712, 5 figs. Characteristics of vessels designed expressly as ice breakers. American and European practice. Work in pack ice.

SHIPS, CONCRETE

Advantages. The Question of Concrete Ships (La question des navires en béton armé), R. Tardieu. Revue de l'Ingénieur et Index technique, vol. 27, no. 1, July 1920, pp. 25-40, 7 figs. Urges construction of concrete ships in France. Arguments are presented in proof of reliability and advantages of such ships.

Hollow-Tile Construction. New Methods for the Construction of Reinforced-Concrete Ships (Neue Wege beim Bau von Eisenbetonschiffen), Martin Mertes. Beton u. Eisen, vol. 19, nos. 6 and 9-10, Apr. 8 and June 5, 1920, pp. 64-66 and 112-113, 9 figs. Suggests new method which differs from usual one mainly in that the walls and floor of ship are built of hollow tiles made from light concrete about 26 in. long and 13 in. wide.

Oil Tanker. Concrete Tanker Built of Separetely Cast Cylinders. Eng. New-Rec., vol. 85, no. 9, Aug. 26, 1920, pp. 388-393, 17 figs. Sections of two interlocked cylinders poured upright on platform and turned horizontally to be joined together to make 2000-ton oil carrying self-propelled vessel.

SHIPYARDS

Europe. Shipbuilding in Europe, James J. Pearson, Pac. Mar. Rev., vol. 17, no. 9, Sept. 1920, pp. 107-108, 4 figs. Observations on conditions in British and continental shipyards.

Slipway Haulage Machinery. 800-Ton Electric Shipway Machinery at Southampton. Eng., vol. 110, no. 2851, Aug. 20, 1920, pp. 246 and 255, 7 figs. Slipway haulage machinery for raising vessels out of water. Single-drum design driven by reversible continuous-current motor. Cradle which travels up and down slipway is made in four positions coupled together, each portion having an independent sheave block.

SHOP COMMITTEE

Advantages of. Laying the Cards on the Table, Fred H. Colvin. Am. Mach., vol. 53, no. 12, Sept. 16, 1920, pp. 531-532, 2 figs. Advantages of shop-committee system established at plant of White Motor Co., Cleveland, Ohio.

Working in Practice. Serious Labor Problems in Cleveland, George Smart. Iron Age, vol. 106, no. 9, Aug. 26, 1920, pp. 515-517. Practical demonstration of working of shop committees.

SIPHONS

See Aqueducts, Reinforced Concrete.

SPARK PLUGS

Insulators. Methods of Measuring Resistance of Insulators at High Temperatures, F. B. Silsbee and R. K. Honaman. Aerial Age, vol. 11, no. 24, Aug. 23, 1920, pp. 806-809, 11 figs. Report on preliminary experiments made on conductivity of sparkplug insulators in order to develop satisfactory comparative method for testing various materials. Measurements were made at temperatures between 200 deg. and 900 deg. cent. and with both alternating and direct current at voltages as high as 2000 volts. Report No. 53 of Nat. Advisory Committee for Aeronautics.

Visible Ignition. A Visible Ignition Spark Plug, and Another with an Air-Cooled Central Electrode, Auto, vol. 25, no. 36, Sept. 2, 1920, p. 921, 2 figs. Leda ignition plugs. Central electrode is hollow and is fitted at top with cup-shaped terminal and massive cap containing circular window of transparent material.

SPRINGS

Helical. Application of Equations of Elasticity to the Deformations of a Helical Spring (Sur l'application des équations de l'élasticité aux deformations d'un ressort en hélice), M. Galbrun. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 2, July 12, 1920, pp. 91-93.

Testing Machine. Spring Scragging Machine. Eng., vol. 110, no. 2851, Aug. 20, 1920, pp. 242-244, 4 figs. System adopted for applying scragging tests to springs embodying motor-driven variable rotary oil pump on Hele-Shaw principle. Arrangement permits obtaining about 40 complete strokes of tup per minute.

SPROCKET WHEELS

Cast-Steel, Machining of. The Machining of Large Cast Steel Sprocket Wheels, H. Varley. Eng. & Indus. Management, vol. 4, no. 9, Aug. 26, 1920, pp. 260-263, 9 figs. Discusses difficulties in machining of cast steel where large production is undertaken, and explains how big output was gained in connection with important detail of Mark V tanks without employing gear-cutting machine.

STANDARDIZATION

Industrial. Engineering and Industrial Standardization. Mech. Eng., vol. 42, no. 9, Sept. 1920, pp. 544-545. Review of standardization work now in progress, both in this country and abroad, as reported by Am. Eng. Standards Committee and foreign standardizing bodies.

STANDARDS

See Screw Threads, National Screw Thread Commission.

STEAM

Flow in Pipes. Flow of Steam Through Pipes and Fittings, M. C. Stuart and M. H. Russell. Jl. Am. Soc. Naval Engrs., vol. 32, no. 3, Aug. 1920, pp. 472-480, 5 figs. Charts constructed from Carpenter formula.

STEAM HOSE

Construction. Construction of Steam Hose. Ry. Mech. Engr., vol. 94, no. 8, Aug. 1920, pp. 519-520. Experimental comparative study of relative values of seamless and plied tubes, and of simple duck and duck supplemented by braiding. Steam hose made with seamless tubes was found superior in endurance under steam pressure to hose with tubes made up of successive piles of sheeted stock. Hose with plied tubes was found to fail by splitting and separation of seam necessarily formed at surface of tube in its construction. Steam hose with fabric constructed of successive plies of frictioned duck proved superior in endurance to, and practically equal in expansion and contraction of, hose made of fewer number of plies of duck supplemented by plies of braiding.

STEAM POWER PLANTS

Shipyards. Ten-Thousand Horsepower Station for Operating Shipyard, Julius G. Berger. Power, vol. 52, no. 8, Aug. 24, 1920, pp. 284-289, 8 figs. Combined 5000-kva. turbo-alternator and 4500-hp. air-compressor plant. New plant built around old station while latter was kept in operation. Steam header 590 ft. long and main air line 2315 ft. long has butt-welded connections. Acceptance test data and performance are given.

Tests. Steam Power Plant Tests—III, H. L. Doolittle. Jl. Electricity, vol. 45, no. 4, Aug. 15, 1920, pp. 182-183, 1 fig. Charts showing results of simultaneous readings of pressures on steam and oil headers and also pressures of steam and oil at burner.

STEAM TURBINES

Balancing, Testing of. Levelling Micrometer for Testing the Balancing of Turbines. Eng., vol. 110, no. 2850, Aug. 13, 1920, p. 210, 2 figs. Designed and manufactured by Cambridge and Paul Instrument Co., Ltd., of Cambridge, London.

Operation and Adjustment. Operation and Adjustment of Turbine Machinery, Eustis H. Thompson. Power, vol. 52, nos. 8 and 10, Aug. 24 and Sept. 7, 1920, pp. 297-298, 16 figs., and 389-390, 1 fig. Troubles encountered in operation of turbine machinery are discussed, such as accumulation of coat of scale on blades, loss of balance of machine, shaft packing, etc.

See also Marine Steam Turbines.

STEEL

Arsenic in, Effect of. Effect of Arsenic in Steel, P. E. McKinney. Chem. & Metallurgical Eng., vol. 23, no. 7, Aug. 18, 1920, p. 294. Static testing disclosed that 0.3 arsenic is not injurious. It is observed, however, that arsenic is extremely hard to get rid of after it is once present in steel and that if steel used for scrap purposes after its usefulness has ceased, there is a constant automatic augmentation of arsenic content which will in time get beyond limits desired.

Cast, Macrostructure of. Studies of the Macrostructure of Cast Steel, Fred G. Allison and Martin M. Rock. Chem. & Metallurgical Eng., vol. 23, no. 9, Sept. 1, 1920, pp. 383-389, 25 figs. Procedure is outlined for development and record of macrostructure. It is observed that symmetrical arrangement of dendrites is necessary for consistent physical tests, and it is pointed out that pouring cold metal suppresses dendrites.

High-Carbon, Welding. Difficulties in Welding High-Carbon Steel, G. H. Higgens. Am. Drop Forger, vol. 6, no. 8, Aug. 1920, pp. 387-388, 3 figs. It is shown that welding high-carbon steel tends to weaken part welded. Photomicrographs are presented illustrating actual structure of spring steel and patch after operation.

Magnetic Properties. The Variations of Residual Induction and Coercive Force with Magnetizing Force, R. L. Sanford and W. L. Cheney. Scientific Papers of Bur. of Standards, Dept. of Commerce, no. 384, June 23, 1920, pp. 291-298, 6 figs. Graphs and tables giving magnetic properties of steels of various compositions.

Properties at High Temperatures. Properties of Iron and Steel at High Temperatures, A. E. White. Jl. of Am. Steel Treaters Soc., vol. 2, no. 10, Sept. 1920, pp. 521-528, 8 figs. Photomicrographs of steels of different compositions at high temperatures. Graphs of physical characteristics of various steels at high temperatures, constructed from data obtained by various experimenters, notably, H. J. French at United States Bur. of Standards.

SUPERHEATERS

Tests Nickel Plate Power Plant at Conneaut, J. S. Morris. Ry. Mech. Engr., vol. 94, no. 8, Aug 1920, pp. 537-539, 4 figs. Results of tests of superheater installation in stationary boilers.

SWITCHBOARDS

See Electrical Apparatus, Testing.

T

TAYLOR SYSTEM

Mnemonic Classification. The Mnemonic System of Classification, H. K. Hathaway. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 173-183, 13 figs. Method as used in Taylor system of management. Reason for and advantages of mnemonic classification in industry and examples showing how system is applied and used.

TELEGRAPHY

Earth-Current. Earth-Current Telegraphy, L. C. Carus-Wilson. Bul. Int. Ry. Assn., vol. 2, no. 7, July 1920, pp. 422-431, 9 figs. Methods developed by armies for communication with troops at front. From Ry. Engrs. Jl.

TERMINALS, MARINE

Bulk Cargo Handling. Bulk Cargo Handling on the Atlantic Coast. Int. Mar. Eng., vol. 25, no. 9, Sept. 1920, pp. 740-743, 3 figs. Wellman-Seaver-Morgan unloader. Leg is so mounted in walking beam that it can rotate in circle, allowing bucket to reach out in all directions. Machine can unload 97 per cent of cargo without help of shovelers.

Economical Construction and Equipment. Quays More Economical Than Piers for Comprehensive Port, F. T. Chambers. Eng. News-Rec., vol. 85, no. 12, Sept. 16, 1920, pp. 556-558, 3 figs. Urges economical construction and equipment of marine terminals and their co-ordinate economic management.

Inefficiency, Cost of. The Cost of Inefficiency at Our Terminals, Harwood Frost. Int. Mar. Eng., vol. 25, no. 9, Sept. 1920, pp. 768-769. Writer estimates an annual waste of not less than $400,000,000 at American terminals due to inefficient equipment and methods. He indicates way in which it can be eliminated.

TERMINALS, RAILWAY

Columbus, Ohio. Up-to-Date Engine Terminal Management. Ry. Rev., vol. 67, no. 10, Sept. 4, 1920, pp. 345-356, 33 figs. Description of intensive operations and facilities therefor at Pennsylvania terminal at Columbus, Ohio.

Freight, Municipal. Municipal Freight Terminals, O. W. Stiles. Ry. Rev., vol. 67, no. 7, Aug. 14, 1920, pp. 233-235. Suggestion is offered as means of making present rolling stock adequate to needs of present-day transportation requirements, that each municipality assume financial and operating responsibility for its own terminals, leaving roads with more definite transportation duty and less of business duty to perform.

TERRA COTTA

Grog Grain, Effect of Size. The Effect of the Size of Grog Grain in a Terra Cotta Body, H. E. Davis. Jl. Am. Ceramic Soc., vol. 3, no. 8, Aug. 1920, pp. 641-652, 7 figs. It is concluded from results obtained experimentally that to develop good strength, both burned and dry, grog ingredient should contain rather large amounts of fine material as coarser material cracks and thus weakens body.

TESTING MACHINES

Bending Tests. Dynamic Tests of Metals by the Vibroflectometer (Essais dynamiques des métaux par le vibroflectomètre), H. Lepage. Technique Automobile et Aérienne, vol. 2, no. 109, second quarter 1920, pp. 43-45, 4 figs. Patented machine for quantity testing.

Foundry. Testing Machines as Related to the Foundry, Thorsten Y. Olsen. Am. Mach., vol. 53, no. 12, Sept. 16, 1920, pp. 525-530, 13 figs. Survey of recent types, notably standard level type Brinell hardness-testing machines, hydraulic type Brinell hardness-testing type, automatic and autographic torsion machine, universal efficiency testing machine, Matsumura repeat-impact testing machine, and Norris slip-abrasion testing machine.

Hardness Testing. New Hardness Testing Machine has Wider Range of Action. Automotive Manufacturer, vol. 62, no. 5, Aug. 1920, pp. 20-21, 4 figs. Rockwell machine. Tests is made by forcing alloy steel point under constant pressure into work under test.

Paper Strength. New Tearing Machine Measures Strength of Paper. Paper, vol. 26, no. 26, Sept. 1, 1920, p. 11, 1 fig. Recent development by Forest Products Laboratory makes duplicate tears in several sheets at once. Operations means of a pendulum.

See also Springs, Testing Machine.

TEXTILE INDUSTRY

Machinery. The British and Foreign Textile Machinery Industry. Eng., vol. 110, no. 2850, Aug. 13, 1920, p. 209. Tables of exports of textile machinery from Great Britain from 1913 to 1920.

Electrically Deposited. Electrically Deposited Thermo-Couples. Engr., vol. 130, no. 3373, Aug. 20, 1920, p. 143, 7 figs. Number of turns of constantan wire wound upon ebonite rod and immersed in copper plating bath so that half circumferantial surface of rod was above level of liquid. Wire was then plated, thus forming sheathing of copper on each turn for approximately half its length. When junctions along one side of cylinder were heated above temperature of those on opposite side contrivance behaved as thermopile having large number of junctions in series.

THERMOELECTRICITY

Currents in Mercury. Thermoelectric Currents in Mercury (Ueber thermoelektrische Strome in Quecksilber), H. Haga and F. Zernike. Annalen der Physik, vol. 61, no. 8, May 4, 1920, pp. 753-760, 1 fig. Results of experiments, in authors' opinion, refute existence of effect sought by Benedicks, and it is therefore not necessary to alter present theory of thermoelectricity. Report from Physical Inst. of Groningen University.

TIDAL POWER

Utilization. Economical Utilization of Tidal Power (Un moyen économique d'utiliser la force des marées), G. Bigourdan. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 4, July 26, 1920, pp. 211-212. Idea is suggested of utilizing tidal power by means of bell into which air is compressed during flow and a suction established during ebb.

TIME STUDY

Foundries. Time Study Underlines Bonus System, H. E. Diller. Foundry, vol. 48, no. 354, Sept. 1, 1920, pp. 682-686, 5 figs. Methods used for determining standard time for different foundry operations and forms used for recording amount of each kind of stock on hand and being consumed at foundry of Saginaw Malleable Iron Co.

Power Shovel. Time Studies for a Power Shovel, Daniel J. Hauer. Eng. and Contracting, vol. 54, no. 7, Aug. 18, 1920, pp. 168-170, 2 figs. Forms used.

Rate Setting. Time and Job Analysis in Management—VI, William O. Lichtner. Indus. Management, vol. 60, no. 3, Sept. 1920, pp. 201-207, 2 figs. Possibility is pointed out of employing analyst jointly by employers and employees to secure facts in regard to industrial disputes and reaching a just decision. Reference is made to agreements worked out in garment making industry of New York City in support of this contention.

TIN PLATING

Alkaline Tin Baths. Tin Plating from Alkaline Tin Baths by the Use of Addition Agents, Frank C. Mathers and William H. Bell. Thirty-eighth General Meeting of Am. Electrochmical Soc., Sept. 30 to Oct. 2, 1920, paper no. 6, pp. 41-44. Balsam copaiba, rosin, and to lesser extent, other similar organic fatty acids or acid-containing substances were found to be successful addition agents in producing smooth, adherent deposits of tin from sodium stannite baths.

TIRES, RUBBER

TOOL-GRINDING MACHINES

Automatic. New Automatic Universal Machine for Sharpening Tools of Lathes, Planing Machines, Slotting Machines, etc. (Nouvelle machine automatique et universelle à affuter les outils de tour, raboteuses, mortoiseuses, etc.), Serge Haranger. Ouvrier Moderne, vol. 3, no. 1, April 1920, pp. 24-28, 5 figs. Description of S. H. D. machine. (Concluded.)

TOOLS

Cutting Edges of. Cutting Edges, R. E. Crompton. Eng., vol 110, no. 2852, Aug. 27, 1920, p. 292. Table indicating angles for cutting edges of tools or other cutting appliances. Paper read before Eng. Section, British Assn. for Advancement of Science.

TOWN PLANNING

Transportation and. City Building and Transportation, James Rowland Bibbins. Jl. Western Soc. Engrs., vol. 25, no. 12, Aug. 20, 1920, pp. 441-459 and (discussion), pp. 459-469, 25 figs. Technical relationships involved with reference to conditions in large American cities.

TRACTOR ENGINES

Burt Sleeve-Valve. The Burt Single Sleeve-Valve Petrol Engine. Engr., vol. 130, no. 3372, Aug. 13, 1920, pp. 154-156 and p. 158, 7 figs. Manufactured by Wallace Farm Implements, Ltd., Cardonald, Glasgow, for its "Glasgow" tractor and other agricultural appliances. Sleeve is disposed between piston and walls of cylinder barrel and projects down into interior of crank case where it is formed on one side with pair of flanges. Link engaging between flanges connects sleeve to short-throw crankshaft in such a way that as valve shaft rotates sleeves rotates backwards and forwards through small arc and at same time rises and falls vertically.

V

VENTILATION

W

WATER SOFTENING

Continuous Lime-Soda Type. Data on operation of Continuous Type Lime-Soda Ash Water Softener, R. F. Catherman and H. C. Fisher. Chem. & Metallurgical Eng., vol. 23, no. 11, Sept. 15, 1920, pp. 526-528, 5 figs. Information obtained during operation of Booth continuous water softener for a period of six months, 16 hr. per day.

WELDING

Boiler Repairs. Repairs to Boiler by Welding, Eng. & Indus. Management, vol. 4, no. 8, Aug. 19, 1920, pp. 234-235, 2 figs. Regulations enacted by Nat. Boiler & General Insurance Co., Ltd., Manchester for use and information of its inspectors and of firms insuring their machinery under company's policy. Rules refer to both electrical and gas welding.

See also Electric Welding; Electric Welding Arc; Oxy-Acetylene Welding; Steel, High-Carbon Welding.

WELFARE WORK

Technical Institute for Employees. Ford Technical Institute to Better Education of Employees. Motor Age, vol. 38, no. 10, Sept. 2, 1920, p. 26. University plans to confer degrees in mechanical, electrical and chemical engineering.

See also Hospitals, Shop.

WELLS

Percolation. The Analysis of Yield Tests Made on a Percolation Well. Eng., vol. 110, no. 2852, Aug. 27, 1920, pp. 272-273, 2 figs. Analysis of yield tests made on experimental well sunk into water bearing, decomposed and disintegrated granite soil in order to ascertain if locality was suitable for obtaining supply of water sufficient for water supply of small town in South India.

WINCHES

Electric. Efficiency in Electric-Winch Design, Sv. Fasting. Motorship, vol. 5, no. 9, Sept. 1920, pp. 812-815, 3 figs. Diagrams showing relative values of winch with standard type of dynamic breaking and winch equipped with Shepard automatic mechanical load brake.

WIRES

Elastic Limits of Copper, Bronze and Iron. Elastic Limits of Copper, Bronze and Iron Wires (Sur la limite d'élasticité des fils de cuivre, bronze et fer), Société belge des Electriciens, Bulletin mensuel, vol. 34, no. 3, July 1920, pp. 127-129. Values measured at State research laboratories at Malines, Belgium.

WOOD

Allowable Stresses. Douglas Fir as a Structural Timber. Can. Engr., vol. 39, no. 11, Sept. 9, 1920, pp. 317-318. Table of working stresses adopted by various authorities, such as Department of Railways and Canals, Canada, Am. Ry. Ry. Eng. & Maintenance-of-way Assn., etc.

Cellulose in Determination of. Some Observations on the Determination of Cellulose in Woods, S. A. Mahood. Jl. Indus. & Eng. Chem., vol. 12, no. 9, Sept. 1920, pp. 873-875. Experiments to investigate effect of size of particle on yield of cellulose. Material which passes an 80-mesh standard (Am.Soc.C.E.) sieve but is retained on 100-mesh sieve was found to be most satisfactory from standpoint of both yield and manipulation.

Distillation. Recent Developments in the Hardwood Distillation Industry and Suggestions for the Future, L. F. Hawley. Chem. & Metallurgical Eng., vol. 23, no. 10, Sept. 8, 1920, pp. 466-468, 2 figs. Work on increase and variation of yields of pyroligneous products: acetate of lime, methanol and charcoal. Cord stocks cut into 5-in. blocks. Control of retorting temperatures. Central research organization.

Moisture-Resistant Finishes. Moisture Resistant Finishes for Airplane Woods, M. E. Dunlap. Nat. Advisory Committee for Aeronautics, report no. 85, 1920, 8 pp., 2 figs. Investigations made at Forest Products Laboratory. Types tested were oil, wax, oil varnish, enamel, spirit varnish, cellulose varnish, condensation varnish, rubber coating and metal coating. Graph showing relative effectiveness of different materials and methods of treatment.

Properties. Properties of Woods at 10 Per Cent Moisture, B. C. Boulton. Aerial Age, vol. 12, no. 1, Sept. 13, 1920, pp. 11-13 and p. 30, 1 fig. Table of strength properties of woods reduced to standard moisture of 15 per cent prepared by Forest Products Laboratory for use of aeroplane designers in Navy, is reduced to bases of 10 per cent moisture content. (To be concluded.)

Testing Laboratory, Canada. Wood Testing Laboratory Does Good Work, L. N. Seaman. Contract Rec., vol. 34, no. 36, Sept. 8, 1920, pp. 848-849. 1 fig. Organization and scope of work of Forest Products Laboratories of Canada.

Engineering Index

This Index is prepared by the American Society of Mechanical Engineers

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A

AERIAL PHOTOGRAPHY

STEEL TUBING. Report of Test on Steel Tubing and Wing Beams Taken from the Fokker D-VII. Air Service Information Circular, vol. 2, no. 104, Aug. 10, 1920, 4 pp., 6 figs.

AIRSHIPS

GERMAN. German Airships. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 347-348, 2 figs. Data regarding L 70 class dirigible; maximum diameter, 79 ft.; length, 745 ft.; cubic contents, 242,000 cu. ft.; useful load, 57½ tons; maximum speed 83¾ m.p.h.; maximum weight of gasoline carried, 44 tons.

RIGID. The Effect of Distortion on the Bending Stresses in a Rigid Airship, E. H. Lewitt. Aeronautics, vol. 19, no. 360, Sept. 9, 1920, pp. 196-198, 5 figs. Derivation of formulæ, and results of experiments.

Vickers Rigid Airship R. 80. Aeronautics, vol. 19, no. 363, Sept. 30, 1920, pp. 243-245, 2 figs. Designed for use for long patrol cruises over sea and particularly to obtain greatest endurance and speed possible. Capacity is only 1,250,000 cu. ft., but airship is said to give performance in speed and endurance equal to that of R. 33 and R. 34. Dimensions: Overall length, 530 ft.; diameter, 70 ft.; height, 85 ft.; engines, four of Wolseley-Maybach type of 230 b.hp.

SCHUTTE-LANZ. New Schutte-Lanz Construction. Aviation, vol. 9, no. 5, Oct. 1, 1920, p. 165. Airship has capacity of 2,048,360 cu. ft., overall length of 650 ft. 8 in. and maximum diameter of 75 ft. 6 in. It is provided with five 240-hp. Maybach motors which give it maximum speed of 62 m.p.h. Carrying capacity is 37.5 tons.

ALCOHOL

INDUSTRIAL. Industrial Alcohol, Burnell R. Tunison. Jl. Franklin Inst., vol. 190, no. 3, Sept. 1920, pp. 373-420, 24 figs. Notes on manufacture of alcohol for industrial purposes. Nature and scope of alcohol industry and vast number of other industries in which industrial alcohol is a necessity are pointed out, and favorable legislation concerning industrial alcohol and stimulation of those industries which have not yet attained their proper expansion in United States.

RECOVERY FROM COKE OVEN GAS. The Recovery of Industrial Alcohol from Coke Oven Gases. Gas World, vol. 73, no. 1885, Sept. 4, 1920, pp. 13-16, 1 fig. Bury & Ollander process for recovery of ethylene and its homologues from gases of distillation by use of sulphuric acid and subsequently to convert acid sulphates into industrial alcohol. Report of Fuel Economy Committee of British Assn. for Advancement of Science.

See also Automobile Fuels, Alcohol.

ALLOYS

MAGNESIUM. New Magnesium Alloy Shows Much Promise. Automotive Manufacturer, vol. 42, no. 6, Sept. 1920, pp. 33 and 35. Alloy, called Dow metal, brought out by Dow Chemical Co., Midland, Mich. It is said to contain over 90 per cent of metallic magnesium and to have specific garvity of 1.97 and tensile strength of 22,000 to 25,000 lb. per sq. in.

METALLOGRAPHY. Micrographic Similarities Among Carbon Steels, Brasses, Copper, Bronzes and Aluminum Bronzes (Similitudes d'aspect micrographique existant aux divers états, entre les alliages fer-carbone (aciers), cuivre-étain (bronzes d'étain), cuivre-zinc (laitons) et cuivre-aluminium (bronzes d'aluminium), A. Portevin. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 6, Aug. 9, 1920, pp. 350-353, 3 figs. Experimental observations. Photomicrographs.

See also Aluminum Alloys.

PROGRESS DURING WAR. Improvements in Alloys and Metal Treatment (Ueber Fortschritte auf dem Gebiet der Legierungskunde und Metallverarbeitung) E. H. Schulz. Metall u. Erz, vol. 17, nos. 10 and 11, May 22 and June 8, 1920, pp. 229-233 and 251-256. Brief review of progress during war in investigation of constitution and recommendations of new alloys, production smelting and annealing), treatment by swaging and annealing, and investigation of properties.

ALUMINUM ALLOYS

ALUMINUM-COPPER. Foundry Methods for Light Aluminum: Copper Alloys, Robert J. Anderson. Chem. & Metallurgical Eng., vol. 23, no. 15, Oct. 13, 1920, pp. 735-737. Statement of melting and alloying practice in vogue in America for production of no. 12 alloy, and discussion of apparent advantages and disadvantages in use of copper or various copper-rich hardeners.

Manufacture of Rich Copper: Aluminum Alloys or Hardeners, Robert J. Anderson. Chem. & Metallurgical Eng., vol. 23, no. 13, Sept. 29, 1920, pp. 617-621, 5 figs. Describes methods in use in aluminum foundries of United States for manufacturing rich alloys of copper and aluminum, and details of experiments carried out for purpose of comparing different methods.

BRONZES. Self Annealing in Aluminum Bronze, Austin B. Wilson. Foundry, vol. 48, no. 19, Oct. 1, 1920, pp. 776-778, 9 figs. Results of tests of self-annealed aluminum bronze.

HARDNESS OF. Hardness of Certain Aluminum Alloys, R. E. Search. Metal Industry (N. Y.), vol. 18, no. 9, Sept. 1920, pp. 403-405, 6 figs. Compilation of investigations of M. M. Leon Guillet, Jean Durand and Jean Galibourg, from Revue de Metallurgie. (To be concluded.)

AMMONIA COMPRESSORS

ENGLISH. Some Profitable Reflections or the Intending Purchaser of Ammonia Refrigerating Plant, Leuig Chew. Cold Storage & Ice Assn., vol. 16, no. 2, 1920, pp. 35-58 and (discussion), pp. 59-68, 6 figs., on 5 supp. plates. Improvements in design and construction of ammonia compressors which are outcome of reecnt experimental work and comparative tests carried out by H. J. West & Co., England, and other manufacturers.

APPRAISAL

VALUATION and. Appraisal and Valuation of Properties. Mech. Eng., vol. 42, no. 10, Oct. 1920, pp. 549-561 and p. 597. Symposium at St. Louis meeting of Am. Soc. Mech. Engrs. Papers given are: Rational Valuation—A Comparative Study, James Rowland Bibbins; Price Levels in Relation to Value, Cecil F. Elmes; The Cost of Organizing and Financing a Public-Utility Project, F. B. H. Paine; The Construction Period, H. C. Anderson.

SYSTEMS OF INSTRUCTION. Programs of Apprenticeship and Special Training in Representative Corporations, J. V. L. Morris. Am. Mach., vol. 53, nos. 13, 15 and 17, Sept. 23, Oct. 7 and Oct. 21, 1920, pp. 565-568, 657-559 and 765-766, 15 figs. Sept. 23: System in use in Schenectady plant of General Electric Co'y. Oct. 7: System in use in plant of R. Hoe & Co., New York. Oct. 21: System of instruction given to trades apprentices and machine specialists by Mergenthaler Linotype Co., Brooklyn, N.Y.

ALCOHOL. Alcohol Fuel Patents. Motor Traction, vol. 31, no. 813, Sept. 27, 1920, pp. 310-311, 3 figs. Legal considerations affecting their validity.

ALCOHOL-BENZOL MIXTURES. Alcohol-Benzol Fuels are Found Satisfactory Abroad. Power Wagon, no. 191, Oct. 1920, p. 22. Higher efficiency and easier starting is claimed for such fuels by London General Omnibus Co. who have experimented with them under service conditions. Mixtures used have been 50 per cent alcohol and benzol.

AUTOMOBILES

AIR PROPELLER-OPERATED. The Air-Propeller Automobile (Das Luftschrauben-Automobil). Allgemeine Automobile-Zeitung, vol. 21, no. 33, Aug. 14, 1920, p. 23, 1 fig. Discussion of its advantages and disadvantages.

ALUMINUM PARTS. Machining Aluminum Automobile Parts. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 115-119, 9 figs. Machining operations performed in construction of Essex car built by Hudson Motor Car Co., Detroit, Mich.

CLUTCHES, MACHINING. Machining Cluth Parts on Turret Lathes. Machy. (N.Y.), vol. 27, no. 2, Oct. 1920, pp. 156-159, 11 figs. Tooling equipment used in plant of Borg & Beck Co., Chicago, Ill., for machining automobile clutches.

ITALIAN TYPES. The 35.8 H. P. 8-Cylindered Isotta-Fraschini. Auto, vol. 25, no. 38, Sept. 16, 1920, pp. 962-965, 10 figs. Italian type. (To be continued.)

SPECIFICATIONS. British Standard Dimensions for Body Spaces and Frame Ends for Chassis for Private Automobiles. British Eng. Standards Assn., no. 100, 1920, 8 pp., 4 figs. Specifications approved in March 1920.

WHEELS. Indestructible Pressed Steel Double Disc Wheels. Automotive Manufacturer, vol. 42, no. 6, Sept. 1920, pp. 30-31, 1 fig. Built on triangle principle and equipped with Firestone demountable rim.

See also Garages; Tires, Rubber.

AVIATORS

PHYSIOLOGY OF. Physiological Effects of Insufficient Oxygen Supply, J. Barcroft. Nature (Lond.), vol. 106, no. 2656, Sept. 23, 1920, pp. 125-129. From presidential address delivered at Physiology Section, British Assn. for Advancement of Science.

B

BALLOON FABRICS

FIREPROOFING. The Fireproofing of Sacking, Tent Linen and Balloon Material (Die Imprägnierung von Sackstoffen, Zeltleinen und Ballonstoffen gegen Feuer), W. Hacker. Feuerwehrtechnische Zeitschrift, vol. 8, nos. 13-14, July 5-20, 1920, pp. 109-112. Of all the media for rendering textiles fireproof, ammonia sulphate and ammonium phosphate are said to be the most expedient. Description of various foreign and domestic patents.

BEAMS

CALCULATION OF SIZE. Short Cut to Accurate Calculations, E. I. Freese. Am. Architect, vol. 118, no. 2336, Sept. 29, 1920, pp. 416-418, 2 figs. Tables for calculating sizes of timber beams and steel firders.

REINFORCED-CONCRETE. Control Cement Content by Field Beam Tests. Marshall G. Findley. Eng. News-Rec., vol. 85, no. 15, Oct. 7, 1920, pp. 703-704, 2 figs. Machine devised on New Orleans inner harbor canal, which measures breaking load of large concrete beams.

BEARINGS

EXPANDING OF. Expanding Bronze Bearings, C. M. Cross. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 452-453, 1 fig. Method for expanding loose armature bearings of electric motors.

SELF-LUBRICATING BUSHINGS. New Bearing Material Announced after 6 Years' Tests, Charles H. Fish. Belting & Transmission, vol. 17, no. 7, Oct. 5, 1920, pp. 37-38. Description of cellugraph, a self-lubricant bushing made of hard wood impregnated by long and carefully followed chemical treatment, which is said to form basis of practically inexhaustible supply of lubricant.

BEARINGS, BALL

LOAD-CARRYING CAPACITY. Load-Carrying Capacity of the Single-Row Groove-Type Ball Bearing, Arvid Palmgren. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 335-339, 9 figs. Methods of investigating, both theoretically and experimentally, carrying capacity of ball bearings, followed by SKF Co., Gothenburg, Sweden.

STANDARD ALLOWANCES. Ball Bearing Allowances (Kugellagerpassungen), Friedrich Weidmann. Betrieb, vol. 2, no. 13, July 1920, pp. 325-330, 4 figs. Critical discussion of the allowances heretofore employed for ball bearings and recommendations for the development of a unit system, taking into consideration the work of the German Industry Committee on Standards (NDI).

C

CASTINGS

NON-FERROUS. Heat Control in Non-ferrous Melting, John Arnot. Foundry, vol. 48, no. 19, Oct. 1, 1920, pp. 766-767. Influence exerted by temperature at pouring in quality of non-ferrous castings. British methods of measuring temperature are outlined and instruments described. Paper read before Instn. British Foundrymen.

CEMENT, PORTLAND

SPECIFICATIONS. British Standard Specification for Portland Cement. British Eng. Standards Assn., no. 12, 1920, 18 pp., 6 figs. Specifications approved on Aug. 5, 1920.

TESTS. On Long-Time Tests of Portland Cement, Hydraulic Lime, and Volcanic Ashes, I. Hiroi. Jl. College of Eng., Tokyo Imperial University, vol. 10, no. 7, June 30, 1920, pp. 155-172, 32 figs. on 10 supp. plates.

CHEMICAL INDUSTRY

DEVELOPMENTS. Recent developments in Chemical Plant and Machinery, W. B. Davidson. Chem. Trade Jl. & Chem. Engr., vol. 67, no. 1741, Oct. 2, 1920, pp 435-438. Developments in England in manufacture of sulphuric acid. developments in German chemical plant, and survey of patents and inventions.

NEW YORK EXPOSITION. Sidelights on the Chemical Exposition. Chem. and Metallurgical Eng., vol. 23, no. 14, Oct. 6, 1920, pp. 653-657, 4 figs. Notes on new developments as featured at Sixth National Exposition held in New York, September 20 to 25.

CHRONOMETERS

REGULATING MECHANISM. Regulating Mechanism of Chronometers (Sur les organes réglants des chronomètres), Jules Andrade. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 9, Aug 30, 1920, pp, 458-461. Proposed simplification of present system employing spiral springs.

CENTRAL STATIONS

COAL STORAGE. Effect of Coal Situation. Elec. World, vol. 76, no. 16, Oct. 16, 1920, pp. 772-775. Reports from 54 central stations show storage one-thrid normal. Prices average 176 per cent higher, economy and boiler rating are much impaired and operating difficulties are greatly increased.

FINANCING. Central-Station Financing, H. M. Addinsell. Elec. World, vol. 76, no. 15, Oct. 9, 1920, pp. 725-727. Proper ratio of debt to capitalization and of earnings to interest. From paper read before Assn. of Edison Illuminating Companies.

COAL

DISTILLATION OF. Extraction of Different Products from Distillation of Coal. Process and installations of the Société du Gaz de Paris (L'extraction des différents produits de la distillation de la houille. Procédés et installations de la Société du Gaz de Paris), A. Grebel. Génie Civil, vol. 77, no. 9, Aug. 28, 1920, pp. 165-170, 13 figs. Recuperation of naphthalene and benzol.

ECONOMIC SELECTION OF. Economic Selection of Coal, A. L. Booth. Iron and Steel Inst., Meeting, Sept. 21-22, 1920, paper no 1a, 9 pp., 16 figs. on supp. plate. Photomicrographic studies of coal and conclusions as to their suitability for various kinds of work. Only coals in commercial use in England are considered. It is determined for example, that Humic coals, which contain fair proportion of cuticle or spores, are most suitable for steam raising.

STORAGE. Bituminous Coal Storage Practice, H. H. Stoek, C. W. Hippard, W. D. Langrty. University of Illinois Bul., Eng. Experiment Station, Bul. no. 116, 157 pp., 75 figs. Data obtained from replies received from questionnaire sent to representative individuals and companies, from investigations made by writers of fires in coal piles which have occurred in various parts of the county, and from information furnished by Fuel Conservation Section of U. S. Railroad Administration.

COAL GAS

ADDING WATER GAS TO. Advantages and disadvantages of Adding Water Gas to Illuminating Gas (Avantages et inconvénients de l'adjonction du gaz à l'eau au gaz d'éclairage), H. Pfeiffer. Journal des Usines à Gaz, vol. 44, nos. 16 and 17, Aug. 20, and Sept. 5, 1920, pp. 253-255 and 266-271. Conference delivered before Union of Gas and Water Technicians of Saxony and Thuringia. From Jourrnal für Gasbeleuchtung.

FIREDAMP. Effects of Earth Pressure in Coal Mining ((Quelques effets de pressions de terrains dans les exploitations houillères), L. Morin. Bulletin et comptes rendus mensuels de la Société de l'Industrie minérale, vol. 17, no. 3, May-June 1920, pp. 229-274, 2 figs. Sudden, disengagements of firedamp are explained as resulting from mechanical actions on coal produced by great pressures it has borne in terrestrial movements, as also from pressures to which it might have been subjected in recent times. It is therefore, concluded that study of instantaneous vibrations of firedamp should be linked with examination of pressures that have existed in region. Points to consider in coal mining for preventing sudden escape of firedamp are also formulated.

See also Mine Rescue Work.

COAL MINING

CULM. Removing Boiler Ash Burned Coal and Slate from the Coal in a Culm Bank, Dever C. Ashmead. Coal Age, vol. 18, no. 16, Oct. 14, 1920, pp. 796-798, 3 figs. Problems involved in preparation of anthracite from culm banks.

STRIPPING. A Modern Coal Stripping Installation, Excavating Engr., vol. 14, no. 8, Oct. 1920, pp. 959-961, 2 figs. Description of allied Coal Co.'s installation in Ohio with special reference to operation of coal-stripping and coal-loading shovels.

See also Explosives, Safety Devices.

COAL POCKETS

DESIGN. Coal Pockets—A Construction Opportunity, W. G. Kaiser. Concrete, vol. 17, no. 4, Oct. 1920, pp. 120-122, 5 figs. Coal pockets equipped with power-driven conveyors for unloading coal from cars into bins and with gravity chutes for transferring it from bins to wagons or trucks for delivery.

COAL STORAGE

FIRES. Typical Fires in Stored Coal, W. D. Langtry. Power, vol. 52, no. 14, Oct. 5, 1920, pp. 546-547, 10 figs. From records of fires compiled by U. S. Fuel Administration for Illinois.

COMBUSTION

AIR PREHEATERS. Recuperation of Heat in Products of Combustion with Air Preheaters (Sur la récupération de chaleur sensible dans les produits de la combustion par l'emploi de l'air chaud), G. Bastien. Chaleur et Industrie, no. 5, July-Aug. 1920, pp. 297-301. Results of tests showing economical value of air preheaters.

CONCRETE

AGGREGATES, PROPORTIONING. Surface Area of Sand Determined by Volume-Moisture Relations, R. B. Young and W. D. Walcott. Eng. World, vol. 17, no. 4, Oct. 1920, pp. 243-245, 5 figs. Results of tests carried out in laboratories of Hydro-Electric Power Commission of Ontario as part of extended research being conducted there into problem of concrete proportioning.

AGGREGATES, TESTING. Making sure of the Concrete Batch. Sci. Am. vol. 123, no. 15, Oct. 9, 1920, p. 379, 1 fig. Apparatus for testing aggregates, developed at United States Bur. of Public Roads.

ALKALI SOILS, ACTION OF. Concrete in Alkali Soils and Waters, A. S. Dawson. Jl. Eng. Inst. of Canada, vol. 3, no. 10, Oct. 1920, pp. 476-493. Experimental work by Concrete Committee of Eng. Inst. of Canada. It has so far been found that in concrete of high density, where absorption of alkali ground water is mainly at surface of concrete, action is relatively slow and is largely in the nature of surface action, gradually extending to interior; presence of alkali soil solutions does not retard setting of cement; action is more rapid in weaker mixtures and mixtures of low density.

RESEARCH. Notes on Recent Developments in Concrete, H. C. Boyden. Jl. Am. Water Works Assn., vol. 7, no. 5, Sept. 1920, pp. 672-682. Research work conducted at Structural Materials Research Laboratory at Lewis Institute, Chicago.

CONCRETE BLOCKS

BRICK VS. Comparative Cost of Laying Block and Brick, A. J. R. Curtis. Concrete, vol. 17, no. 4, Oct. 1920, p. 130, 1 fig. Figures obtained in actual cases show greater economy of concrete block.

CONCRETE CONSTRUCTION

PORTABLE TRACK AND CARS FOR. Use of Portable Track and Cars in Concrete Construction, William Wren Hay. Concrete, vol. 17, no. 4, Oct. 1920, pp. 128-130, 1 fig. Table giving costs of loading and unloading materials.

CONCRETE CONSTRUCTION, REINFORCED

OFFICE BUILDDINGS. Reinforced Concrete Office Buildings for New York City. Eng. World, vol. 17, no. 4, Oct. 1920, pp. 233-235, 1 fig. Proportions for concrete used in building under construction for Western Electric Co. are generally 1: 2: 4 but in certain columns richer mixture is used. Specifications require use of 1½ in. stone.

CONCRETE, REINFORCED

FLAT-SLAB. Concrete Flat Slab Regulations. Eng. World, vol. 17, no. 4, Oct. 1920, pp. 239-240. Adopted by New York City as standard.

ROOF TRUSSES. Concrete Trusses and Cantilever Girders in Theatre. Eng. News-Rec., vol. 85, no. 13, Sept. 23, 1920, pp. 604-605, 4 figs. Roof cost reduced by substituting concrete for steel. Balcony has heavy girders and long cantilevers in theatre at Cleveland, O.

CONDENSERS, STEAM

NAVAL. Service Experience with Condensers, G. B. Allen. Shipbuilding & Shipping Rec., vol. 16, no. 14, Sept. 30, 1920, pp. 395-396; also Eng., vol. 110, no. 2856, Sept. 24, 1920, pp. 423-424, 1 fig. Analysis of causes of failure of naval condenser tubes, with suggestions as to their prevention. Paper read before Inst. of Metals.

CORROSION

IRON AND STEEL. The Influence of Copper, Manganese and Chromium and Some of their Combinations on the Corrosion of Iron and Steel, E. A. Richardson and L. T. Richardson. Gen. Meeting of Am. Electrochem, Soc., Sept. 30-Oct. 2, 1920, paper no 13, pp. 123-125, 6 figs.

CRANKCASES

MACHINING OPERATIONS. Machining Operations on a Six-Cylinder and Crankcase Block, P. M. Heldt. Automotive Industries, vol. 43, no. 15, Oct. 7, 1920, pp. 712-716, 12 figs. Practice of casting top half of crankcase integral with cylinder block, first applied in connection with four-cylinder engines, has recently been adopted for six-cylinder construction. Milling and drilling work which has to be done on block in preparation for attachment of other parts is described.

D

DISABLED MEN

DISTILLATION

DOCKS

DRAINAGE

DRILLING

E

EARTH

ELECTRIC GENERATORS, A. C.

Design. Factors Determining Generator Design, F. D. Newbury, R. B. Williamson and W. J. Foster. Elec. World, vol. 76, no. 16, Oct. 16, 1920, pp. 779-783, 8 figs. Principal dimensions and weights of 32,500-kwa., 12,000-volt, three-phase, 25-cycle, 150-r.p.m., Westinghouse waterwheel-driven generators installed in new 100,000 hp. extension of Niagara Falls Co.

ELECTRIC LAMPS, INCANDESCENT

Watertight Fittings. British Standard Specification for Watertight Fittings for Incandescent Electric Lamps. British Eng. Standards Assn., no. 97, 1920, 33 pp., 38 figs. Specifications approved on Aug. 5, 1920.

ELECTRIC LOCOMOTIVES

Overloads on Motor Armatures. Effect of Short-Time Overloads on Railway Motor Armatures, J. K. Stotz. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 473-474, 2 figs. Graphs showing comparative temperature rises on field coils of ventilated and non-ventilated motors having same continuous capacity.

Repair Costs. The Logical Unit for Comparing Repair Costs of Electric Locomotives and Cars, Hugh Pattison. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 475-477. Kilowatt-hour input to locomotive or car is thought to be much more correct and convenient unit than locomotive-mile or train-mile units.

See also locomotives Diesel-Electric.

ELECTRIC MOTORS

Installation. Lining up a Motor for Shafting or Machine Drive, K. A. Reed. Power, vol. 52, no. 12, Sept. 21, 1920, pp. 459-461, 4 figs. How to install motor on ceiling, wall or floor and line it up to shafting is explained and methods of handling motor during installation are given.

ELECTRIC MOTORS, A. C.

Induction. Induction Motor Core Losses, P. L. Alger and R. Eksergian. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 10, Oct. 1920, pp. 906-920, 17 figs.

Reconnecting Two-Phase Induction Motors, A. C. Roe. Elec. World, vol. 76, no. 14, Oct. 2, 1920, pp. 683-684, 30 figs., on supp. plate. Tables and winding diagrams giving information necessary for connecting two-pole to twelve-pole motors.

ELECTRIC MOTORS, D. C.

Mine Installations. Treatment of Direct-Current Motorsf or Mining Conditions, T. H. Arnold. Power, vol. 52, no. 15, Oct. 12, 1920, pp. 582-583, 2 figs. Advises dipping and baking armatures in field coils systematically. Dipping and baking process in described.

ELECTRIC PLANTS

Load Factor. The Measurement of Maximum Demand and the Determination of Load Factor, Perry A. Borden. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 10, Oct. 1920, pp. 875-887, 14 figs. Determination of load factor with a view to rate making. Survey of present situation. Comparison of performance of a number of demand-measuring devices.

ELECTRIC RAILWAYS

Braking, Regenerative. Electric Braking of Direct-Current Vehicles, W. M. Hutchinson. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 471-473, 5 figs. Fundamental principles involved.

Multiple-Unit Train Operation, S. B. Schenck. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 457-460, 6 figs. Types of multiple-unit controls.

Operation. The Scientific Arrangement of Schedules, Edward Dana. Elec. Ry. Jl., vol. 56, no. 14, Oct. 2, 1920, pp. 647-651, 7 figs. Close relation of efficient schedules to economical operation. Eight-hour-day problem as worked out on Boston Elevated Railway.

Protection of Electrical Equipments. Methods of Protecting Electrical Equipments, Lynn G. Riley. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 453-456, 12 figs. Methods of protecting electricl equipments on cars and locomotives.

ELECTRIC SWITCHES

Oil. Oil Circuit Breaker Arrangements and Switching Schemes for Steel Mills, G. P. Wilson. Elec. Jl.,, vol. 17, no. 9, Sept. 1920, pp. 402-410, 15 figs. Schematic diagram of power plants and mill equipment located in five separate mills of one large company.

Oil Switches for Large Electrical Supply Systems, Eng., vol. 130, no. 3375, Sept. 3, 1920, pp. 220-222, 9 figs. Critical study of present designs.

The Phenomena of Switching in Oil and the Possibilities of Standardizing the Apparatus, P. Charpentier. Elecn., vol. 84, no. 2196, June 18, 1920, pp. 668-670. Paper read before Union des Syndicats de l'Electricité. This organization is about to draw up standard rules for oil switching apparatus. Lines along which standards are practicable are discussed in article. Translated from Revue Electrique.

ELECTRIC TRANSMISSION

Long-Distance, Power Required. The Power Required for Long Distance Transmission. Radio Rev., vol. 1, no. 12, Sept. 1920, pp. 598-608, 8 figs. Formulæ and graphs. Distances considered are 1000, 2000, 3000, 5000 and 10,000 km.

ELECTRIC TRANSMISSION LINES

Automatic Protective Devices. Automatic Protective Devices for Alternating-Current Systems, A. E. McColl. Jl. Instn. Elec. Engrs., vol. 58, no. 293, July 1920, pp. 525-543 and (discussion) pp. 543-554, 40 figs. Survey of recent developments.

Economics of. Economic Study of Secondary Distribution, P. O. Reyneau and Howard P. Seelye. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 10, Oct. 1920, pp. 861-874, 13 figs. Problems taken up are (1) new lines in thinly populated districts where load will probably build up rapidly, (2) old lines in residence districts well built up where revision is necessary to care for slowly increasing load, (3) old lines in districts with heavy, increasing load such as business districts, and (4) exceptional installations such as for permanent loads with no increase or for a decreasing load. Equations and curves are derived and constructed and their application explained.

High-Tension. Calculation of Electric Transmission Lines by Means of Vectors Representing Real Quantities (Sur le calcul des lignes électriques par l'emploi de fonctions victorielles en notations réelles), André Blondel Comptes rendus des Séances de l'Académie des Sciences, vol 171, no. 11, Sept. 13, 1920, pp. 504-509. Suggests system of computing elements of high tension electric transmission lines without introducing imaginary quantities.

Three-Phase. The Electrical Properties of Three-Phase Transmission Lines, E. Parry. English Elec. Jl., vol. 1, no. 2, April 1920, pp. 54-68, 4 figs. Compilation of tables and data for use of departmental offices in designing transmission lines.

ELECTRIC WELDING, ARC

Strength of Joint. Notes on Electric Welding, Henry S. Rawdon and O. H. Eschholz. Mech. Engr., vol. 42, no. 10, Oct. 1920, pp. 567-574, 21 figs. Electric welding of steel. Data on strength of joint and properties of arc-fused metal. Papers read before Washington Section of Am. Soc. Mech. Engrs.

ELECTRIC WELDING, RESISTANCE

Percussive Welding. Developments in Electro-Percussive Welding. Iron Age, vol. 106, no. 17, Oct. 21, 1920, pp. 1040-1041, 6 figs. Quantity production of duplicate parts. Dissimilar metals joined and cutting tools attached to low grade shanks. Paper read before American Welding Society.

ELECTRODES

See Electric Furnaces, Electrodes for.

ELECTROPLATING

See Brass, Electric Deposition of.

EMPLOYEES

Shop Magazines for. Gaging Employees' Magazine Results, John T. Bartlett. Am. Mach., vol. 53, no. 13, 1920, pp. 589-591. Writer tells of means of estimating results obtained by means of such papers, and also of means of getting results through them.

EMPLOYMENT MANAGEMENT

Interviewing Applicants. The Art of Interviewing, R. T. Fennell. Indus. Management, vol. 60, no. 4, Oct. 1920, pp. 310-311. Requirements of successful interviewing.

The Art of Interviewing Applicants, Russell J. Waldo. Indus. Management, vol. 60, no. 4, Oct. 1920, pp. 273-277, 14 figs. Procedure followed in employment department of representative firms. System of keeping records of applicants.

Methods of Hiring Men. Methods of Hiring and Training Men, Henry S. Day. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 447-451, 6 figs. Methods used by Mechanical Department of Kansas City Railways.

ENGINEERING SCHOOLS

Co-operative Course. A new Co-operative Course in Electrical Engineering, W. H. Timbie. Gen. Elec.-Rev., vol. 23, no. 9, Sept. 1920, pp. 784-790. Co-operative course given by General Electric Co. and Massachusetts Institute of Technology. Practical training is given in six thirteen-week periods during last three years of five-year course.

ENGINEERING SOCIETIES

Federated American Engineering Societies.. Am.-Soc. C. E. Arguments for and Against Federation, Eng. News-Rec., vol. 85, no. 14, Sept. 30, 1920, pp. 663-665. Membership receives presentation of opposing views prior to voting on question of joining the new organization.

ENGINEERS

Civic Activities, Italy. The National Convention of the Italian Engineers at Naples (Il convehno nazionale degli ingegneri italiani a Napoli). Associazione nazionale degli Ingegneri italiani Giornale ufficiale, vol. 1, no. 21, July 30, 1920, pp. 157-161. Summary of proceedings of National Convention of Italian Engineers held at Naples, May 20 to 25, 1920. One of topics discussed was, "Civic Activities of Engineers."

Participation in Civic Affairs. Responsibilities of Technical Men and Obligations of the People, Warren G. Harding. Chem. Eng (N. Y.), vol. 28, no. 9, Sept. 1920, pp. 309-310. Opinion is expressed by writer that "representatives of the engineering professions should sit in our state and national legislative bodies, instead of being merely the administrative agents of the great engineering projects that our intensive civilization now demands shall have greater fruition."

F

FACTORY MANAGEMENT

FERTILIZERS

FIR

FLOOD PROTECTION

FLOW OF OIL

FLOW OF WATER

FIREMEN

G

GARAGES

CONCRETE. Concrete Cantilever Construction in Chicago Garage, Eng. News-Rec., vol. 85, no. 13 Sept. 23, 1920, pp. 609-611, 3 figs. Single and double cantilever beams support 11-ft. span of floor and roof slab and carry 50-ft. monitor trusses.

GAS

CALORIFIC VALUE. Advantages of a Reasonable Standard of Calorific Value for City Gas—Experiences in Canada, Arthur Hewitt. Am. Gas Light Assn. Monthly, vol. 2, no. 10, Oct. 1920, pp. 595-598, 1 fig. Minimum calorific standard of 150 B.t.u. was fixed by Canadian government as temporary measure in Nov. 1919, and was to be continued for a period of four months. Results realized are said to have been "most satisfactory to all interests concerned."

GAS ENGINES

GOVERNING. Stabilized Governing, Oscar C. Roos. Sci. Am. Monthly, vol. 2, no. 2, Oct. 1920, pp. 141-144. 9 figs. "Dead beat" governor for auto-truck radio plants.

GAS MAINS

SUBMERGED. Laying Submerged Gas Mains, D. L. Hill. Gas Age, vol 46, no. 6, Sept. 25, 1920, pp. 213-215, 1 fig. Particulars of various submerged mains, notably Astoria 72-in. double line, Toronto 12-in. line, and 36-in. water main across Narrows, New York Harbor.

See also Molding Methods, Large Gas Mains.

GAS PRODUCERS

MECHANICAL. Smith Mechanical Gas Producer, Power, vol. 52, no. 15, Oct. 12, 1920, pp. 572-573, 2 figs. Type of gas producer in which fuel is distributed mechanically over bed and poking done automatically, developed by Smith Gas Engineering Co., Dayton, Ohio.

TAR RECOVERY IN. The Recovery of Fuels at Low Temperatures (Die Entstehung der Brennstoffe bei tiefen Temperaturen), H. Gwodz. Oel- u. Gasmaschine, vol. 17, no. 8, Aug. 1920, pp. 119-125, 7 figs. Details of various patented gas producers provided with tar-recovery apparatus.

GASES

DUST PRECIPITATION IN. A New Electrical Precipitation Treater, Motoji Shibusawa and Yasujiro Niwa. Jl. Am. Inst. Elec. Engrs., vol. 39, no. 10, Oct. 1920, pp. 890-903, 35 figs. Treater, as in case of modern type, consists of metal cylinder as passive electrode and metal wire suspended along center of cylinder as active electrode; only difference being that electrodes in their treater are entirely separated with dielectric substances such as glass, procelain, etc. Treater was developed as result of experience at Electrotechnical Laboratory in Tokyo, Japan, and has been recently applied to treater at Nikko Copper Refining Works. Theory of new treater is given in detail.

GASOLINE

RECOVERY FROM NATURAL GAS. *See Natural Gas, Gasoline Recovry from.*

SITUATION IN U. S. The Gasoline Situation, R. L. Welch. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 353-355. Statistics regarding oil production and consumption in U. S.

SUBSTITUTES FOR. New Gasoline Substitute an Alcohol Derivative. Automotive Manufacturer, vol. 42, no. 6, Sept. 1920, pp. 24 and 26. Fermogas, manufactured by Fermogas Corporation, New York. It is described as specially denatured alcohol wherein denaturizing agent is petroleum or coal tar derivative.

GASOLINE ENGINES

CENTRIFUGAL OIL CLEANER. Experimental Centrifugal Oil Cleaner Attached to Liberty Engine. Automotive Industries, vol. 43, no. 13, Sept. 23, 1920, pp. 610-611, 3 figs. Device designed and developed by Installation Branch, Power Plant Section, and constructed in shops at McCook Field.

GEARS

BEVEL. Chordal Thickness of Tooth and Corrected Pitch Depth of Bevel Gears, C. W. Mapes. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 169-170, 1 fig. Diagram showing dimensions and angles used in determining chordal thickness and corrected pitch depth of bevel gear teeth.

CALIPERS FOR. The "Sykes" Gear Tooth Caliper. Machy. (Lond.), vol. 16, no. 418, Sept. 30, 1920, pp. 8-4-805, 2 figs. Type of gear caliper that enables gear teeth to be gaged with one setting only.

HELICAL. Calculation of Helical Gears with Axes at Right Angles (Calcul des engrenages hélicoidaux à axes rectangulaires), Jean Bertrand. Vie Technique & Industrielle, vol. 1, no. 12, Sept. 1920, pp. 489-494, 8 figs. Formulæ and graphs for designing such gears.

HOBBING. Formulæ Used in Hobbing Large Prime Numbered Gears, A. Fisher. Machy. (Lond.), vol. 16, no. 415, Sept. 9, 1920, pp. 705-706. Formulæ used in calculations of change wheels for hobbing machines when cutting gears with large prime number of teeth.

INVOLUTE. Interference of Involute Spur-Gear Teeth, A. B. Cox. Am. Mach., vol. 53, no. 16, Oct. 14, 1920, pp. 707-708, 2 figs. Formula expressing relation between gear ratio, number of teeth in pinion and interference.

TESTING, MACHINE FOR. Machines for Testing Gears (Machine à essayer les engrenages). Technique Automobile et Aérienne, vol. 10, no. 110, 1920, pp. 67-69, 7 figs. Mechanism for comparing gears with untoothed discs. (Concluded.)

GRAIN ELEVATORS

PNEUMATIC. Pneumatic Elevators, William Cramp. Eng., vol. 110, no. 2853, Sept. 3, 1920, p. 330. Experiments to determine power required to lift granular material by pneumatic means. Empirical formula for vacuum in centimenters of mercury is developed in treatment of different pressures across conveying pipe and quantity of air per second moved under this pressure difference. (Abstract.) Paper read before Eng. Section, British Assn. for Advancement of Science.

GRINDING

AUTOMOBILE PARTS. Cadillac Grinding Practice, Edward K. Hammond. Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 103-107, 9 figs. Description of methods employed in grinding department of plant building high-grade automobiles.

GRINDING MACHINES

NORTON. Norton 10-inch "B" Type Grinding Machine. Am. Mach., vol. 53, no. 13, Sept. 23, 1920, pp. 604f-604g, 4 figs. Tables speed has been increased to 36 ft. per minute, which is three times that of fastest speed hitherto attempted.

H

HARBOR IMPROVEMENTS

KINGSTON HARBOR. Proposed Development of Kingston Harbor, A. Langlois. Can. Engr., vol. 39, no. 15, Oct. 7, 1920, p. 408, 1 fig. Movement contemplates making Kingston the Lake Ontario terminal, for proper utilization of Welland Ship Canal.

HEAT TRANSMISSION

THIN WALLS. Heating and Ventilating Research Work—V. Domestic Eng. (Lond.), vol. 40, no. 22, Oct. 1920, pp. 149-150. Heat transmission through thin walls. From report of Building Matls. Research Committee under British Department of Scientific and Industrial Research.

HEATING

BUILDINGS, LOSSES IN. Fundamental Principles of the Calculation of Heat Losses for Buildings (Grundlagen der Wärmeverlusberechnung für Gebäude), B. Biegeleisen. Gesundheits-Ingenieur, vol. 43, no. 31, July 31, 1920, pp. 361-372, 4 figs. Writer points out that, until other and more accurate tests are available, the most expedient way of improving method of calculation is (1) through determination of faults in existing methods, and (2) through utilization of results of tests carried out since the development of Rietschel's calculations. New method is evolved for calculation of heat transmission which, it is claimed, under certain conditions, may be more accurate than the Rietschel values.

SYSTEMS. Short Cuts to Accurate Calculations, Am. Architect, vol. 118, no. 2337, Oct. 6, 1920, pp. 450-452. Chart and table for computing steam radiation.

HEATING, ELECTRIC

COOKING RANGE. British Standard Specification for Electrically Heated Cooking Range (Two Sizes), British Eng. Standards Assn., no. 106, 1920, 15 pp., 6 figs. Specifications approved on July 8, 1920.

DEVELOPMENTS IN. New Heating and Cooking Apparatus. Elecn., vol. 85, no. 2210, Sept. 24, 1920, pp. 365-371, 24 figs. Survey of developments shows that electric heating and cooking continue to progress particularly in connection with large installations for restaurants, canteens, etc. It is also noted that electric heating and cooking is becoming increasingly popular for marine work, both cargo and passenger steamers and in Navy. Equipment survey is principally of British manufacture.

HEAVY-OIL ENGINES

FUEL SELECTION. The Selection of Fuel Oil for Heavy Oil Engines, Allen F. Brewer. Gas Engine, vol. 22, no. 10, Oct. 1920, pp. 295-297. It is advised that customer should approach market in selection of fuel oil from angle of presenting operating conditions and peculiarities of his plant, rather than limiting himself to laboratory specifications.

HELICOPTERS

See Aeroplanes, Helicopters.

HOISTS

MINE. Mine Safety Experts Discuss at Milwaukee Accidents, Health and Warfare—II, R. Dawson Hall. Coal Age, vol.18, no. 16, Oct. 14, 1920. pp. 801-806. Safety devices on hoisting engines. Paper read before Nat. Safety Council.

HOSE

STEAM. Standard Specification for Steam Hose, Power, vol. 52, no. 15, Oct. 12, 1920, p. 601. Specifications adopted by Am. Soc. for Testing Matls.

HOUSES, CONCRETE

CONCRETE BLOCKS. Local Authorities and Housing, Surveyor, vol. 58, no. 1499, Oct. 8, 1920, pp. 235-236, 2 figs. Plan of constructing houses on continuous cavity system at Brighton.

HOUSING

GARDEN CITY SCHEME, LONDON. Unpopulating London, John Irwin Bright. Jl. Am. Inst. of Architects, vol. 8, no. 10, Oct. 1920, pp. 354-356, 2 figs. Housing scheme prepared by Garden Cities and Town Planning Assn., London. Instead of houses being packed together, it is proposed to create separate "Garden Cities" with population from 30,000 to 50,000, at convenient distances apart and ready for communication with center of metropolis.

MINING TOWNS. [illegible] Coal Age, vol. 18, [illegible] [illegible] figs. [illegible]

[illegible]. [illegible] Building [illegible] Automotive [illegible], vol. [illegible], no. [illegible], Sept. [illegible] 1920, p. [illegible]. [illegible] General Motors [illegible] Flint, Mich.

[illegible]

HYDRAULIC TURBINES

DESIGN. Design of the [illegible] h.p. Turbines at Niagara [illegible]. Eng. [illegible], vol. [illegible], no. [illegible], Sept. [illegible], 1920, pp. [illegible], [illegible] figs. [illegible] American side of the [illegible] Falls. Design of the two types of turbines.

DEVELOPMENTS. [illegible] Developments [illegible] Eng. [illegible], vol. [illegible], no. [illegible], Oct. [illegible], 1920, pp. [illegible]. [illegible] Niagara [illegible] a factor in efficiency.

HYDROELECTRIC PLANTS

NIAGARA FALLS DEVELOPMENT. [illegible] the American Niagara Power [illegible]. [illegible] Eng. [illegible], vol. [illegible], no. [illegible], Oct. [illegible], 1920, pp. [illegible], [illegible] figs. [illegible] Niagara Falls Power Co.

[illegible] at Niagara. [illegible] Eng. [illegible], vol. [illegible], no. [illegible], Sept. [illegible], 1920, pp. [illegible], [illegible] figs. [illegible] American side of Falls.

Niagara Development [illegible] [illegible] kw.

I

ICE PLANTS

RAW-WATER. World's Largest Raw-Water Plant. [illegible] Refrigerating World, vol. [illegible], no. [illegible], Oct. 1920, pp. [illegible], [illegible] figs. [illegible] New York [illegible] tons of ice per day. [illegible]

IGNITION

CIRCUIT CHARACTERISTICS. Ignition Circuit Characteristics as Determined by Engine Requirements. [illegible] Automotive Industries, vol. 43, no. [illegible], Sept. [illegible], 1920, pp. [illegible], [illegible] figs. [illegible]

INDUCTANCE

MEASUREMENT OF. [illegible] Measurement of Inductance and Capacity in the Wireless [illegible]. Radio [illegible], vol. 1, no. 12, Sept. 1920, pp. [illegible], [illegible] figs. [illegible] England.

INDUSTRIAL MANAGEMENT

INSPECTION. Inspection: The Control of Quality—II. George S. Radford. Indus. Management, vol. 60, no. 4, Oct. 1920, pp. [illegible]. [illegible]

OFFICE MANAGEMENT. Getting the Office Work Done—IV. Walter Clark. Indus. Management, vol. 60, no. 4, Oct. 1920, pp. [illegible], 1 fig. Suggestions to office managers.

OPERATING STORES. [illegible] Factory, vol. 25, no. [illegible], Sept. 15, 1920, pp. [illegible], [illegible] figs. [illegible] plants.

PLANNING DEPARTMENT. The Planning Department. [illegible] Production, vol. [illegible], no. 11, Oct. 1920, pp. [illegible], [illegible] figs. [illegible]

PRODUCTION SYSTEMS. Keeping Production up with Sales. [illegible] Factory, vol. 25, no. 6, Sept. 15, 1920, pp. [illegible], [illegible] figs. [illegible] charts.

Modern Production Methods. [illegible] Am. Mach., vol. 53, nos. [illegible] [illegible]

ROUTING MATERIALS. Routing Considered as a Function of Up-to-date Management. [illegible] Indus. Management, vol. 60, no. 4, Oct. 1920, pp. [illegible], [illegible] figs. [illegible] materials.

SUPERVISION. [illegible] Indus. Management, vol. 60, no. 4, Oct. 1920, pp. [illegible]. [illegible]

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INDUSTRIAL RELATIONS

[illegible] England.

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INDUSTRIES

JAPAN. [illegible] Japan. [illegible], vol. [illegible], no. [illegible], Sept. [illegible], 1920, pp. [illegible]. [illegible]

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IRON AND STEEL

[illegible]

PRODUCTION IN U. S. [illegible] Production of Iron and Steel. [illegible]

IRON METALLURGY

[illegible]

IRON-NICKEL ALLOYS

See Nickel-Iron Alloys.

IRRIGATION

CURRENT METERS FOR. An Automatic Current Meter. [illegible] Los Angeles, Cal.

L

LABORATORIES

PHOTOGRAPHIC RESEARCH. A Photographic Research Laboratory. [illegible] Eastman Kodak Co.

TEXTILE RESEARCH. Textile Research Laboratory. [illegible]

LADLES

LIFTERS FOR. Fractures in Ladle Lifters (Bruche an Giesspfannengehängen), A. Pomp. Stahl u. Eisen, vol. 40, no. 34, Aug. 26, 1920, pp. 1136-1138, 3 figs. Results of investigations show that fracture of a ladle lifter is due to changes in form of material at blue heat.

LATHES

TURRET. Alfred Herbert No. 5 Automatic Turret Lathe. Am. Mach., vol. 53, no. 13, Sept. 23, 1920, pp. 600-601, 1 fig. General-purpose automatic machines representative of English practice. Comparison with American automatic turret lathes.

See also Automobiles, Clutches, Machining.

LIGHT

TRANSMISSION THROUGH ATMOSPHERE. Relative Spectral Transmission of the Atmosphere, Wnoch Karrar and E. P. T. Tyndall. Dept. of Commerce, Sci. Papers of Bur. of Standards, no. 389, July 21, 1920, pp. 377-408, 20 figs. Transmission of atmosphere was studied with a view to determining data useful for aerial photography and use of light projectors for automobile and locomotive head-lamps, for signaling and as beacons, and for searching on land, water and in the air.

LIGHTING

ARC VS. INCANDESCENT LAMPS. Comparative Cost of Lighting by Arc and by Incandescent Lamps (Coût comparatif de l'éclairage par arc et par incandescence), M. H. Dupont. Bulletin mensuel de la Société belge de l'Electriciens, vol. 34, no. 4, Aug. 1920, pp. 157-172. Total cost, including installation and maintenance, is determined to be smaller for incandescent lamps. Installations considered are principally those in industrial works.

CANDLEPOWER REQUIRED. Relation of Lighting Feeders to Watts per Square Foot, Victor Tousley. Elec. World, vol. 76, no. 14, Oct. 2, 1920, pp. 686-687. Tables showing actual demand factors in units per square foot used in different classes of business and industry.

DESIGN OF SYSTEM. Designing Direct and Indirect Illumination, M. M. Samuels and C. O. von Dannenberg. Elec. World, vol. 76, no. 15, Oct. 9, 1920, pp. 721-724, 9 figs. Practical method of determining illumination in given plane for either direct or indirect fixtures and original scheme of calculating foot-candle in one horizontal plane from values obtained in another.

FACTORY. Shop Lighting, C. W. Price. Bul. Dept. of Labor & Industry, vol. 7, no. 4, 1920, pp. 39-44. Suggested standardization.

THEATRES. Lighting the World's Largest Theatre. Elec. World, vol. 76, no. 16, Oct. 16, 1920, pp. 776-779, 9 figs. Electric fixtures used for lighting Capitol Theatre, New York City, which has seating capacity of 5300.

LOCOMOTIVE BOILERS

COPPER VS. STEEL TUBES. Locomotive Boiler Tubes: Copper vs. Steel, Gerard A. Muntz. Ry. Gaz., vol. 32, no. 26, June 25, 1920, pp. 943-944. Comparative economy in use of copper, brass and steel tubes in locomotive boilers. Further notes on discussion given in issue of June 4, Ry. Gaz.

WATER-LEVEL INDICATORS. Correct Application of Water-Level Indicators in Locomotive Boilers, A. G. Pack. Boiler Maker, vol. 20, no. 9, Sept. 1920, pp. 261-265, 5 figs. Investigations conducted by Bur. of Locomotive Inspection, Interstate Commerce Commission, to determine effect of water circulation on accuracy of indicating devices.

Government Test of Water-Indicating Devices, A. G. Pack. Ry. Mech. engr., vol. 94, nos. 9 and 10, Sept. and Oct. 1920, pp. 575-579 and 630-633, 7 figs. Sept.: Account of tests conducted by Bureau of Locomotive Inspection. Tests demonstrated unreliability of many water-indicating appliances on modern locomotives; Oct.; Report of final tests and recommendations submitted by Bureau of Locomotive Inspection.

LOCOMOTIVES

DEVELOPMENT IN U. S. The Development of the Modern Steam Locomotive in the United States, Fredk. V. Green and John D. Rogers. Jl. South African Instn. Engrs., vol. 19, no. 2, Sept. 1920, pp. 14-22 and (discussion) pp. 22-29, 2 figs.

FEEDWATER HEATERS. Locomotive Feedwater heating in Europe, Robert E. Thayer. Ry. Mech. Engr., vol. 94, no. 9, Sept. 1920, pp. 569-572, 8 figs. There are over 10,000 feedwater heaters in use on railways of Europe. These are distributed among Weir system. Caille-Potonie system and Knorr system, the latter having by far the greater distribution. Weir system is confined almost entirely to Great Britain, Caille-Potonie to France, and Knorr to Germany, Holland and Switzerland.

FREIGHT. New Mountain Type Locomotives for Fast Freight. Ry. Age, vol. 69, no. 15, Oct. 8, 1920, pp. 608-611, 7 figs. Dimensions: Tractive effort, 53,900 tons; weight of engine and tender in working order, 511,000 tons; wheel base, total, 40 ft.; total heating surface, 4121 sq. ft.; super heater heating surface, 1009 sq. ft.; working pressure, 200 lb. per sq. in.

OIL FIRING. Heavy-Oil Firing for Locomotives, L. Pierre-Guedon. Bul. Int. Ry. Assn., vol. 2, no. 8, Aug. 1920, pp. 517-527, 10 figs. Historical summary, with special reference to developments in design of locomotives for burning oil, as worked out by Paris-Lyons-Mediterranean Ry. Translated from Génie Civil.

The Scarab System of Oil Fuel Burning on Locomotives, Eng., vol. 110, no. 2853, Sept. 3, 1920, pp. 324, 3 figs. System as applied in locomotive of London and Northwestern Railway. System was introduced by Scarab Oil Burning Co., Ltd., Haymarket, England.

REBUILDING. Rebuilding Locomotives at Kilmarnock Works, Glasgow & South Western Railway, Ry. Gaz., vol. 33, no. 13, Sept. 24, 1920, pp. 396-399, 7 figs. Reconstruction work involves putting boiler 6 in. larger in diameter, and making steam reversing gear direct instead of being actuated through rocking lever and link, as formerly.

LUBRICATING OILS

CASTOR VS. MINERAL OIL. A Comparison of Qualities of Castor and Mineral Oils, Fred C. Ziesenheim. Automotive Industries, vol. 43, no. 13, Sept. 23, 1920, pp. 612-613, 1 figs. Results of tests. Superiority of castor oil over mineral oils for particular conditions of service is due primarily to its greater capillarity which results from presence of free fatty acids.

SPECIFICATIONS. Development of Oil Specifications, William F. Parish. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 313-315. Points to be considered in drawing up specifications, with reference to specifications for lubricating oils used by War Department.

M

MACHINE TOOLS

COUNTERWEIGHTS FOR. Machine Tool Counterweights, Fred. Horner. Machy. (N. Y.), vol 27, no. 2, Oct. 1920, pp. 108-114, 17 figs. Methods of applying counterweights to different types of machine tools for counterbalancing weights of spindles, slides and work-tables.

PARIS EXHIBITION. Machine Tools at the Paris Exhibition (Les machines-outils et l'outillage méchanique à la foire de Paris), Ouvrier Moderne, vol. 3, nos. 3, 4 and 5, June July and Aug. 1920, pp. 111-112, 159-160 and 206-208, 10 figs. Details of principal exhibits shown at Paris exhibition held May 5-20, 1920.

SPECIAL-PURPOSE. Special-Purpose Machines in the LeBlond Plant. Machy. (Lond.), vol. 16, no. 418, Sept. 30, 1920, pp. 797-803, 7 figs. Also Machy. (N. Y.), vol. 27, no. 2, Oct. 1920, pp. 144-150, 7 figs. Vertical sawing machine built for operation customarily performed on radial drilling machines, special keyseater for long shafts, planer adapted for grinding large flat surfaces, etc.

MACHINERY

SHIPMENT OF. Insuring the Safe Shipment of Machinery, Fred H. Colvin. Am. Mach., vol. 53, no. 16, Oct. 14, 1920, pp. 712-718, 17 figs. Methods of development by Brown & Sharpe Mfg. Co., Providence, R. I.

MALLEABLE IRON

ANNEALING OVENS. New Oven Secures Uniform Anneal. Foundry, vol. 48, no. 19, Oct. 1, 1920, pp. 768-771, 11 figs. Two fireboxes at each side are in oven proper. Flues are located in center of floor. Four tons of castings are annealed with one ton of coal.

MANGANESE ORE

SMELTING ELECTRIC. Electric Furnace Smelting of Montana Manganese Ores, E. S. Bardwell. Gen. Meeting of Am. Electrochem, Soc., Sept. 30-Oct. 2, 1920, paper no. 14, pp. 137-152. Account of plant of Onaconda Copper Co. at Great Falls, Mont, for reducing Montana rhodochrosite manganese ores. Detailed description is given of furnace, electrode holders, and operation of furnaces.

MARINE BOILERS

See Boilers, Water-Tube, Houghton's Patent.

MARINE ENGINES

See Oil Engines.

MARINE STEAM TURBINES

EMERGENCY GOVERNOR. Emergency Governor and Gear for Marine Turbine. Eng., vol. 110, no. 2854, Sept. 10, 1920, pp. 344-345, 8 figs. Type being introduced by Messrs. Aspinall's Patent Governor Co., Liverpool.

FLEXIBLE EXPANSION COUPLING. The "Robertson-Fairfield" Flexible Expansion Coupling. Eng., vol. 110, no. 2854, Sept. 10, 1920, p. 357, 5 figs. Coupling consists of casing or shell made in halves which are bolted together when coupling is assembled. "Pivot keys sockets" fitted in slots machined in casing, transmit drive to casing. Any relative axial motion between drivers and driving shaft is provided for by sliding these blocks along their slots in shell.

RATEAU. The Development of the Rateau Geared Turbine for Marine Work, A. V. Jarratt. Elecn., vol. 85, no. 2207, Sept. 3, 1920, pp. 253-257, 6 figs. Rateau turbines as manufactured by Metropolitan-Vickers Electrical Co., Ltd. Turbine is constructed with two cylinders, high and low pressure, mounted side by side, both driving high-speed pinions on reduction gearings.

MATERIALS

TESTING. Compares Fatigue and Recovery, Robert G. Guthrie. Iron Trade Rev., vol. 67, no. 13, Sept. 23, 1920, pp. 843-845, 4 figs. Instruments for determining recoverance, which is capacity of material to return immediately energy that has been imparted to it by any external force. Records of operation of machine.

Recoverance, Robert G. Guthrie. Chem. and Metallurgical Eng., vol. 23, no. 14, Oct. 6, 1920, pp. 671-672. Recoverance is defined as capacity of material to return immediately energy that has been imparted to it by any external forces. Methods of measuring recoverance are explained.

MEASURING INSTRUMENTS

TWO-NEEDLE. New Type of Apparatus for the Direct Measurement of Magnitudes which are Functions of Two Variables (Sur une nouvelle classe d'appareils de mesure pour l'évaluation directe des grandeurs fonctions de deux variables), L. Barbillion and M. Dugit. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 7, Aug. 17, 1920, pp. 389-392. Instruments using two needles, one curvilinear and one rectilinear, or both curvilinear, turning about the same axis. As exampled are quoted an instrument for measuring relative velocity of an aeroplane, and an indicator of carburation in explosion motors.

METALS

METEOROLOGY

METRIC SYSTEM

MOTOR TRUCKS

STEAMSHIPS vs. Cargo Motorships vs. Steamships—II, Charles E. Lucke. Int. Mar. Eng., vol. 25, no. 10, Oct. 1920, pp. 837-841. Fixed annual expenses and service expenses. Cost of cargo transportation, net earnings and investment returns.

Motorships v. Steamships, Charles E. Lucke. Motorship, vol 5, no. 10, Oct. 1920, p. 910. Comparative operating expenses and earnings of cargo vessels. (Continuation of serial.)

N

NATURAL GAS

CONSERVATION OF. Conservation of Gas, L. B. Denning. Natural Gas & Gasoline Jl., vol. 14, no. 9, Sept. 1920, pp. 261-262. Work done by National Committee on National Gas Conservation, which consists of four representatives of public, four representatives of gas-producing companies, and two representatives of Dept. of Interior. Set of rules and regulations drawn up by committee is given.

CURTAILMENT IN INDUSTRY. Chemical Industries Likely to Lose Natural Gas Supply, R. S. McBride. Chem. & Metallurgical Eng., vol. 23, no. 15, Oct. 13, 1920, pp. 743-744, 4 figs. Investigations being conducted by State Public Service Commissions of West Va., Pa., Ohio, Md. and New York, in regard to advisability of restricting use of natural gas to domestic purposes.

UTILIZATION AND CONSERVATION. Mud Process in Saving Gas, A. W. Ambrose. Gas Rec., vol. 18, no. 6, Sept. 22, 1920, pp. 31-33. Method of preventing waste while drilling for gas and oil.

NAVIGATION

SUBMARINES, NAVIGATIONAL OBLIGATIONS. Modern Marine Problems in War and Peace, C. V. Drysdale. Jl. Instn. Elec. Engrs., vol. 58, no. 293, July 1920, pp. 572-597. Account of scientific investigations which have been carried out in marine problems during and after the war under British Admiralty at various experimental stations. Work during war consisted chiefly of devising means for detecting submarines. Eleventh Kelvin Lecture.

See also Radio Communication, Guiding Aerial and Marine Craft.

NICKEL-IRON ALLOYS

CONSTITUTION. The Constitution of the Nickel-Iron Alloys, D. Hanson and Hilda E. Hanson. Iron and Steel Inst., Meeting Sept. 21-22, 1920, paper no. 5.20 pp., 31 figs. Investigation into constitution of nickel-iron alloys. Special attention was given to determination of effect of small quantities of nickel on critical points of pure iron. Osmond's theory of nickel-iron alloys is examined, and attempt is made to construct "stable" diagram of nickel-iron alloys.

NOZZLES

STEAM ACTION IN. Steam Action in Simple Nozzle Forms. A. L. Mellanby and Wm. Kerr. Eng., vol. 110, no. 2853, Sept. 3, 1920, pp. 310-314, 15 figs. Charts giving pressure ratio curves for various types, constructed from results obtained from experiments. Paper read before Eng. Section, British Assn. for Advancement of Science.

O

OFFICE MANAGEMENT

See Industrial Management, Office Management.

OIL

FLOW IN PIPES. *See Flow of Oil, Pipes.*

OIL ENGINES

FAIRBANKS-MORSE. The Fairbanks-Morse "C-O" Marine Oil Engines. Practical Engr., vol. 62, no. 1752, Sept. 23, 1920, pp. 201-203, 5 figs. Outstanding features are (1) no water injection into cylinders, (2) water jacketing of combustion chamber and exhaust manifold, and (3) special means for quick starting.

MARINE. A High-Compression Marine Oil Engine. Engr., vol. 130, no. 3375, Sept. 3, 1920, pp. 224-226, 5 figs. Built by Plenty & Son, Ltd., Newbury, England. Engines are manufactured with two sizes of cylinders, 270 mm. bore by 300 mm. stroke and 335 mm. by 350 mm., grouped according to power required.

See also Diesel Engines; Semi-Diesel Engines.

OIL FIELDS

ARGENTINE. Petroleum in Commodoro Rivadavia (El petro leo en Commodoro Rivadavia), Walter C. Kretz. Ingenieria Internacional, vol. 4, no. 4, Oct. 1920, pp. 195-201, 7 figs. Description of oil fields and methods of exploitation.

BOLIVIA. Bolivia as a Source of Petroleum Supply. Petroleum Times, vol. 4, no. 90, Sept. 25, 1920, p. 312. Nature of oil deposits. Conditions governing concessions of oil lands.

OIL FUEL

PASSENGER SHIPS. Oil Fuel on Passenger Ships, Shipbuilding and Shipping Rec., vol. 16, no. 13, Sept. 23, 1920, pp. 373-376. Report of Board of Trade Committee on prevention of fire on passenger ships burning oil fuel. Minimum flash point. Precautions proposed.

OIL SHALES

UTILIZATION. The Oil Shale Industry in Scotland and England. Am. Gas Eng. Jl., vol. 113, no. 14, Oct. 2, 1920, pp. 255-260 and p. 265. Analyzes methods employed abroad and bases suggestions on these findings for utilization of American shales.

OIL TANKS

MEASURING LIQUIDS IN. Measuring Liquids in Ships' Tanks. Int. Mar. Eng., vol. 25, no. 10, Oct. 1920, pp. 841-843, 3 figs. Operation of tank gage and draft indicator.

ORE DRESSING

CLASSIFIER EFFICIENCY. Classifier Efficiency, R. T. Hancock. Eng. and Min. Jl., vol. 110, no. 13, Sept. 25, 1920, pp. 622-623. Improvement over former methods of determination suggested. Elutriation preferable to screening tests.

OXY-ACETYLENE WELDING

AUTOMOBILES. Autogenous Welding in the Citroen Automobile Factory (Die autogene Schweissung in der Automobilfabrik Citroen), Autogene Metallbearbeitung, vol. 13, no. 11, June 1, 1920, pp. 118-124, 3 figs. Includes illustrations of auxiliary welding devices and of the numerous welded automobile parts. From report of the Swiss Acetylene Assn.

CHARACTERISTICS OF WELDS. Characteristics Peculiar to Oxy-Acetylene Welds, Alfred S. Kinsey. Welding Engr., vol. 5, no. 9, Sept. 1920, pp. 23-24. One of characteristics noted is its applicability to all kinds of metals. Paper read before Joint Meeting, New York Section Am. Soc. M.E. and Am. Welding Soc.

OXYGEN

LIQUID. *See Explosives, Liquid Oxygen.*

P

PAINTS

EXPOSURE TESTS. Report on Paint Exposure Tests at Atlantic City, New Jersey, Henry A. Gardner. Am. Architect, vol. 118, no. 2337, Oct. 6, 1920, pp. 445-449, 6 figs. Further account of paint exposure test panels consisting of wood and metal, both bare and coated with various types of paint and varnish, exposed on Young's Million Dollar Pier at Atlantic City, N.J., and described in Am. Architect issue of Aug. 27, 1919.

PAVEMENTS

COMPARATIVE VALUES OF. Costs on Four Types of Pavement in Philadelphia Test Road. Eng. News-Rec., vol. 85, no. 13, Sept. 23, 1920, pp. 607-608. Twenty-six sections, comprising bituminous macadam, mixed and penetration methods, concrete and vitrified block compared.

PAVEMENTS, ASPHALT

MAINTENANCE COSTS. Sheet Asphalt Maintenance Costs in District of Columbia, F. S. Besson. Eng. News-Rec., vol. 85, no. 15, Oct. 7, 1920, pp. 705-707. Use of salvaged material makes cost $1.74 square yard, including asphalt cost, haulage, cutting out, working patch.

SPECIFICATIONS. Specifications for Asphalt Pavements. Good Roads, vol. 20, no. 14, Oct. 13, 1920, pp. 186-187. Prepared by technical committee of Asphalt Assn., New York, N.Y.

PAVEMENTS, BRICK

MONOLITHIC. Monolithic Brick Pavement Fails from Expansion, M. W. Watson. Eng. News-Rec., vol. 85, no. 13, Sept. 23, 1920, pp. 595-596, 3 figs. Experience in Kansas highways. Heat caused brick slabs to separate from concrete base and finally to rupture with violence.

PAVEMENTS, CONCRETE

HANDLING CONCRETE MATERIAL. New Method of Handling Concrete Material on Minneapolis Paving Job. Ellis R. Dutton. Mun. and County Eng., vol. 59, no. 3, Sept. 1920, pp. 22-24, 3 figs. Truck tractor having dumping body used in connection with bucket loader.

PAVEMENTS, STONE

GRANITE-BLOCK. Method of Constructing Duras Pavement, W. C. Mallonee. Eng. & Contracting, vol. 54, no. 14, Oct. 6, 1920, pp. 351-352, 2 figs. Granite block pavements laid upon concrete foundation.

PAVEMENTS WOOD-BLOCK

COMPARATIVE VALUE OF WOODS. Utility of Hardwoods for Paving Shown in Comparative Tests, E. E. Butterfield. Eng. News-Rec., vol. 85, no. 14, Sept. 30. 1920, pp. 656-658. Relative insusceptibility to expansion through water absorption, and greater strength are said to recommend oaks and hickory.

TIGHTENING BLOCKS. Jackscrews Tighten Wood Block Pavement in Place, W. W. Horner. Eng. News-Rec., vol. 85, no. 15, Oct. 7, 1920, pp. 686-689, 3 figs. Method developed at St. Louis, Mo. Pavement is cut in two at intervals and blocks on each side of cuts are tightened up with jack-screws.

PETROLEUM

PERU AND BOLIVIA. The Prospects for Petroleum Production in Peru and Bolivia, Charles S. Haley. Eng. & Min. Jl., vol. 110, no. 16, Oct. 16, 1920, pp. 772-774. High cost of development, difficulties of transportation, high royalties asked and objection to long-term concessions are drawbacks to exploitation of oil possibilities in these countries.

RESIDUALS. Characteristics of Steam-Distilled Petroleum Residuals, B. A. Anderton. Can. Engr., vol. 39, no. 15, Oct. 7, 1920, pp. 411-414, 11 figs. Tests of consistency with progress of distillation. Paper presented before Am. Soc. for Testing Matls.

WATER IN [illegible]. [illegible] Mine [illegible] by [illegible] W. [illegible] [illegible]. [illegible]
See also [illegible]

PIPE

[illegible]. [illegible] Strength of [illegible] Pipe [illegible]. [illegible]
See also [illegible]

PIPE, CONCRETE

[illegible]. New Type of Concrete Pipe [illegible]. Concrete [illegible]

PIPE LINES

[illegible]. Oil Pipe Lines. [illegible]

[illegible]. [illegible] Pipe Line. [illegible]
The [illegible] Pipe Line. [illegible]

PIPE, WOODSTAVE

[illegible]. The Use of Wooden [illegible] Pipe [illegible]

PNEUMATIC TOOLS

See Drills, Pneumatic.

PORTS

VANCOUVER, B. C. Port of Vancouver and Proposed Development. W. [illegible] Can. Engr. [illegible]. Paper read before Eng. Inst. of Canada.

POWER TRANSMISSION

SONIC WAVES. The Transmission of Power by Waves through Liquids. [illegible] Wave transmission [illegible]

PROPELLERS, SHIP

DESIGN. Characteristics of a Marine Propeller in a Non-Uniform Stream. T. B. Abell. Engr., vol. [illegible], Sept. 24, 1926, p. [illegible]. Notes on design of ship propeller.

PUBLIC UTILITIES

STATE VS. LOCAL REGULATION. State Versus Local Regulation of Public Utilities. William J. [illegible]. Elec. Wld. (Chicago), vol. [illegible]. Paper presented before Nat. Elec. Light Assn.

PULLEYS

COMPRESSED-SPRUCE. An Investigation of Compressed Spruce Pulleys. George S. Wilson. Belting & Transmission, vol. [illegible]. Results [illegible] of construction. [illegible] Washington State [illegible] Am. Soc. Mech. Engrs. [illegible]

PULVERIZED COAL

BOILER FIRING. Recent Progress in the Firing of Boilers with Pulverized Coal [illegible] with good thermal efficiency.

[illegible]

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Q

QUAY WALLS

[illegible]

R

RADIO COMMUNICATION

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RAILWAY ELECTRIFICATION

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RAILWAY OPERATION

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[illegible]

RAILWAY SIGNALING

[illegible]

RAILWAY TIES

[illegible]

RAILWAY TRACK

See Snow Plows.

RAILWAYS

SAFETY WORK. The Economic Value of Railway Safety Work, Samuel O. Dunn. Ry. Age, vol. 69, no. 15, Oct. 8, 1920, pp. 605-607. Survey of improvements in railway accident record within last decade. Paper read before Nat. Safety Council.

RECOVERANCE

See materials, Testing.

RESEARCH

AGRICULTURAL. Scientific Research in Relation to Agricultural Problems. Science, vol. 52, no. 1344, Oct. 1, 1920. pp. 301-307. Address delivered at organizing convention of Can. Soc. of Technical Agriculturists, Ottawa, June 3, 1920.

EGYPTIAN GOVERNMENT ANALYTICAL LABORATORY. Egyptian Analytical Laboratory and Assay Office, A. Lucas. Chem. Age (Lond.), vol. 3. no. 64, Sept. 4, 1920, pp. 256-257. Report on work of Government Analytical Laboratory and Assay of Office during period of 1913-1919. Report emphasizes need of industrial research and of thoroughly up-tp-date scientific library for general reference.

INDUSTRIAL. Relations between Science and Industry and the Societies for Industrial Advancement (Les relations entre la science et l'industrie et les sociétés de perfectionnements industriels), R. d'Adhémar. Revue générale des Sciences, vol. 31, nos. 15-16, Aug. 15-30, 1920, pp. 513-519. Advantages of industrial research.

Scientific and Industrial Research. Chem. Age (Lond.), vol. 3, no. 67, Sept. 25, 1920, pp. 332-334. Also Gas World, vol. 73, no. 1888, Sept. 25, 1920, pp. 228-229. Fifth annual progress report of British Committee of Privy Council for Scientific and Industrial Research.

Science and the Industries, John J. Carty. Reprint & Circular Series of Nat. Research Council, no. 8, 16 pp, 2 figs. Address delivered under auspices of Nat. Research Council, Washington, D. S.. Feb. 6, 1920.

The Engineer in Industry, Edward A. Deeds. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920, pp. 331-333. Necessity for research in industry.

INTERNATIONAL RESEARCH COUNCIL. The International Organization of Scientific Research, George Ellery Hale. Int. Concillation, no. 154, Sept. 1920, pp. 431-441. Notes on International Research Council organized at International meeting held in Brussels, July 18-28, 1919.

NATIONAL RESEARCH COUNCIL. Fourth Annual Report of the National Research Council. Washington Government Printing Office, 1920, 68 pp. Council was established in 1916 at request of President of United States under charter of Nalt. Academy of Sciences.

REDUCTION OF OBSERVATIONS. Adjustment of Parabolic and Linear Curves to Observations Taken at Equal Intervals of the Independent Variable, Harry M. Roeser. Dept. of Commerce, Sci. Papers of Bur. of Standards, no. 388, July 21, 1920, pp. 363-375. Ordinary least-square formulæ are subjected to mathematical treatment and rigorous solutions are evolved which require ultimate minimum of arithmetical work. Table is furnished from which large portion of solutions can be written down from mere inspection of observations. Application of solutions is made to typical problems and absolute check with ordinary least-square aolutions is shown.

UNITED STATES. The Development of Research in the United States. James Rowland Angell. Reprint & Circular Series of Nat. Research Council, no. 6, 19 pp. Address delivered before Assn. of Land-Grant Colleges at Chicago, Nov. 13, 1919. Reprinted from Proceedings of Thirty-third Annual Convention of Assn. of Am. Agricultural Colleges & Experiment Stations.

See also Concrete, Research; Flotation, Research.

RHEOSTATS

LIQUID. The New Liquid Rheostats for the Norfolk & Western Railway, D. C. West. Elec. Jl., vol. 17, no. 10, Oct. 1920, pp. 483-484. Rheostat for each truck consists of two electrode assemblies, of three electrodes each, mounted side by side in rectangular tank, which is provided with set of weirs for raising and lowering height of electrolyte around electrodes.

RIPARIAN RIGHTS

RETENTION BY STATE. Riparian Rights, J. Spencer Smith. Freight Handling & Terminal Eng., vol. 6, no. 9, Sept. 1920, p. 334. Contrast is made between developments at Montreal and New Orleans, where riparian rights have been retained by state, and Jersey City, N. J., where riparian rights have not been so retained. More scientific developments on former ports is attributed to retention of such rights. Paper read before Am. Port Authorities, Chicago, Sept. 1920.

RIVER VESSELS

COAL BARGES. Material for Construction of Coal Barges (Note sur le matériel de la batellerie). Bulletin technique du Bureau Veritas, vol. 2, no. 9, Sept. 1920, pp. 179-182, 3 figs. Coal barges employed for canal transportation of coal from Sarre district. Dimensions are: Length between perpendiculars, 38.35 m.; breadth, 5 m.; mean depth, 2.7 m.

RIVERS

See Riparian Rights.

RIVETING

ELECTRIC RIVET HEATERS. An Electric Rivet Heater Eng., vol. 110, no. 2856, Sept. 24, 1920, p. 408, 1 fig. Apparatus consists of simple framework on wheels for carrying transformer. It is constructed by A.1 Manufacturing Co., Bradford, England.

ROAD CONSTRUCTION

ILLINOIS. Highway Work in Illinois. Good Roads, vol. 20, no. 14, Oct. 13, 1920, pp. 179-180. 49 miles were completed during September on Federal Aid System which involves construction of 225 miles. $2,881,504 bridge and grading contracts were let.

MACHINERY. Novel Construction Methods Employed on Morris-Ottawa, Illinois Concrete Road, J. E. Huber. 1920, pp. 83-85, 11 figs. Specially constructed excavator which operates like elevating grader and is equipped with caterpillar traction, its power being furnished by large gas engine.

ROAD ROLLERS

STEAM VS. ELECTRIC. Power Road Rollers (Motor-Strassenwalzen), H. Jacoby. Allgemeine Automobil-Zeitung, vol. 21, no. 33, Aug. 13, 1920, pp. 24-26, 4 figs. Describes various new types and gives data of comparative costs of 12-ton steam roller and 6 to 8-ton electric roller.

ROADS

FEDERAL-AID TYPES. The Selection and Comparison of Federal-Aid Road Types, E. W. James. Eng. & Contracting, vol. 54, no. 14, Oct. 6, 1920, pp. 348-351. Paper presented before conference of District Engrs. of U. S. Bur. of Public Roads.

ROADS, CONCRETE

CONSTRUCTION. Central Mixing and Proportioning Plants in National Old Trails Road Construction in Illinois. Eng. & Contracting, vol. 54, no. 14, Oct. 6, 1920, pp. 339-342, 13 figs. Comparison of two methods of handling concreting, in central mixing plant or in central proportioning plant, based on experience of contractors who have used these two methods in road construction work in Illinois.

ROLLING MILLS

ALLOY-STEEL SHEETS. Carbon Steel Company Jobbing Mill, J. F. Burt. Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, pp. 545-547, 5 figs. New mill used for rolling high-carbon and alloy-steel sheets and plates at Pittsburgh plant of Carbon Steel Co.

ELECTRIC. Electric Reversing Mill Considered from the Standpoint of Tonnage, K. A. Pauly. Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, pp. 541-544, 2 figs. Discussion of influence of control on rolling time, particularly to effect of limiting maximum power delivered to direct current motor driving rolls. (Abstract.) Paper read before Assn. Iron & Steel Elec. Engrs.

See also Electric Drive, Rolling Mills.

RUBBER

PERMEABILITY TO GASES. Permeability of Rubber to Gases, Junius David Edwards and S. F. Pickering. Dept. Commerce, Sci. Papers of Bur. of Standards, no. 387, July 12, 1920, pp. 327-363, 9 figs. Certain of factors which determine permeability of rubber to gases were investigated and relative rates of penetration of number of gases determined. It was found for example, that permeability to hydrogen is inversely proportional to thickness of rubber and that permeability to any gas is found to be directly proportional to its partial pressure, provided total pressure is constant.

S

SAFETY

See Railways, Safety Work.

SAND, MOLDING

STANDARDIZATION. Standardization of Molding Sands, C. Powell Karr Iron Age, vol. 106, no. 14, Sept. 30, 1920, pp. 845-849, 2 figs. Suggestions for classifying and establishing relative values. Apparatus and methods for testing. Characteristics of typical sands.

SANITATION

WORKS. The New Sanitation Works of Codigoro (La nouvelle installation d'assainissement de Codigoro), G. Muller. Bulletion technique de la Suisse romande, vol. 46, no. 17, Aug. 21, 1920, pp. 193-197, 9 figs. Details of pumping installation. (Continuation of serial.)

SCIENTIFIC MANAGEMENT

See Industrial Management.

SCREW THREADS

CONICAL. Device for Cutting Conical Screw Threads (Vorrichtung zum Schneiden von konischem Aussenund Innengewinde), Metall-Technik, vol. 46, nos. 25-26, June 28, 1920, p. 97, 2 figs. Describes patented device for cutting internal and external threads which can be attached to any lathe, and is especially adapted to the machining of workpieces of large diameter, such as pipe sleeves, nipples, etc.

NATIONAL SCREW THREAD COMMISSION. Tentative Report of the National Screw Thread Commission. Jl. Soc. Automotive Engrs., vol. 7, no. 4, Oct. 1920. pp. 317-320. Tables giving proposed series of coarse-thread and fine-thread screws.

SEAPLANES

AIR MINISTRY COMPETITION. The Air Ministry Seaplane (Amphibian) Competition. Flight, vol. 12, no. 39, Sept. 23, 1920, pp. 1013-1021, 22 figs. Description of machines entered in British air ministry competion for amphibian machines.

Electric, Manufacture of. Electric Steels, C. G. Carlisle. Iron and Steel Inst., Meeting, Sept. 21-22, 1920, paper no. 2, 23, pp., 1 fig. Tension, compression and torsion tests of steel manufacture in electric furnace, also tests of endurance. Study of suitability for die making, etc.

Macrostructure. Revealing Macrostructure of Iron and Steel, Henry S. Rawdon. Iron Age, vol. 106, no. 16, Oct. 14, 1920, pp. 965-968, 7 figs. Method of etching with ammonium persulphate as agent.

Non-Magnetic. Non-Magnetic, Flame, Acid, and Rust Resisting Steel, C. M. Johnson. Am. Drop Forger, vol. 6, no. 9, Sept. 1920, pp. 423-424. Properties of steel developed in Research Dept., Crucible Steel Co. of America.

Physical and Chemical Properties, Relation of. Notes as to Rates of Reaction in Certain Steels at 930 deg. cent., E. D. Campbell and B. A. Soule. Iron and Steel Inst., Meeting, Sept. 21-22, 1920, paper no. 1, 6 pp. It was desired to determine whether when bar of steel 6 mm. square by 15 cm. long was hardened by quickly plunging it into ice water there would be detectable difference in chemical constitution between two ends of bar. It was found that difference in rate of cooling of two ends of bar produces changes in chemical constitution which result in differences in thermo-electromotive potential much in excess of anything attributable to experimental error. Differences in potential at opposite ends indicated difference in chemical constitution.

Production in U. S. Statistics of Rolled Steel Products—Smaller Tonnages in 1919 than in Preceding Year. Iron Age, vol. 106, no. 16, Oct. 14, 1920, pp. 985-987. Statistics compiled by Am. Iron & Steel Inst. showing production of steel ingots and castings and other products.

STEEL, HEAT TREATMENT OF

Electric Furnaces. Heat Treating Steel Electrically, E. F. Collins. Iron Trade Rev., vol.67, no. 15, Oct. 7, 1920, pp. 990-994, 12 figs. Factors affecting uniformity and quality of castings. Advantages of electric furnaces for heat treating. Automatic control is recommended. Paper read before Am. Foundrymen's Assn.

Gas Heating. Heat Treatment Using High Pressure Gas, A. C. Roessler. Am. Drop Forger, vol. 6, no. 9, Sept. 1920, pp. 450-452, 2 figs. "Romec" system of high pressure gas heating.

Hump Method. Hump Method of Heat Treatment of Steel in Electrical Furnaces, Mr. Tall. Proc. Steel Treating Research Soc. & Jl. Am. Steel Treaters Soc., vol. 2, no. 13, pp. 18-22, 11 figs. Equipment manufactured by Leeds-Northrup Co.

STEEL, HIGH-SPEED

Forging Temperatures, Effect of. Some Effects of Forging Temperatures on Drill Steel, B. Franklin Shepherd. Compressed Air Mag., vol. 25, no. 10, Oct. 1920, p. 9833, 2 figs. Results of tests.

STEEL MANUFACTURE

Ingot Molds. Influence of Manganese Content on Duration of Molds for Steel Ingots (Influence d'une augmentation notable de la teneur en manganèse des fontes de lingotières d'acierie), M. Groschaude. Génie Civil, vol. 77, no. 10, Sept. 4, 1920, pp. 198-199, 1 fig. Molds containing from 1.75 to 2.25 per cent manganese are said to have resisted 250 casts. Diagram showing ralation between manganese content and duration of mold is constructed from results of experimence in steel foundry.

STEEL MILLS

Electrical Equipment, Standardization of. Standardization of Electrical Equipment and its Relation to Accident Hazard, Walter Greenwood. Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, pp. 548-549. Standardization demanded on account of economy in construction and operation and equally so on account of lowering of accident hazard. (Abstract.) Paper read before Assn. Iron & Steel Elec. Engrs.

Power Plants. Current Limiting Reactances, R. H. Kiel. Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, pp. 554-556. Disadvantages of centralizing generating equipment. Means for aiding power house in maintaining a continuous supply of electric power on its lines. (Abstract). Paper read before Assn. Iron & Steel Elec. Engrs.

Some Economic Consideration in Design of Power Plants for Steel Mills, T. E. Keating. Blast Furnace & Steel Plant, vol. 8, no. 10, Oct. 1920, pp. 570-574. Deals with economic centralization of power generation for various units of steel industry. How to design power plants for greatest economy. (Abstract.) Paper read before Assn. Iron & Steel Elec. Engrs.

See also Electric Drive, Rolling Mills.

STEEL WORKS

Ebbw Vale. The Electrification of the Works and Collieries of the Ebbw Vale Steel, Iron and Coal Company, Limited, Walter Dixon. Eng., vol. 110, no. 2856, Sept. 24, 1920, pp. 419-421, 5 figs. Also Engr., vol. 130, no. 3378, Sept. 24, 1920, pp. 299-300, 5 figs. Works are expected to provide after completion of improvements, annual output of 5,500,000 tons of coal, 575,000 tons of coke, and 450,000 tons pig iron. Allied industries embrace manufacture of steel rails and sleepers, galvanized steel sheets, weldless steel tubes and couplings, coke-oven and blast-furnace by-products, iron and steel castings and engineering work. Paper read before Iron & Steel Inst.

Waste-Heat Operated. Steel Plant Operated with Waste Heat. Iron Age, vol. 106, no. 13, Sept. 23, 1920, pp. 765-769, 7 figs. New Works of Electric Steel & Forge Co., Cleveland, for manufacture of alloy steels. Ingots broken down under hammer.

STREET RAILWAYS

Cars, Safety. New Standard Type of Safety Car Suggested, Wray T. Thorn. Elec. Ry. Jl., vol. 56, no. 12, Sept. 18, 1920, pp. 549-550, 1 figs. Separate entrance and exit, longitudinal seats at the ends and other changes recommended to make small one-man car better adapted to fairly heavy traffic lines.

Results of Safety Car Operation, J. C. Thirlwall. Elec. Ry. Jl., vol. 56, no. 14, Oct. 2, 1920, pp. 642-646, 8 figs. Experience of 38 companies. It is said that safety cars reduce injuries to passengers, provide safer, better paid and more interesting work for employees, and are popular with public.

Snow and Ice Loads on Trolley Wires. Formulæ for Ice-Covered Trolley Lines (Aneisungsformeln), Robert Edler. Schweiz. elektrotchnischer Verein Bul., vol. 11, no. 8, Aug. 1920, pp. 207-214, 3 figs. Results of calculation of additional load caused by snow and ice. (To be concluded.)

Switchboard Connections. Scheme for Investigating the Electrical Condition of one of the Lines in a Street Railway Network (Installation permettant de vérifier rapidement l'isolement des différentes lignes d'un réseau de tramways), E. Favreau. Revue générale de l'Electricité, vol. 7, no. 25, June 19, pp. 827-828, 2 figs. Suggests arrangement whereby voltmeter becomes connected to circuit when automatic circuit breaker opens.

STREETS

Cleaning. Contract Work vs. Municipal Forces in Street Cleaning, Eng. & contracting, vol. 54, no. 14, Oct. 6, 1920, pp. 346-347. Study of method employed by various municipalities in street cleaning and in collection and disposal of municipal waste.

See also Snow Removal.

STRUCTURAL STEEL

Specifications. Specifications for Carbon Steel Bars, Blooms and Billets for other Purposes than Machine Tools (Cahier des charges pour la fourniture de barres, blooms, billettes et largets en aciers au carbone autres que les Aciers à outils). Revue de Métallurgie, vol. 17, no. 7, July 1920, pp. 478-483. Specifications prepared by Commission Permanente de Standardisation.

Specifications for Non-Tempering Carbon Steel Bars, Blooms and Billets (Cahier des charges pour la fourniture des barres, blooms, billettes et largets en aciers au carbone non trempants). Revue de Métallurgie, vol. 17, no. 7, July 1920, pp. 469-473, 1 fig. Specifications prepared by Commission Permanente de Standardisation.

Standard Sections. Lists of British Standard Rolled Steel Sections for Structural purposes. British Eng. Standards Assn., no. 1, 1920, 19 pp., 6 figs. Standards adopted in July 1920.

SUBMARINE WARFARE

Detection of Submarines. Detection of Submarines Harvey C. Hayes. Proc. Am. Philosophical Soc., vol. 59, no. 1, 1920, pp. 1-47, 18 figs. Research and development work carried out by two groups of scientists, one group backed by private companies, the other by the U. S. Navy. Types of submarine detectors developed by England, France and United States.

SUBMARINES

Uses in Peace. Small Submarine for Oceanographic Work (Sur un petit sous-marin destiné aux travaux océanographiques, Maxime Laubeuf. Comptes rendus des Séances de l'Académie des Sciences, vol. 171, no. 10, Sept. 6, 1920, pp. 485-489. Suggests design.

See also Navigation, Submarine, Navigational Obligations.

SUPERHEATERS

Steam Velocities in. Steam Velocities and Pressure Drop in Superheaters, H. B. Oatley. Int. Mar. Eng., vol. 25, no. 10. Oct. 1920, pp. 824-825. Advantages resulting from use of high steam velocities.

SWITCHBOARDS

See Street Railways, Switchboard Connections.

T

TELEGRAPHY

Duplexing Submarine Cables. The Semi-Bridge System of Duplexing Submarine Telegraph Cables (Kajiura's System), J. Kajiura. Telegraphs & Telephone Age, vol. 38, no. 19, Oct. 1, 1920, pp. 510-512, 2 figs. Japanese invention said to have proven successful in application to a number of submarine telegraph cables.

Rapid. Rapid Telegraphy (La télégraphie rapide), J. B. Pomey. Electricien, vol. 51, no. 1258, Aug. 15, 1920, pp. 342-349, 7 figs. Comparison of Buckingham and Baudot apparatus.

TRACTORS

U

V

VALUATION

W

WATER HAMMER

METALLIC CONDUITS UNDER PRESSURE. Study of Water Hammer in Metal Conduits under Pressure (L'étude des coups de bélier dans les canalisations métalliques sous pression), C. Camichel and D. Eydoux. Houille Blanche, vol. 19, nos. 43-44, July-Aug. 1920, pp. 127-131, 3 figs. Formulæ for determining velocity of transmission, pressure exerted, etc., and graphs indicating transmission of water hammer. (Continuation of serial.)

SOUTH AMERICA. Electrical Possibilities in South America, Verne Leroy Havens. Elec. World, vol. 76, no. 15, Oct. 9, 1920, pp. 729-730. Opportunities for water power development. Operating difficulties and how they are overcome.

WATER PURIFICATION

ASPIRATORS, DESIGN OF. The Design of Aspirators of Sterilizing Water. A. E. Walden. Mech. Eng., vol. 42, no. 10, Oct. 1920, pp. 562-564, 7 figs. Type developed from results of numerous tests with different forms of aspirators, ejectors, siphons, jets and nozzles.

WATER WORKS

COST-PLUS CONTRACTS. Cost-Plus Contracts for Water Works Construction, George W. Fuller. Jl. Am. Water Works Assn., vol. 7, no. 5, Sept. 1920, pp. 683-692. It is held that cost plus contracts, with proper provision for accounting and supervision, may be satisfactory where conditions are not definitely known and in case of private corporations where well qualified contractors may be selected to work under adequate supervision. Under war conditions, it is said cost-plus contracts were necessary and even now have many advantages.

WATERWAYS, INLAND

RECONSTRUCTION. The Reconstruction of French Inland Waterways (Pour la reconstruction de notre réseau navigable), J. Boudet. Vie Technique & Industrielle, vol. 1, no. 12, Sept. 1920, pp. 463-472, 7 figs. Method of "isolated sections" for reconstructing waterway without interrupting traffic, Special portable dams are firmly placed about 600 ft. apart; water is pumped out from section thus isolated and work required performed over night. Method was invented by Enterprise Fougerolle and is said to have been applied successfully by them in various enterprises.

WELDING

See Electric Welding, Arc; Electric Welding, Resistance; Oxy-Acetylene welding.

WELFARE WORK

INDUSTRIAL HYGIENE. Economic Aspect of Industrial Hygiene, Bernard J. Newman. Indus. Management, vol. 60, no. 4, Oct. 1920, pp. 271-272. Relation between health and general welfare of employees and their working efficiency.

WELFARE DEPARTMENT. Is "Welfare Work" Accomplishing Constructive Results? Norman G. Shidle. Automotive Industries, vol. 43, no. 13, Sept. 23, 1920, pp. 619-621. Suggests auditing "welfare" department and making it justify its existence just as definitely as in production department.

See also Mining Industry, Welfare Work.

WOMEN WORKERS

See Executives, Women as.

WOOD

TREATMENT OF. Treatment, Seasoning and Fire-proofing of Industrial Wood (Imprégnation, sénilisation et ignifugation des bois d'industrie), J. Escard. Houille Blanche, vol. 19, nos. 43-44, July-Aug. 1920, pp. 148-151. Chemical compounds used for treating. (Continuation of serial.)

Z

ZINC

CORROSION. Corrosion of Zinc of Various Compositions after Exposure to the Air for Five Years (Corrosion de zincs de compositions diverses après cinq ans d'exposition à l'air), Eng. Prost. Revue universelle des Mines, vol. 6, no. 5, Sept. 1. 1920, pp. 353-363, 16 figs. Researches at metallurgical laboratory of Liège University.