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The Canadian Engineer

An Engineering Weekly

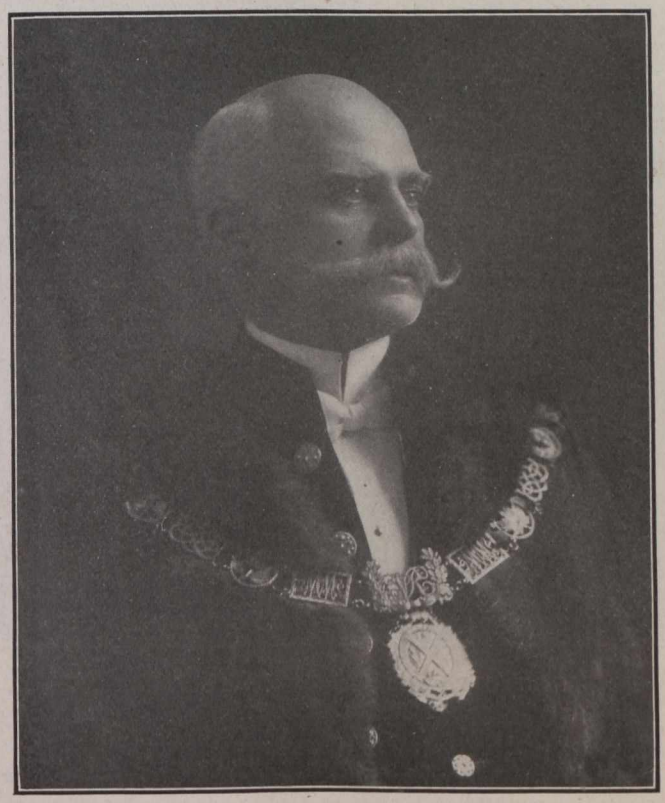
MONTREAL.

Montreal, the commercial metropolis of Canada, situated at the head of navigation, is now entitled to be classed among the great cities of the world. Including the annexations during the past few years, it has a total area of slightly over forty square miles. It extends a distance of about twelve miles in length along the harbor front and its northern extremity fronts upon the Riviere des Prairies which, together with the St. Lawrence, makes the Island of Montreal. Of the territory embraced within the borders of the city, a very considerable area would hardly be recognizable as city property. A certain proportion of it is country district; but houses are springing up in every direction and ere many years have passed the entire area will, no doubt, assume the appearance of the suburbs of the city. It may be worthy of remark that until 1910 the area of the city was only in the vicinity of twenty square miles, the additional twenty having been added through annexation of outlying districts since then.

In the matter of population Montreal has increased very rapidly, having almost trebled in twenty years and having considerably more than doubled in ten years, as the following will show:—

Population of Montreal in	1891	220,181
do.	1901	266,826
do.	1910	456,000
do.	1912	600,000

It must be admitted that a certain proportion of the above increase was due to annexaion of outlying districts. Included in the above figures is the population of some districts which, strictly speaking, are really not portions of the city proper but which, in any consideration of the present character, must be included. For instance, Westmount's population of 15,000 is included, as is Outremont's 5,000 and some 20,000 in Maisonneuve. This, however, is quite justifiable when it is remembered that Montreal surrounds each of these municipalities and even the citizens of the city, itself, would be unaware that they would be passing through a separate municipality.



Mr. Jas. J. Guerin, Mayor of Montreal.

In point of population Montreal now stands somewhere among the largest thirty or thirty-five cities of the world. In a recent comparison she stood ahead of Pittsburg, Birmingham, Leipzig, Detroit, Rome, San Francisco, Cincinnati, Mexico, New Orleans, Bristol and other well known large cities and capitals.

The increase in population and area, large as it has been, is small when compared with the increase in valuation of taxable property which has taken place. Within five or six years the value of the property has more than doubled, according to the report of the assessors. The value of the property exempt from taxation also has more than doubled. Exemptions for the most part consist of civic property which is owned by educational, charitable or religious organizations. These exemptions in a city which never has sufficient money to carry out works of a character which are representative of good government, have been fruitful of much discussion. An attempt was made a few years ago by which many of the exemptions would be transferred to the taxable list, but little came of it. The following shows the growth in the value of the property under discussion since the beginning of the present century.

	Exempt.	Taxable.	Total.
1900	$ 37,000,000	$148,000,000	$185,000,000
1905	46,000,000	173,000,000	219,000,000
1911	120,000,000	381,000,000	501,000,000

Included in the exemptions are some 38 parks and public squares having an area of slightly over 800 acres and a value of $12,000,000.

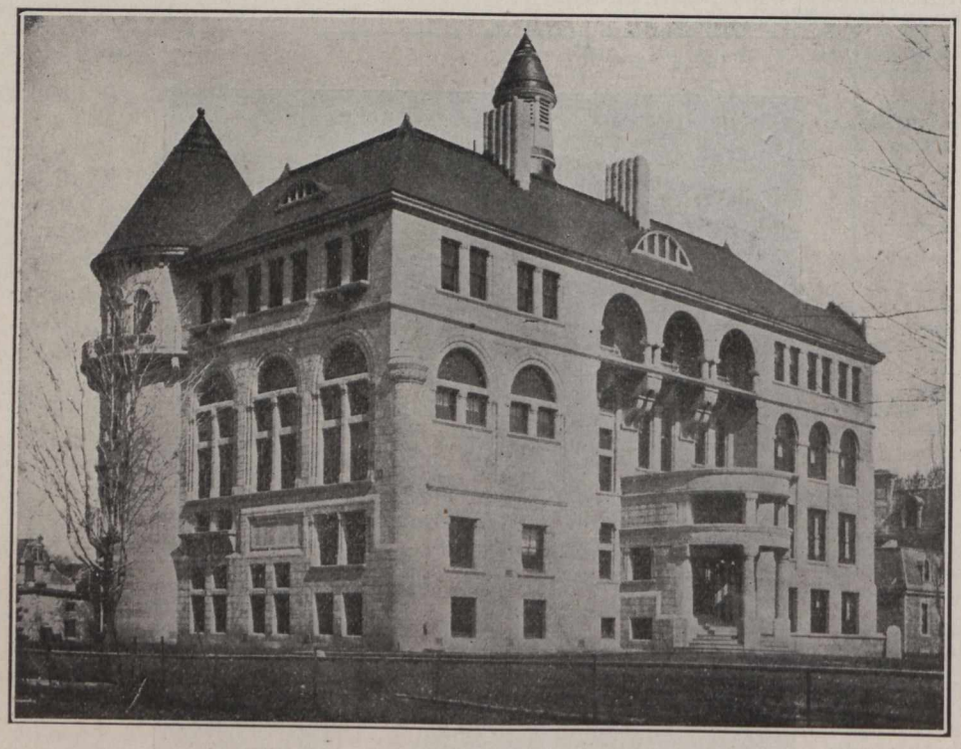
...

During the year 1911, the values of the building permits taken out at the City Hall was approximaely $15,000,000. These figures, of course, represent only new construction in the city proper. Not included in the figures, however, are the newly annexed wards of Longue Pointe and Notre Dame de Grace, these wards having been expressly exempted from the building regulations of the city. It was estimated also that the values registered at the City Hall were 40% under the actual value. In addition to this there is to be added for Westmount $1,335,000; Verdun, $600,000; Outremont $1,500,000; and Maisonneuve, $2,000,000. Altogether, therefore, it is considered that the total building operations for Montreal and vicinity amounted to $26,000,000. This compares with about $28,000,000 the previous year, so that a slight falling off is shown. To explain the falling off, it is only necessary to remember that the permits for some of the largest buildings ever undertaken in the city were taken out in the year 1910.

Some of the principal buildings constructed during the past few years may be shortly referred to as follows:—

The extension to the Windsor Depot. This comprised an enormous amount of work. The addition was on the down-hill side of the original Windsor Depot, extending for about a block, the lower end resting upon St. Antoine Street, and the frontage all the way along being on Windsor Street. The St. Antoine Street end of the building had to be a couple of stories higher than the original building in order to bring the roof in line from end to end. The building is not yet completed and some nice engineering problems were involved.

Two very fine buildings undertaken by Lyall & Sons this year were the Transportation Building and the Dominion Express Building. These are two of the largest office buildings in Canada, the former being considered the largest. In the construction of this building it is likely that a record was made. The contractors only obtained possession of the site on the 1st of May. It took three weeks to remove the buildings thereon, and by the middle of August the excavation had been performed and the steel structural work, comprising 3,000 tons, completed. Meantime, the bricklayers and masons had begun work on the 24th of June and by the 11th of September the entire building, ten stories in height and covering a block, was roofed in and ready for the interior work. During this period, 30,000 cubic feet of stone and 1,250,000 brick had been put in place. Just across the corner, work was being proceeded with, simultaneously, upon the Dominion Express Building, on the site of the old St. Lawrence Hall. Some difficult engineering problems were here carried out also, the Foundation Company have done some very interesting work on the concrete piers, the same company having also carried out work on the Windsor Station, referred to.



Macdonald Physics Building, McGill University.
View from Southwest. Mr. A. T. Taylor, Architect.

Other big buildings carried out by Lyalls during the last couple of years were the Yorkshire Building, just across from the Dominion Express; the Technical School up on Sherbrooke Street and the Willis Building on St. Catherine Street.

Other big buildings now in course of construction are the Ritz-Carlton Hotel on Sherbrooke Street, by the Fullet Company. Nearly opposite it the new Art Gallery, a beautiful building of classic architecture, is being constructed by the same company. Several reinforced concrete buildings of the skyscraper type—which in Montreal is confined to ten stories—have been constructed in the upper section of the city during the past few years. Probably the first and one of the finest and largest, is the Jacobs Building, on St. Catherine Street. The Blumenthal Building on the same street, farther east, and the Kellert Building, yet farther along, as well as the Wilder Building on Bleury Street, nearby, are all buildings of much the same character, constructed during the past few years. These mark the progress of the building in the city and more especially the transition of the uptown section from the two and three story era into the eight and ten story era. Practically all these new reinforced concrete and other sky-scraping structures involve engineering problems, particularly along certain sections of St. Catherine Street, where the nature of the ground necessitates going to solid rock in order to obtain safety.

Montreal has practically solved its great harbor problems. For years this was the one thing Montreal talked about. A dozen or thirteen commissioners used to gather down at the harbor office and discuss ways and means. Meantime the ships came to an antiquated harbor. The wharves were constructed of wood and the sheds of the same material. Owing to the high water and ice shoves of the early spring, it had been found necessary to construct a dyke all along the harbor front, with openings for access to the wharves below. Each fall all the buildings on the wharves and the wharf levels on the harbor front had to be pulled down and piled away in such a manner that they could be erected again the following May. When the ice began breaking up in the spring the openings in the dyke were closed in by gates in order to prevent the lower part of the city from being flooded when the ice shoves began. Until the ice jam in the river below broke and allowed the waters to subside not a sign of the wharves could be seen along the whole harbor front, the river being high above them. When the water fell, tons upon tons of ice would be left piled high all over the wharves. There were no grain elevators of consequence along the harbor front, and the loading was done mainly by floating grain elevators, operating on barges or lake steamers loaded with grain and moored alongside the out-going steamer.

Half a dozen years ago the old Harbor Board, which spent its time mainly fighting, was dispensed with and the work was handed over to a commission of three. Since that time the most wonderful progress has taken place along the harbor front. High level wharves of a permanent character have been built, and practically indestructible and fireproof sheds have been erected upon them. The capacity for docking ships has been largely increased, and as the sheds are two stories high their capacity for freight accommodation is several times that of the old sheds. Goods are stored here throughout the entire winter. The dyke is constructed of stone. Several modern grain elevators, two of which are the property of the harbor commissioners, have been built along the harbor front. These are being added to by the commissioners as quickly as possible. Conveyor belts carry the garin to the ships at almost all points in the centre harbor. The commissioners have their own locomotives for handling cars along the harbor front, and a proper system of tracks and switches lead down between the lines of sheds on the different piers. Floating cranes, with enormous lifting capacity, and devices of all kinds for the rapid loading and unloading of vessels have been installed. Meantime, also, the deepening, widening and buoying of the ship channel between Montreal and Quebec and below have been carried out, until ships may proceed by day or night with reasonable safety. Accidents in the channel are now almost unheard of.

The programme of the commissioners, however, is by no means completed. Comprehensive plans covering ten or twelve years' work were laid down shortly after they took office, and when these have been carried to completion Montreal will be—as it is to a large extent now—one of the best equipped ports in the world.

While, heretofore, the principal engineering problems in the vicinity of Montreal have probably been in connection with the harbor and channel, other problems are now arising which will undoubtedly claim a large share of attention during the next decade or two. A means of rapid transit throughout the city of Montreal and connecting up with points outside the city must quickly be devised and the problem will call for the exercise of the greatest skill and ingenuity. The south shore must be connected up with the city, by means of a bridge or tunnel, or partly by bridge and partly by tunnel, the Grand Trunk bridge above the city being inadequate for the general purposes of the citizens. Whatever method is employed accommodation must be provided for foot passengers and for the passage to and fro of street cars and vehicles of all kinds which may require access, and in addition thereto must be provided accommodation for the various railways which approach Montreal from the south. Consideration is already being given to this undertaking, but the problem is a very difficult one, and it is impossible to say how it will be solved.

Equally important is a means of rapid transit within the city itself and a more rapid approach to the heart of the city, both for street cars and for passenger trains, more especially from the west and from the north. The problem becomes all the more difficult because of the location of Mount Royal, immediately back of the city. Ere many years, the city will have extended completely around the mountain. In fact, it may already be said to have done so; and it is the growing needs of the residents of the outlying districts to reach the centre of the city, which is occasioning the present clamor for more rapid transit.

Many suggestions have been made respecting quicker transit in the city itself. Chief among these is the subway project. Nothing definite has yet been proposed, but there is talk at the present moment of applying to legislature for the right to construct a subway or tunnel, and to operate municipal street cars therein. Included in the same discussion is the question of permitting the operation of motor busses on the different streets.

Of a more immediate character than any of the above, however, would seem to be the problems raised by the Canadian Northern Railway. Precisely what it is the intention of the Canadian Northern Railway to propose to the city is not yet known. The railway, however, intends to take the matter up with the city at almost any moment, and ere this article appears will probably have done so. Meantime, it is commonly reported—and there is every reason to accept this report—that the railway has purchased a site for depot and terminals adjacent to the present quarters of the Canadian Society of Civil Engineers, which is a short distance east of Dominion Square, and within a few minutes of the C.P.R. Windsor depot. How the C.N.R. proposes to reach its new terminal is the interesting question. The most-talked-of

means is through a tunnel to be constructed under Mt. Royal. It is understood that the tunnel would enter the mountain immediately in rear and come out at the new depot, a distance of probably three miles through. This would undoubtedly be the quickest means of access to the city which has yet been considered. An alternative proposal is entry by means of a viaduct. From its depot the C.N.R. would make connections with the harbor front by means of an elevated track.

Work on the Highlands Side of the River.

All this brings up the equally important point of motive power. The citizens are becoming tired of breathing tons of coal dust. Scores of locomotives are constantly puffing to and fro, making discordant noises and emitting volumes of smoke, the unpleasantness of which need not be described. It has already been proposed that both the C.P.R. and G.T.R. should electrify their systems in order to place themselves in a position to discard their smoky locomotives. The C.P.R. has probably declined; but of course it is only a matter of time until it will have to give its assent. Fortunately, Montreal is well supplied with power. The Montreal Light, Heat & Power Co. has contracted for at least 30,000 h.p. more than it is making use of at the present moment, and no doubt it could add yet 50,000 to this if necessity arose. The Cedar Rapids development is now going on. From this will be drawn 50,000 h.p. on the first installation, and yet other installations are to be added. Several other water powers of a minor character are located within commercial distance of the city. The promoters of the Long Sault dan· project promise hundreds of thousands of horse-power for Eastern Ontario and Quebec. It would, therefore, seem that there need not, for a long time to come, be any trouble in obtaining all the hydraulic development necessary to operate the industries of the city, and to electrify the various railway terminals.

It is estimated that by 1920 Montreal will have over 1,000,000 inhabitants. There seems no reason at present to doubt that this prediction will be fulfilled. Industries of all kinds and with enormous requirements for employees are being added year by year. Undertakings of a magnitude undreamed of until lately are calling for immediate attention. Railway and canal construction, harbor and river improvements, rapid transit requirements, hydraulic power construction, underground conduit systems for the reception of overhead wires, better electric lighting and telephone service, more efficient fire protection, including proper provisions for the construction of modern fireproof buildings; increased water supply and a filtration system on a large scale, sewage disposal—all these are problems which Montreal is now facing or will have to face within the next few years. There is work for the engineer.

NEW FOUNDATIONS FOR THE C. P. R. LACHINE BRIDGE.

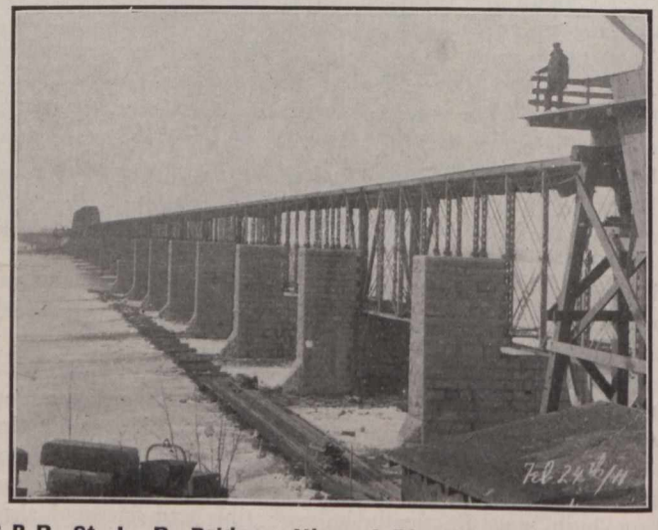
In the finishing of the foundations for the above bridge on or about December 1st of this year, the heaviest piece of construction encountered on the Farnham Section of the Canadian Pacific Railway in its double tracking, is completed.

The old bridge was located about two miles above the well-known Lachine Rapids, and was a single track structure 3,657 ft. 6 in. long between abutments, with three 80-ft. deck plate girder spans, one 120-ft., two 270-ft. and eight 240-ft. deck truss spans, and two through truss spans about 408 ft. centre to centre of piers, supported on two abutments, two land piers, and thirteen river piers. The work of extending the lines to accommodate the double track of the bridge involved the extension of the existing piers and abutments, and the construction of four new river piers to allow the replacing of four of the original 242-ft. spans by eight 121 ft. spans.

All of the new piers and the extensions to the old, are of rock-faced limestone ashlar with concrete footings carried down to bed rock, at a maximum depth of 37 ft. below water level. This bed rock was covered with from three to sixteen feet of gravel and large boulders, and large bodies of riprap deposited from time to time around old pier.

A current of from eight to ten miles per hour had to be contended with, and the force of the current can be better appreciated by the fact that the pressure against the caissons for the deep water piers was estimated to be no less than 100 tons.

For the construction of the four new river piers, open cofferdams with puddled walls were used. The overlying sand and gravel was dredged off and the cribs, after being carefully fitted to the irregularities of the rock bottom, were sunk in the required position. The rock in puddled chamber was then cleaned off with divers. Sheeting was driven and the space between the two walls filled with puddle clay. The cofferdam was then pumped dry, permitting the rock to be cleaned off and the concrete deposited in the open.

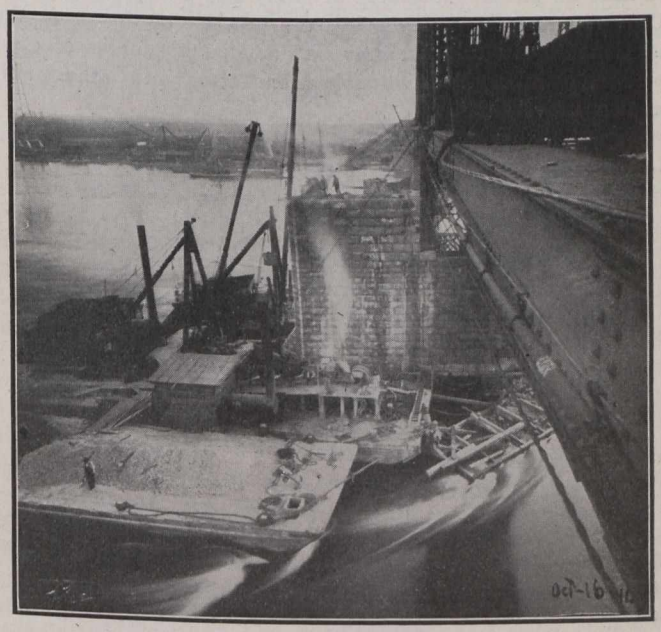


C.P.R. St. L. R. Bridge. View of Piers on Highlands Side of River, Just Before Steel was Placed on the Down-stream End.

With the exception of seven of the piers, where the water was deep, the extensions to the existing piers were made in substantially the same manner. The cribs for these were closed in on three sides only and so arranged that the sides would overlap and fit closely against the old cofferdams used in the original construction of the bridge which had been left in place. After these joints had been carefully caulked by

divers, and the cofferdam walls puddled with clay, no difficulty was experienced in unwatering with 8-inch centrifugal pumps. Practically all of the leakage came from open joints in the old cofferdam.

The foundations for the extensions to the seven remaining piers, where the depth of water was from 20 to 27 ft., were carried down to rock by a combined pneumatic and open process. In order to reduce the current from 8 to 10 miles an hour, to about 2 or 3 an hour at each of the seven piers above mentioned, breakwaters were constructed on both sides of each old pier.



Showing Erection of Channel Piers.

A derrick boat equipped with grapples and an orange peel bucket were then used in removing the riprap and boulders to allow the pneumatic caissons to rest on a comparatively level bottom when they were sunk.

The pneumatic caissons were constructed of long leaf yellow pine. The walls were heavily cross-braced in the usual manner. A single shaft with the contractor's standard type of air-lock was used for both men and material.

It is customary to build caissons for river work on the shore, launch them in the usual manner, then tow to position. On account of the heavy current at this bridge site, it was considered advisable to build each caisson in place. Accordingly, the contractors constructed a pontoon of sufficient size to sustain the caisson without drawing more than a few feet of water. As fast as they were required for the work, the caissons were constructed in this pontoon and anchored with steel cables to existing piers. The temporary bolts in the pontoon were then withdrawn, allowing the pontoon to fill with water and the pontoon pulled from under the caisson as it settled in the water.

After a caisson was launched, the same pontoon was towed to the next pier. When launched, the caisson was located and was sunk to bottom of river. Walls of caisson were built up and caulked as caisson went down.

All pneumatic caissons were sunk at the end of the footings of old pier, which were rectangular in shape. There was therefore left two triangles to be filled up between pneumatic caissons and old foundations of old pier. These triangles were dredged out as near solid rock as possible, then a cofferdam was built on each side of extension attached to pneumatic caisson on one end, and old footing on other. Divers were then sent down to clean off bed rock. Concrete was deposited under water in the triangles for a few feet by means of a special submarine bucket. This cofferdam was then pumped out and huge I beams were then placed in concrete, one end resting on pneumatic caisson and the other on the old pier. All was then concreted to the elevation where the masonry started.

Material for piers Nos. 3 to 7 inclusive, where the water was shallow 4 to 10 ft., was delivered to the work by means of a tramway 1,000 ft. long. Derricks were attached to old bridge and two derrick boats used also.

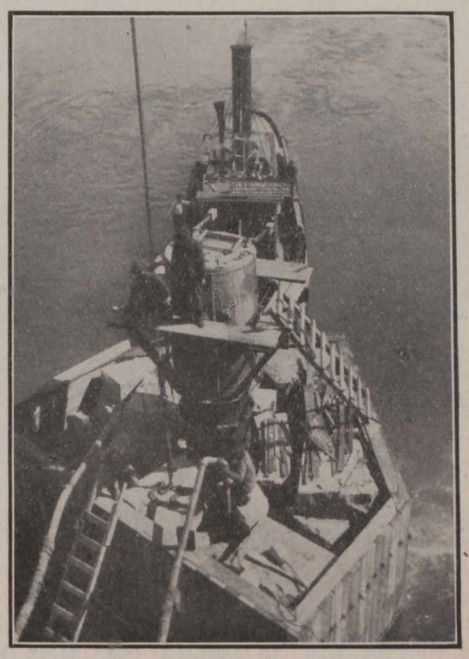
Material for piers Nos. 8 to 14 inclusive, was delivered to each pier from the south shore by means of scows and a tug. A large material yard with the necessary switching tracks connecting with C.P.R. main line and buildings built on south shore and a temporary deck built also.

Power house containing compressors, boilers, pumps and dynamo, was located on south shore. Air line was laid on old bridge.

The contractors for the substructure used the following plant on the job: 2 derrick scows, 1 concrete mixing scow, 7 material scows, 1 tug, 12 hoisting engines, 350 h.p. boilers, 2 concrete mixers, 12 derricks, 3 compressors, besides pumps, dynamo, etc.

Work was commenced in July, 1910, and finished December 1st, 1911.

The great difficulty in doing this work was principally in building and sinking caissons, and in moving scows, row boats and tugs around in the swift 10-mile current. The current was not uniform as the obstructions in the river made by the old piers produced a series of eddys, cross-currents and whirlpools. Even in deep water there were a lot of boulders lying near the surface. Operating floating equipment around in such a locality was an operation fraught with danger to both life and property.



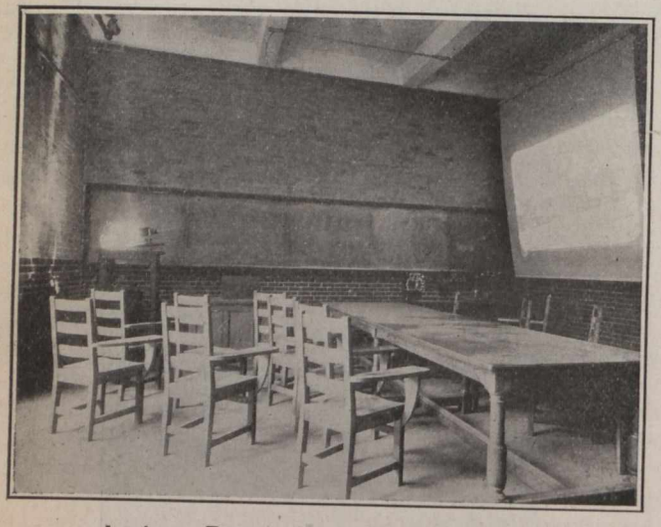
Sinking a Pneumatic Caisson at Down-stream End of One of Channel Piers.

The contract for the new substructure of the bridge was executed by The Foundation Company, Limited, of Montreal, under the supervision of Mr. J. M. R. Fairbairn, assistant chief engineer of the Canadian Pacific Railway. Mr. J. H. Barber was resident engineer on the work.

McGILL UNIVERSITY, COURSES IN THE FACULTY OF APPLIED SCIENCE.

By E. BROWN, M.Sc., M. Eng., Professor of Applied Mechanics and Hydraulics, McGill University.

The name of McGill University is known throughout the world, and not a little of the prestige of the city of Montreal is due to the great university, which occupies such a prominent position in its midst. The eminence of McGill in many branches of learning is well known to all our readers, but the work of the Faculty of Applied Science in training the young engineers who are going out to contribute to the progress of the Dominion is of special interest. The annual meeting of the Canadian Society of Civil Engineers, which takes place in Montreal shortly, will doubtless attract many of our leading engineers, and it seems appropriate to give some account of the work of McGill University in which they will find the greatest professional interest. We do not propose to give a history of the rapid development of the Faculty of Applied Science, interesting though that would be, nor to set forth the details of the numerous courses offered, but rather to explain in some measure the aims and objects of the training given, no matter what branch of the profession a student may enter. To this end it will be necessary to describe the training common to all courses, and then to proceed to show



Lecture Room, (Railway Department.)

its logical development in some special branch of engineering. Our readers will thus be able to realize more clearly the continuity of the work than if several courses were described inadequately. The particular features of the various specialized courses will be pointed out, after the general scheme of one course has been followed to its conclusion.

It is a striking feature of the work that the undergraduate body is drawn from all parts of the world, and this fact, in itself, bears eloquent testimony to the high position which the engineering school occupies in the academic and professional world. Of a total of 555 students enrolled in the present session, only 257 come from the Province of Quebec, and the remainder are distributed as follows: Ontario 108, Nova Scotia 17, New Brunswick 22, Prince Edward Island 11, Manitoba 12, Saskatchewan 5, Alberta 12, British Columbia 22, Newfoundland 4, England 31, Scotland, Ireland and Wales 2 each, British West Indies 15, United States 17, Mexico, Peru and South Africa 2 each, Republic of Colombia, Ecuador, Italy and Switzerland 1 each, unclassified 6. The graduates of McGill are likewise scattered all over the world, and occupy the highest positions in the profession. The name of McGill is thus widely known, and the courses attract not only those commencing their college training, but many who have graduated in other universities and find it advantageous to take an additional course of study and a degree in McGill University before commencing the practice of the profession in Canada. In this list may be included graduates of Cambridge, Edinburgh, Liverpool, Manchester and other well-known universities.

Courses of study extending over a period of four years and leading to the degree of Bachelor of Science are offered in the following ten subjects:—

Civil Engineering.
Electrical Engineering.
Mechanical Engineering.
Mining Engineering.
Railway Engineering.
Metallurgical Engineering.
Chemical Engineering.
Chemistry.
Metallurgy.
Architecture.

Seven of these subjects bear the distinctive title of "engineering," and in all of these the course of study is the same in the first two years. These courses will be considered first, and the courses in chemistry, metallurgy and architecture later. In all courses the work of the session extends from about September 1st to the end of April, thus leaving the summer months free for the student to engage in practical work.

Engineering Courses.—The fundamental principles underlying the various courses of study are as follows:—

(a) That a thorough grounding in mathematics, geometry, mechanics, physics, chemistry, and the elements of draughting, is essential to intelligent study in any branch of engineering, and in conjunction with the general and specialized work which follows, enables a student after graduation to adapt himself to the requirements of the various branches of the profession, if called upon to do so.

(b) That having had such a preliminary training, all engineering students require professional training in certain subjects, such as strength of materials, the elements of mechanical and electrical engineering, and surveying, coupled with specialized training which will fit them for some particular branch of the profession.

(c) That the professional training common to all branches of the profession should precede the specialized training of any one branch, so that the student may have as broad a view of these studies as possible, and that a considerable amount of time may be spent as continuously as possible in the specialized studies.

(d) That no subject of study in any course should be undertaken unless the student is properly qualified by previous study to appreciate the work, and to pursue it in a manner which will make it of real educational value to him, and not merely the opportunity for collecting a few disconnected ideas. This is ensured by a scheme of pre-requisites.

First Year Study (All Engineering Courses).—This includes algebra, trigonometry, geometry, mechanics, descriptive geometry, physics, English, freehand, mechanical drawing and shopwork.

Practically one-half of the total time is devoted to the first five of these subjects, these being regarded as of supreme importance in the course of fundamental training. The progress made in this work is tested from time to time during the first term, and although the final standing is not determined until the end of session, the regulations compel any student whose progress is unsatisfactory in any four of these subjects to withdraw from the faculty at the end of the first term. The class is thus freed automatically of any, who, either from incompetence or lack of application, are failing to profit from the instruction given, and are thereby imposing a needless burden, both on the instructors and on their fellow-students. The operation of this rule has a salutary effect and accustoms the class to the idea underlying the scheme of instruction as regards pre-requisite knowledge.

The course in physics, dealing with heat, light and sound, includes laboratory work, in which experiments, **mainly quantitative,** are made to illustrate the subject matter of the lectures. This is an important point, as engineering students spend much time in making quantitative measurements in the various laboratories, and in the practice of their profession. Such measurements are made frequently under difficulties and in circumstances in which errors must arise. It is well that in the preliminary scientific work a student should learn to appreciate the conditions for precise measurement, and to realize the relative importance of accuracy of measurement of the various quantities involved, in considering the probable degree of accuracy in the result they are seeking. Not only must an engineer know the probable degree of accuracy of his results, but he must be able to present them in a consise and accurate manner. The course in English composition is designed to stimulate ease and directness of expression, and in the preparation of reports on laboratory work carried out during the full course of study, and in the writing of theses on summer work, the student has an excellent opportunity for practice in the handling of available material. The course in English includes the reading of some five or six English classics during the first summer vacation, on which an examination is given on entering the second year.

The courses in shopwork, in the first and second years, are designed to give the student some working knowledge of materials and of methods of manipulation. Thorough manual skill can only be obtained by longer practice in engineering shops, but an endeavor is made to familiarize the student with shop equipment and methods, so that he may profit as much as possible by working in engineering shops later on. At the same time those who do not work in this way are not altogether devoid of sound ideas on such matters. Definite exercises are carried out in the first year course, in carpentry and wood turning, and in the smithing and foundry, and in the second year similar work is done in the metal workshop, and students are instructed in the use of the various machine tools, and in the preparation and care of tools.

The courses in freehand and mechanical drawing are designed to familiarize the student with sketching, and with the methods of preparing working drawings. Drafting room methods are explained and practice is given in the drawing of simple machine details, in lettering, and dimensioning of working drawings, etc.

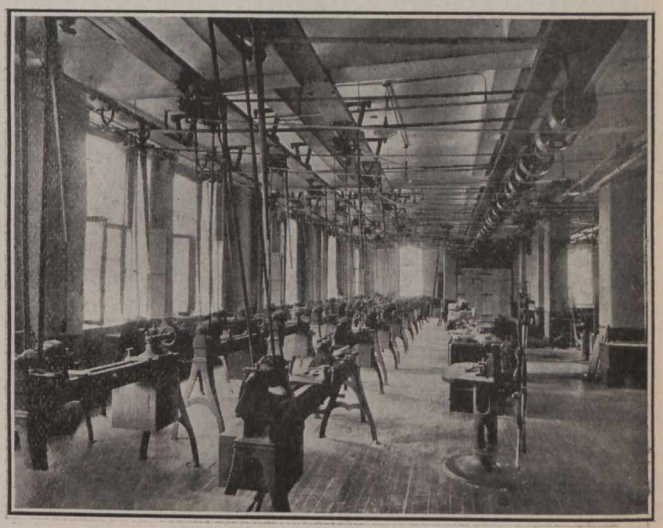
After completing the course outlined above, the students leave about the end of April, the great majority obtaining work for the summer vacation. Some details of this work are given later, but it may be mentioned here that during last summer 85 per cent. of the students in Applied Science worked for an average period of 3.2 months.

All students entering second year courses are required to return to Montreal for the month of September to take a course of field instruction in the principles of surveying, as a preliminary to the work in that subject noted below.

Second Year. (All Engineering Courses).—The work in mathematics, mechanics, physics, mechanical drawing and shopwork are extended, the mechanical drawing course with a view to preparing the student for design work of the third and fourth years, and the shopwork as already noted.

In mathematics, courses in the calculus are given and are of the highest importance in the work of the year, being prerequisite to much of the late work. A course in analytic geometry is also given. The work in mechanics is done after progress has been made with the calculus course, and the work of the first year is extended to include many problems in variable motion arising in engineering practice. It may be pointed out that mechanics is taught as a separate subject through three years, and not as a part of the various professional subjects (such as mechanics of machines, dynamics of machines, strength of materials, etc.), to meet the bare requirements of any particular problem. The work is brought to bear directly on the professional subjects by carefully selected problems, and this adds interest to the work in mechanics, and minimises the amount of purely extraneous teaching in professional subjects.

The physics of the second year deal with the laws of electricity and magnetism, the laboratory work including quantitative measurements of magnetic fields, pole strength, current, resistance, potential, etc., and the calibration of measuring instruments. It thus provides the preliminary training required for a study of the elements of electrical engineering, which is taken as a part of the professional



Wood Workshop.

work by all students, for there is scarcely any phase of engineering activity at the present day, in which electricity does not play an important part.

The lectures and laboratory course in general chemistry familiarizes the student with the principles of inorganic chemistry, and gives some practice in qualitative analysis. It is desirable for all engineering students, and especially for those who intend to specialize in metallurgical, chemical or mining work. Concurrently with the chemistry course, a course on materials of construction is given, dealing with the principal methods of manufacture of steel, iron, the chief metal alloys, cement, etc. The uses of these materials, and of timber, masonry, etc., are considered, and some typical standard specifications are discussed.

As a preliminary to some of the third year work, courses in mechanics of machines and graphical statics are given.

The field surveying work carried out before the opening of session has been referred to above. It forms part of a

general course in the principles and practice of surveying, and includes the ordinary problems of chain surveying, the use of the level, theodolite, compass, etc. Detailed surveys are carried out and recorded, and the data so gathered are used in the preparation of detailed plans in the mapping course. The problems arising in ordinary practice are dealt with in a lecture course, and in this way a comprehensive idea is given of the field and office work necessary in the preparation of a surveyor's plan.

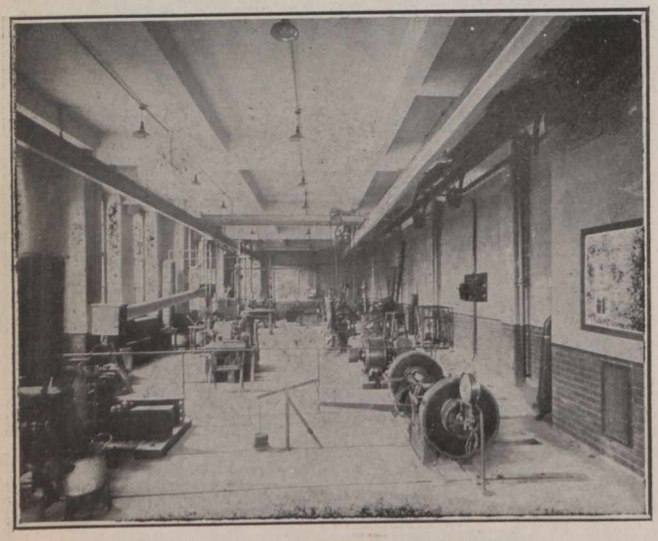
The students are again free at the end of April to take up practical work for the summer months, but are again required to attend a summer school course of four weeks before commencing the work of the third year. The work undertaken depends upon the branch of study which the student desires to enter upon, and is as follows:

(a) Field surveying for students in civil, mining or railway engineering.

(b) Mechanical drawing and design, physics, (including more advanced electricity and magnetism, and electrical measurements than that given in second year), and shop-work for students in electrical and mechanical engineering.

(c) Qualitative and quantitative chemical analysis for students in metallurgical engineering.

In addition to the above, all students are required to prepare an essay, preferably upon their summer work (or upon some prescribed subject), or to follow a course of reading in which an examination test is given. These essays are a distinctive feature of the work, and frequently reveal decidedly strong powers of observation. A similar require-



Mechanical Engineering Laboratory.

ment is exacted of students entering the fourth year, and many excellent essays result. Credit is given for excellence of material, successful presentation, originality, and literary style, and no essay prepared merely from books is accepted unless special permission has been granted. The high standard of many of the essays may be judged from the fact that very frequently a similar essay secures the prize given for papers presented by student members to the Canadian Society of Civil Engineers, the Canadian Mining Institute, etc. The class of work secured by students during the summer months and their ability to make good use of the opportunity afforded, are shown by the fact that it is no uncommon thing for a student to be refused permission to publish certain parts of an essay—such for example as cost data.

As an example of the summer reading prescribed instead of an essay it may be stated that Shadwell's "Industrial Efficiency" was the set book for the past year.

Third and Fourth Year Courses.—Having completed the above course, the student must choose some branch of engineering in which to specialize, and complete two years of further study. The whole of this time is not spent in specialized work, as all courses have certain professional subjects in common, such as strength of materials which is the basis of many calculations in all branches of engineering. The elements of mechanical and electrical engineering are also common to all courses. Alternative subjects are allowed in some fourth year courses. For example, one electrical engineer may wish to study electro-chemistry and electro-metallurgy, while another, more interested in power development, may wish to take up hydraulics. Provision is made for the exercise of such legitimate preferences, but the greater part of any course is fixed, so that a sound general training is assured. With seven engineering courses to be considered and many alternatives in each, it will be seen that no connected idea of the progress of the scheme of study can be given within reasonable compass, by attempting to describe all courses. Selection must be made, and for present purposes, the specialized work of the civil engineering student will be considered. The trend of the course of study in other branches will then be indicated.

The work of the civil engineer requires that he be specially informed upon such subjects as the strength and testing of materials, theory and design of structures, surveying, hydraulics, railroad engineering, etc., and the third and fourth year courses afford the training necessary.

Third Year Course (Civil Engineering).—An important part of the course is the study of strength of materials and the allied subjects of foundations and structural design, Lectures in strength of materials are given throughout the session, and laboratory work is added to familiarize the student with the various types of testing machines and method of testing. The students themselves carry out all the tests made to illustrate fundamental principles, and also make complete tests of cement, following standard specifications. They also witness demonstrations on the strength of timber beams, reinforced concrete, reinforcing materials, bricks, concrete, etc., and prepare reports on all laboratory work. (This course is taken by all engineering students.)

A lecture and draughting course in foundations runs concurrently with the strength of materials, work, and, as progress permits, simple designs are carried out. The graphical statics work of the second year is made use of in such problems as the stability of retaining walls. Practice is given in taking out quantities from working drawings and in preparation of cost data, and relative costs of alternative designs are considered in some simple cases. This work is only taken by civil engineering students, and is completed in the first term. The progress with strength of materials work then enables the course in structural engineering to be started, and this is also taken by all except electrical engineers. A combined lecture and draughting course deals with the design and structural details of columns and girders (as for a steel frame building), roof trusses, box and plate girders, reinforced concrete beams and columns, etc. Working drawings, with bill of materials, and cost estimates, in some cases, are prepared, and the student becomes familiar with much of the ordinary day to day practices. The course affords the necessary preliminary training for the more advanced design of the fourth year civil engineering course and gives to the students the necessary acquaintance with the elements of structural practice.

Another important group of subjects is surveying, railway engineering and mapping, for which the summer school work in surveying, already mentioned, is a prerequisite. This includes practice with and adjustments of level and theodolite, survey and location of a railway line; hydro-

graphic work, including measurement of river discharge; astronomical observations, etc. The data thus collected forms the basis of the subsequent mapping course in which the paper location of a railway line is drafted from the notes, maps and profiles are drawn, earthwork quantities taken out, etc. A yard and switch design is also made and drawn out. Concurrently with the mapping course and supplementing the work done in the field, lectures are given in railway engineering dealing with grade problems; effect of distance, grade and curvature on train-mile costs; economics of location; turnouts, yards, terminals, etc. The above work is taken by civil, railway and mining students. Students in the civil course take also a course of lectures in surveying dealing with the theory and use of instruments; mining, magnetic, hydrographic, trigonometric surveys; transition curves, etc.

Instruction is given in municipal engineering problems, and is continued in the fourth year. The third year work includes systems of removal and treatment of sewage; construction of sewers; field and office work in the preparation of plans, cost data, etc.; construction and maintennance of roads. This special work and that of the fourth year is in charge of an instructor engaged in municipal engineering practice.

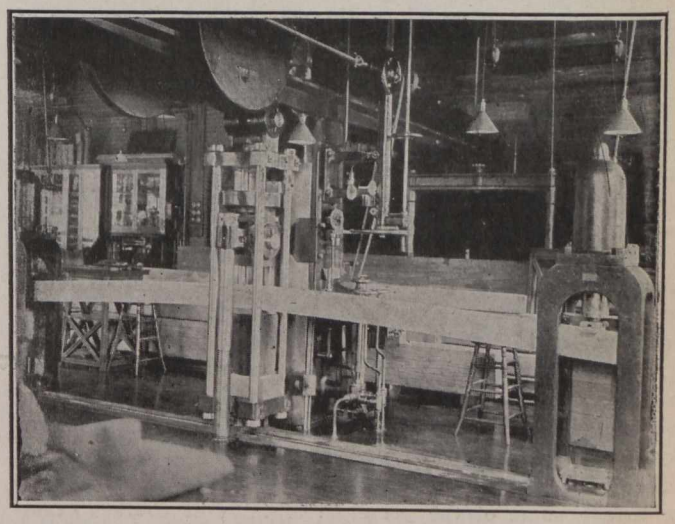
A course in mechanics dealing with the motion of rigid bodies is also given. Geology is treated in a course which is taken also by mining, metallurgical and chemical engineers. The course is a general one, including some mineralogy, and special attention is devoted to dynamical and historical geology and to the economic aspects of the subject. Field excursions are made in the neighborhood of Montreal, and practical instruction is given in the museums and by the aid of maps and models.

The remainder of the course includes (a) descriptive geometry dealing with perspective, plotting a photographic survey; spherical projection and map construction; (b) engineering economics including the subjects of money, credit, formation and organization of business companies, operating and fixed charges; specifications, contracts, etc.; (c) general course in mechanical engineering with laboratory work, dealing with the equipment and operation of power plants; (d) an optional course in differential equations.

The above concludes the work of the third year, and with the exception of elements of electrical engineering taken in the fourth year, along with electric railways, it may be said that the general professional work is completed, leaving the fourth year almost entirely free for more advanced study of those civil engineering subjects taken up in the third year, and for other specialized work. Summer work may again be obtained from the end of April to the end of August, the class being required to attend four weeks field course in surveying in September, after which the work of the final year of study commences. Students must also submit an essay of from 2,000-5,000 words, consisting preferably of a critical description of the work in which they have been engaged during the summer.

Fourth Year Course (Civil Engineering).—The specialized work of the final year falls into groups of subjects more or less related: (a) Theory and design of structures; (b) surveying; (c) hydraulics and municipal engineering (water supply); (d) railway engineering and electric railways, and a general course in elements of electrical engineering. In the theory and design of structures, the aim is to explain the fundamental principles of the determination of stresses in various types of structures, to apply the principles of strength of materials to the computation of the necessary dimensions of the main members of structures, and to develop a considerable knowledge of the detailing in design work. To this end, lecture and draughting work is taken concurrently, the latter bearing directly on the former, and as the work progresses designs for selected types of bridges are worked out in considerable detail, and working drawings are prepared. A large part of the time available is devoted to this form of practice, as it is thought that a sound knowledge of bridge design evolved from fundamental principles is the most suitable form of training for the whole field of structural design. A course in reinforced concrete dealing with the design of floor and column units for a large building, retaining walls, arches, etc., is also given, and includes draughting room work and laboratory tests on reinforced beams.

The work in surveying carried out in the summer school includes astronomical observations for latitude and longitude; base line measurements; precision levelling, special problems in track work, etc. This is followed by a course of lectures dealing mainly with the reduction of astronomical observations, measurement of base lines, large triangulation surveys, etc., and by a laboratory course in which instruction is given in the determination of errors and constants for surveying instruments in general. This completes the comprehensive course in surveying work which commenced in the second year.



Testing Laboratory, Beam Under Load in Wicksteed Testing Machine. Capacity 200,000 lbs.

In the hydraulics course the fundamental principles are developed and applied to problems on the flow over weirs, in pipes and open channels.. Turbines, pumps and other hydraulic machines are considered, the endeavor being in all cases to treat the problems from elementary principles, which enable the characteristics of various types to be understood. Concurrently with the lecture course a series of laboratory tests is carried out to illustrate the more important principles of the subject. The work of the municipal engineering course deals with problems in water supply and includes discussion of rainfall, evaporation, works for storage and distribution; purification; calculations for systems of supply mains, preparation of plans, costs, etc.

Problems in railway engineering practice which border on civil engineering work are dealt with, and include the organization of an operating department, construction, maintenance, renewals, train service, signalling, etc. The course supplementing the work of the third year in railway location, etc., gives a good foundation for more extended study, if a student is thrown into contact with such work.

A course in engineering law is given, the object being to present such an outline of the law as will be useful to engineers and business men. The main topics discussed are the general law of contracts; law of architect and

builder; statutes affecting labor; commercial paper; sale; lease; agency and partnership; joint stock companies; insurance carriers by land and sea. All students in the Faculty except electrical engineers take the lectures either in their third or fourth year course.

The remainder of the course is electrical in character and includes a series of lectures on the principles of direct and alternating current machines, systems of distribution of power, lighting, traction, etc. A laboratory course is given to supplement the lecture work, and when some progress has been made with the subject, a course in railway engineering dealing with the equipment, maintenance and operation of electric railways is added.

The student who passes successfully through the course described is granted the Degree of Bachelor of Science in Civil Engineering. It will be seen that a continuous endeavor is made to give a sound general scientific training, introducing specialization to a sufficient extent to ensure that a successful student may enter on the practice of the particular branch of the profession in which he has studied, well equipped to avail himself of the opportunities offered. At the same time the general training given is sufficiently broad to give him a good grip on subjects outside the strict limits of his own special branch of work, and to enable him to deal intelligently with problems in other branches of engineering which inevitably arise in the practice of any particular branch of the profession.

Specialized Work in Other Engineering Courses.—The above account of the work of the civil engineering course illustrates the principle underlying the development of the courses of study in all branches of engineering. After the training of the first and second years, which is the same for all students, and is mainly of a mathematical and general scientific character, the third year study includes professional work common to all students, viz., elements of mechanical and electrical engineering, structural engineering, strength of materials, etc., and some specialized work, professional or scientific, leading up to the more advanced work of the fourth year. The differences in training noted in connection with the summer school work, preceding entry to the third year, emphasise this specialization. We may note briefly some of the principal features of courses other than the civil.

On entering the third year the electrical student continues his study of physics, takes a more complete course in the elements of electrical engineering than that given to the general body of students, studies machine design instead of structural design, and if he is contemplating specializing in electro-chemistry and electro-metallurgy in his fourth year, an introductory course in this work is prescribed for the third year. Following this specialization the work of the fourth year develops along the same lines.

The student in mechanical engineering prepares for the specialization of the fourth year by taking a more complete course in mechanical engineering than that given to the general body of students, and studies problems in mechanism, thermodynamics, machine design, shop processes, etc. In the fourth year more advanced work follows, and such subjects as manufacturing, plant design, heating and ventilation, locomotive engineering, works organization, and accounting may be studied.

Metallurgical and mining students prepare for their fourth year by taking courses in quantitative chemical analysis, mineralogy, geology, and the subjects of ore dressing, fire assaying, metallurgy, and general mining are commenced, and are more fully developed in the fourth year. A special feature is the field class in mining, which all students of the course must attend. This consists of a six weeks duration, following the close of the third year work in college, and places of professional interest are visited, the party being in charge of the staff of the mining department. Time is devoted to geological field work, mining work proper, and to an examination of ore dressing and milling plants. It may be of interest to note that these parties have visited at various times British Columbia, Nova Scotia, Pennsylvania, Newfoundland, Michigan, and numerous places of interest en route to these distant points.

Metallurgical engineering students make similar visits to manufacturing plants in Montreal and at a distance, and a short lecture course is given in exvlanation of the processes to be studied.

The course in chemical engineering is designed to prepare the student for the duties of a managing engineer in a chemical factory. He must have some general engineering training and be conversant with chemical processes. The course includes the general work specified above for all engineering students, and a special summer course in chemical analysis precedes entry to the third year. Other subjects of study include geology, metallurgy, organic and inorganic chemistry and industrial processes with special reference to the branch of work to be taken up. Between the third and fourth years at least six weeks must be devoted to suitable work in a chemical factory or to equivalent laboratory work in the university.

Courses in railway engineering prepare students to enter (1) the operating department or executive offices; (2) the mechanical department; (3) the engineering department.

The Canadian Pacific, Grand Trunk, Canadian Northern and Intercolonial railways contribute to the support of the work of this department. Arrangements exist whereby students may enter the employment of a company during summer vacations as special apprentices. They thus acquire, under the direction of the officials of the company, a general experience which will fit them to fill higher positions after successful graduation. Full particulars of these arrangements are given in the Bulletin of the Department of Railways.

Students preparing to enter the mechanical department follow the same course as mechanical engineering students, but make a special study of locomotive construction and operation as part of their specialized work. Those entering the engineering department take the regular civil engineering course, but are required to engage in practical railway work during the summer months under the direction of the department of railways.

The operating and executive course includes, in the third or fourth year course of study, much of the general work common to all engineering courses (strength of materials, electrical and mechanical engineering, etc.). In the third year includes a more advanced course in economics than that given to the general body of students, and this is followed by a special course in railway economics in the fourth year. Courses in engineering law and in railway law are also given, and courses in English afford practice in the preparation and criticism of reports on stated subjects. Railway organization and accounting, freight and passenger service, and telegraphy are dealt with by officers of the railway companies engaged in these departments of work, and the course also includes instruction in railway mechanical engineering (locomotive design, operation, etc.), railway engineering (grade problems, train costs, economics of location, layout of terminals, yards, etc., organization of operating department, construction and maintenance of way, etc., etc.); railway operation and systems of signals; physical geography and shorthand.

The work of the department is developing steadily, and while it is not numerically as large as many of the older de-

partments, the success attained by many of its graduates who have entered the service of the companies which are co-operating in the work, proves that the work is developing along sound lines, and that the course affords the opportunity for efficient training along specialized lines outside the older recognized branches of the profession.

Courses in Chemistry and Metallurgy.—These differ from the chemical engineering and metallurgical engineering courses in that they are intended to train men for the purely scientific side of such work, i.e., to become analyists, or chemists, or metallurgists in a manufactory. Such engineering subjects as strength of materials, mechanical and electrical engineering, etc., are not taken, and the time devoted to these in the engineering course is given to more advanced study in chemistry and metallurgy. The general preliminary training resembles that of the engineering student, but the specialized work is purely scientific.

Course in Architecture.—Four years of study in the Department of Architecture lead to the degree of Bachelor of Architecture, and an increasing number of students are availing themselves of the facilities offered to secure a thorough grounding in those principles of architecture which tell later on in a professional career. The work done is also recognized by the Province of Quebec Architects' Association in that a graduate in architecture will be admitted to practice in the province, after spending one year in the office of a member of the association, and passing an examination in design. This office work may be made up of instalments during the summer vacations. The training also prepares the student for the examinations of the Royal Institute of British Architects.

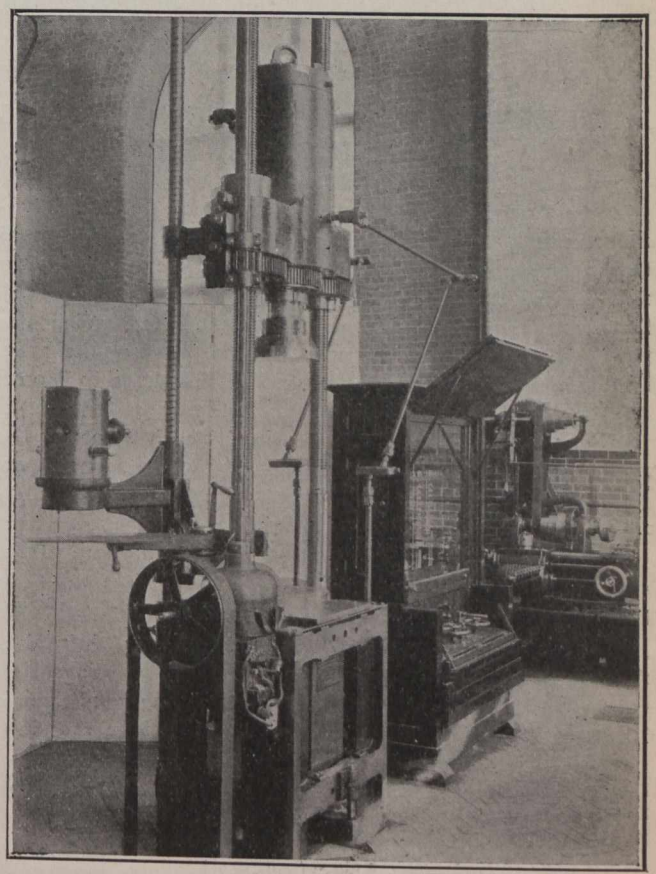
The course is under the direction of the Faculty of Applied Science, but in the first two years general culture courses in history, French, physics and mathematics are taken in the Faculty of Arts. Geometry and English are taken with the first year students in Applied Science and the professional work of the first year includes freehand and architectural drawings, modelling, and the elements of architecture. This work is intended to give the student practice in draftsmanship, and teach him the basic principles of design. Freehand and detail drawings are made of recognized types of forms and architectural details. The student is thus prepared for more specialized professional work of the second year in which design is given a prominent place.

Mathematics and general history are continued in the second year, and the courses in surveying, mapping, and graphical statics of the second year engineering course are included. The architectural work includes lectures and draughting practice in the following: Building construction and details; architectural history; ornament and decoration; modelling; theory of architecture. Continuous practice is given in the draughting room in the development of the principles explained in the lectures, and this is facilitated by the large number of reference books, etc., which are available. The reference library of som 300 selected books adjoins the draughting room, and the equipment of the department also includes some 2,500 large photographs, 5,000 plates and nearly 3,000 selected lantern slides. These are available for reference at all times.

The third and fourth year courses are almost entirely professional. Geometrical drawing and perspective are continued, and the course in engineering law previously referred to is included. Courses are given in graphical statics, structural design and details, hygiene, ventilation and heating, etc., and the architectural work includes theory of design and planning; history of architecture; ornament and decoraton; architectural practice and modelling. The draughting room work includes problems in composition requiring different treatment, and of increasing difficulty. In the latter part of the course a series of planning problems are set, some of which are worked out in detail, and the diploma design for graduation occupies the work of one term.

The summer vacations extend from the end of April to the end of September, but students entering the second year course are required to attend the field work in surveying during the month of September.

Instead of writing an essay, as prescribed for engineering students, students in architecture are required to read and pass an examination on certain books. The prescribed books for the past summer for students entering second year were "The Mistress Art," Reginald Bloomfield, and "Essentials in Architecture," by John Belcher. For third and fourth year students "The Mistress Art" and "Memories of Benvenuto Cellini" were prescribed.



Testing Laboratory. Emory Testing Machine. Capacity 150,000 lbs.

In addition to the above, students must either spend at least five weeks in the employ of an architect or contractor, or submit thirty-five free hand drawings of reasonable size. During the past summer 80 per cent. of the students worked for from three to four months in architects' offices or with contractors, and thus on graduation many will be ready for admission to the Architects' Association of the province.

Summer Employment.—The following information regarding summer employment may be of interest: All students entering the second, third and fourth years are required to state the nature and duration of their summer work. The information is not asked from the first year class, as they have not had any previous connection with the faculty.

The returns for the past summer show that 298 out of 350 students were engaged in summer work. Of these, 13 worked for one month or less; 62 for two months; 18 for 2½ months; 76 for three months; 24 for 3½ months; 78 for four months, and 27 for five months. This gives 85 per cent.

of the students engaged in practical work for an average of 3.2 months each. The varied nature of the work obtained is shown by the following return of the number of students engaged in different classes of work: Mining and geology, 32; surveying, 53; prospecting, 3; draughting and design, 21; machine shops, 48; construction and general contracting, 48; electrical work, 31; metallurgy, 4; chemistry, 7; architecture, 13; office work and railway operating, 30; farming and lumbering, 6; military work, 2.

The programme of the meeting of the Canadian Society of Civil Engineers, in Montreal, from January 24th to 26th, includes a reception by the president and members of council in the Engineering Building, which has been placed at the dispcsal of the society by the University authorities. The laboratories and workshops will be open for inspection, and no doubt the members of the society will avail themselves cf the opportunity of becoming acquainted with the equipment of the faculty, whose work has been described above.

HIGH-HEAD REACTION TURBINES BUILT IN MONTREAL.

The Canadian Society of Civil Engineers will have an opportunity of examining the details of construction of high head reaction turbines during the annual meeting in Montreal. Allis-Chalmers-Bullock, Limited, is the only firm in Canada which builds turbines of this character, and has lately worked out some interesting features. Among the hydraulic turbines now under construction in the shops in Montreal are the following for Price Bros., Limited:

Four turbines in spiral casings, each 4,000 h.p., 225 r.p.m. under 264 feet head for driving pulpwood grinders.

Two turbines in spiral casings, each 3,350 h.p., 600 r.p.m. under 264 feet head, for driving electric generators.

Two turbines in spiral casings, each 600 h.p., 1,000 r.p.m. under 264 feet head, for driving centrifugal pumps, with governors, valves and other auxiliary apparatus.

The accompanying illustrations show many of the details of this style of turbine. The runners are always designed specially to meet the requirements which the conditions call for, and, whenever possible, are made of bronze cast in one

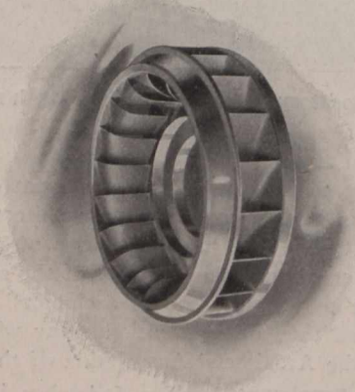


Fig. 1.—Bronze Runner.

piece, as shown in Fig. 1. The runner is bolted to a forged flange or steel hub, (shown in Fig. 2) and only machined steel bolts are used in reamed holes, to make the construction "fool proof" and safe. The guide vanes shown in Fig. 3 are made of forged steel in one piece, are made to gauge, and are interchangeable. Both runners and guide vanes are carefully machined and polished all over and all rotating parts are balanced by static and running methods. Every spiral casing is provided with a "speed ring" (shown in Fig. 4) made of cast steel. This ring is rigid in constructon and

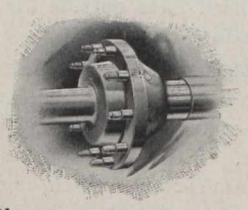


Fig. 2.—Forged Flange.

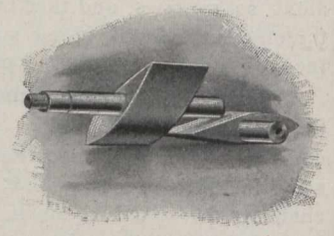


Fig. 3.
Forged Steel Guide Vanes.

is designed to guide the water properly from the casing to the guide vanes and runner.

On all turbines with spiral casing the gate rigging (shown in Fig. 5) is arranged outside, so that it may be attended to without any interruption of operation. All bearings are lined with the highest grade babbitt, and are care-

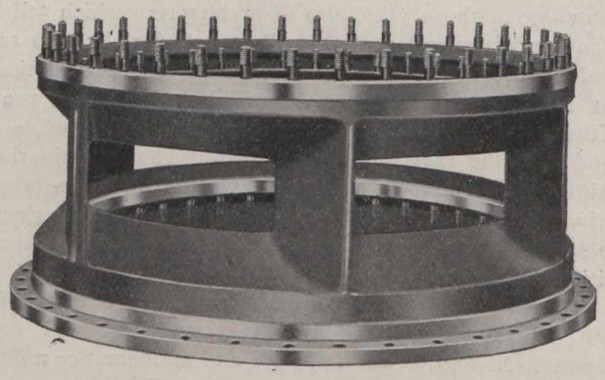


Fig. 4.—Cast Steel Speed Ring.

fully scraped to fit the shaft. The covers for places where water and moving parts come into contact are bronze or steel lined and machined accurately to gauge. Every turbine,

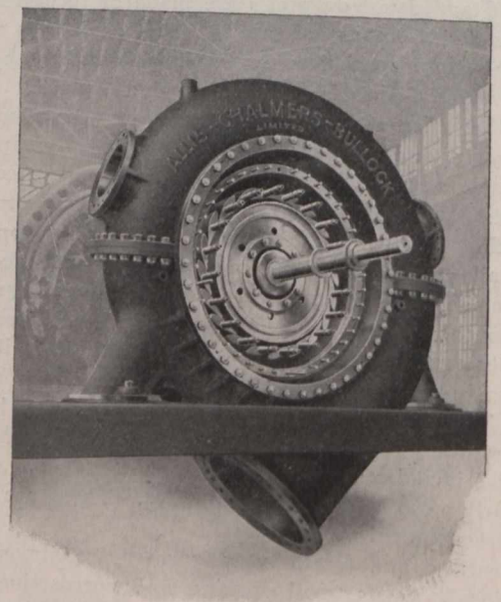


Fig. 7.—Guide Vanes and Runner in Position Within the Casing.

before shipment, is completely assembled in the shop and subjected to an overspeed test, as shown in Fig. 6.

This company has also developed a new oil pressure turbine governor. (Shown in Fig. 5). This governor is pro-

vided with all the modern appliances to make a quick and sensitive regulation possible.

The governor is of the self-contained type, and is designed for any operating conditions. Runaways are not possible with this design. The hand power control is combined with this governor and is ready for connection at any moment, without loss of time. No gears or racks of any kind are used with this governor. The oil pump is of ample capacity and well proportioned to operate without wear and tear. The space occupied for any setting is not more than four feet square. The governor body is of heavy design and neat in appearance. All enclosed parts are easily attended to during operation. The flyball is of the strongest possible design, and its construction is such as to make it one of the most sensitive on the market. The connection of this governor to the turbine is of a very simple construction. The governor is designed in such a way that the turbine gates can be operated either:

1st—By governor operated.
2nd—By hand hydraulically.
3rd—By hand mechanically.

These three operations can be changed at a moment's notice by touching one lever.

There was an impression for many years that it was necessary to go to Europe for high-class hydraulic turbines of this class, but Allis-Chalmers-Bullock, Limited, has shown

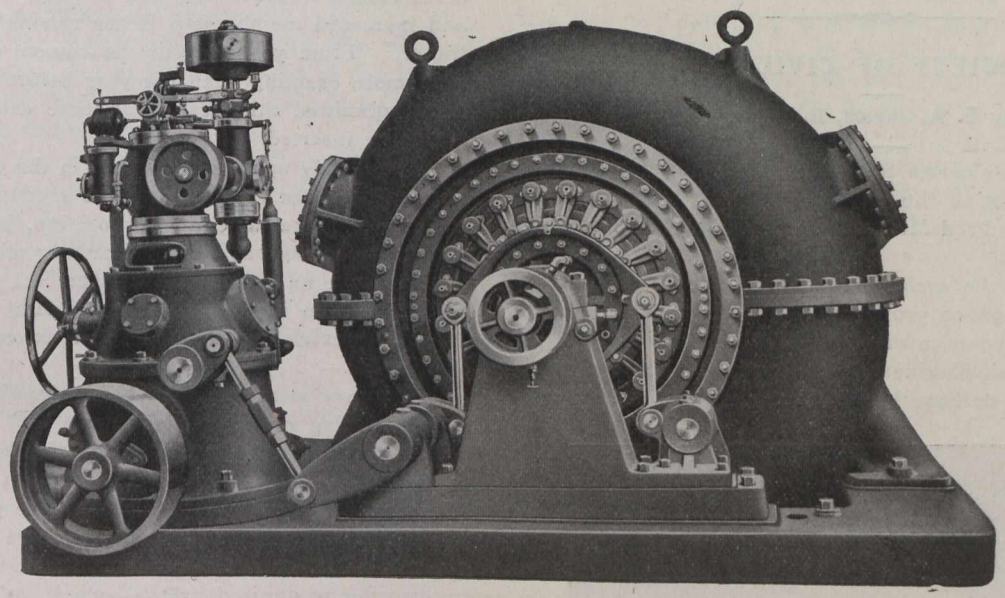


Fig. 5.—New Oil Pressure Governor and Outside Gate Rigging.

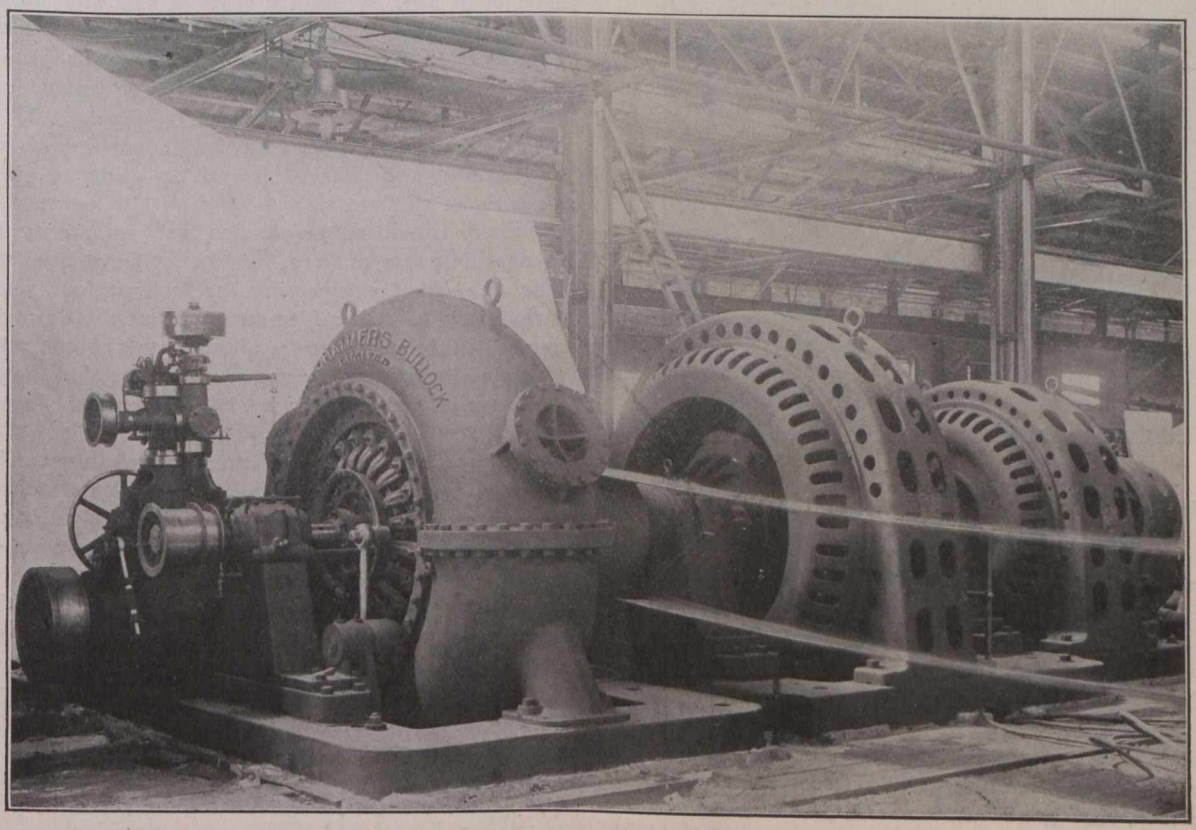


Fig. 6.—1,600 h.p. Turbine Motor Generator Set under Runaway Speed Test in the Shops Before Shipment.

that this is no longer the case. In fact the efficient design and thorough workmanship shown in the turbines which they have built have recently kept in Canada orders which formerly went abroad.

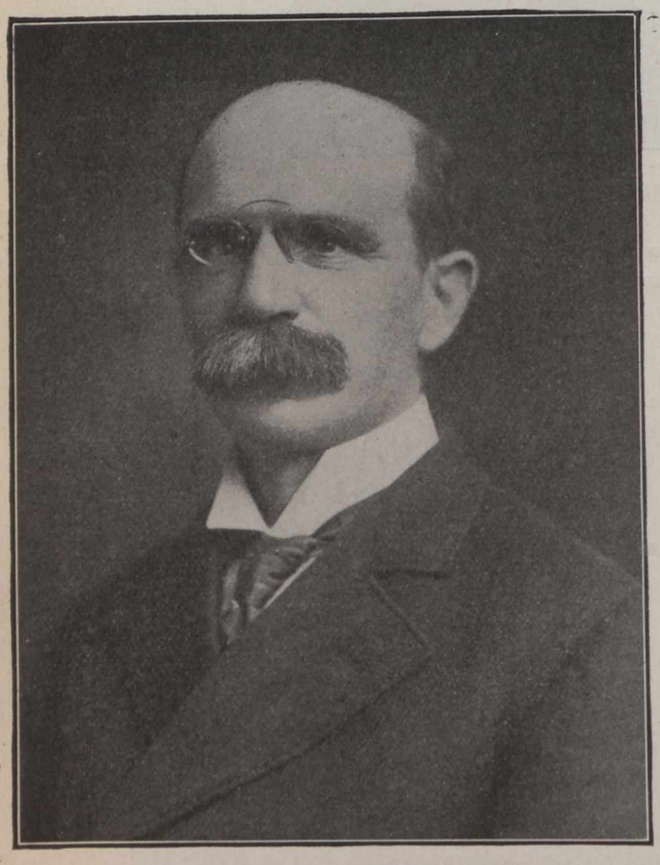
CANADIAN SOCIETY OF CIVIL ENGINEERS.

By E. A. James, B.A.Sc.

This year the Canadian Society of Civil Engineers held their annual meeting in the city of Montreal. Ever since the society was organized Montreal has been the home of the head office.

The objects of the society are to facilitate the acquirement and interchange of professional knowledge among its members and to encourage original investigation.

The term "Civil Engineer," as used in this society, means all who are, or have been, engaged in the designing



MR. C. H. RUST,
City Engineer, Toronto, and President of the Canadian Society of Civil Engineers.

or constructing of railways, canals, harbors, lighthouses, bridges, roads, river improvements or other hydraulic works, sanitary, electrical, mining, mechanical or military works, or in the study and practice of navigation by water or air, or in the directing of the great sources of power in nature for the use and convenience of man.

The society consists of honorary members, members, associate members, juniors, students and associates, and was organized in 1887, having now a membership of over 2,700.

Mr. C. H. McLeod is secretary of the society, and headquarters are situated at 413 Dorchester Street West, Montreal.

During recent years there has been a movement among the members to encourage the establishment of branch societies. It was expected that each branch would have their own society quarters, library, reading room and weekly or monthly meetings. The movement was a popular one and already there are branches at Quebec, Toronto, Manitoba, Vancouver and Ottawa and steps have been taken to organize at least three more branches at other centres.

The forming of branch societies is the natural outgrowth of increased membership, and another evidence of strength and increased membership is the raising of standard of entrance. From year to year the council of the society have been more exacting than the year before and in the amendment submitted this year, still more exacting requirements are being inserted.

The steady upward movement in the qualification for admission does not indicate that the society are unanimous in wishing to make a close corporation, but rather that they recognize the responsibility which they are undertaking when they attempt to give status to members of the engineering profession who identify themselves with the organization.

The present qualification for election to membership is as follows:—

Honorary members shall be distinguished men, eminent in engineering or kindred sciences.

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 for election as junior must 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 years.

Every candidate for election as student must be at least seventeen years of age, and must present a certificate of having successfully passed an examination equivalent to the final examination of a high school or the matriculation of an Arts or Science course, and must be pursuing a course of instruction in some school of engineering recognized by the council, in which case he shall not remain in the class of student for more than one year after graduation; or be receiving a practical training in the profession, in which case he shall not remain in the class of student after he has attained the age of twenty-three years.

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.

Engineering ethics is a question every engineer has to consider at some time or other. It may be that he debates the subject with himself or he may discuss it with other engineers.

The code of ethics assembled by the Canadian Society of Civil Engineers is a good one, and as the membership

approaches closer to both the spirit and letter of this code, the standing of the society will be improved and its influence increased.

The code of engineering ethics as given in the publications of the society is as follows:—

Every member of the society should perform the work he undertakes to do to the best of his ability and in the true spirit of his engagement, feeling it to be his duty to present all ascertained facts in their true light.

The civil engineer has a right to expect from his client the same consideration and deference to his opinion as is by their clients accorded to the members of other professions—law and medicine, for example—and without which the adviser should decline to advise. The surest way for the engineer to obtain such necessary consideration and deference from the public will be found in his manner of carrying himself.

The assistant engineer must loyally obey and support his chief, to whom it will be his duty to report directly on all matters relating to the work on which they may be jointly engaged. His report should be full and explicit on all important points, and exact to the best of the assistant's knowledge and belief, cloaking nothing, even though going to show that previous reports had been inaccurate or not duly weighed, in some particulars affecting the well being of the business in hand.

The assistant engineer is entitled to look to his chief for, and to receive from him, advice for his guidance in the proper performance of his duties, and, where right, to expect his support in matters in dispute between him (the assistant) and his subordinates, or between him and the contractors working under him. He is also entitled to the aid of the chief engineer's professional experience or counsel where unlooked-for or extraordinary difficulties present themselves, or changes of original plan may be called for in the work on which they are associated, so that responsibility may be fairly apportioned between them.

It is the duty of both chief and assistant, each in his department, to study proper economy in the doing of the work, the management of which they have undertaken, and in every way consistent with the maintaining of the good character of the work to make the client's interest the guiding object.

The engineer may legitimately suggest experiments with a view to improvement, whether in methods of doing the work which he oversees, or for raising its character; but such experiments should only be undertaken with the full consent and co-operation of the person, whether client or contractor, on whom the expense may fall, and on the understanding that to them will accrue all pecuniary benefit from the success of the experiment.

It shall be considered unprofessional for any member of this society to seek the position of an expert to report on any work that is in charge of a recognized engineer.

It shall be the duty of any engineer, before examining any work with a view to report thereon, to give the engineer due notice before going on with the investigation in order that he may have every facility to explain and sustain his methods of carrying on the work in question.

Interchange of professional assistance between members, as tending to promote fraternal intercourse and mutual goodwill, is not to be discouraged, but neither is it to be considered obligatory on a member to respond to the request of a fellow member for professional counsel or assistance. Service so rendered must be entirely voluntary on the part of the member whose aid is sought.

The civil engineer may, consistently with professional status, take out patents for new inventions or for improvements on old ones, and may sell or otherwise dispose of the patents for his own advantage. He may undertake surveys and the engineering of works by contract, or he may take contracts for the construction of works on a percentage of their cost. Advertising with a view to attracting business should, where resorted to, be as far as possible free from egotistic or self-laudatory references, and expressed in language not derogatory to the dignity of the profession.

The civil engineer, whose advice is sought in respect to the usefulness, practicability, and cost of work, should, before expressing his opinion, obtain reliable information on all points involved in the matter submitted to his judgment, including the probable paying capacity of the contemplated undertaking. He must be cautious how he recommends large preliminary outlay, should avoid connecting himself with schemes or projects of merely speculative character, always bearing in mind that his professional reputation will be to a great extent judged by the inherent merits and commercial

COL. H. N. RUTTAN,
City Engineer, Winnipeg, and Immediate Past President of the Canadian Society of Civil Engineers.

value of the undertakings with which his name may come to be associated.

The Canadian Society of Civil Engineers contains among its members leaders in every branch of engineering in Canada. Each year membership in the society is more eagerly sought, and in four years the society should double its membership and quadruple its influence.

NOVA SCOTIA MANGANESE.

Much interest is shown in the new manganese mine at New Ross, Lunenburg, N.S. For upwards of a year, the work of development has been going on, new buildings erected and machinery installed for fitting the ore, which is of a very high grade, for the consumer. In a few weeks the company will be in a position to market the finished product in quantities. In this mine the manganese occurs in fissure in the granite, and in this respect is unique It has been practically proven that the product is eminently suited to the requirements of the glass makers and varnish manufacturers, as apart from its high chemical grade, its physical characteristics give it a long-continued high efficiency.

THE BUILDINGS OF McGILL UNIVERSITY.

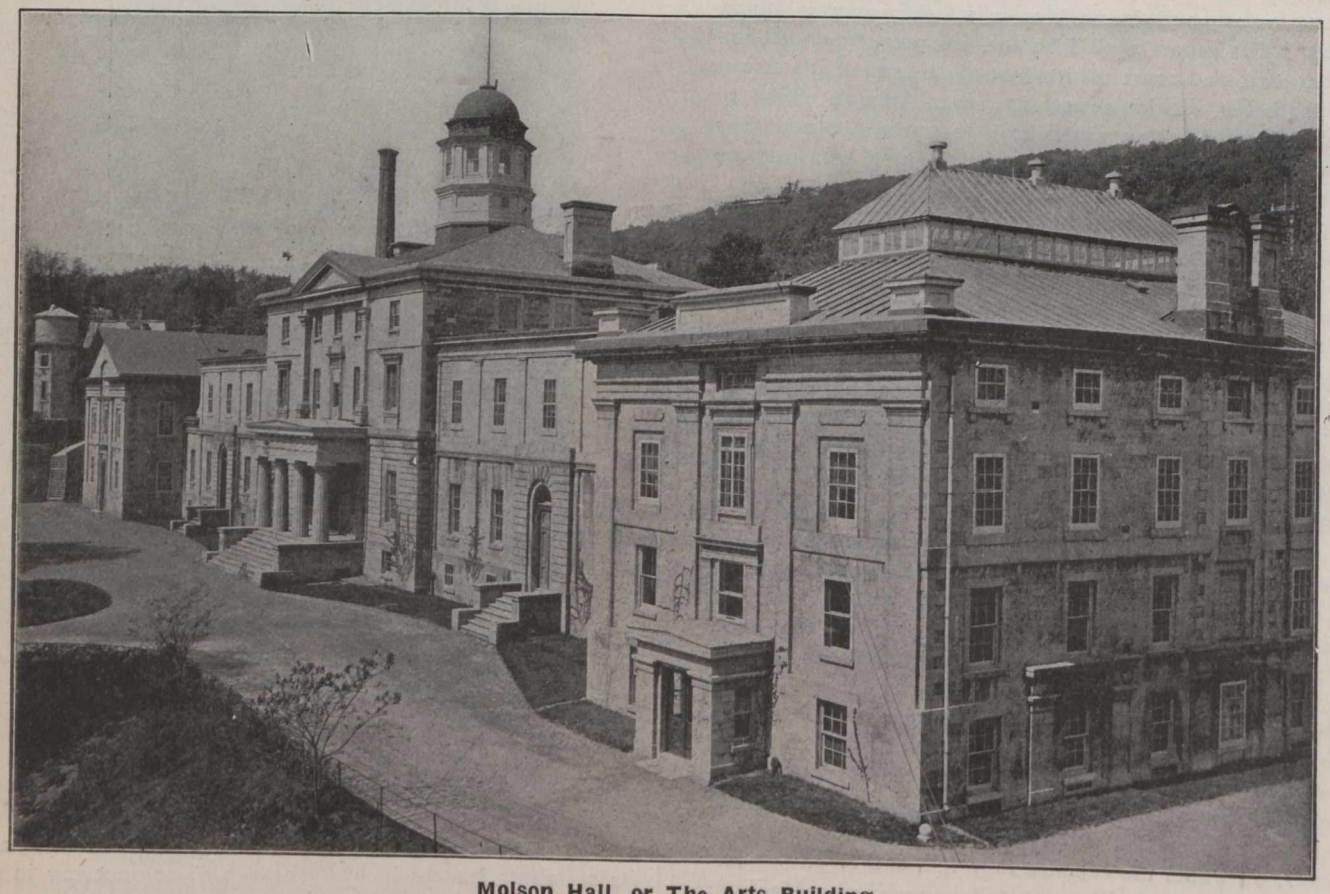
By T. W. LUDLOW, B.Sc., M.A., Professor of Architecture, McGill University.

McGill University, like all the older seats of learning on this continent, owes its foundation to a private endowment. The Honorable James McGill, who died in 1813, bequeathed his property of Burnside, consisting of forty-six acres of land, with the dwelling house and other buildings, and a sum of £10,000 in money to found a college, in a provincial university, the erection of which had already been provided for by the British Government. Owing, however, to a disagreement among the trustees, the idea of a provincial university was abandoned; but application was made at once for a Royal Charter for the independent establishment of McGill College, along the lines laid down in the bequest. The charter was granted in 1821, and the Royal Institution for the Advancement of Learning, a body which was incorporated in 1802 to encourage universal education in the province of Quebec, proposed to take possession of the estate. Owing to protracted litigation, this was not surrendered to them until 1829, when the work of teaching was begun in two faculties, Arts and Medicine. The record of the first thirty years of the University's existence is an unbroken tale of financial embarrassment and administrative difficulties, and, with the exception of the Medical Faculty, became almost extinct as a body. In 1852 a revised and less wieldy charter was secured, and in 1855 a new era of progress and prosperity opened.

This second period of the University's history, that is from 1855 to the present day, may properly be called the formative period, as it has been marked by a very rapid growth both in aims and teachings of the institution, an expansion in all branches of learning, the establishment of new faculties (Law in 1853, Applied Science in 1878, and Agriculture in 1907), and the erection of new and modern buildings in which to properly carry on the work of instruction; so that to-day, with fourteen buildings, without counting those of the Agricultural College at Ste. Anne de Bellevue or the affiliated Theological and other schools, brings the University to the dawn of an era of maturity.

The fourteen buildings under discussion are:—

Molson Hall or the Arts Building.....1862
Peter Redpath Museum 1882
Macdonald Physics Building 1893
Redpath Library 1893
Macdonald Chemistry and Mining Building 1898



Molson Hall, or The Arts Building.

Royal Victoria College 1899
Strathcona (Old) Medical Building 1901
Conservatorium of Music 1904
Macdonald Engineering Building (New) and Workman Engineering Building .....1893 to 1907
McGill or Students' Union 1907
New Medical Building 1907
Observatory.....1911
Strathcona Hall (Students' Y.M.C.A.).....
Power Station .....

The above buildings divide themselves, architecturally, into three groups, which reflect the prevailing taste at the time when each of the structures was built. These are:—

1. The Greek Revival or Neo--Grecque.
2. Romanesque.
3. The Early Renaissance of Elizabeth's England.

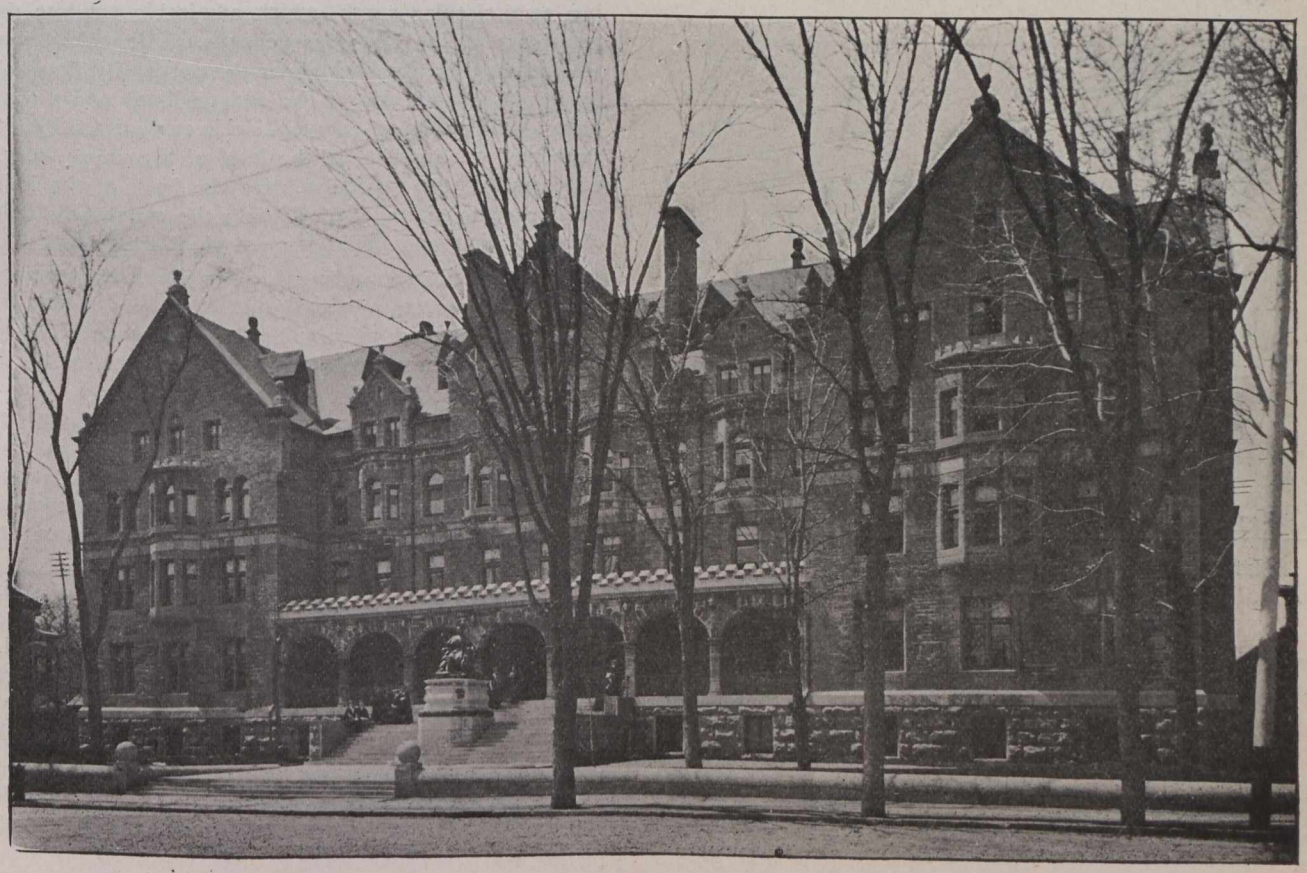
The Greek Revival is a recognized style in the history of architectural development, that owes its origin to the rediscovery of Attic forms by Messrs. Stuart and Revett in the first half of the XVIII. century. The character of the other two groups is based on the modernization of historic forms to suit present day conditions, and they are considered rather in the light of adaptations than styles.

To the first group belong Molson Hall and the Redpath Museum, the two oldest buildings of the University. The older of these, Molson Hall, is, with possibly the exception of the New Medical Building, the finest of all McGill's structures. This Hall is a long, low edifice with a commanding situation on the side of a hill, closing the long vista at the end of the shady driveway from the main entrance to the college grounds on Sherbrooke Street. It consists of a central and two end pavilions of three stories each and connecting wings, joining them two stories in height. The whole is built of local gray stone, which is so admirably suited, from the aesthetic view point, to the low color tones of Montreal's atmosphere. The central pavilion is naturally the focal point of interest; it consists of a very nicely proportioned, cubical building, crowned with a low roof, above which rises a well-arranged lantern. A porch of four Greek Doric columns, supporting the entablature, that does not follow too closely classical traditions and a very low pediment, forms the main entrance to the building. This feature is raised on a high base, and is approached by an imposing ramp of steps, equal in width to the porch itself. The arrangement of the end pavilions and connecting wings shows the same dignified simplicity that marks the central motive, they also show an interesting variety of treatment of window openings, that harmonizes perfectly with the main lines of the composition, yet differ materially one from the other. This is an excellent expression of true symmetry, one where the main masses agree, considered in relation to a central axis line, yet they are sufficiently varied in their individual parts to place this structure in a class above the so-called symmetrical buildings that are characterized by a repetition of parts. Unfortunately, as much cannot be said about the interior.

Directly in front of Molson Hall, situated on a plot of grass at the head of the driveway, is the burial monument of McGill's founder. It was moved to its present suitable location, together with the earthly remains of the Hon. James McGill, from the Protestant Cemetery in 1875. The monument is late Georgian in style and possesses all of the delicacy, charm and quaintness that characterized the funerary architecture of that period.

The second building of this group, the Redpath Museum, was built some twenty years later than Molson Hall, and its style reflects the change of taste even in that short decade. The treatment lacks entirely the vitality of the older structure. Here the front consists of a high central bay flanked on either side by lower wings, in much the same manner as the nave and side aisles of a church. The whole structure is raised on a high base and is approached by a broad flight of steps; above the base the facade is divided into two parts, a low one and a higher one above it. The main entrance is through a doorway in the central bay, above which there are two Corinthianesque columns in antis; this feature is crowned by a pediment. From the decorative point of view this edifice is particularly unfortunate, as the architect was evidently laboring under the impression that all that was necessary to make a good building was to use on a naturally limited surface all of the ornamental forms that he knew, as here one sees, especially on the main front, the whole grammar of classical Greek and Roman motives used indiscriminately, alike as to position, fitness and scale.

The Library, Chemistry and Physics Buildings form the Romanesque group, and they are all the work of Mr. Andrew



Royal Victoria College for Women. Mr. Bruce Price. Architect.

T. Taylor, who for many years was a leading practitioner in Montreal. He may briefly be summarized as a decorative architect, that is, one who designs his buildings around decorative forms, instead of having them grow out of a logical arrangement of parts. This must not be taken in the light of a severe criticism, as Mr. Taylor's work possesses many good points beside a charming decorative arrangement of the exterior.

The Library is the most worthy of this trio of buildings. It, like Mr. Taylor's chief works, is in a style adapted from the rich Romanesque of Southern France, which is known by its picturesque grouping of masses, low circular headed openings, a pleasing arrangement of doors and windows, and interesting decorative details. All of these features are well emphasized in the building under discussion, which has for its focal point a richly proportioned tower on the north front, on either side of which there are two wings, the one to the east containing the main reading room, while the one to the west houses several special reading rooms and the administrative offices. Stretching off to the south, back of the offices and a corner of the general reading room, are the

The Macdonald Engineering Building. View from Southwest.

Prof. P. E. Nobbs, Architect.

stacks. The different functions of the interior are well expressed in the exterior arrangement of this structure, as the long triple windows in the east front of the main reading room and the closely grouped small windows of the stack and offices illustrate.

The decorative details which adorn the exterior are in character with the architectural treatment of the whole. They consist mostly of low relief carvings of vegetable and geometric forms, on the mouldings around the door and window openings, and well sculptured gargoyles at intervals on the cornice.

The interior, reached through a doorway in the tower, has a very nice tone throughout, with the interest chiefly centred on the main reading room. This room is of generous proportions, being 110 feet long, 44 feet wide and 34 feet high, and will easily seat one hundred and fifty readers. The walls are wainscoted in light panelled oak to a height of about eight feet, and an open oak beamed ceiling covers this vast space with pleasing effect. In the east wall there is a group of three long, narrow windows that are filled with good stained glass, in which rich blues predominate. The arrangement of the leading in the other windows shows a carefully studied variety in handling and is well worthy of notice.

The stacks, arranged in four and five stories in the modern seven foot high steel units, have a working capacity of two hundred and fifty thousand volumes, although at present they shelve only about one hundred and thirty thousand books, but the total collection consists of about thirty thousand more pamphlets, maps, and photographs. Of especial interest may be mentioned the Redpath collection of works on English history, and the Griffin library of Canadian history.

Next, in general excellence of design as well as in date, is the Macdonald Physics Building. Mr. Taylor had a much more difficult task here to harmonize the severely technical instruction given within these walls with the picturesque grouping that the style demands, and as is so well exemplified in the Redpath Library. The great laboratories and their adjuncts required for convenience of operation a rectangular building, and the result is an admirably disposed structure on an axis running east and west, with the main front turned towards the south. This building is five stories in height, and is crowned by a well proportioned roof. The ornament is concentrated on the lower and upper stories, in architectural forms, with panels of purely decorative ornament under the windows of the intermediate floors. The architectural ornament on the main floor consists of an elaborate projecting semi-circular porch, which admirably exhibits the characteristics of the Romanesque style. The central portion of the building breaks back above the porch, dividing the facade up into a composition of two end pavilions and a connecting link. This motive of composition is emphasized by a balcony supported on brackets at the level of the upper story, which connects the two pavilions. On the back of the building a similar composition is used, only the connecting balcony is of a different and perhaps more pleasing design.

The interior throughout is simply finished with red brick walls, with plaster or wooden ceilings. The doorways, in many instances, are circular headed and are moulded in terra-cotta with geometric or vegetable patterns, after the Romanesque manner.

There is a finely wrought mantel in the entrance hall with the fitting motto "Prove All Things" cut in its central panel. The delicately carved foliage of the capitals of the supporting shafts and the mouldings of this feature are well worthy of notice, and certainly would excite more attention if the hall were not so small.

The main lecture theatre is up half a flight of stairs from the entrance hall, on the left hand side. It is a fine, high room, finished in light oak and red brick, with a good, heavy flat beamed oak ceiling, and a gallery running across the back and along one side. It will seat at individual chair desks about two hundred persons, and it is fitted with every scientific device for instruction in mathematical physics. The great care exercised to obtain perfect results is shown by the fact that the foundations of the demonstrating desk are carried down to solid rock.

Five years after the completion of the Physics Building and the Redpath Library, the Macdonald Chemistry & Mining Building was opened. This structure is placed between the Physics and Engineering Buildings; thus the group of structures devoted to the use of Applied Science is separated distinctly from the buildings of the other faculties. In style this edifice does not follow the Romanesque form as closely as Mr. Taylor's earlier work, but rather shows a treatment adopted from a later French school, that of the just developed Renaissance, which has more the appearance of being influenced by Spanish, than Italian models.

In this case, as in the one just cited, the structure rises from a rectangular plan to a height of five stories from the main floor, while in the rear, at a considerably lower level, extend shops for the miners and metallurgists to the north and south, making in this way a "T" shaped plan.

Notwithstanding the very ornate entrance motive and the richly moulded cornice at the roof line, this building is

simpler in general treatment than either the Library or Physics Building; the lower story is plainly rusticated and is lighted with arched windows, the intermediate stories are almost severe, with square headed, unornamented openings, while the upper story is somewhat relieved by wall arcades framing the windows. Above the cornice some nicely proportioned ornamental dormers break the sky-line, standing out as they do from a rather low roof. The treatment of the southern face differs from the other sides in that it is divided vertically into a series of bays by buttresses, which terminate under the cornice in inverted scrolls.

The interior contains a lecture theatre, seating about two hundred and fifty students, and several large chemical, assaying, ore dressing and other laboratories. These are all treated more from the utilitarian view point than from one of architectural pretension.

Besides the three buildings already described, Mr. Taylor was the architect of the old Macdonald Engineering Building, which was completely destroyed by fire on April 5th, 1907, the Thomas Workman Mechanical Engineering Building, and the old Strathcona Medical Building, which was partly destroyed by fire on April 16th, 1907.

The remaining buildings of this group show a complete change of style from his other work, being severely plain in their treatment, depending upon an exceedingly well proportioned fenistration rather than decorated mouldings and panels for their chief effect. Looking casually at the old Medical Building, this effect is somewhat lost owing to the wretched colored yellow paint that has been used on the mullions, transom bars and window frames.

After the fire of 1907 two stories were added to the Workman Building. These are easily distinguished from the older work, because they are in dressed stone, which forms a pleasing contrast with the rougher stone work below. More will be said about this later.

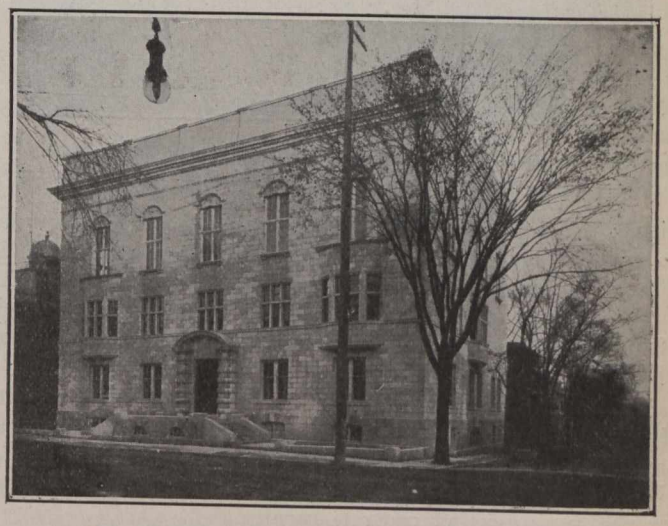
The third group, comprising those structures built in the style of the Early English Renaissance, includes such buildings as the Royal Victoria College, the new Macdonald Engineering Building, the McGill Union and the new Medical Building. These are unquestionably the finest of the McGill edifices, and they show what systematized study has done for the development of modern architecture; built under diverse conditions by men who received their training either in the Old Country or in the larger centres of the Eastern States, they show a remarkable homogeneity in style and fitness to their surroundings.

The oldest of these, the Royal Victoria College, the academical and residential hall for McGill's women students, was made possible through the generosity of Lord Strathcona and Mount Royal. This building, opened in September, 1899, was erected from the designs of the late Mr. Bruce Price, formerly a well known architect of New York. Mr. Price is familiar to all Canadians because of his very excellent work in designing the Place Viger Hotel and Terminal in Montreal and the still finer Chateau Frontenac at Quebec.

This structure, situated on Sherbrooke Street at the head of Union Avenue, just east of the main college campus, has a commanding situation that shows the fine design off to the best advantage. The composition consists of two end pavilons joined by a connecting link, which is subordinated to the pavilions only by the fine seven-bayed arcade, which serves at the same time as a porch and the joining link. The building rises to a height of four stories and an attic, above a low basement, and is approached by a broad ramp of stairs equal in width to the three central bays of the arcade. In the centre of this ramp there is a fine pedestal with bronze ornamentations, which is surmounted by a graceful and well designed seated bronze statue of Queen Victoria.

Each of the end pavilions terminates in a gable, which marks the height of the ridge of the roof of the main building, the eaves line of which is broken up by one major and two minor gables, of similar proportions but smaller than those of the pavilions. Oriel windows, extending through two stories in the pavilions and one story in the body of the building (the connecting link) form the chief decorative note outside of the arcade, on this facade, which depends upon subtile proportions rather than ornamentation for its chief effect. The roof is broken up in an interesting manner by a series of small dormer windows and chimney stacks.

The treatment of the interior is very simple, but the deposition of parts is convenient and good. On the entrance floor there are the offices of administration, lecture rooms, students' common room and a spacious dining room in a separate wing projecting to the north; on the floor above there are more lecture rooms, a library and reading room and the largest assembly hall in the University, in the wing over the dining room; while the two upper floors are devoted entirely to suites of rooms for the resident students and tutors. A well equipped gymnasium service and kitchens



The McGill Union, Sherbrooke Street Front.
Prof. P. E. Nobbs, Architect.

are on the basement. The whole building is well but not luxuriously furnished, and has a comfortable, homelike appearance that is alike beneficial for the student and the visitor.

The new Macdonald Engineering Building, built to replace the former structure which was destroyed by fire in 1907, rises from the old foundations. This handicapped the architect, Professor Percy E. Nobbs of the Architectural Department, now practising under the firm name of Nobbs & Hyde, architects, at the very outset of his task, and made the final solution all the more creditable to him. The main lines of the composition follow those of the Royal Victoria College, that is, the building is composed of two end pavilions and a connecting link, but at this point the comparison must stop, as every line and window of the Engineering Building reflects the serious character of the work carried on within it. This structure rises from a high rusticated base, above which there are four stories in the pavilions and three in the connecting link. The roof is moderately high and is broken up by small dormer windows and some large chimneys at the ridge.

The entrance motive consists of a projecting vestibule, the chief features of which are the flanking rusticated pilasters and a broken curved pediment, above which rises a simple carved group symbolizing engineering. In direct elevation this entrance feature harmonizes very well with the

composition, but from the side the effect is somewhat spoiled by a too great projection. Nicely curved steps lead up to the doorway from either side.

This central decorative note is repeated on the next story in two sculptured panels bearing the arms of McGill, and on the story above by a small balcony carried on fine brackets decorated in low relief carving. At the third story level a second balcony runs across the facade connecting the pavil-

McGill Union, Students' Lounge on Second Floor.
Prof. P. E. Nobbs, Architect

ions; this is interrupted in the centre by an edicule framing a small window and a niche, which runs up and breaks the line of the main cornice.

The ends and the back repeat the treatment of the main front, as far as it is possible to do so, and at the same time join on to the Workman Mechanical Building.

The two upper stories of the Workman Building—the lower one consisting of a high arched motive surmounted by a story with small rectangular openings—is also the work of Professor Nobbs, with its most charming feature to be seen in the far projecting concrete cornice.

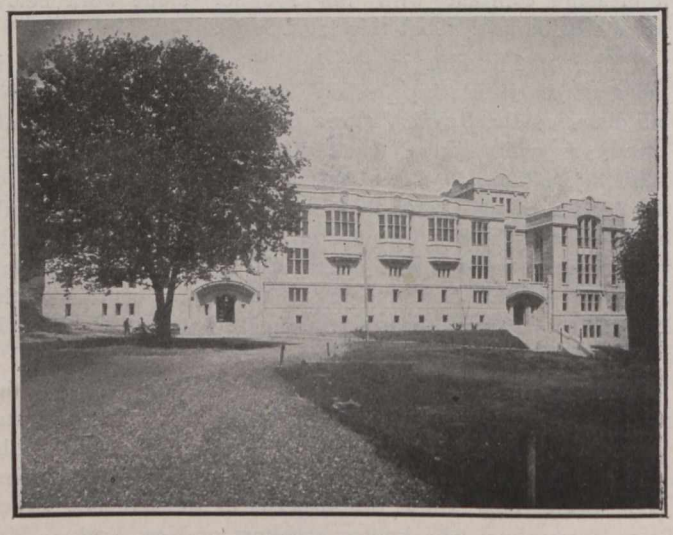
The Engineering Building was erected as the permanent home of the Department of Civil Engineering, Architecture and Transportation, but until other structures can be erected the Departments of Electrical and Mechanical Engineering are given here temporary accommodation. The space is allotted as follows:—The great laboratories for the Civil, Electrical and Mechanical Engineers are in the basement and have a clear height of twenty-three feet, which gives ample room for the most interesting experiments. The first floor is devoted chiefly to the Agricultural Museum, the Museum of the Railroad Department, the Engineering Reference Library, and locker space. On the floor above are the architectural draughting and lecture rooms and reference library, the private offices of the professors and the faculty room; while the two upper floors are given over to large draughting rooms and lecture halls.

No special interior architectural effect has been sought after in this building, the dominant note being security against fire, as each of the floors is divided into sections by unplastered brick fire walls, with great copper fire doors operating automatically with a fusible link to isolate any conflagration that might start.

The halls, lecture and draughting rooms and museums are finished in a lovely rich buff yellow brick, laid up in various bonds. In some cases the brickwork is four-foot wainscot only, in others it goes up to the ceiling; when the wainscot is used, the walls above are plastered and tinted an agreeable shade in a low key. The central portion of the second floor, used for administrative purposes, is more decorative than the rest of the rooms: here the corridor is wainscoted with mat glazed white terra cotta tiles, with at intervals decorative panels in terra cotta, symbolical of the different departmental activities. In the faculty room there is a fine but simple moulded ceiling, with a great elliptical panel in the centre, framed with a rich band of fruits and flowers in low relief. The walls are tinted a delicate green, and the hangings are a dull orange buff. The finish of the furniture blends in color with the hangings, giving to the whole room a warm and attractive aspect.

The furniture throughout the building was also designed by Professor Nobbs; it is particularly interesting on account of its variety, the excellence of the substantial designs, the fine workmanship and beauty of finish.

The most beautiful of Professor Nobbs' buildings is the McGill Union, situated just off the college campus on the corner of Sherbrooke and Victoria Streets. It is a rectangular structure 91 feet long by 71 feet deep, and rises in three well proportioned stories above a low basement. The upper story is terminated by a nicely moulded cornice, which is crowned with a high plain attic. The chief decorative features of the main front are the entrance and two oriel windows on the second story at either end of the composition. The doorway consists of a pleasing shallow porch, formed by a group of three rusticated pilasters, crowned by a curved pediment, in the tympanum of which there is a shield bearing the arms of McGill. In the centre of the Victoria Street elevation there is, also on the second story level, an oriel window which is flanked by two slightly projecting decorative chimneys which break through the cornice in a pleasing manner. The windows of the upper story are considerably higher than those of the stories below, and thus fittingly express on the exterior the great hall within.



New Medical Building. Front Elevation from Upper Campus.
Brown & Vallance, Architects.

The arrangement of the interior, which is given over entirely to social intercourse between the students of all faculties, is very simple, but well laid out; it is further a splendid expression of the proper handling of different colored materials to obtain a rich and harmonious effect. On the entrance floor, beside a commodious hall, there are the dining and grille rooms; on the second floor there is a splendid lounging gallery, running across the whole front of the building, 88 feet long by 21 feet wide, back of which are billiard, news and reading rooms, a library and a study. The top floor is given over to the great hall in front—a room 88 feet long by 45 feet wide—and several small rooms for society meetings. The interior is too rich and varied to be properly described within these limits, but particular attention must

be called to the delicate moulded plaster work of the ceilings and cornices, the grace and variety of the wrought iron details, the interesting heraldic devices, the fine joining of the panelling and furniture, and the varied and harmonious color scheme of the whole.

The last of the English Renaissance group forms the latest addition to McGill's equipment. This is the New Medical Building which was completed only last spring from the designs of Messrs. Brown & Vallance, architects, Montreal. This structure is without question the finest building of the University and one of the finest in the whole Dominion, the great pity being that its situation at the corner of University Street and Pine Avenue, although excellent on account of its proximity to the Royal Victoria Hospital, is unfortunate from the view point of the observer, as besides being somewhat screened, the sharp rise in the ground from the Milton Street level to the building makes it very difficult to see more than a portion of the composition at any one time.

New Medical Building. Rear Elevation from Royal Victoria Hospital, Showing North Wings.
Brown & Vallance, Architects.

In plan this building is of the conventional "E" type with the three wings projecting to the north. The body of the building to the south recalls the northern divisions in the main masses, and joins them by recessed stair towers, which are built out from the lower story, to form the entrances. The central portion is given over to the library and stack, the reading room being on the top floor, while the other two floors above the basement are devoted to the storage of books and supplies, and for administrative purposes. The east and west wings, to the south, are occupied by smaller departmental laboratories and lecture rooms; while large laboratories, the museum and an assembly hall fill the northern wings.

The interior disposition is exceedingly well expressed in the arrangement of the outside, the library, for instance, with its three oriel windows; the stack below by slit openings, while the great laboratories and halls are shown by large finely proportioned windows.

The interior is treated with the same simple harmony that characterizes the exterior, and is so designed that the first impression is one of spaciousness and light. The halls, corridors and many of the rooms are finished with a mat white terra cotta wainscot, the dead whiteness of which is relieved by shields bearing the names of famous men of medicine in red or gold letters, or colored heraldic devices.

The Museum, three stories in height, occupies the central northern wing. It is a cross in plan, with a low glass dome over the central rotunda. The faculty room on the ground floor with its fine mantel, and the reading room on the top floor, show the refinement and simplicity to which this style lends itself.

Of the other buildings Strathcona Hall, the home of the University Young Men's Christian Association, on Sherbroke Street, just opposite the college gate, and the new power station, back of the Arts Building, are the most interesting. Strathcona Hall was built from the designs of Messrs. Finley & Spence, architects, of Montreal. It is a rectangular building of the modified French type, five stories in height. The two lower floors are given over to social purposes, while the upper ones afford residential accommodation for about sixty students. The interior is nicely finished, but is not as rich or varied as the interior of the Union.

The Power Station, the work of Professors Nobbs and Durley, has a splendid equipment, which includes boilers of 1,000 h.p. and engines and generators of 600 kilowatt capacity. The heating distribution is partly by tunnel and partly by underground conduit, and is utilized in the New and Old Medical, Engineering and Workman, Chemistry & Mining, and Physics Buildings. The electric current for light and power is distributed through cables in vitrified clay conduits to all of the above structures as well as to the Royal Victoria College, the Union and Strathcona Hall.

In conclusion, the general impression left on the mind by the McGill group is one of homogeneity and repose. The diverse styles of the individual units is lost in the spaciousness of the campus, which at the same time separates yet binds the buildings together. Out of this whole, two buildings stand forth prominently, Molson Hall and the New Medical Building, the older one dominating the lower campus, the newer one the upper campus. Two other buildings also claim attention, the Union and the Royal Victoria College, but on account of their isolation they lose in comparison with the main group.

A NOVEL METHOD OF POURING CONCRETE BRIDGE FLOORS.

In the construction of the main viaduct of the McAdoo Tunnel extension into Newark, a very interesting method was used in pouring concrete bridge floors, which are trough-shaped and each 13 ft. wide, 11½ in. thick, and laid in sections 250 ft. long with expansion joints between.

The forms are built complete several hundred feet in advance of the concrete, and the reinforcing steel is set and tied by the force of the steel contractor before a run of concrete is started. Concrete is then placed by two traveling plants on the deck of the viaduct. One consists of a 7-ft gauge car carrying a 1-yd. Ransome mixer and timber feeding bins.

It runs on the temporary track mentioned at one side of the slab which is being placed. This track has three rails to accommodate standard-gauge and the 7-ft. gauge. A locomotive crane on the track accompanies the traveling plant and supplies its bins from material cars standing on one side of the outer freight tracks below. Concrete is delivered from the mixer to any part of the slab on the opposite half of the viaduct by a sectional chute, and is tamped in place by the concrete gang. Under this plan of operation 250 ft. of single track slab is placed in an 8-hour day and at times two sections, or 500 ft., have been laid, the time required being 14 hours. On a part of the work, in placing the second track-slab, a second mixing plant has been installed, consisting of a mixer on a flat car, with the material cars coupled at the ends. This traveling plant moves over the completed first track and operates similarly to the other described.

THE GREAT NATIONAL PORT OF CANADA.

Features of the Important Extension Works in Progress in Montreal Harbor.

By FREDERICK W. COWIE, Chief Engineer for the Montreal Harbor Commissioners.

The first attempt to make a harbor for ocean vessels at Montreal was in 1830.

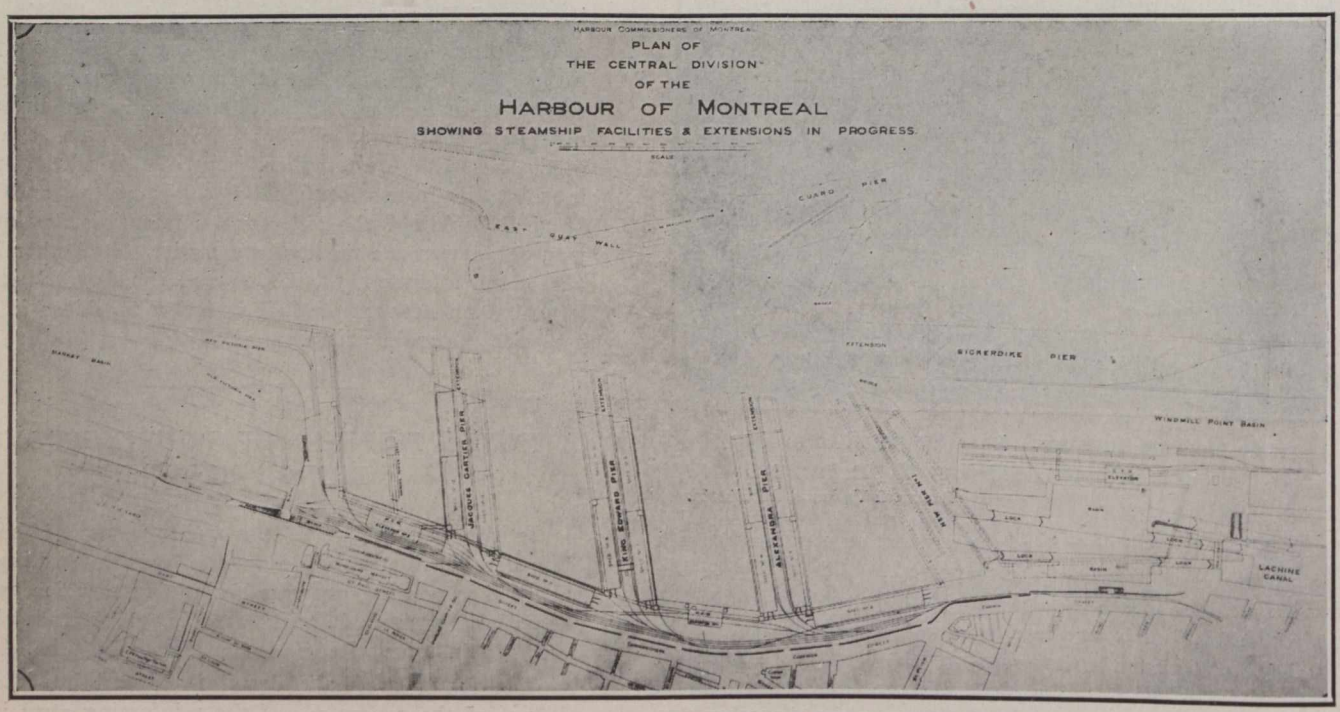
The Canadian inland canal system, connecting the Great Lakes of the central part of the North American continent with the St. Lawrence at Montreal, had just been opened. The physical features of the locality, the trade situation, and the position as a point of interchange between ocean and inland vessels was recognized.

The city of Montreal was fast becoming a commercial and manufacturing centre, and the situation for warehouses and trade was excellent.

From 10 feet in 1850, the channel had been deepened in 1888 to 27½ feet at ordinary low water, over a length of river requiring dredging of about 50 miles, the work being carried on departmentally by the Harbor Commissioners of Montreal.

In 1888 the Government of Canada, recognizing the St. Lawrence as the national route of Canada, assumed the debt incurred with respect to the channel and opened the waterway free to the shipping of the world.

The government, in 1899, undertook the task of deepening the channel about four feet to obtain a depth of 30 feet



Plan of Central Division, Montreal Harbor.

Eastward was the mighty St. Lawrence, with its clean water and permanent river bed, passing through Lake St. Peter and on 160 miles to Quebec, and 800 miles farther to the Atlantic Ocean.

Navigation to Quebec was an accomplished fact for all classes of ocean vessels, but at Lake St. Peter, half way up to Montreal, there was only a depth of 10 feet at low water.

The River St. Lawrence Ship Channel.—Commencing modestly, as it would be considered at the present time, but on right lines, the Montreal far-seeing business men undertook to construct a harbor and to deepen the channel through Lake St. Peter.

Their lessons were gained from the successes in taking navigation up the Clyde, which, before being improved, had been a shallow stream, but with the deepening of the river had resulted in creating the port of Glasgow.

Dredging on the St. Lawrence commenced in 1850. The plant was designed and the machinery made in Scotland.

of the lowest stage of river level recorded, and of widening, straightening and marking the channel with the most modern system of aids to navigation.

In 1907 the channel was opened to commerce with a depth of 30 feet, the actual lowest recorded depth that season being 31 feet 10 inches, and having a magnificent system of lights, buoys, signal service and swept channel.

The standard curves are easy and the width ample, as compared with any other artificial navigable waterway of the world.

Montreal harbor and the St. Lawrence has had a bad name. It is unfortunate that in Canada misfortunes are often unduly advertised. The facts and actual records show to the contrary, and the St. Lawrence should be known as the most advantageous route in the world.

The St. Lawrence, as well as the whole of the Great Lakes navigation, amounting to 70,000,000 tons per annum, is closed by ice from December to April of each year. This situation is accepted for the present, but the future may

bring about great changes, both on the Lakes and the St. Lawrence.

During the navigation season the St. Lawrence has splendid weather conditions, and is notably adapted to navigation. Fogs are very rare in the whole of the contracted part of the river between Murray Bay, 235 miles below Montreal, right up to the harbor.

In 30 years only two ships have been totally lost between Quebec and Montreal.

Groundings, which are so well advertised, are not frequent. The reports of 1906 state that between Montreal and Quebec the loss due to navigation accidents did not amount to $1,000. During the season just closed only one marine accident of any importance happened in the ship channel, when a large freight ship grounded a short distance below Montreal and was released by tugs after lightering part of the cargo. None of the accidents whatever in recent years have been due in any measure to the channel.

Montreal Harbor.—In the consideration of Montreal as a position for a great port, except for its winter season, it would be regarded as an ideal situation, according to the best British and Continental practice.

1. It is as far inland as it is possible for ocean navigation to go.

2. It has a splendid channel approach and dredging plant organization at least equal to any in the world.

3. The navigable conditions are excellent.

4. It is on the direct lines of the great summer trade route of North America.

5. It is the nearest and most advantageous ocean port for a large section of the North American Continent's most productive area.

6. It is a route which, with its up to the present meagre facilities, has successfully held its own with the Buffalo-New York route.

7. It is the eastern terminus of the St. Lawrence Canal System, giving 14 feet navigation, from Montreal to Port Colborne.

From Port Colborne the depth is 20 feet to Buffalo, Cleveland, Detroit, Chicago, Sault Ste. Marie, Fort William and Duluth, a total distance of 1,400 miles.

8. Montreal is the railway centre of Canada, trunk lines extend in every direction and three transcontinental lines first reach ocean navigation at Montreal.

9. Physically, Montreal is favorable for the construction of a port.

10. The water is free from sediment and constant dredging is not required.

11. The whole of the water front and river bed is controlled by the port authorities.

12. The harbor is in the heart of the business section of the city.

13. The railway connections with the docks are the best on the continent.

14. The great transportation companies of Canada, both rail and water, have their headquarters in Montreal.

15. The trade by the St. Lawrence to and from Montreal is now 25 per cent. of the total foreign commerce of Canada.

The total length of wharfage is 38,097 feet, or 7.215 miles.

The total shed area is 35 acres.

There are no tonnage dues on vessels.

The revenues are chiefly derived from wharfage rates on the goods, rentals of sheds and space, storage and handling of grain and operation of harbor railway terminals.

Payment of pilotage to the port is compulsory, and it is controlled by the Government of Canada.

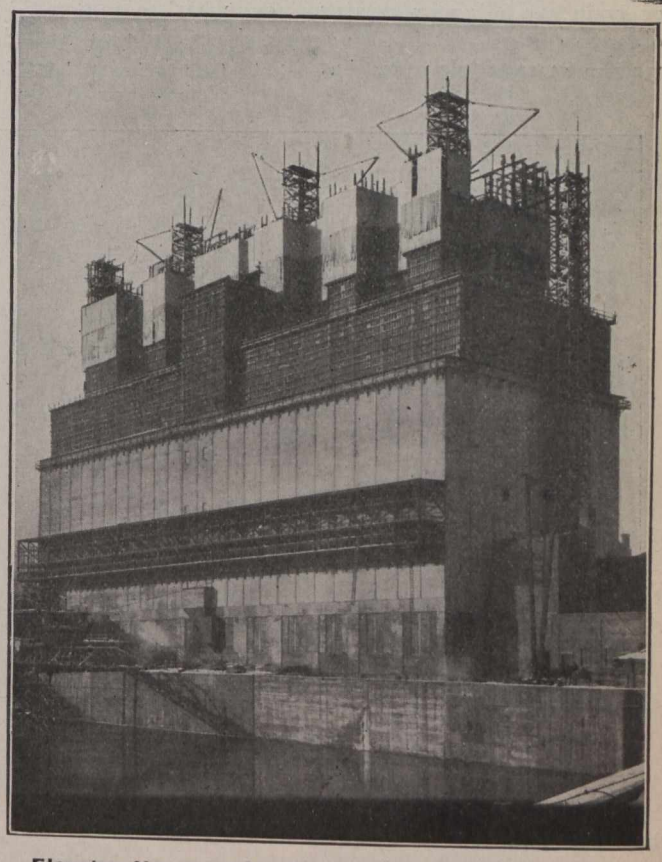
Physical Description of Montreal Harbor.—The jurisdiction of the harbor commissioners extends over the whole of the River St. Lawrence, with the exception of the ship channel, from Bout de l'Ile to above Victoria Bridge, a distance of 17 miles. This area comprises all the land under water and the beaches up to high water mark, including the whole of Ile Ronde. Thus the whole of the water front on both sides of the river is under the jurisdiction of the commissioners, who hold it in trust and administer it for the Government of Canada.

The total water area is 12,000 acres.

The total land area, improved, is 200 acres.

The present harbor represents a development of 80 years.

There is no rise and fall of tide, but the river level fluctuates to an extent of about 12 feet from high water in the spring to low water in the autumn. During the winter, due to ice shoves, the water occasionally rises to an extreme of 28 feet above the low water level.



Elevator No. 2 Under Construction for Harbor Commissioners of Montreal.

An artificial embankment, parallel to the shore, about one and one-third miles long, protects the whole of the upper part of the harbor, including the entrance to the Lachine canal, from not only the currents of the river, but from ice shoves. This constitutes the protected tidal basin in which the water rises and falls with the river level.

It has not been necessary to purchase any land above the high water mark on the beach, as all piers and wharves have been made artificially by building out into the shallow water, and the berths formed by dredging.

The Storage and Handling of Grain.—Montreal harbor being the farthest inland ocean port on the Northern Continent, and also the terminus of the inland Canadian canal

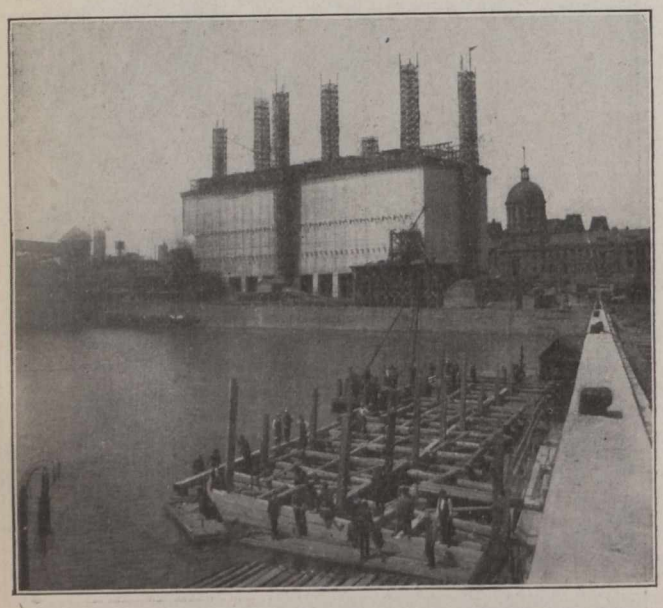
and railway routes, it is an important factor in the grain-carrying trade of the northern part of the continent.

A few years ago the bulk of Western grain came to Montreal in barges. These vessels, without machinery and with small crews, could afford to hold grain in storage until the ocean ship was ready for it, and the grain was then transferred from the barges to the ships by floating elevators.

With the enlargement of the canals, much of the grain now comes to Montreal in steamers capable of carrying about 2,500 tons on the present 14-ft. draft of the Welland and St. Lawrence canals. These vessels cannot afford to wait, but must unload their cargo at once, otherwise they will not choose this port.

Grain coming from Georgian Bay ports by rail must also be unloaded quickly, as even now, during the grain rush, there is a constant railway car shortage.

In the last few years, therefore, the storage and handling of grain has become a new problem in harbor economy. In order to solve it, the harbor commissioners in 1903 erected a modern storage elevator, having a capacity of 1,000,000



Victoria Pier, Showing Construction of Cribwork Substructure New Finished Concrete Quay Wall.

bushels. The G.T.R. leased a site from the harbor commissioners and also erected an elevator, in 1904, having a capacity of 1,000,000 bushels. Other elevators having a capacity of 2,100,000 bushels have been principally occupied with local business.

Elevator No. 2.—Additional storage capacity being urgently required, the construction of Elevator No. 2 was commenced in 1910. The site chosen was on the bulkhead wharf, opposite Jacques Cartier Square, between Jacques Cartier and Victoria Piers. Although planned in 1909 to have a capacity of 1,000,000 bushels, the designs were made in 1910, by order of the commissioners, for a capacity of 1,750,000 bushels, and the elevator was commenced. The grain congestion in 1911, being even more acute than in 1910, the commissioners decided in July, 1911, to enlarge the storage capacity of the elevator under construction to the total of 2,600,000 bushels.

The unique feature with regard to the handling of grain in Montreal harbor is the placing of the elevators in such positions that by a system of conveyors the grain can be carried direct to the ships at their different berths and delivered without interfering with their ordinary loading and unloading.

The construction of the marine tower jetty, the new quay wall in front of the elevator, the excavation for the site and the railway tracks were undertaken directly by the harbor commissioners' engineering department.

The elevator designs and construction were given to the John S. Metcalf Co., Ltd., as designing and constructing engineers for the commissioners.

The illustration showing Elevator No. 2 gives an idea of this immense structure and its progress towards completion.

It is not claimed to be the largest elevator in the world, but it will be the most completely equipped and connected with the most extensive conveyor system ever put into operation.

The elevator, while designed primarily for car business, will have two unloading berths for vessels and, with a receiving capacity of 250 cars of grain per 10 hours with an equal quantity by vessel, it should take a foremost place in the Canadian equipment for the storage and handling of grain.

The new elevator is built of reinforced concrete throughout. It is a structure 456 ft. long by 100 ft wide. The receiving elevator is 314 ft. long by 100 ft. wide. The bins have been completed and the frame work of the cupola has been carried up almost to the top. The portion of the elevator, 142 ft. long by 100 ft. wide, which will be used for storage purposes only, has not yet risen above the surface of the ground; the driving of concrete piles for this portion being now in progress.

The working elevator is built on wooden piles cut off at low water level, which is about 25 ft. below the top of the wharf. In order to get the elevator pits to the necessary depth, a deep basement is required and for that reason the excavation is carried down to low water mark and wooden piles driven. For the storage addition, where no basement is required, concrete piles with their tops 17 ft. above low water level are used.

The wooden piles beneath the working elevator are covered with reinforced concrete slab 3 ft. thick. On top of this the piers and walls of the foundation are built up to approximately track level. The first story consists of large reinforced columns and girders supporting bins. The bin walls are of reinforced concrete 90 ft. high with walls 8 in. thick. Total number of bins in the building is 205. The bin bottoms are of reinforced concrete of a design originated especially for this elevator, which affords a large amount of head room in the first story. On top of the bins the cupola is built. This consists of reinforced concrete column and girder work, with floors, roofs and curtain walls of concrete. The top of the bins is 113 ft. above track level, and the cupola is 107 ft. high above the top of the bins, making the total height of the building 220 ft. This elevator is, therefore, one of the very highest reinforced concrete buildings ever constructed in any country, about as high as a 16-story office building.

In the construction of the bin walls of the elevator moving forms were used. They were raised by means of 1¼ in. threaded steel rods imbedded in the concrete, on which a special nut carriage is used. This nut carriage is turned by means of steel bars and as it climbed the rods the forms moved upward with it. The bins were constructed in two units. Progress on the first unit being at the rate of about 4½ ft. per day, and on the second unit of over 6 ft. per day.

The new elevator marine towers and galleries will be operated by electric motors, as are the present elevator and galleries. The new motor equipment will total about 5,500 horse-power, and a very efficient and complete system of telephones and electric signals between the shipping gallery and

elevator and between various parts of the elevator will be installed.

High Level Railway Tracks.—The railway tracks on the wharves were formerly all located on what is commonly termed low level wharves. This level is above the level of floods during navigation season, but during the winter and spring floods is always submerged. In 1898 the wharves in the central part of the harbor were raised to high level, that is, 24 feet above the low water. These high level wharves have only been submerged on two or three occasions during record spring floods.

The high level wharves, up to the year 1910, were only included in the central part of the harbor, and between Victoria Pier and the eastern limit of the harbor railways that were constructed at low level and, therefore, not only put out of business in winter, but required a great deal of work for repairs and removal of ice in spring in order to prepare them for traffic.

In 1910 the harbor commissioners authorized the construction of high level railways from Victoria Pier eastward, for the purpose of facilitating traffic all year round and for the abolition of level railway crossings.

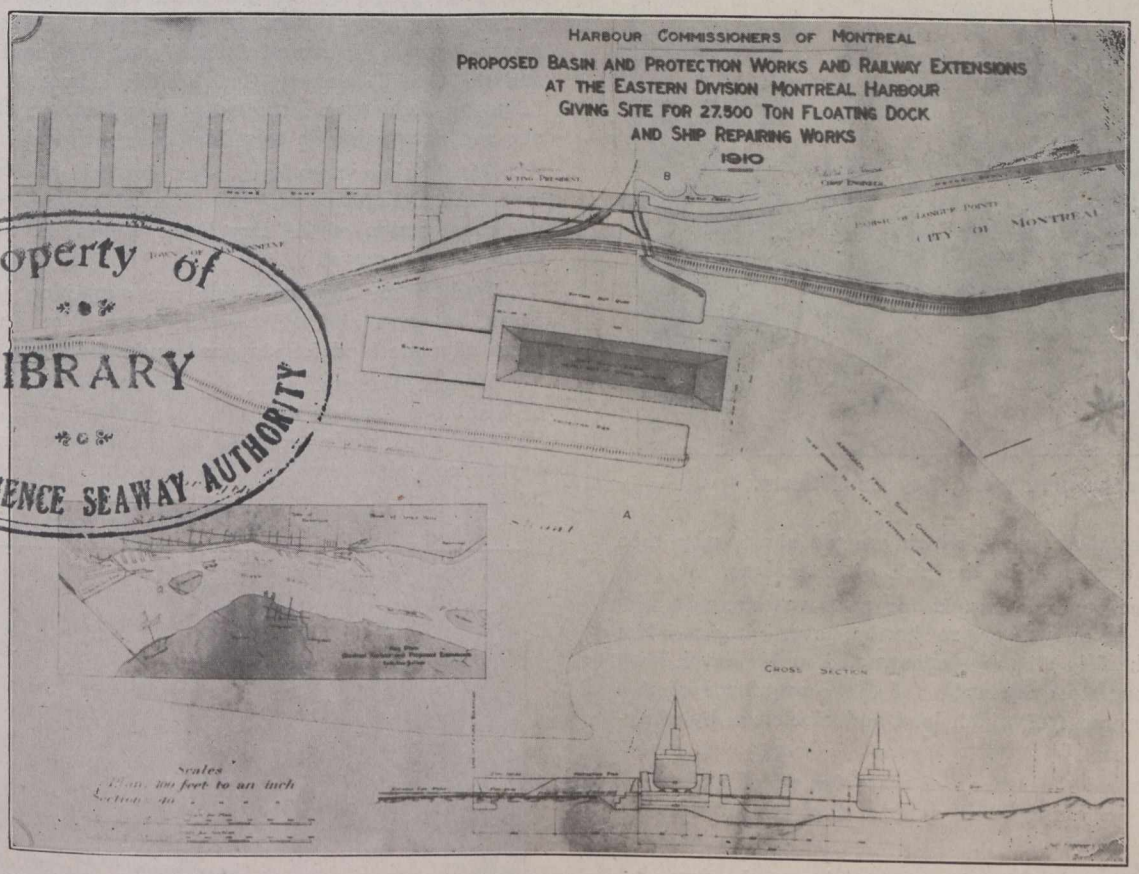
The method of raising the level consisted in the construction of an earthwork embankment, the track being elevated to an extent of about 14 ft. to a level which would be above extreme spring floods.

At 11 of the most important connections with city streets subways were constructed with permanent concrete abutments and steel bridges. At the two important city approaches, opposite Bonsecours market and Berri Street, opposite the subways leading to the harbor, switching railways on the low level were completely abolished and the wharves permanently paved. This now permits the large number of passengers and carriages appoaching to or coming from river steamers to pass without danger from the greatly increased railway traffic along that important railway thoroughfare. At the Longueuil Ferry, another important passenger landing, the low level railway track was also removed and another safe and convenient access between the ferry steamers and the city streets provided.

The construction of this high level railway embankment was commenced in 1910, and was fully completed during the past season. In the construction of this embankment about 650,000 cubic yards of material were used.

Twelve miles of new railway track were laid, eleven steel bridges were constructed, and 520 tons of rock ballast were used.

The harbor railways, which are operated directly by the harbor commissioners' traffic department, now extend from the foot of the Lachine Canal eastward to Racine Pier, along a water front of 5½ miles. Railway connections are given to the G.T.R., the C.P.R., the C.N.R., and the Montreal Locomotive Works.



General Plan, Dry Dock Site.

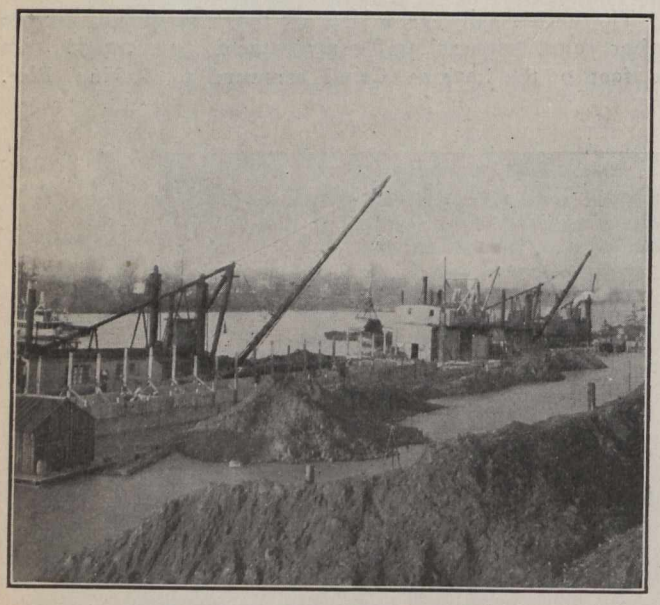
Victoria Pier and Market Basin.—In the scheme of extensions, designed in 1909, every consideration was given to enlarging the steamship accommodation in the central part of the harbor, to connect with the present shed system and the successful grain equipment already in operation and proposed for this season.

At the same time, it was recognized that river and passenger and market vessels should have a location convenient to the city transportation systems and the Bonsecours market.

The improvement of the old Victoria Pier was proposed on the same lines as the old pier, except that the upper and outside quays should be high level for steamships, and the whole of the inner basin quays low level, fitted with slips and exclusively devoted to vessels of the river class.

As most urgent, this was one of the first items of work commenced in 1910. It involves construction in the most congested part of the harbor, while passenger and general market and shipping business is being carried on.

The high level steamship portion will give berths for five ocean vessels, where permanent sheds, railway and grain shipping facilities will be available. The completion of it will involve the widening of the ship channel to 700 feet, the diversion of the guard pier to give the necessary room and protection and compensation by enlarging the channel for the outlet of a portion of the flow of the river, south of St. Helen's Island.



Construction Work, Dry Dock Basin.

The present three piers, which are too short, may then be lengthened according to the plan of extensions.

The market basin, designed for river vessels, will provide 4,000 feet of quays, or 20 berths, averaging 200 feet each. This wharf is all to be constructed at low level, with slips in the concrete quay walls for the convenience of this class of vessels, most of which load and discharge by gangways.

At the close of the season of 1911, 600 ft. of high level quay wall had been completed, and 300 feet advanced sufficiently so as to be capable of completion in May, 1912.

The contract was let for the construction of the first permanent transit shed, which was designed to be similar to the 14 two-story fireproof sheds already erected. By the close of the present year foundations will have been completed for this shed and erection of the steel work commenced, and it is hoped that this first permanent berth in connection with the present scheme of extensions may be sufficiently advanced to be occupied early next season.

The special engineering features in connection with this large work of construction are the wooden cribwork founded 37 feet below low water level, and strong enough to carry a solid concrete wall 24 feet high from low water level to cope; the filling of the interior of the wharves and the putting in of a system of reinforced concrete piling through the newly filled ground to hard bottom, for permanent sheds; and the means taken to make the concrete walls, when constructed in water, able to withstand the disintegrating action of weather and frost.

Dry Dock Site.—One of the most important items of construction work in connection with the progress of the harbor improvements is the important work of providing a site for a floating dock in the eastern division, below St. Mary's Current.

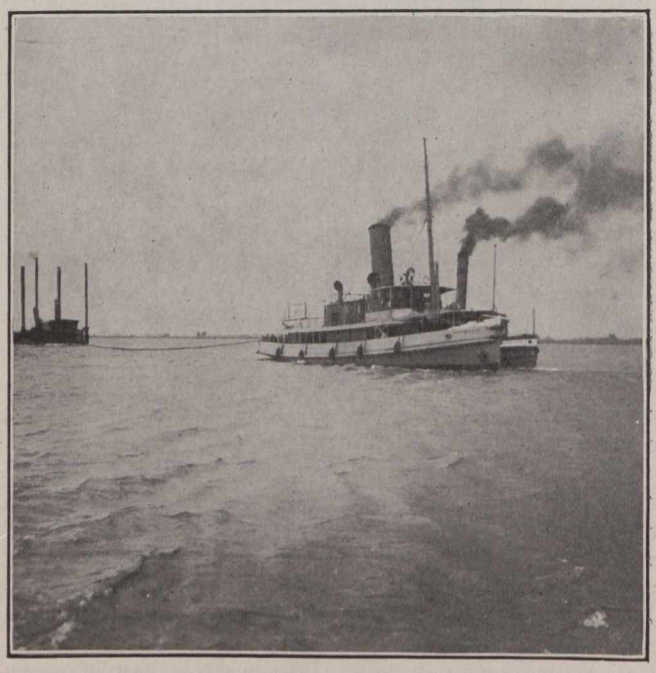
A glance at the chart will show, at the boundary line between the town of Maisonneuve and the parish of Longue Pointe, near the outlet of Molson's Creek, a natural bay. This bay, where the water is very shallow, and which is of large extent, appears to have been admirably adapted by nature for the purpose of a dry dock or shipyard. There is ample room between the ship channel and the shore. No streets or railways intersect the site. The river is wide and the current very gentle.

The site is connected with the harbor commissioners' independent railway tracks, which themselves connect with all Montreal railways. The important main lines of the street railway service pass close to the site. The new and extensive works of the Montreal Steel Works or Canadian Steel Foundries, Ltd., which will be one of the most up-to-date steel plants on the continent, are rapidly nearing completion, just across Notre Dame Street, the extensive Locomotive Works, Structural Steel Works, National Bridge Co., and the Canada Cement Co.. besides a host of other manufacturing industries attracted to this locality, are branching out and flourishing in this immediate neighborhood.

Considering, therefore, labor conditions, access by railways and steamships and the physical suitability of the site, the construction of the Dry Dock Works is meeting with unanimous approval.

The harbor commissioners are supplying the protected basin, wharves and deep water, as well as an area of 30 acres of made land for shipyard and subsidiary plant.

Messrs. Vickers, Ltd., the celebrated shipbuilding firm, of England, through the newly-organized firm of Canadian Vickers, Ltd., under contract with the government and the harbor commissioners, are to construct and maintain the floating dock and a magnificent shipyard and repair plant.



"Sir Hugh Allen" Towing Dredge from Quebec to Montreal.

The unusual features in connection with this construction job are the deep dredging; the tremendous amount of filling in, disposing of the dredged materials so as to make valuable land for the ship yard, and the construction of 2,500 feet of standard cribwork and concrete quay walls.

General Items of Construction.—Two reinforced concrete one-story transit sheds are under construction on the Tarte

Pier, and are sufficiently advanced to assure their availability early next season.

A new ferry wharf, a locomotive round house and shop, a new 10-ton electric hoist and dredges under construction will, in addition to the larger items of construction, be of interest to civil, electrical and mechanical engineers.

With the exception of buildings and steel hulls, all the harbor commissioners' construction and repair work is carried on departmentally, and plant belonging to the organization consists of a very complete and up-to-date equipment.

The new and powerful tug "Sir Hugh Allen," built for the harbor commissioners in 1911, completely fulfilled the expectations and requirements. Received in July, this tug was immediately put to work towing scows up the St. Mary's Current, towing the floating crane between Montreal and Sorel and Quebec, and handling and towing dredges.

This tug, strengthened for ice work, made a record by sailing from Montreal to Pointe-aux-Trembles on New Year's Day, 1912, the river being still open.

During the season a total of 1,805,340 cubic yards were dredged; a total of 28,934 cubic yards of concrete were constructed by the departmental force of the commissioners; a total of 3,290,470 cubic feet of crib work constructed; a total of 1,229,620 cubic yards placed in the embankments and reclaimed land areas by derricks and 2,562 lin. feet of quay wall constructed.

A maximum number of 1,233 men were engaged, not including work being carried on by contract or the special force engaged on Elevator No. 2.

The important items of material were all purchased by public tender, including 12,300,000 ft. B.M., of timber; 42,000 tons of broken stone; 24,000 tons of unbroken stone; 31,490 cubic yards of sand and gravel; 82,000 barrels of cement; 275 tons of steel and iron castings; 2,000 tons of steel and iron bars; 16,000 tons of steam coal; 700 tons rails and fastenings, and 325 tons of wharf spikes and nails.

The season of navigation for 1911 opened by the arrival of the first trans-Atlantic steamship, the "Royal George," of the Canadian Northern Steamship Co., and navigation is still open, the commissioners having made an inspection of the harbor on January 1st, 1912.

PROGRAMME OF THE TWENTY-SIXTH ANNUAL MEETING, CANADIAN SOCIETY OF CIVIL ENGINEERS.

The annual meeting for the election of officers and members of council for 1912, and for the transaction of business, will be held as follows in the rooms of the society, 413 Dorchester Street West, Montreal.

Wednesday, January 24th.—10 a.m. Meeting for the nomination of scrutineers, receiving the report of council reception and discussion of reports of committees, and transaction of the general business of the society.

1 p.m. Adjournment for members' luncheon in the Windsor Hotel, Montreal, to which the visiting members are invited by the members resident in Montreal.

3 p.m. Continuation of the business meeting for the discussion of reports, etc.

4 p.m. An address by the retiring president, Mr. C. H. Rust.

8 p.m. Address by Dr. H. T. Barnes on "Iceberg Detection in Navigation," in the lecture hall of the Chemistry Building, McGill University.

9.30 p.m. Reception by the president and members of council in the Engineering Building, McGill University, and inspection of the laboratories and workshops.

Through the courtesy of the Board of Governors of the University, the building has been placed at the disposal of the society for this evening. Members and ladies accompanying them are invited to the reception and lecture. Cards will not be issued.

Thursday, January 25th.—Two parties will be formed for the purpose of visiting engineering works.

(a) The Angus shops. By the courtesy of the Canadian Pacific Railway Company, a special train will convey this party to the works, leaving the Windsor Station at 10 a.m. Dining cars will be attached to the train, and luncheon will be served during the inspection of the works.

(b) The works of the Dominion Bridge Company and the Canadian Car and Foundry Company. By the kindness of the Montreal Street Car Company, cars will be in waiting at the Windsor Hotel, and will leave there at 10.30 a.m. sharp, for Dominion. The Bridge Company will lunch this party at 1.30 p.m., and the works of the Canadian Car Company will be visited on the return journey.

8 p.m. Annual dinner in the Windsor Hotel.

Friday, January 26th.—10 a.m. Meeting for the reception of reports of scrutineers and conclusion of the business of the annual meeting.

3 p.m. Meeting of council.

By the kindness of the railways of the Eastern Canadian Passenger Association, members and their families who have paid a full one way first-class fare going to the meeting in Montreal, will be returned free on presentation of a standard convention certificate signed by the ticket agent from whom a ticket has been procured at the point of commencement of the journey. The certificate is to be endorsed by the secretary of the society, and to be vised by a special agent of the Passenger Association who will be in attendance at the meeting from 3 p.m. to 6 p.m. on Wednesday and Friday, January 24th and 26th. A fee of 25 cents will be charged by the Passenger Association in each case.

The Canadian Pacific Railway and the Canadian Northern Railway will grant a further extension of time to persons residing west of Fort William, making this free return available for 15 days after the close of the meeting; the ticket to Montreal having been purchased at any time and receipt obtained therefor on the standard convention form as above.

Tickets to the luncheon may be purchased at the rooms of the society. Prices: Luncheon $1.50 to resident members, dinner $3.00. C. H. McLeod, Secretary.

THE WINDSOR STATION OF THE CANADIAN PACIFIC RAILWAY AT MONTREAL.

When a company has 75,000 employees on its pay rolls it becomes a big problem to keep strict account of their doings, and when, as in the case of the Canadian Pacific Railway, these employees are scattered over practically the whole world, the office space required to properly tabulate information regarding them is enormous. In the earlier days of the C.P.R., when a ten per cent. dividend, as well as the hundred millions earnings per annum were a matter of years, the office problem was of not so serious a nature, but within the last decade the volume of business passing over the company's lines has been so great, and its many side interests have paid so handsomely, that its staff has increased by the thousands, necessitating a corresponding increase in office space. We have had an example of this only recently in Toronto, where the C.P.R. is erecting a sixteen-story building at the corner of King and Yonge Streets.

Another example is afforded in Montreal. In this city alone, there are 12,000 people in the employ of the C.P.R., and while these do not all work under the same roof, it has

been found necessary to build a huge extension to the Windsor Street station, in order to properly look after the work and general conduct of the company's employees.

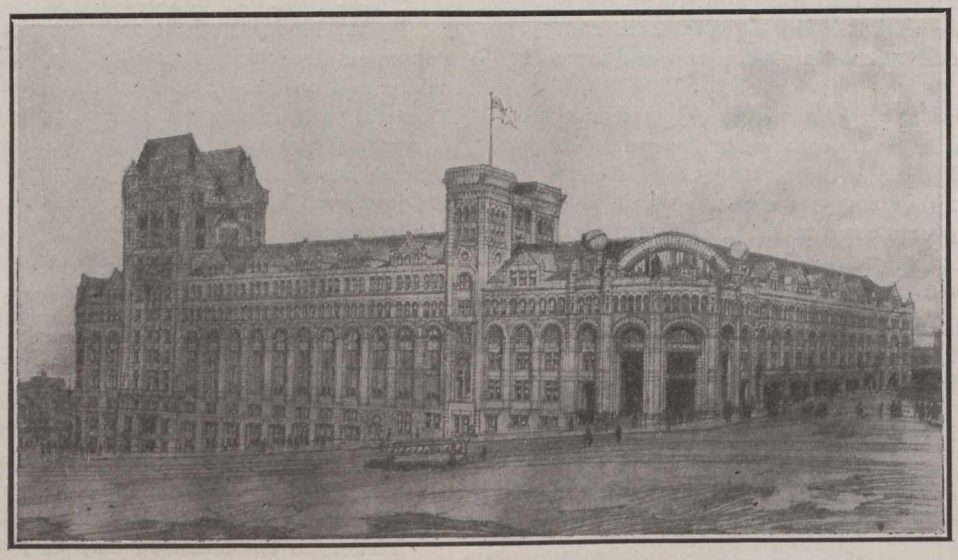
The history of the Windsor Street station is practically the history of the C.P.R. itself. The first and original Windsor station, erected in 1889, was only a small affair, but as the company's business grew it was added to until this, the fifth extension, will make it the largest and most complete railway station in Canada.

The present building is situated on the southwest corner of Windsor and Osborne Streets, and the extension is being built just south of this, so that the new station extends from Osborne Street on the north to St. Antoine on the south, and from Windsor on the east to Mountain Street on the west. The extension proper has a frontage on Windsor Street of 293 feet, and on Osborne of 850 feet, so that taking into consideration the offices now occupied by the Dominion Express Company on Osborne Street, the station, as it will be when the extension is completed, will have the following frontages: on Windsor Street, 493 feet; on St. Antoine, 175 feet; on Osborne, 850 feet. This gives the station a ground floor area of 77,000 square feet.

crete work has also been completed, including the building of a huge viaduct for the carrying of the tracks. This viaduct was rendered necessary by the Windsor Street grade, the tracks having to be brought in at a height of about forty feet above St. Antoine Street, in order to have them on a level with those now in use. The foundations of the building are the heaviest ever built in Montreal, the concrete piers going down forty feet to solid rock.

Plans for the whole interior of the building have not as yet been completed, but in this connection considerable remodeling will be done in the present structure. At present the main entrance is on Osborne Street, but this will be moved directly to the Windsor Street corner, and there will also be main entrances at the foot of the tower and at the St. Antoine Street corner. The offices now used by the ticket sellers will be moved to another part of the building, and they will be greatly enlarged, and other sweeping changes will be made.

Entering from the St. Antoine Street corner the main floor can be gained either by two huge passenger elevators, or by the marble stairways on either side of the doorway. These will admit of a direct entrance to the concourse, which



Windsor Station, Montreal.

In point of height the new building is the highest in the British Empire. When the new C.P.R. offices in Toronto are erected it may possibly have a rival in this respect, but until that building materializes, Montreal has the highest building. This is Montreal's first sky-scraper. They have several of the ten-story variety, but this one is sixteen stories. In reality it has three heights. Starting at Osborne Street, Windsor Street slopes down to St. Antoine at an angle of about twelve degrees, and the building has been planned to conform with this slope, the present height of 60 feet at the corner of Windsor and Osborne. being retained, while at Windsor and St. Antoine the height is 105 feet. About half way between Osborne and St. 'Antoine is the tower, and here is where the greatest height is, the building towering up 214 feet from the pavement to the base of the flag pole. For sight-seers this will prove a splendid site for a panoramic view of Montreal, and long stretches of the St. Lawrence river will be visible from its upper stories.

Before work on the extension could be started, the land had to be cleared. This was a work of some dimensions in itself, as there were a number of large brick buildings on the property. Good progress was made with the work, however, and now the extension of the building is practically completed. The con-

will include the present concourse, giving it a total floor area of about 8,000 square feet. It will be 26 feet high, and will be beautifully finished. On one side of the general waiting room will be a long row of ticket offices, and from here, too, access to the ladies' waiting room will be gained. This room will be fitted up in the most up-to-date manner, and south of it will be the ladies' retiring room, the nursery, and the women's pay and free toilets.

The dining facilities will be unsurpassed. That part of the concourse floor directly over the St. Antoine Street corner will be the dining room proper, and opening onto this from the Windsor Street side will be the officials' dining room with the kitchen looking out on St. Antoine Street. Next to the kitchen will be the lunch room. This room will be about sixty feet square, anl will have a large accommodation to the space between the lunch room and the concourse.

Below the concourse floor will be the store rooms, engine rooms, and immigrant quarters. Entrance to the latter will be gained by a large elevator from the concourse and by a side entrance.

Unique heating, lighting and ventilating systems will be installed and the company is arranging for its own supply of drinking water. The architecture of the extension will conform with that of the present building.

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The Canadian Engineer absorbed The Canadian Cement and Concrete Review in 1910.

NOTICE TO ADVERTISERS.

Change of advertisement copy should reach the Head Office two weeks before the date of publication, except in cases where proofs are to be submitted, for which the necessary extra time should be allowed.

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THE MONTREAL HARBOR.

It will be a matter of regret to many of the visiting engineers representing every important centre in Canada, that during their coming visit to Montreal, to the annual meeting of the Canadian Society, the important construction works in connection with the harbor extensions will be practically closed for the winter.

The engineering features in connection with Montreal Harbor and the continuous progress of its improvements are matters which interest engineers and all other Canadians interested in the building up of this country.

A meeting in the summer season would afford an opportunity of visiting the important works in connection with the improvements to the River St. Lawrence Ship Channel and the modern aids to navigation being vigorously advanced by the Department of Marine and Fisheries of Canada, as well as the splendid scheme of extensions in full swing in Montreal Harbor.

We have asked Mr. Frederick W. Cowie, chief engineer for the Montreal Harbor Commissioners, who for many years had charge of the River St. Lawrence Ship Channel, to prepare an article on the Montreal Harbor extension works. This article will be found on another page of this issue of The Canadian Engineer, and is recommended to the attention of all those who intend to be present at the annual meeting next week, as well as to those who will not have this pleasure.

THE MONTREAL MEETING OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS.

The Canadian Society of Civil Engineers again hold their annual meeting in Montreal, the birthplace of the society and home of the head office. Last year the meeting in Winnipeg, the first to be held west of the Great Lakes, was a splendid success, and it is to be hoped that this home-coming will also prosper.

The Canadian society has done a great work in drawing together and developing the social and ethical sides of the engineering profession. It comprises in its membership the best from coast to coast, and these men have striven to raise the standard of the profession to the highest point.

The engineering profession has become to-day what might be called a public utility service. The engineer, to be professionally competent, must, as Professor James Scherer so pithily puts it in a recent address to the American Institute of Electrical Engineers, be a man of affairs, versed in business usages, in economics and the history of political reform. Processor Scherer says: "The helpful engineer must be nothing less than a publicist; must not only know his own profession, but must know politics; be in touch with the spirit of the times and able to assist in a proper direction of political reform; but beyond that and above all that he must, in order to do his great work, be, to an extent required of no other profession to-day, a man of known unimpeachable integrity. When you come to the very crux of the matter, the real obstacle in the pathway of your helpfulness to the public is the stumbling-block of doubt, or lack of confidence, on the part of the people in your incorruptibility. I do not question that the character of the average engineer is far above that of the average man in the street; my point is that you must have an extraordinary hold upon the people in order to win their confidence, so that they will give into your hands the solution of obscure and complex problems with which you alone are com-

petent adequately to deal. The very nature of your profession," he continued, "should make possible the attainment of an extraordinarily high standard of character. Take your vocation in comparison with the 'three learned professions,' as they used to be known. The physician necessarily juggles with the credulity of his patient, and plays upon his foibles in order to relieve him of imaginary ailments; thus the physician is open to subtle temptations that may undermine absolute truthfulness of character. The lawyer, by the very nature of the case, must consider solely his client's point of view and become a special pleader, committed by duty to prejudice. Even the clergyman, in order to harmonize the entire body of scriptural teaching, is in danger of quibbling with his exegesis. But it is yours to seek the clear, cold truth, and to declare it without fear or favor. This is the chief glory of science, high priestess of our modern civilization."

It must be the aim of all members of the Canadian Society of Civil Engineers to foster such sentiments as the above. When the individual engineer appreciates that his character and his work must be above the breath of suspicion, then the profession will begin to come into its own. The Canadian society has done much towards raising the ethical standard, but there remains room for still greater effort.

EDITORIAL COMMENT.

We have received a copy of the first issue of the Journal of the Canadian Peat Society. We are glad to welcome this new publication into the technical journal field. Its object is to disseminate information regarding the status of the peat industry in Canada. This society and its organ deserve the support of every power user and fuel user, as well as the owners of peat lands and the manufacturers of machinery for making peat fuel.

* * * *

Moosejaw has appointed a Commissioner of Public Works. Among the applicants for the position were some of our most capable Canadian engineers. However, Moosejaw, with the characteristic loyalty of so many of our public-spirited cities and towns, chose a man from St. Paul, Minnesota. Their appointment of a city engineer will now be awaited with interest. No doubt the gentleman from St. Paul will be able to furnish them with a competent man.

* * * *

The question of an Engineering Standards Committee for Canada is suggested in a letter by Mr. Alfred S. L. Barnes. We agree with Mr. Barnes that it is time such a committee was formed. It is our impression that the Canadian Society of Civil Engineers have been working along this line for some years past. In fact, the Dominion Government, before the last election, acting on representations of the Canadian society, had given assurances that they would establish a Department of Standards and a testing station. There is no doubt that the need of a central organization is urgent, and it is to be hoped that the matter will not be dropped.

* * * *

The letter of Professor H. T. Barnes, printed in this issue under letters to the editor, is of special interest at this particular season. As Professor Barnes states, many of the large hydraulic power companies operating in Canada have little or no provision for ice protection. In the early days of hydro-electric installations, when plants were small and customers few in number, continuity of operation was not so important as it is at the present time. Some of these companies have hundreds of power users and many public utilities dependent on them. Whether it is floe ice, anchor ice or frazil ice conditions, there is usually little or no excuse for serious trouble. With reasonable care in design, by the covering of racks by the provision of ice runs and curtain walls, and by good judgment in the location and design of intake, little trouble need be experienced. It can only be classed as criminal negligence when cities and towns are without car service and light as a result of troubles due to inadequate design.

GENERAL NOTES.

The table shows for fifteen stations, included in the report of the Meteorological Office, Toronto, the total precipitation of these stations for December, 1911:—

	Depth in inches	Departure from the average of twenty years
Calgary, Alta.	0.2	—0.34
Edmonton, Alta.	0.3	—0.50
Swift Current, Sask	0.7	—0.02
Winnipeg, Man.	...	....
Port Stanley, Ont.	3.2	+0.12
Toronto, Ont.	2.85	+0.24
Parry Sound, Ont.	3.0	—1.66
Ottawa, Ont.	3.1	+0.39
Kingston, Ont.	3.5	+0.66
Montreal, Que.	4.4	+0.58
Quebec, Que.	3.6	+0.44
Chatham, N.B.	3.3	+0.12
Halifax, N.S.	3.4	—0.29
Victoria, B.C.	2.8	—3.47
Kamloops, B.C.	1.6	+0.78

CORRECTION.

In the issue of The Canadian Engineer dated December 7th, we published an article on Molybdenum. The material for this article was abstracted from a bulletin of the Geological Surveys Department of Canada, by Mr. T. S. Walker. Through inadvertence on our part, full credit was not given to the Department and to Mr. Walker. We take pleasure in making this explanation now.

SHUTDOWNS DUE TO ICE TROUBLES.

The Editor:

Sir,—In your issue of January 4th you call attention to the "shut down" of the Dominion Power and Transmission Company from anchor-ice at the intake. For some time I have wanted to draw your attention to the culpable lack of provision made at so many hydraulic works for handling ice. No producer of power has a right to have his works inoperative even a few hours a year when the comfort of human beings is jeopardized. It was sad to see so many valuable plants rendered useless this year by the sudden advent of the cold weather, but this happens year after year with painful regularity. With all that has been said and written on this subject one still sees the exposed rack bars inviting trouble from anchor-ice, and a head race or canal plugged with frazil. How long, may I ask, will it take these big companies to realize the practical value of the modern theories of ice formation, and that

preventive measures based on these are proving such a success in so many places. Careful readers of your valuable journal are certainly not kept in ignorance of modern developments in dealing with the ice question. To-day no power house properly equipped need fear a "shut down" by anchor-ice, frazil or any other kind of ice.

H. T. BARNES, D.Sc., F.R.S.
McGill University, January 8th, 1912.

MOTION PICTURES FOR ENGINEERING LECTURES.

The Editor:

Sir,—Re your editorial comment of 4th inst. on the use of motion pictures to illustrate a recent lecture of the Canadian Society of Civil Engineers, you mention that this is probably the first time they have been used for such a purpose.

It may interest you to hear that this method of illustration was used some seven years ago by the Glasgow Association of the Institution of Civil Engineers, of which association I was a member of council.

At that time moving pictures were not so efficient as they are to-day, but I still retain a most vivid recollection of the works displayed then, and can strongly endorse what you say as to the excellence of the method, especially from the point of view of a man who is trying to teach. Yours faithfully,

R. D. BROWN. City Engineer,
St. Catharines, Ont.

ENGINEERING STANDARDS COMMITTEE.

The Editor:

Sir,—Will you allow me to suggest through the medium of your paper that it is time that Canada had an "Engineering Standards Committee" of her own, something like that which has been in existence in London since 1901?

For the information of those of your readers who are not acquainted with the work and constitution of the British committee, it may be stated that it is supported by H.M. Government, the Institutions of Civil Engineers, Mechanical Engineers, Naval Architects, Electrical Engineers, and the Iron and Steel Institute, as well as by nearly all the leading railway companies, engineering and shipbuilding firms of Great Britain. The India Government also makes a yearly grant.

The work of the committee covers a wide and ever-enlarging field, as the following selection of the titles of some of the already published reports will show:—

Specifications and Sections of British Standard Tramway Rails and Fishplates.

British Standard Tables of Pipe Flanges.

British Standard Specifications for Portland Cement.

British Standard Specifications and Tables for Telegraph Material.

Tables of British Standard Whitworth Threads.

Tables of British Standard Fine Threads.

Tables of British Standard Pipe Threads.

British Standard Specification for Cast-iron Pipe for Hydraulic Power.

The committee also recognizes the necessity of keeping abreast of the times, as is made clear in the following extract from its "Report on Work Accomplished," dated 1911:—

> " . . it is necessary to review from time to time the original standard specifications, and unless this be a recognized part of the work of the committee, the process of standardization might lead to undesirable stereotyping of procedure, checking inventions and impeding improvements."

From Canada's point of view the extract below from the same report is of great significance:—

> "A comparatively new branch of the committee's activities is the co-operation which it has been asked to extend to the subject of International Standardization, and the secretary has attended, in an advising capacity, congresses held at Copenhagen, Brussels and Paris. **One salient feature which has been evident at these Congresses is the advantage which this country enjoys over most of the Continental countries in the possession of a central organization on which all the interests concerned are represented, and to which reference can be made and information obtained as to the reasons which led to the determination of the present British Standard.**"

The italics are the writer's, and are employed to give emphasis to the opinion expressed in this portion of the paragraph, more especially in view of the fact that a Canadian Committee of the International Electrotechnical Commission is now in existence and has held its first meeting.

This country, so far, has been content, and perhaps unavoidably, to adopt standards made by other countries without question, but the time is coming, if it be not already here, when there will be British Standards for one thing and American Standards for another, with perhaps a few international ones thrown in. No one will know the why or the wherefore of the Standards. and it is not unlikely that by means of such a haphazard kind of selection the standards which would be the best for this country will, in some instances, be the very ones that are not adopted.

It will not, in many cases, be essential, if an Engineering Standards Committee be formed here, that such a body should itself go over the whole ground of discussion and experiment which has led to the adoption of standards in other countries, but it could, after due consideration of the existing standards of other countries—and having in mind any requirements peculiar to Canada—decide whether to adopt an existing standard or to frame a fresh one. The writer believes that this subject has already been mooted in some quarters, but, as far as he is aware, it has not yet been given any publicity. The proper time for the formation of such a committee is now; its work will be much harder five, or even two, years hence. Government support, both Dominion and Provincial, should be asked from the commencement, and also that of all leading railway companies, engineering societies and manufacturers, telephone and telegraph companies, etc., in the Dominion, as each of them would derive very great benefit from the labors of such a committee.

Another reason for the necessity of prompt action in this matter is the proposed formation of various Provincial Commissions to take charge of "public utilities." These Commissions will probably each begin to formulate their own standards, and in a few years there will be in existence a state of "confusion worse confounded."

Your correspondent would be glad to do anything in his power to further the formation of such a body. Yours faithfully,

ALFRED S. L. BARNES,
Room 512, Continental Life Building, Toronto.

FOUNDATION WORK IN MONTREAL.

By ALEXANDER ALLAIRE, M.E., Manager of The Foundation Company, Limited.

In designing foundations for heavy structures, the engineer has before him in each specific case two problems; first, that the type finally selected shall fulfill all the necessary conditions, and second, that this shall be accomplished with a minimum expenditure of money.

In arriving at the result, both of the above are governed by the following:—

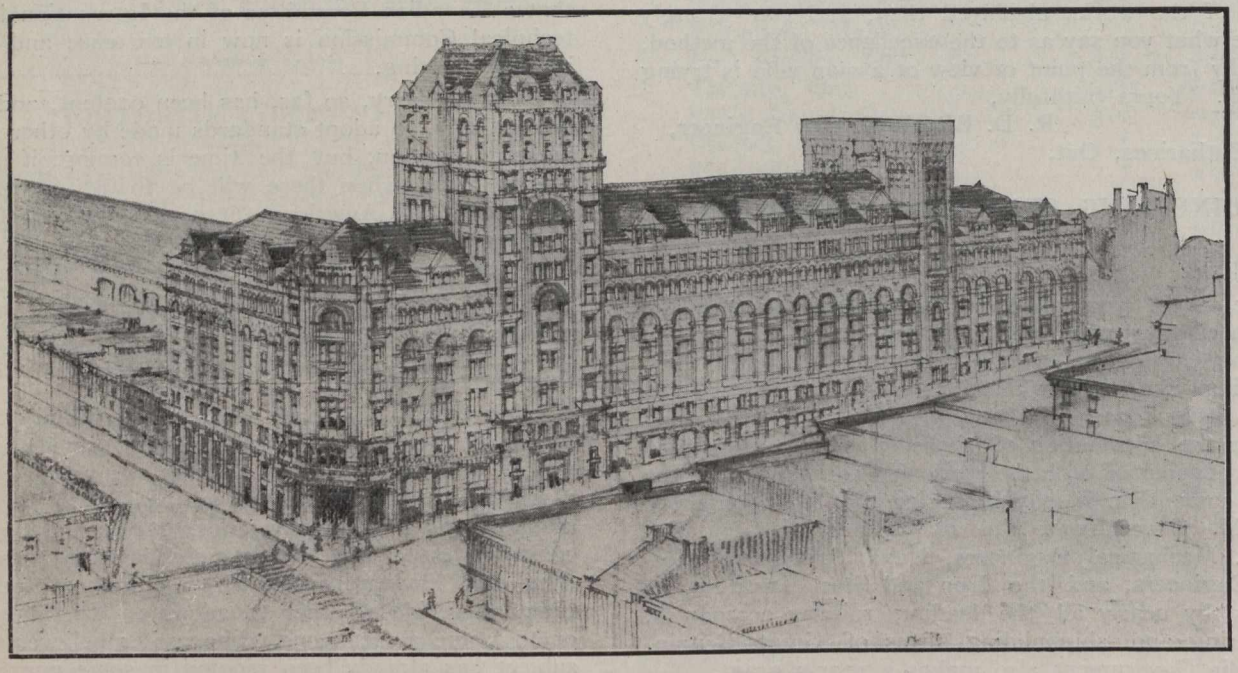
1. The nature of the soil.
2. The depth of rock or satisfactory bottom.
3. The magnitude and distribution of the loads to be supported.
4. The elevation of water level.
5. The depth of the general excavation.
6. The surrounding conditions, including the possibility of future disturbance.
7. The value of the structure to be supported.

precautionary method usually consists in carriyng the foundation to a depth sufficiently great to preclude any possibility of future disturbance.

The recognized types of foundations may be grouped in well defined classes. These are essentially as follows:—

Class 1.—Spread Footings.—Under this head we have (a) timber grillage; (b) plain concrete footings, and (c) reinforced concrete footings. These comprise the ordinary building foundations.

Class 2.—Piles.—This is divided into (a) wooden piles; (b) concrete piles, both those moulded in the ground and those built up and allowed to set before driving; (c) steel pipe driven, interiors cleaned out and filled with concrete. This kind of work is more expensive than the previous class, but often permits building where under the former it would be impossible.



General View of Windsor Station.

The careful consideration of these seven factors must be considered as essential to the successful working out of a proper design.

In item number "six" we have a point to which enough thought is often not given. Frequently the study of the foundation for a structure shows that two types may be used, often one less costly than the other.

Here the fact that apparently the result may be obtained with a smaller expenditure of money would seem to govern. A further investigation of the surrounding conditions, however, often shows that the apparent first saving is not the governing element. The modern tall building, costing as it does, hundreds of thousands and often millions of dollars, makes it imperative that this large investment shall not be jeopardized. When, therefore, the examination of the adjoining properties and neighboring streets indicates the probability of future operations which may endanger the stability and safety of the structure, it is often necessary to accept what appeared to be at first the more expensive design. This

Class 3.—Open Method—Which may be sub-divided into (a) cofferdams of wood or steel sheeting; (b) open excavation followed by timber lining; (c) timber or steel box built up above ground and sunk, (d) monolithic concrete caissons built up above ground and sunk. The foundations are often carried to considerable depth below the ground line.

Class 4.—Pneumatic Method.—(a) Caissons of timber or steel filled with concrete before sinking; (b) monolithic concrete caissons built up before sinking. These foundations are usually carried to rock.

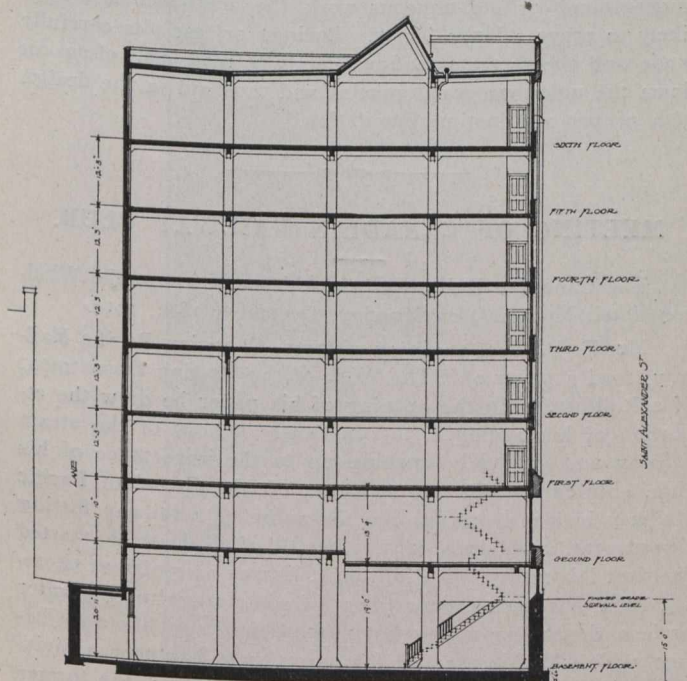
Class 5.—Which consists of a combination of two of the above classes, usually II. and III., or by starting with III. and finishing by means of the pneumatic method.

The city of Montreal, lying in good port between Mount Royal on one side and the St. Lawrence River on the other, presents to the engineer soils of widely varying character. We are told that ages ago this section of the country formed a part of the Gulf of St. Lawrence, and at that period the water level was practically at the top of Mount Royal. As

the centuries passed this water receded, during certain periods more or less rapidly, while at others it remained practically stationary. The periods of stationary and falling water levels were clearly shown by well defined beach or shore lines found in recent investigations.

As a result of the above, the blanket of earth, covering the rock underlying Montreal, is not a uniform quality over the whole area of the city. Usually the rock is found to be overlain with a shallow layer of boulder clay left from the glacial period, while over this the soil is of various natures, depending upon the localities. Excavations in various parts of the city show this to consist of loam, sand, gravel, soft and medium clays, as well as quicksand and a silty clay resembling quicksand.

The upper stratum of limestone underlying the city is also worthy of consideration. In constructing the foundations for certain buildings, whose weight made advisable the carrying of the piers to rock, The Foundation Co. found the upper surface of this rock to be badly shattered, necessitating the excavation of same in some instances for a number of feet



Section Through Herald Building, Montreal.

before a satisfactory bottom could be secured. This, geologists tell us, is due to the upheaval at the time that Mount Royal, formed by some volcanic eruption, burst its way through the overlying rock strata.

As a result of the varied character of soils to be encountered in the different parts of the city, we find many different types of foundations. A great majority of the buildings having moderate height and loading are carried on spread footings. These are to be seen daily in the course of erection and need no further comment.

There is one type of structure, however, which while it comes under this class, is not common to Montreal. This is exemplified in the Herald Building. The building in question is carried on what is known as a floating foundation; that is, the columns, instead of each being carried on an individual footing, are all set in one immense footing or mat, which covers the whole area of the lot. The reinforced concrete mat, 2½ ft. thick, at the Herald Building is built on a bed of gravel overlying black sand of considerable depth. The idea of spreading the footing, as mentioned, was to reduce the load per square foot, the loading of the soil in this case being estimated at one ton per sq. ft.

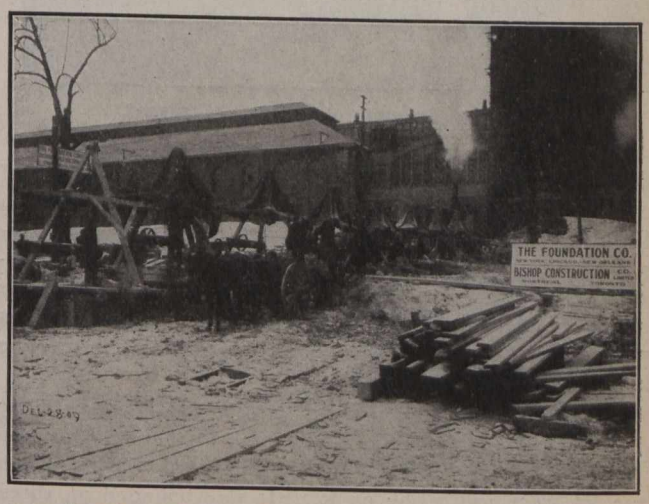
In certain sections of the city wooden piles have been used in the foundations, as these were thought to meet conditions satisfactorily. Along the harbor front several structures are carried on concrete piles, both the moulded in the ground and built-up types having been used.

At the Montreal General Hospital we have a more difficult class of foundation work. Here the open method was

Driving Steel Sheeting, General Hospital, Montreal.

used, steel sheeting being driven and the excavation made inside same down to hard pan. These piers were circular in form, though of varying diameter. The sheeting was driven to depth with both steam and drop hammers. To facilitate handling these and the pieces of steel sheeting, four stiff-leg derricks were set up at different points on the lot. On this work the average distance from the lot, as excavated, to the hard pan on which the piers were started, was approximately 30 ft.

The Windsor Street extension is another example of the open method, differing, however, in manner of execution from that just described. This work comprised the construction of approximately 300 piers, a few rectangular but most of them circular in form. The Foundation Co. started on this work the latter part of November, 1909, and finished



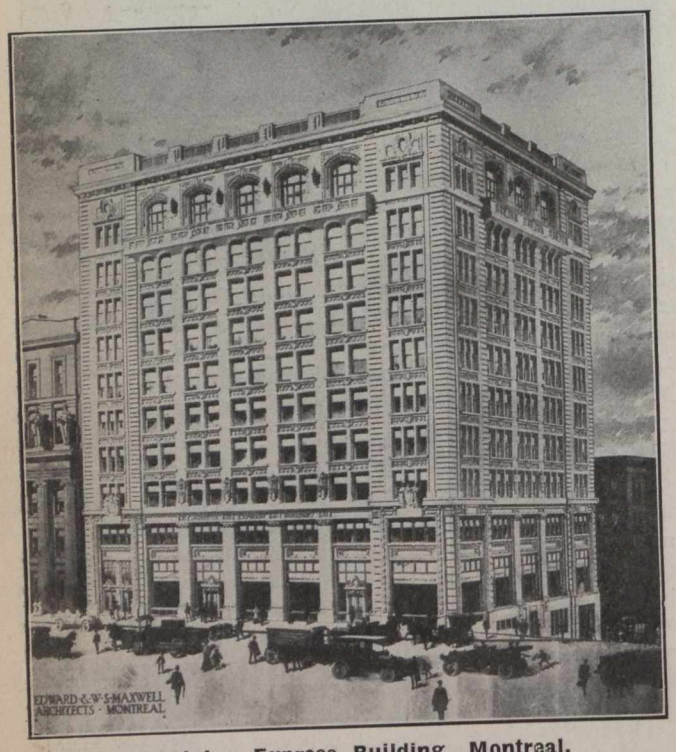
Windsor Station Extension, Work in Progress.

about June 1st, 1910. This is particularlyy noteworthy when the season of the year, during which the work was carried on, is considered.

The pier excavations in this instance were made by open digging and lining the sides of the wells with wooden lagging, which was held in place by iron bands. The material was hoisted to the surface in buckets by means of a revolving winch head mounted on a tripod at the top of each well. The pits were excavated in sets of from 7 to 9, each row having a hoisting engine, which by means of an endless cable, furnished the power to turn the winch heads. Five complete outfits of hoisting engines and tripod sets were used, so that while 4 rows of holes were being operated a fifth could be prepared. This precluded any loss of time as the gangs coming out of the completed piers immediately started in on the row of holes which had been made ready.

On this site, as the excavation of a great number of piers was completed, and the rock bared, it was found that its upper surface was broken up by very noticeable cracks. It was, therefore, necessary to remove this faulty material down to a sound strata. In some instances the excavation was carried to a depth of twelve feet before a satisfactory bottom was secured.

At the Dominion Express Building, corner of St. James and St. Francois Xavier Streets, we have an example coming under Class IV. Here The Foundation Co. sank pneumatic



Dominion Express Building, Montreal.

caissons to rock, each forming a pier on which rested one of the building columns. These caissons were built with wooden walls filled with concrete. As the work was carried on during the winter of 1910-1911, these walls protected the concrete from the cold weather. The setting up of the concrete was further aided by hanging salamanders, in which fires were kept burning, in the interior of the caisson shaft. The total number of caissons sunk was 42.

The depth of rock was found to vary somewhat over the lot, the deepest caissons reaching same at a distance of 90 ft. below St. James Street curb. The extreme dimensions of the lot were 120 ft. by 95 ft. It was bounded on three sides by streets and on the remaining side by the Royal Bank. On account of the columns along the Royal Bank being very close to the building line, it was necessary to set these caissons back the necessary distance to clear the wall. The new columns then being thrown off the centre of the piers, were cantilevered by means of girders composed of 24-inch I beams extending from these caissons to those in the next row from the building.

On account of the excavation having to be carried below the footing of the Royal Bank, it was necessary to take care of the building while the work was carried on. This was very successfully done by means of long inclined pushers, these being adjusted to preclude the possibility of any settlement.

At this building, also, the upper surface of the rock was found to be badly fractured at a number of the pier sites. This condition did not extend over the lot, being confined to the northeast corner. Wherever this was found to exist, however, the rock was taken out under air by means of blasting, assisted by bull points and wedges.

The modern tall building, representing, as it does, such a large investment of capital should receive very exhaustive study before any particular type of foundation is decided upon. It is in this connection that the taking of careful borings or sinking of test pits is strongly recommended. In underground or sub-aqueous work the unknown is always likely to prove a large factor. Borings or test pits carefully made and the records obtained carefully read, will often cut down the unknown contingencies and thus aid in the design of a proper and lasting foundation.

MEETING OF CANADIAN RAILWAY CLUB.

The Canadian Railway Club held a meeting at the Windsor Hotel, Montreal, on Monday, December 18th, 1911.

Mr. E. B. Tilt, engineer of tests, Canadian Pacific Railway, read a paper on "The Work of the Testing Department of a Railway." In the opening of his paper he drew the attention of his audience to the early history of the steam railway and gradually working up to the importance of his title, showed that the management of the Canadian Pacific Railway had early recognized the value of a railway testing department, and since 1891, when W. Bell Dawson started the first laboratory, with Milton L. Hersey as assistant chemist, there has been a department of some magnitude, greater or less, depending upon what purchases of supplies were being made. Within the last few years there has been a division of the system into western and eastern lines, the former of which has had its own chemical laboratory at Winnipeg since 1905, which has specialized in water troubles with much success, in addition to doing the other routine work which comes to a railway chemical laboratory. The work on eastern lines is done conjointly, by commercial testing companies who do all of the foreign mill inspection; Dr. Milton L. Hersey and associates, of Montreal, who do all of the chemical work; and the testing department with laboratory at Angus shops, who do a portion of the domestic mill inspection, and who take charge of the routine sampling and inspection of materials received at the Angus shops, where are located the locomotive and the car departments and the general stores. The duties of the Angus shops testing department include also the preparation of suitable specifications, the investigation of the failures of materials and the studies of processes or special materials. The testing of devices is handled by the mechanical engineers of the locomotive or the car departments.

In the purchase of materials of such wide variety and origin as are required for the C.P.R. the question of economical inspection is important and the present organization has been found to be a satisfactory and cheap one.

The president, Mr. A. A. Goodchild, was in the chair.

THE MONTREAL FILTRATION WORKS.

By FREDERICK E. FIELD, Resident Engineer.

Historical.—The present water supply of the city is drawn from a shore intake about two miles above Lachine Rapids. It is a mixture of waters from the St. Lawrence and Ottawa Rivers, which above this point have a combined drainage area of about 570,000 square miles and a combined population of 172,000 contributing sewage to the rivers. The extension of the intake to a point 1,200 feet from shore is now under contract.

The water is conveyed to the low level pumping station at Point St. Charles, a distance of about five miles, by an 8½-ft. concrete conduit which parallels the power aqueduct which delivered water to the wheels of the original pumping station.

At the Point St. Charles pumping station five steam pumps are in service to elevate the present daily consumption of 44,000,000 gallons to the distributing reservoirs of the city. The municipal plant supplies a population of about 350,000, and the remaining 200,000 residents of the city are supplied by The Montreal Water & Power Company, a private corporation, which is now completing a filter plant of 20,000,000 gallons daily capacity.

Owing to the striking increase in the number of typhoid cases which happened towards the end of the year 1909, the newly-elected Board of Commissioners at the beginning of 1910 decided to confer with experts of high repute as to the study of the present and possible sources of supply of the aqueduct of Montreal. Meantime, on February the 8th, 1910, the treatment of the municipal water supply by hypochlorite of lime was started and has been regularly continued up to the present time.

On April 4th, 1910, Messrs. Hering & Fuller. consulting engineers, of New York city, were instructed to report on the best means of securing an improved water supply for the city.

On July 2nd, 1910, the consulting engineers submitted their report and recommended double filtration of the St. Lawrence River water. This recommendation was adopted by the city, and Messrs. Hering & Fuller were engaged to cooperate with Mr. George Janin, chief engineer, and Mr. T. W. Lesage, engineering superintendent of waterworks of the city, in preparing contract plans and specifications, and in supervising the construction of filtration works for the city of Montreal.

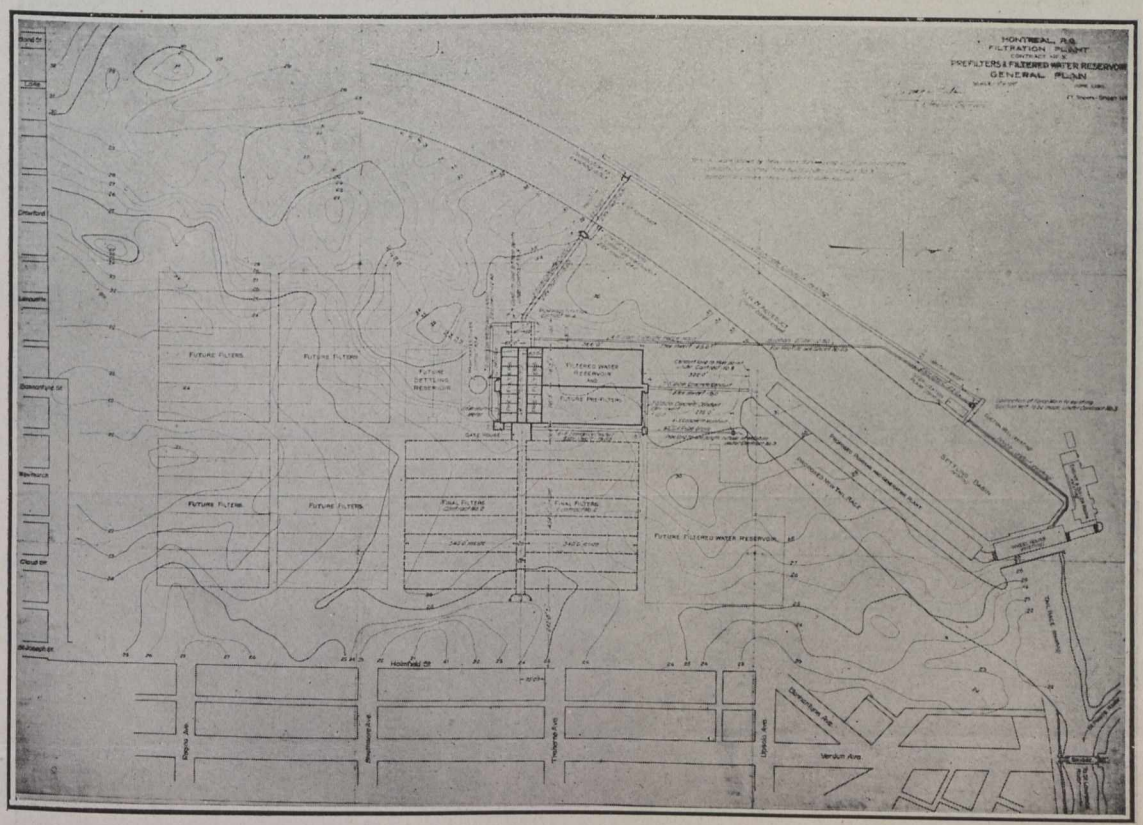


Fig. 2.

The work has been divided into four contracts, in order to facilitate the rapid and economical completion of the project.

Contracts.—Contract No. 1, for the pumping machinery, blower, and cranes was awarded on August 9th, 1911, to the British Electric Plant Co., of Alloa, Scotland, for the lump sum of $40,250.

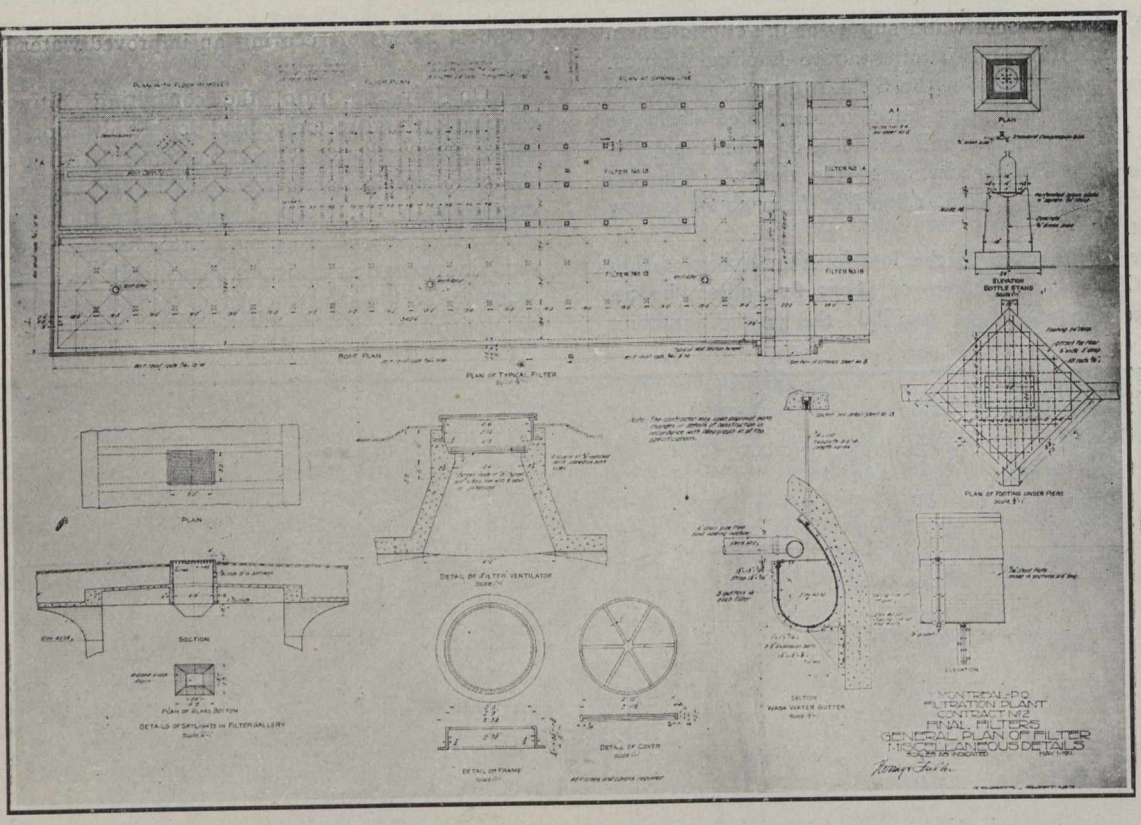
Contract No. 2, for the final filters and appurtenances, was awarded on August 16th, 1911, to F. H. McGuigan, of Toronto, for the lump sum of $673,000.

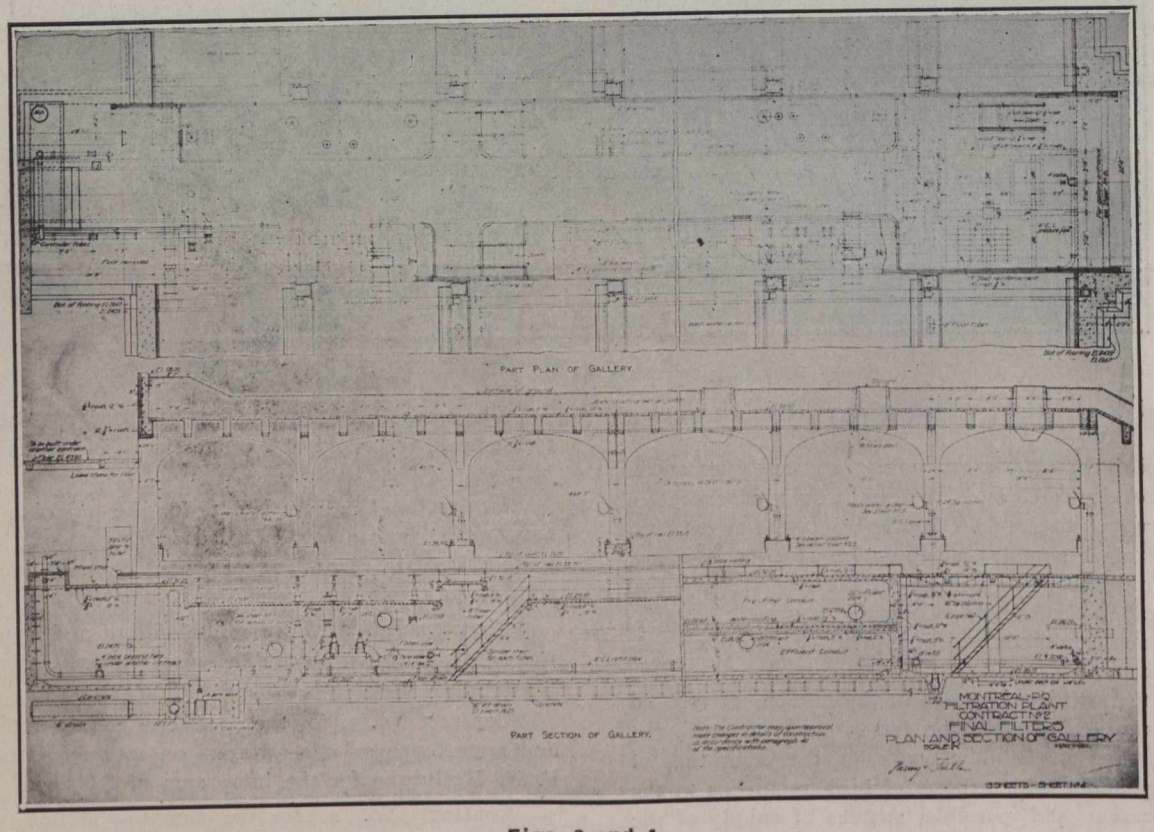
Contract No. 3, for the prefilters, filtered water reservoir and appurtenances was awarded on 16th December, 1911, to F. H. McGuigan for the lump sum of $485,000.

Contract No. 4, for the pumping station, wash water tower, and the superstructures of the various buildings and gate chambers, has not, as yet, been placed under contract.

The work will be built on land in the town of Verdun and adjoining the city water works property at Point St. Charles. The general arrangement of the several parts of the work are shown in Fig. 2.

The present construction is designed for a daily capacity of 50,000,000 imperial gallons (60,000,000 U.S. gals.), and will serve about 350,000 people. Sufficient land has been acquired, and provision has been made in the present plans for enlarging the works, as required by future needs, to an ultimate daily capacity of about 150,000,000 imperial gallons.





Figs. 3 and 4.

Contract No. 1—Pumping Machinery.—This contract includes:—

Two raw water pumps, unit capacity 17,500 imperial gallons per minute.

Two raw water pumps, unit capacity 17,500 imperial gallons per minute.

Two raw water pumps, unit capacity 5,800 imperial gallons per minute.

Two wash water pumps, unit capacity 1,300 imperial gallons per minute.

Two sump pumps, unit capacity 330 imperial gallons per minute.

Two sump pumps, unit capacity 150 imperial gallons per minute.

One rotary blower, unit capacity 5,000 cubic feet of free air against five pounds pressure per square inch.

Two cranes, hand operated, each six tons capacity.

Switchboards, transformers and appurtenances.

All pumps are horizontal, except the sump pumps, and all, together with the blower, are driven by direct connected three-phase 60-cycle alternating current motors.

The voltage for the 8 largest pumps and the blower will be approximately 2,200. That for the remaining 6 pumps will be approximately 550.

The ordinary lift for the raw water pumps is 18 feet, for the wash water pumps 46 feet, and for the sump pumps 15 feet. The raw water pumps receive their supply from a connection with the present raw water conduit previously mentioned, and have no suction lift.

Contract No. 2—Final Filters and Appurtenances.—The final filters are 16 in number and are arranged in batteries of 8 on either side of an operating gallery. The filters are covered by groined arches, supported on piers spaced on 19 feet centres. The floor is flat and so constructed that the pier load is carried on foundation blocks, independent of the rest of the floor. The filters are 55 by 340 feet inside, with the short dimensions adjoining the gallery to accommodate the design to the use of the Blaisdell washing machines, which will run from the gallery to the extreme end of the filters upon tracks carried by concrete beams between the filter piers. The underdrainage system consists of two half-round 8-inch laterals in each bay, which discharge into a central main collector, 2½ feet in diameter, extending the entire length of the filter and below the filter floor.

The filtering material comprises 12 inches of gravel and 27 inches of sand.

The gravel will be placed in four layers. The lower layer, 5 inches thick, has particles varying from 2½ to 1½ inches in size.

The second layer is 3½ inches thick and varies from 1½ to ½ inch.

The third layer is 2 inches thick, with particles from ½ inch to 9/32 inch in size.

The fourth layer is 1½ inches thick and has particles from 3/16 inch to 5/64 inch in size.

The filter sand will vary from 0.25 to 0.36 mm. in size.

The filters receiving their supply from the prefilters to be built under Contract No. 3, will operate at a rate of 10,000,000 gallons per acre per day, thus giving each of the 16 filters an output of 3,750,000 gallons per day.

The operating gallery, with a clear span of 22 feet, contains the prefiltered and filtered water conduits and the necessary pipe connections to the filters.

The side walls carry tracks upon which a transfer table, for conveying the washing machines from one filter to another, will be operated.

The filters and gallery are lighted by electricity, and the gallery also has skylights for natural illumination.

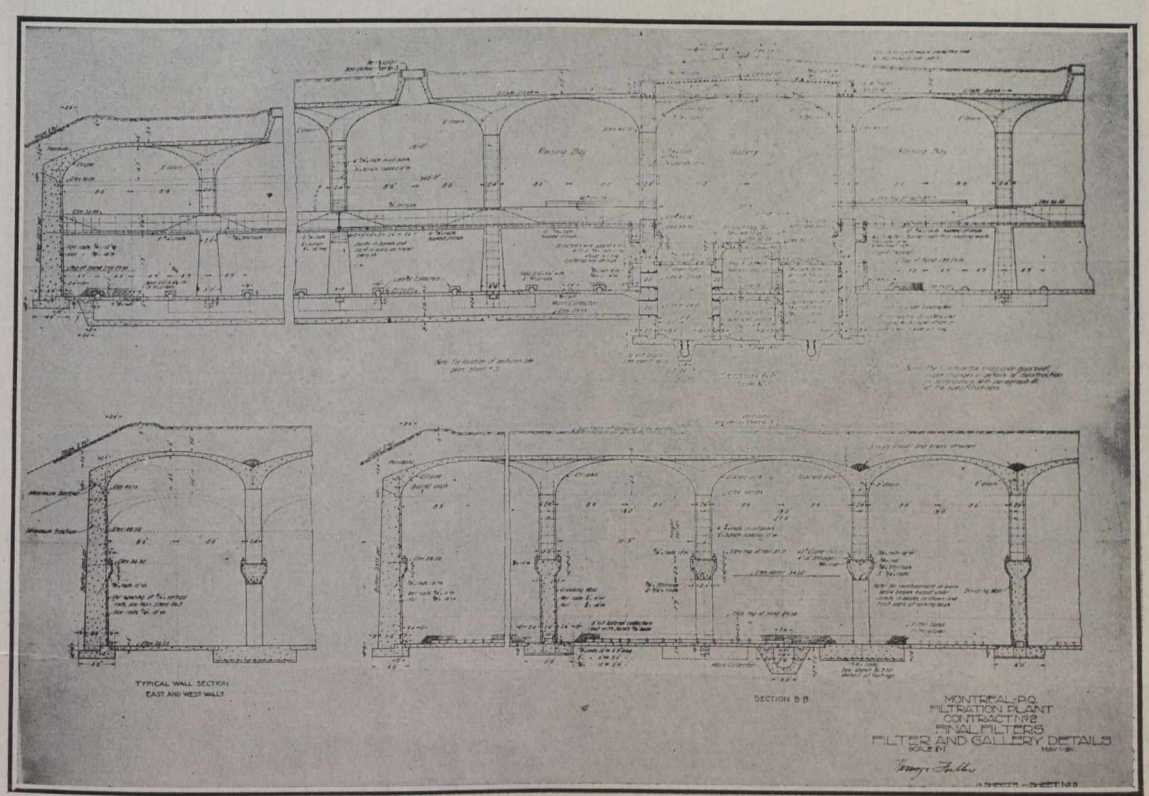


Fig. 5.

A heating and ventilating system will be installed to prevent the formation of skim ice on the filters during cold weather, and to make the filters and gallery hygienic for workmen at all times.

From a fan, with a capacity of 65,000 cubic feet of air per minute, installed in an adjoining gate house, the air electrically heated will be conveyed in plaster ducts along the end walls of the filters. Between each row of piers an opening with an adjustable door will allow the heated air to pass into the filter.

On each side of the gallery and in the arch of the filter roof a similar duct takes the air back to the fan.

Electric radiators are also provided in the lower part of the gallery to prevent the freezing of gauge and controller piping.

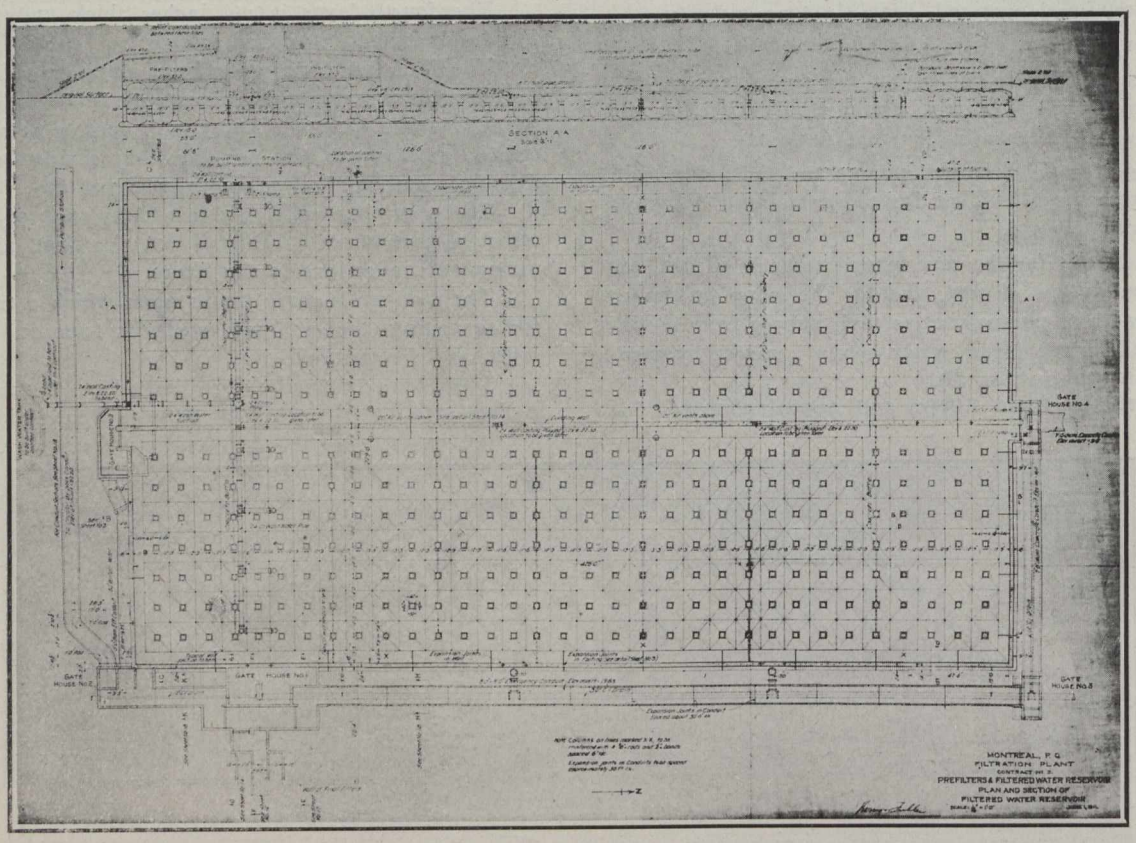
Figures 3, 4 and 5 give many details of the design of the final filters.

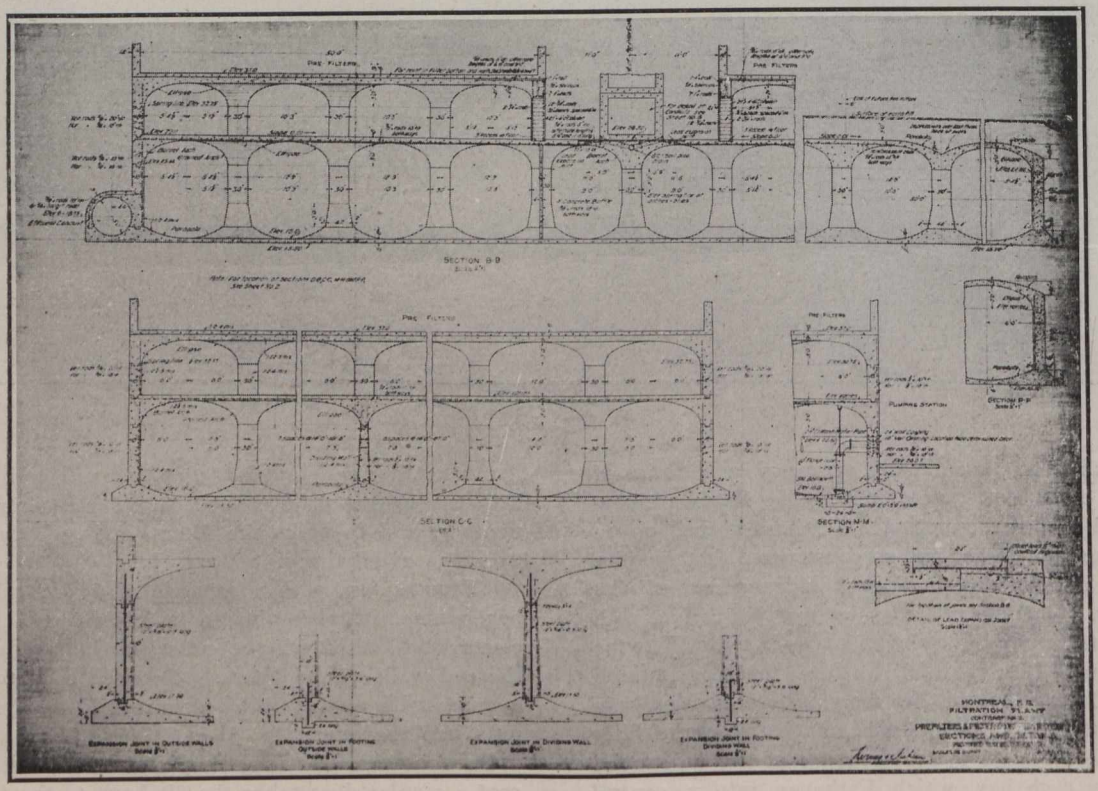
Contract No. 3—Prefilters and Filtered Water Reservoir.—The prefilters and filtered water reservoir are to be built just west of the final filters, and between them and the aqueduct.

The filtered water reservoir is of concrete, with groined arches for the roof and inverted groined arches for the floor.

ed on each side of the operating gallery, which is practically a continuation of the gallery of the final filters.

The floors of the prefilters are carried by a second series of groined arches, 8 feet above the roof of the filtered water reservoir.





Figs. 6 and 7.

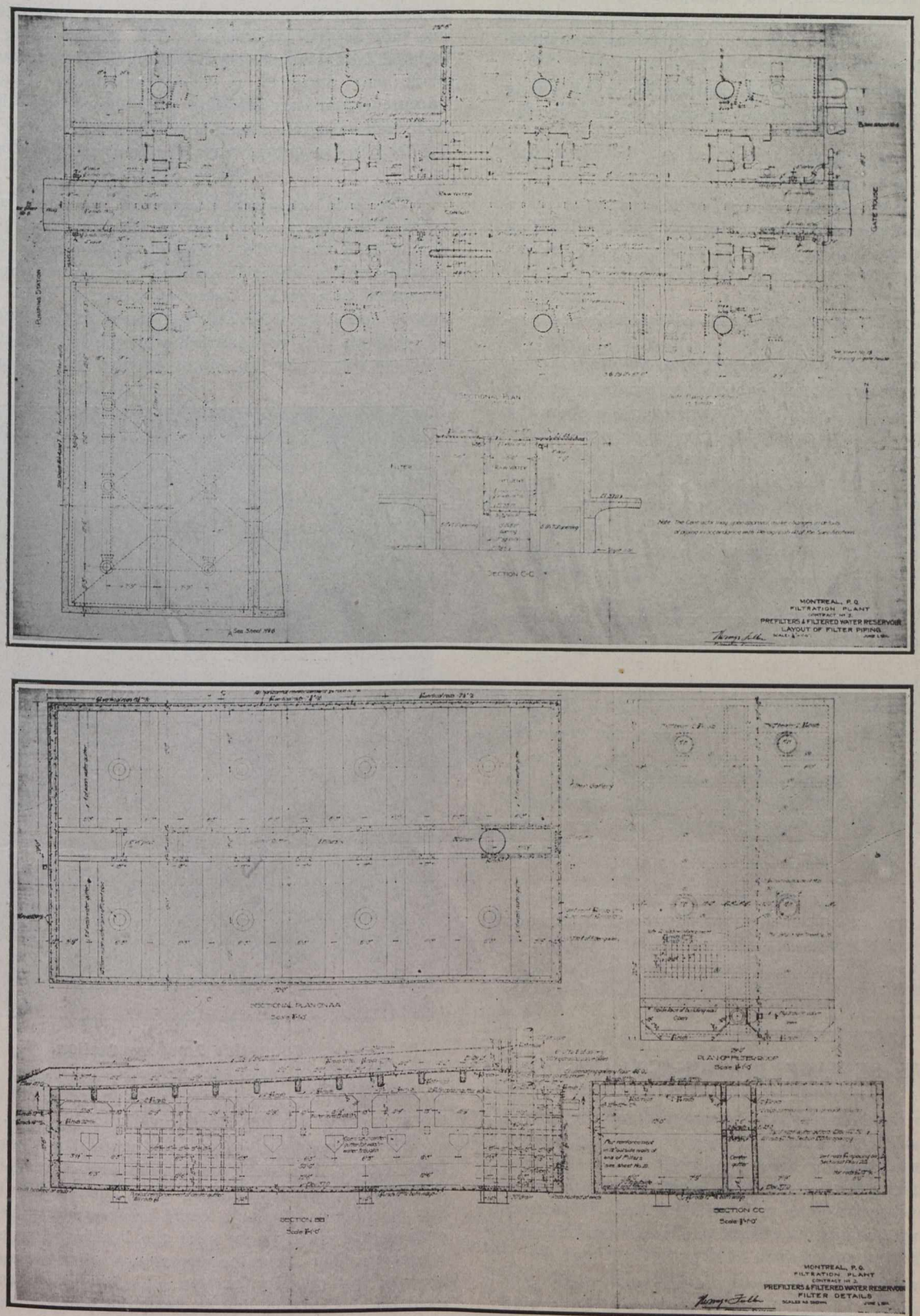
It is 429 by 232½ feet in size, and has a capacity of 7,500,000 gallons. The roof is designed to take the load of the present and future installations of prefilters. The prefilters now under contract are 16 in number, and are arrang-

Each prefilter has an effective sand area 50 by 24 feet, which is divided longitudinally by a central wash water gutter, the sides of which extend above the normal water level of the filters.

Each prefilter has 8 lateral wash water gutters on each side of the central gutter.

The filtering material consists of 8 inches of gravel and 30 inches of sand.

Each prefilter will be equipped with a strainer and air system. Water for washing will be supplied from the wash water tower, to be built under contract No. 4, and fed by duplicate motor driven pumps, already mentioned under the



Figs. 8 and 9.

The gravel will be placed in four layers, varying in size from 1 inch in the lower layer to about 0.1 inch in the top layer.

The sand will have an effective size of from 0.50 to 0.60 mm.

description of Contract No. 1.

The air will be supplied by the rotary blower, previously mentioned.

The prefilters are designed to operate at a rate of about 136,000,000 gallons per acre per day. Each filter unit will

be equipped with a rate controller, which will allow the passage of 3,750,000 gallons daily, the same rated capacity as each of the final filters.

The operating gallery contains the influent and effluent conduits, piping connections, and the operating tables from which all operations for the regulation and washing of the filters are accomplished by means of connections to hydraulically operated valves.

On this contract as well as on contract No. 2, all piping or conduits larger than 30 inches in diameter, are of reinforced concrete.

All work has been designed with the idea of the greatest possible elasticity in operation.

Either the prefilters, final filters, or filtered water reservoir could be put out of service if desired, and the building of such extensions of the works as the future may require can be accomplished without affecting the capacity of the present plant.

Figures 6, 7, 8 and 9 give details of reservoir and prefilters.

Contract No. 4—Pumping Station and Buildings.—This contract, not yet executed, will include the pumping station, the wash water tower, and the buildings over the operating gallery of the prefilters and over the gate chambers.

The buildings will be of concrete or brick, with either red or green tile roofing laid upon roofs of cinder concrete.

The roof trusses will be of structural steel shapes.

In the wash water tower, equipment will be installed for the treatment of the filtered water with hypochlorite of lime, if such treatment is required after the double filtration of the water.

Part of the main floor of the pumping station will be fitted up as a chemical and bacteriological laboratory.

The building will be heated, if required, by electric radiators.

Associated Work.—A hydro-electric pumping station will be built on the east bank of the enlarged aqueduct, near the old wheel house.

This station will furnish electric current to run the pumps and machinery, and to light and heat the several units of the filtration works. It will also receive the filtered water from the works, and pump the same to the distributing reservoir of the city.

As all the filters and the filtered water reservoir are covered with earth and seeded. it is proposed to construct roads and paths about the works, plant trees and shrubbery, and, in fact, create a park which will compare favorably with the other parks in the city, and be beneficial to the people in this vicinity.

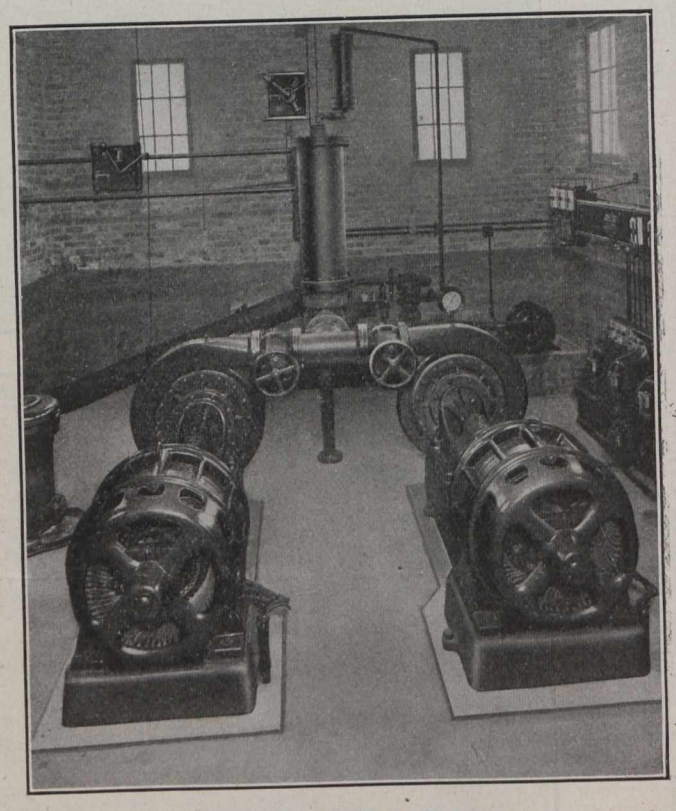
UNIQUE SEWAGE PUMPING PLANT.

One of the first obvious uses discovered for the centrifugal pump was the handling of water containing foreign elements that would either become lodged in the intricate passages of a reciprocating pump or be caught by the closing valves, allowing the pump to lose its suction. In modern sewage pumping stations, therefore, the centrifugal is preferred, as all foreign matter will readily pass through it.

The Sunnyside Avenue sewage pumping plant of the city of Toronto is unique. It is located at the foot of Sunnyside Avenue, on the lake shore, and drains a section of the city whose level is below that of the main trunk sewer running east and west. The difference in elevation between the bottom of the reservoir from which the sewage pumps take their water, and the main sewer is 44 feet, which requires, however, 620 feet of 8-inch pipe. The reservoir occupies the basement of the pump house, and is entirely under ground. It measures 18 feet by 18 feet, and is 10 feet deep, having a capacity of 20,000 imperial gallons.

It was possible to estimate closely the ultimate population which this station would ever be called upon to take care of, and the necessary pumps were installed in duplicate, in order that the station might never be shut down, in case one unit needed overhauling. The station being small and isolated, as far as similar city equipments are concerned, the plant was designed to (1) automatically prime its own pumps; (2) to start pumping when the water in the reservoir had risen to within one foot of the pump house floor, and (3) to stop the pumps when the reservoir had been pumped out

The main equipment consists of two 6-inch special centrifugal sewage pumps, built by the John McDougall Caledonian Iron Works Co., Limited, of Montreal. Each has a capacity of 800 imperial gallons per minute, and is direct connected to a 40 h.p. induction motor. These pumps are started and stopped by Cutler-Hammer relay starters, operated by floats that rise and fall with the level of the water in the reservoir. As the pumps operate automatically, it was considered good practice to provide considerable reserve power to allow for any possible variation in head.



Sunnyside Pumping Station.

Heretofore the city has used vertical submerged centrifugal pumps, but owing to the difficulty of reaching them if they ever required attention, and the desirability of having machinery where it could be frequently inspected, the engineers decided in favor of the horizontal type placed on a concrete floor above the reservoir, so that the motors would be in a perfectly dry location. As foot valves could not be used on the suction line to keep the pump primed, due to the fact that foreign matter contained in the water would lodge in the valve seats and prevent them from closing special device was designed which goes into operation just before one of the main sewage pumps, primes the pump, and holds the priming until the pump is in full operation. A discharge air chamber contains a set of floats which operate at the proper time, causing a small vacuum pump to exhaust

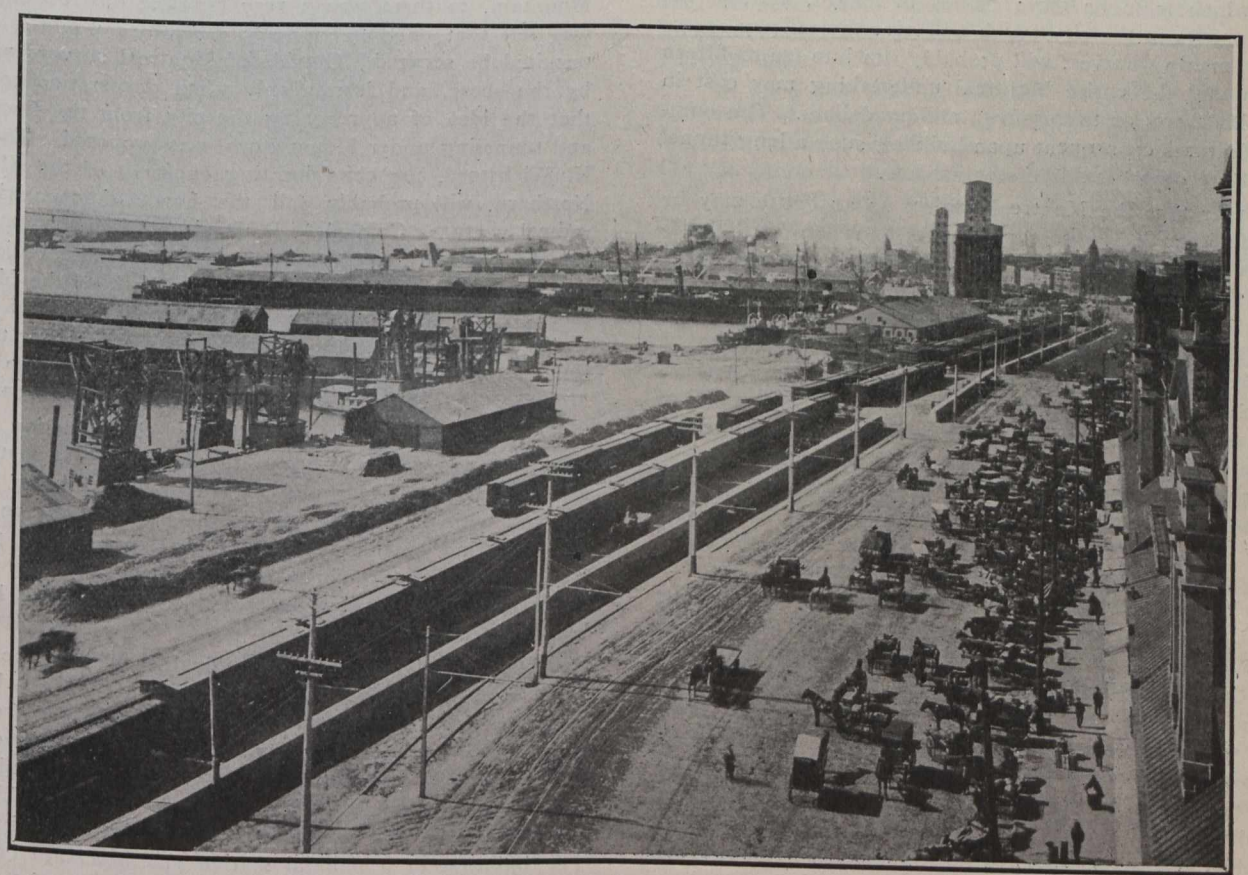
the air in the pup casings, thereby sucking up the necessary priming water from the reservoir below.

This station has now been in operation about six months and the only attention it has received is from an attendant who makes a daily inspection and sees that the oil wells do not run dry.

THE CANADIAN NORTHERN IN MONTREAL.

If a stranger were to inquire in Montreal to-day what had been the most interesting issue discussed during the year the reply would in all probability be: The Canadian Northern and its tunnel right of way into the city.

There is not any doubt about its being the most interesting piece of gossip bandied about among the odd half million inhabitants of the eastern metropolis, and it may also be fairly declared that the problem which the Canadian Northern Railway engineers have set themselves to solve is really the biggest to confront any railway in any city in Canada.



A View of Montreal Harbor.

The tunnel idea of an entrance had always, in the past, been accepted as but a remote possibility by the average railway engineer. True, the subject has probably been often discussed in the executive councils of other roads, but the thing seemed so stupendous an undertaking that it never advanced to the detailed stage, and the railways were quite content to do the best they could with the facilities they had. The Canadian Northern, however, fresh from the conquest of the western prairie, and with the determination born of a transcontinental idea urging on its men, faced the difficulty not with the "impossible" impression, but with the solid conviction that a tunnel was the only proper solution to the problem of an entrance into the heart of the city of Montreal. Mount Royal, while one of the city's most splendid assets, and prominent in Canadian annals since the very inception of the country, is undoubtedly also one of its greatest handicaps. It is not possible for any one to conceive of the city growing over the mountain, and consequently the latitude for growth had been always limited from that fact. The residences of its citizens may flank it but the limited speed of its surface traction line does not make this very desirable. The danger of congestion, for that reason became steadily more imminent.

When the first hint of the Montreal programme by the C.N.R. running into many millions was flashed over the wires to the inhabitants of that city, speculation and curiosity were born. But it is safe to say that no citizen of the eastern city dreamed even of the undertaking which is now taking shape for an entrance through the mountain. The problem was discussed in clubs, hotels, on the streets, and in every place where people congregate. It was, of course, impossible for the executives of the Canadian Northern to announce the beginning and the end of the Montreal scheme, for the difficulties always attending upon the securing of railway right of way, and of rights to do this or that, would have been increased tenfold. On no single occasion during the past year when it was necessary for Sir William Mackenzie, Sir Donald Mann, Mr. D. B. Hanna, or Col. A. D. Davidson to visit their city, did the representatives of the Montreal newspapers forget to ask subtly worded questions as to the scope of the programme which the Canadian Northern had in mind for the city. The direct answer, hoped for but hardly expected was never given, and even to this day it is not on the cards for the citizens of Montreal to understand fully the Canadian Northern entrance in detail.

As the case stands to-day Montreal without taking thought has been increased both in dignity and importance. Its borders have been enlarged and a new garden city is rapidly taking shape behind that beautiful mountain. Mr. F. G. Todd, a landscape surveyor of the city, noted for the

excellent harmony which he has worked out in other subdivisions both in the east and the west, is busy at the present moment working out in comprehensive detail, a beautiful suburb which is to stretch from Mount Royal through to the Back River. The residents of this new subdivision will undoubtedly be highly favored, for it will be quite possible when the tunnel is constructed for the business man to leave his office in the heart of the down-town district and be set down close to his home in anywhere from eight to fifteen minutes. Only the tube, which it is proposed to burrow beneath and through the mountain could make this possible, and in this connection it is safe to say that the sale of the land in question will go a long way towards meeting the initial outlay necessitated by such a large engineering programme. In the five thousand acres at the back of Montreal and in the city property which it was necessary to secure the Canadian Northern has already expended something like ten million dollars. The cost of the engineering work necessary on the tunnel, which is to be three miles in length, and for the elevated tracks in the city which will give the railway access to its steamship wharves, will probably run into ten or fifteen more, so that the entire Montreal undertaking may cost in the neighborhood of twenty-five million dollars. The engineering features consequent upon building such a long tunnel dwarf all the other details of the scheme.

In order that the Montreal project as an entity may be fully understood it is necessary to hark back into recent railway history, as far as this railway is concerned, and show some of the circumstances which have made some such proposition inevitable and imperative. The Canadian Northern Railway, proper, is located in the west, in that part of Canada which extends, roughly speaking, from Port Arthur, in Ontario, to Edmonton in Alberta. There are in those four provinces about forty-five hundred miles of road in actual operation. There are three main lines running east and west in the prairie provinces with a net-work of branch lines connecting these from the north and south, and the railway company has succeeded in girdling with steel the richest section of the western country. This road was born in 1896, and it may be said that at that time the vision of a transcontinental line connecting the Atlantic and the Pacific was also conceived in the minds of the two great founders of the Canadian Northern system. A few years ago the Canadian Northern started the construction of a line from Toronto to Sudbury—a thing apart from the western system, and apparently doomed to do only a local business. In Quebec the Great Northern Railway of Canada was taken over and extended until it connected the cities of Montreal and Quebec, under the name of the Canadian Northern Quebec, while the other line in Ontario was called Canadian Northern Ontario Railway. But these two were still widely separated in fact. Fresh in the recollection of Ontario people at least, was the awarding of contracts for a line of road connecting Toronto and Ottawa. Then there was another contract awarded to a Montreal contractor for a line skirting the Ottawa River and linking together the capital city of Ottawa and the port of Montreal. Both of these two roads should be completed during 1912, and through trains should be running between Toronto and Quebec, and from Toronto to Sudbury and beyond by the end of this year. Thus the process of welding the eastern units together has been proceeded with and the transcontinental idea takes on more definite shape.

Now the contracts to link up the lines between Sudbury and Port Arthur, and for another line to run westerly from Ottawa to connect with the Toronto-Port Arthur line have been awarded and work on both may be said to have fairly commenced. In the west construction men are already working on the remaining section of the transcontinental between Edmonton and Port Mann on the Fraser River. All of these contracts are to be completed by the close of 1913, and so much is the element of speed being considered that 9,000 men are engaged this winter on preliminary construction work in these two widely separated cities.

This brings us to the essential need of a proper terminal in Montreal City. In many interviews the various officials of the Canadian Northern have stated emphatically that the project in that eastern city would be finished by 1914. This means that the Montreal terminals will be ready for operation by the time through transcontinental trains will be running across the continent on Canadian Northern steel. The continuity of purpose marking the letting of all these contracts becomes at once apparent.

The terminal idea in Montreal was almost inspired. For a long time the company's engineers have been worrying over the securing of a plan in Montreal which would be in keeping with the dignity of a continent-wide line. The Mountain, to them was a very tangible obstruction, and it was felt that only under great difficulties would a suitable terminal be secured. Outside of Montreal surveys were run by the score, and it was only when desperation compelled that the idea of approaching the city from the Back River and tunneling under Mount Royal was proposed. To Mr. H. K. Wicksteed, the chief locating engineer of the Canadian Northern, will probably fall the honor of conceiving this radical venture. Colonel A. D. Davidson, Land Commissioner for the company, became enthusiastic over the project, and the possibility of the new subdivision back of the Mountain to the Back River was then born. This section of country would not only afford the company an ideal site for the location of terminal shops and yards, but it would also give to Montreal an opportunity for growth hitherto undreamed of.

Colonel Davidson, immediately the sanction of the executive was secured, began to plan the best methods of securing this territory and the necessary right of way in the city without exciting unduly the curiosity of the holder. The securing of this ten million dollars worth of property stands to-day as a remarkable achievement and is a striking testimonial to a man whose name is already writ large in land matters in Canada.

After all, the engineering difficulties will not be exceedingly great. The line will pass through the suburbs on a gentle rise of about forty feet to the mile, and from that entrance the tunnel will slope citywards at a gradient of about thirty-five feet to the mile, nosing out practically in the business district, for it will run at a considerable depth below what are now some of the principal streets of the city. The building of a palatial station and hotel are only incidents from the engineer's standpoint. The complete plan is not yet advanced sufficiently to allow a proper technical treatment in this paper, and will be considered in a later article.

PERSONAL.

Mr. W. D. Neil, recently of Calgary, has been appointed city manager of C.P.R. telegraphs at Winnipeg, Man.

Mr. J. C. Breithaupt has again been elected chairman of the Water Commission of Berlin, Ont., for the thirteenth term.

Mr. L. W. Rundlett. of St. Paul, Minn., has been appointed to the commissionership of Moose Jaw at a salary of $6,000 per year.

Dr. J. W. S. McCullough, provincial medical health officer, returned yesterday from New York, where he has been investigating the latest methods for water filtration and other matters.

Mr. Frank Swayze has been appointed general manager of the Niagara, Welland and Lake Erie Electric Railway. Previous to accepting this position Mr. Swayze held a position with the Niagara. St. Catharines and Toronto Electric Railway.

Mr. George A. Guess has been appointed to the chair of Metallurgy at Toronto University. Mr. Guess is a graduate of Queen's University, class 1894. His metallurgical experience covers some years spent with the Greene Cavanea Cooper Company, the largest concentrating and smelting concern in Mexico. He was also with the Tennessee Copper Company, a company in the States doing pyritic smelting, and with the Cerro de Pasco Mining Company of Peru, one of the largest metallurgical establishments in South America. All the large copper refineries and smelters of the United States have been visited by him.

Recent changes amongst Canadian Pacific Railway Telegraph officials include the following: W. J. Camp to be assistant manager of telegraphs, with headquarters at Montreal. F. J. Mahon of St. John, N.B., to be superintendent of the eastern division, with headquarters at Montreal. J. Fletcher of Vancouver to be superintendent of traffic, Montreal. J. F. Richardson to be superintendent of the British Columbia division, with headquarters at Vancouver. Wm. Godsoe of Halifax to be superintendent of Atlantic division, with headquarters at St. John. John Tait of Winnipeg to be assistant to the general superintendent at Winnipeg. John McMillan of Calgary to be superintendent of the Manitoba division, with headquarters at Winnipeg. R. W. Young to be superintendent of the Saskatchewan division, with headquarters at Moose Jaw. Donald Coons to be superintendent of the Alberta division, with headquarters at Calgary. Mr. Dan H. Bowen of London, Ont., to be assistant superintendent of Ontario.

OBITUARY.

The death occurred suddenly of Mr. G. H. Massey, a director and chief engineer of the Reid-Newfoundland Company, at his late residence, 4224 Dorchester Street, Westmount, Montreal. The deceased gentleman had been ailing for the past year. His death was due to heart failure.

Mr. Massey was born in Tullow, County Dublin, Ireland, came to Canada in 1871. He was engineer-in-charge of the Chaudiere bridge, Ottawa, the Canadian Pacific Railway bridge at Lachine, and also the Sault Ste. Marie bridge. He had been connected with the Reid-Newfoundland Company for the past 14 years. The deceased is survived by his widow and eight children.

THE ENGINEERS' CLUB OF MONTREAL.

The Engineers' Club of Montreal was organized and incorporated in 1903 by a number of Montreal engineers. While the by-laws were made broad enough to admit not only engineers and architects, but also others engaged in engineering work, the majority of the directors must be engineers. This qualification was included with the intention of preserving control in the hands of the engineers. The functions of the club are of a social nature. The charter members were about forty in number; there is now, however, a full membership of four hundred and fifty and a considerable number on the waiting list.

In 1905 the club purchased the Dow property on Beaver Hall Square, midway between up and down town. This is an ideal location for a club of such a character. On the property was located a fine residence, which, with a few additions and changes, was made into very homelike and comfortable quarters. The president of the club is Mr. H. H. Vaughan, and the secretary, Mr. Smith.

ANNUAL MEETING, PROVINCE OF QUEBEC ASSOCIATION OF ARCHITECTS.

The Province of Quebec Association of Architects held their annual meeting in Quebec on January 13th. A dinner was held in the evening at Kent House, Montmorency Falls.

CANADIAN SOCIETY OF CIVIL ENGINEERS.

A meeting of the Mining Section was held on Thursday, 11th instant, at 8.15 p.m., in the society's rooms, 413 Dorchester Street Montreal.

A paper by Mr. James R. Pearson, managing director of the Asbestos and Asbestic Co., Ltd., was read by the author.

CANADIAN INSTITUTE MEETING.

The members of the Canadian Institute held their usual meeting at the library, 198 College Street, Toronto, January 13th, at 8 p.m. Professor Angus, of the Department of Mechanical Engineering, University of Toronto, gave an illustrated lecture on "Types of Steam Engines," including rotary and reciprocating.

MEETING OF WESTERN CANADA RAILWAY CLUB.

The monthly meeting of the Western Canada Railway Club was held in the Royal Alexandra Hotel, on Monday evening, the 8th inst., at 8.30 o'clock. There was a very interesting discussion on the paper read at the previous meeting on "High Speed Steel."

At the close of the discussion there was a short entertainment and New Year's reunion.

AMERICAN BOILER MANUFACTURERS' ASSOCIATION.

The 24th Annual Convention of the American Boiler Manufacturers' Association, together with its associate members, and the Supplymen's Association, will be held in New Orleans, La., March 12th, 13th, 14th and 15th, 1912, at which time some very important papers will be presented to the association and other important business of interest to all the boiler manufacturers in the United States and Canada, and supply houses dealing with the boiler and tank industry.

An extensive programme of entertainment has been arranged, and a large attendance of boiler manufacturers and supplymen from the United States and Canada are expected to be in attendance.

For further information relative to rates, hotel accommodation, etc., apply to F. B. Slocum, Secretary Supplymen's Association, of the American Boiler Manufacturers' Association, care of Continental Iron Works, Brooklyn, N.Y.

COMING MEETINGS.

THE ENGINEERS' CLUB OF TORONTO.—Wednesday, January 17th, 1912. 90 King Street West. Noonday address by Mr. Wyly Grier. Luncheon will be served promptly at 1.00 p.m., and members are requested to be in their seats before that time. R. B. Wolsey, Secretary.

THE CLEVELAND ENGINEERING SOCIETY.—January 23, 1912. Special Meeting, Chamber of Commerce Bldg., Cleveland, O. R. C. Beardsley, Hydraulic Engineer, will present an illustrated paper on "The Design and Construction of Dams," with special reference to recent failures. Secretary, F. W. Ballard.

THE CANADIAN SOCIETY OF CIVIL ENGINEERS.—Jan. 24. 25, 26, 1912, General meeting, 413 Dorchester St. West, Montreal. Prof, C. H, McLeod, Secretary.

CANADIAN FORESTRY ASSOCIATION.—February 7th and 8th, 1912. Forestry Convention Meetings held in the Railway Committee Room, Parliament Buildings, Ottawa. Secretary, Mr. James Lawler, Canadian Bldg., Ottawa.

CANADIAN LUMBERMEN'S ASSOCIATION.—February 6, 7 and 8, 1912. Annual Meeting to be held at the same time and place as the Canadian Forestry Association.

CANADIAN NATIONAL ASSOCIATION OF BUILDERS. — The Sixth Annual Convention will be held in Toronto, February 20, 1912.

ONTARIO GOOD ROADS ASSOCIATION.—Annual Convention to be held at Toronto, February 26, 27, 28. Secretary, J. E. Farewell, Whitby.

ENGINEERING SOCIETIES.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—413 Dorchester Street West, Montreal. President, C. H. Rust; Secretary, Professor C. H. McLeod.

QUEBEC BRANCH—
Chairman, P. E. Parent; Secretary, S. S. Oliver. Meetings held twice a month at Room 40, City Hall.

TORONTO BRANCH—
96 King Street West, Toronto. Chairman, H. E. T. Haultain, Acting Secretary; E. A. James, 57 Adelaide Street East, Toronto. Meets last Thursday of the month at Engineers' Club.

MANITOBA BRANCH—
Secretary E. Brydone Jack. Meets every first and third Fridays of each month, October to April, in University of Manitoba, Winnipeg.

VANCOUVER BRANCH—
Chairman, Geo. H. Webster; Secretary, H. K. Dutcher, 319 Pender Street West, Vancouver. Meets in Engineering Department, University.

OTTAWA BRANCH—
Chairman, S. J. Chapleau, Ottawa; Secretary, H. Victor Brayley, N. T. Ry., Cory Bldg.

MUNICIPAL ASSOCIATIONS.

ONTARIO MUNICIPAL ASSOCIATION.—President, Chas. Hopewell, Mayor, Ottawa; Secretary-Treasurer, Mr. K. W. McKay, County Clerk, St. Thomas, Ontario.

UNION OF ALBERTA MUNICIPALITIES.—President, H. H. Gaetz, Red Deer, Alta.; Secretary-Treasurer, John T. Hall, Medicine Hat, Alta.

THE UNION OF CANADIAN MUNICIPALITIES.—President, W. Sanford Evans, Mayor of Winnipeg; Hon. Secretary-Treasurer, W. D. Lighthall, K.C., Ex-Mayor of Westmount.

THE UNION OF NEW BRUNSWICK MUNICIPALITIES.—President, Councillor Siddall, Port Elgin; Hon. Secretary-Treasurer, J. W. McCready City Clerk, Fredericton.

UNION OF NOVA SCOTIA MUNICIPALITIES.—President, Mr. A. E. McMahon, Warden, King's Co., Kentville, N.S.; Secretary, A. Roberts, Bridgewater, N.S.

UNION OF SASKATCHEWAN MUNICIPALITIES.—President, Mayor Bee, Lemberg; Secretary, Mr. Heal, Moose Jaw

CANADIAN TECHNICAL SOCIETIES.

ALBERTA ASSOCIATION OF ARCHITECTS.—President, G. M. Lang; Secretary, L. M. Gotch, Calgary, Alta.

ASSOCIATION OF SASKATCHEWAN LAND SURVEYORS.—President, J. L. R. Parsons, Regina; Secretary-Treasurer, M. B. Weeks, Regina.

ASTRONOMICAL SOCIETY OF SASKATCHEWAN.—President, N. McMurchy; Secretary, Mr. McClung, Regina.

BRITISH COLUMBIA LAND SURVEYORS' ASSOCIATION.—President, W. S. Drewry, Nelson, B.C.; Secretary-Treasurer, S. A. Roberts, Victoria, B.C.

BUILDERS, CANADIAN NATIONAL ASSOCIATION.—President, E. T. Nesbitt; Secretary Treasurer, J. H. Lauer, Montreal, Que.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.—President, Charles Kelly, Chatham, Ont.; Secretary, W. A. Crockett, Mount Hamilton, Ont.

CANADIAN CEMENT AND CONCRETE ASSOCIATION.—President, Peter Gillespie, Toronto, Ont.; Secretary-Treasurer, Wm. Snaith, 57 Adelaide Street, Toronto. Ont.

CANADIAN CLAY PRODUCTS' MANUFACTURERS' ASSOCIATION.—President, W. McCredie; Secretary-Treasurer, D. O. McKinnon, Toronto.

CANADIAN ELECTRICAL ASSOCIATION.—President, N. W. Ryerson, Niagara Falls; Secretary, T. S. Young, Canadian Electrical News, Toronto.

CANADIAN FORESTRY ASSOCIATION.—President, Thomas Southworth, Toronto; Secretary, James Lawler, Canadian Building, Ottawa.

CANADIAN GAS ASSOCIATION.—President. Arthur Hewitt, General Manager Consumers' Gas Company, Toronto; J. Keillor, Secretary-Treasurer, Hamilton, Ont.

CANADIAN INDEPENDENT TELEPHONE ASSOCIATION.—President, W. Doan, M.D., Harrietsville, Ont.; Secretary-Treasurer, Francis Dagger, 21 Richmond Street West, Toronto.

CANADIAN MINING INSTITUTE.—Windsor Hotel, Montreal. President, Dr. Frank D. Adams, McGill University, Montreal; Secretary. H Mortimer-Lamb, Windsor Hotel, Montreal.

CANADIAN PEAT SOCIETY.—President, J. McWilliam, M.D., London, Ont.; Secretary-Treasurer, Arthur J. Forward, B.A., 22 Castle Building Ottawa, Ont.

THE CANADIAN PUBLIC HEALTH ASSOCIATION.—President, T. A Starkey, M.B., D.P.H., Montreal. Secretary, F. C. Douglas, M.D., D,P.H. 51 Park Avenue, Montreal.

CANADIAN RAILWAY CLUB.—President, H. H. Vaughan; Secretary, James Powell, P.O. Box 7, St. Lambert, near Montreal, P.Q.

CANADIAN STREET RAILWAY ASSOCIATION.—President, D. McDonald, Manager, Montreal Street Railway; Secretary, Acton Burrows, 70 Bond Street, Toronto.

CANADIAN SOCIETY OF FOREST ENGINEERS.—President, Dr. Fernow, Toronto; Secretary, F. W. H. Jacombe, Department of the Interior, Ottawa.

CENTRAL RAILWAY AND ENGINEERING CLUB.—Toronto, President, G. Baldwin; Secretary, C. L. Worth, 409 Union Station. Meets third Tuesday each month except June, July, August.

DOMINION LAND SURVEYORS.—President, Thos. Fawcett, Niagara Falls; Secretary-Treasurer, A. W. Ashton, Ottawa.

EDMONTON ENGINEERING SOCIETY.—President, J. Chalmers; Secretary, B. F. Mitchell, City Engineer's Office, Edmonton, Alberta.

ENGINEERING SOCIETY, TORONTO UNIVERSITY.—President, W. B. McPherson; Corresponding Secretary, A. McQueen.

ENGINEERS' CLUB OF MONTREAL.—Secretary, C. M. Strange, 9 Beaver Hall Square, Montreal.

ENGINEERS' CLUB OF TORONTO.—96 King Street West. President, Killaly Gamble; Secretary, R. B. Wolsey. Meeting every Thursday evening during the fall and winter months.

INSTITUTION OF ELECTRICAL ENGINEERS.—President, Dr. G. Kapp; Secretary, P. F. Rowell, Victoria Embankment, London, W.C.; Hon. Secretary-Treasurer for Canada, Lawford Grant, Power Building, Montreal, Que.

INSTITUTION OF MINING AND METALLURGY.—President, Edgar Taylor; Secretary, C. McDermid, London, England. Canadian Members of Council:—Prof. F. D. Adams, J. B. Porter, H. E. T. Haultain, and W. H. Miller, and Messrs. W. H. Trewartha-James and J. B. Tyrrell.

INTERNATIONAL ASSOCIATION FOR THE PREVENTION OF SMOKE.—Secretary, R. C. Harris, City Hall, Toronto.

MANITOBA LAND SURVEYORS.—President, George McPhillips; Secretary-Treasurer, C. G. Chataway, Winnipeg, Man.

NOVA SCOTIA MINING SOCIETY.—President, T. J. Brown, Sydney Mines, C.B.; Secretary, A. A. Hayward.

NOVA SCOTIA SOCIETY OF ENGINEERS, HALIFAX.—President, J. N. MacKenzie; Secretary, A. R. McCleave, Assistant Road Commissioner's Office, Halifax, N.S.

ONTARIO PROVINCIAL GOOD ROADS ASSOCIATION.—President, W. H. Pugsley, Richmond Hill, Ont.; Secretary, J. E. Farewell, Whitby.

ONTARIO LAND SURVEYORS' ASSOCIATION.—President, J. Whitson; Secretary, Killaly Gamble, 703 Temple Building, Toronto.

THE PEAT ASSOCIATION OF CANADA.—Secretary, Wm. J. W. Booth, New Drawer, 2263, Main P.O., Montreal.

PROVINCE OF QUEBEC ASSOCIATION OF ARCHITECTS.—Secretary J. E. Ganier, No. 5. Beaver Hall Square, Montreal.

ROYAL ARCHITECTURAL INSTITUTE OF CANADA.—President, F. S. Baker, F.R.I.B.A., Toronto, Ont.; Hon. Secretary, Alcide Chausse, No. 5 Beaver Hall Square, Montreal, Que.

ROYAL ASTRONOMICAL SOCIETY.—President, Prof. Alfred T. de Lury, Toronto; Secretary, J. R. Collins, Toronto.

SOCIETY OF CHEMICAL INDUSTRY.—Dr. A. McGill, Ottawa, President; Alfred Burton, Toronto, Secretary.

UNDERGRADUATE SOCIETY OF APPLIED SCIENCE, McGILL UNIVERSITY.—President, J. P. McRae; Secretary, H. F. Cole.

WESTERN CANADA IRRIGATION ASSOCIATION.—President, Wm. Pierce, Calgary; Secretary-Treasurer, John T. Hall, Brandon, Man.

WESTERN CANADA RAILWAY CLUB.—President, R. R. Nield; Secretary, W. H. Rosevear, 115 Phœnix Block, Winnipeg, Man. Second Monday, except June, July and August, at Winnipeg.

CONSTRUCTION NEWS SECTION

Readers will confer a great favor by sending in news items from time to time. We are particularly eager to get notes regarding engineering work in hand and projected, contracts awarded, changes in staffs, etc. Printed forms for the purpose will be furnished upon application.

TENDERS PENDING.

In Addition to Those in this Issue.

Further information may be had from the issues of The Canadian Engineer referred to.

Place of Work.	Tenders Close.	Issue of.	Page.
Medicine Hat, Alta., church	Jan. 20.	Dec. 28.	59
Ottawa, Ont., iron posts	Jan. 31.	Dec. 21.	68
Ottawa, Ont., breakwater, Rimouski, Que.	Jan. 16.	Jan. 11.	59
Ottawa, Ont., contracting machinery	Feb. 26.	Jan. 11.	59
Ottawa, Ont., jetty, Fraser River, B.C.	Jan. 19.	Jan. 11.	59
Ottawa, Ont., armory, Fernie, B.C.	Jan. 24.	Jan. 11.	59
Toronto, Ont., sewers	Jan. 16.	Jan. 11.	59
Toronto, Ont., supply of lead, 1912	Jan. 16.	Jan. 11.	59
Toronto, Ont., sewers	Jan. 16.	Dec. 28.	70
Toronto, Ont., main drainage works	Jan. 16.	Jan. 4.	70
Walkerton, Ont., bridge, Saugeen River	Jan. 23.	Jan. 4.	59
Winnipeg, Man., drawings for government buildings		Dec. 21.	68
Winnipeg, Man., motor generator set	Jan. 22.	Dec. 21.	59

TENDERS.

Arcola, Sask.—The date for receiving tenders for addition to school building at Arcola, Sask., has been extended to Thursday, February 1st, 1912. Plans and specifications may be secured at the office of Storey and Van Egmond, Architecbts, Regina, Sask. Jas. R. Donaldson, Secretary S.D. 637, Arcola.

Brantford, Ont.—Tenders will be received by the Board of Education until January 27th, 1912, for the erection of a two-story schoolhouse on Chestnut Ave. Building will be comprised of basement, 84 x 112 feet, ten rooms, brick with reinforced concrete floors, concrete foundation, steam heating, electric lighting, etc., two dynamos (1½ h.p. and 5 h.p.), modern plumbing. Secretary, A. K. Bunnell, Brantford.

Calgary, Alta.—Tenders will be received until February 10th, 1912, for the supply of material and construction of a steel bridge, 30 feet wide, in three spans of 150 feet each, on concrete substructure, across the Bow River, within the city limits. (See advertisement on another page of this issue).

Chatham, Ont.—Tenders will be received until January 20th, 1912, for all trades in erection of a reinforced concrete brick and steel, fireproof building for the Chatham Gas and Electric Light Co., Ltd. Drawings, specifications, etc., can be seen at the offie of the architects, Jas. L. Wilson & Son, Chatham, Ontario.

Chesley, Ont.—Tenders will be received by the Department of Public Works, Ottawa, until January 31st, 1912, for the erection of a public building. Plans, specifications, etc., may be obtained at the office of Mr. Thos. A. Hastings, Clerk of Works, Postal Station F, Yonge St., Toronto; at the post-office, Chesley, Ont.; at the office of Foster & Clark, architects, Owen Sound, Ont., and at the office of R. C. Desrochers, Secretary, Department of Public Works, Ottawa.

Grandview, Man.—Wanted—For the Rural Municipality of Grand View, six (6) wheel scrapers, size two and one-half (2½). Tenders to be in by February 1st, 1912. Wm. Dickie, secretary-treasurer, Grandview, Man.

Halifax, N.S.—Tenders will be received until January 17th, 1912, for the installation of a new heating boiler in the city hall. Specifications, etc., may be obtained at the City Engineer's office. J. J. Hopewell, Clerk of Works.

Montreal, Que.—The city is contemplating an addition to the sewage farm at Back River, to cost $50,000. City Engineer, G. Janin.

Ottawa, Ont.—Tenders will be received until February 5th, 1912, for the erection of a wooden lighthouse tower at Lions Head, Lake Huron, Ont. Plans, etc., at the Department of Marine & Fisheries, Ottawa; at the post offices, at Lions Head, Owen Sound, Collingwood, and Wiarton.

Ottawa, Ont.—Tenders for the improvement of the public wharf at Petewawa, North Renfrew County, Ont., will be received at the Department of Public Works until January 31st, 1912. Plans, etc., obtained at the offices of J. G. Sing, Esq., District Engineer, Confederation Life Bldg., Toronto; on application to the Postmaster at Petewawa, Ont., and at the Department of Public Works, Ottawa.

Ottawa, Ont.—Tenders will be received until January 29th, 1912, for the supply of 650,000 tons of Bituminous Coal for the Intercolonial Railway, and 13,000 tons of Bituminous Coal for the Prince Edward Island Railway. Lois Lavoie, Purchasing Agent, Ottawa.

Regina, Sask.—Tenders marked "Tenders for Telephone Supplies," will be received until noon, Saturday, January 20th, 1912, at the office of D. C. McNab, Acting Deputy Minister, Department of Railways and Telephones, Regina.

Saskatoon, Sask.—Tenders will be received until February 16th, 1912, for the construction of approximately 125,750 square yards of pavements. Geo. T. Clark, City Engineer, Saskatoon. (Adv. in the Can. Eng.)

Saskatoon, Sask.—Tenders will be received until February 16th, 1912, for the construction of approximately 621,200 square feet of concrete walk and 100,950 lineal feet of curbing. City Commissioner, Geo. T. Clark, City Engineer, Saskatoon. (Adv. in the Can. Eng.)

Toronto, Ont.—Tenders will be received until January 31st, 1912, for the construction of concrete abutments and a steel bridge, 100-ft. clear span, and also for a reinforced concrete truss bridge, 50-ft. clear span, over the Burnt River, in the village of Haliburton, municipality of Dysart. Frank Barber, Civil Engineer.

Vancouver, B.C.—Tenders will be received by the undersigned up till January 27th, 1912, for the year's supply of the following articles: Cast-iron castings, cement, sand and gravel, sewer pipe and fittings, pig lead, lead pipe, galvanized pipe fittings, brass fittings, lubricating oils and greases, hardware, engineer's supplies. Specifications, blank tender forms and all particulars may be obtained from my office. James Stuart, City Purchasing Agent.

Victoria, B.C.—Tenders will be received until the 31st day of January, 1912, for the erection and completion of a large one-room frame school house at Johnston Road, in the Delta Electoral District, B.C.. Plans, etc., may be seen at the offices of the Rev. T. H. Wright, Secretary of the School Board, Cloverdale, B.C.; the Government Agent, New Westminster; and the office of J. E. Griffith, Public Works Engineer, Department of Public Works, Victoria, B.C.

Winnipeg, Man.—Tenders will be received until February 1st, 1912, for the manufacture and delivery f.o.b. Winnipeg of an electric vehicle. Further information may be obtained at the office of the General Manager City Light and Power Department, 54 King Street. M. Peterson, Secretary Board of Control Office, Winnipeg.

CONTRACTS AWARDED.

Lethbridge, Alta.—A new $20,000 hotel will be erected at Kipp, by Mr. J. V. Harrington, Kalispell, Montana.

Ottawa, Ont.—The contract for the construction of an extension to the protection pier at Gimli, Selkirk Co., Man., has been awarded to Messrs. Buchanan & Fraser, of Winnipeg, at $9,910.

Vancouver, B.C.—The British North America Construction Company, Bank of Ottawa Bldg., will begin shortly the construction work on a wharf, Carrall Street, for the Union S. S. Co., Carrall St. Cost, $70,000.

Vancouver, B.C.—Instructions have been given by the Grand Trunk Pacific to Foley, Welch & Stewart, that the main line from Tete Jaune Cache to Fort George must be finished by next fall. In consequence, sub-contracts have been awarded as follows:—H. E. Carleton & Company, Edmonton, 25 miles west from Cache; Messrs. Burns, Jordan & Company, of Spokane, 50 miles; Messrs. Sims Brothers & Keary, of St. Paul, 75 miles. There is still unlet to sub-contractors a gap of thirty miles.

Vancouver, B.C.—Messrs. Griffin & Wilson, Spokane, have received the sub-contract for the construction of the remaining thirty-five miles on the main line, from Tete Jaune Cache to Fort George, of the Grand Trunk Pacific. General contractors, Messrs. Foley, Welch & Stewart.

Vancouver, B.C.—The Portland Cement Construction Co. has let the contract for the immediate construction of a huge cement plant on Tod Inlet, Vancouver Island, to the McAlpine, Robertson Construction Company, Metropolitan Bldg. This concern is a branch of Robert McAlpine Sons, Glasgow and London. It is understood that the proposed plant will approximate very closely to $1,000,000.

Victoria, B.C.—The contract for the new plant of the Pacific Coast Cement Company on Saanich Arm has been let to the McAlpine, Robertson Construction Company, Vancouver, and work will be commenced immediately.

Winnipeg, Man.—The contract for the superstructure of the twelve-story office building for the Union Trust Company, to be erected on the northeast corner of Main and Lombard Streets, has been let to the George A. Fuller Company of Montreal, Chicago and Winnipeg.

Winnipeg, Man.—The contract for the superstructure of the new Osborne street bridge has been awarded to the Manitoba Bridge & Iron Works. Total cost of work about $116,461, will include cost of tearing down the present superstructure and re-erecting it over the Assiniboine River at Arlington Street. The whole work is to be completed within six months from the date of signing of contract. The Algoma Steel Bridge Company was the lowest tenderer, but as it asked for nine months to build the bridge, the tender was not accepted.

RAILWAYS—STEAM AND ELECTRIC.

Province of Alberta.—A report states that the Canadian Pacific have assumed complete control of the Alberta Central Railway, and will be responsible for all debts of that company. Work will be pushed ahead rapidly by the C.P.R. in the spring in order to have the line to the Brazeau coal fields finished next year, and it is also understood 100 miles of the line east of Red Deer will be built in 1913.

Province of British Columbia.—It is officially stated that the Canadian Pacific Railway will shortly operate its locomotives on its mountain division between Field and Kamloops B.C., by crude oil.

Calgary, Alta.—It is estimated that the yearly receipts from the Street Railway operations will amount to $391,000.00, of which nearly $120,000.00 will be profit.

Fredericton, N.B.—Sir Thomas Tait has acquired the control of the Fredericton and Grand Lake Coal and Railway Company. The plans for the development of the Grand Lake coal areas include the construction of the railway from Gibson to Minto, a distance of 30 miles, for the delivery of 10,000 tons of coal annually, which the C.P.R. will take. The construction work on the railway will be commenced early in the spring. At this session of the Dominion Parliament the Dominion subsidy for the road will be re-voted.

Montreal, P.Q.—Details of the proposed terminals of the Canadian Northern Railway include the following: A double tracked tunnel 3.3 miles in length from a point half a mile west of the C.P.R.'s Outremont yards to Lagauchetiere Street. An underground station on the Dorchester street site of the Joseph Estate. Elevated tracks from the tunnel mouth to the level of the present Brennan Street tracks. Elevated freight sheds between William and Wellington Streets, and Dalhousie and Nazareth Streets. Depth of the tunnel from 700 to 40 feet; elevation of the tracks from 16 to 20 feet. River front communication with the Moreau Street station and a spur line from the latter point to the proposed Dorchester Street terminal.

Ottawa, Ont.—The original plans of the Hudson Bay railway have been adopted, viz., from Pas Mission to Port Nelson. The contract was awarded to J. D. McArthur by the late government. It is understood that he will begin construction work at an early date.

Province of Ontario.—Conservtive members of the Ontario Legislature asked Premier Whitney yesterday to assist the Bruce Mines and Algoma Central Railway to extend its lines farther north.

Prince Rupert, B.C.—The Railway Commission have ordered the Grand Trunk Pacific to re-open Cameron Creek in a way to make it again navigable.

Quebec, P.Q. — The Ottawa, Abitibi and Hudson Bay Railway Company will apply to the Quebec Legislature for an Act authorizing it to construct and operate a line of railway within the Province of Quebec from a point near the City of Hull, Quebec, in a northwesterly direction, through the southwesterly part of the County of Wright; thence in a northwesterly direction through the County of Pontiac, via the Valley of the Coulonge River to Grand Lake Victoria; thence in a northwesterly direction to a point on the National Transcontinental Railway at or near Lake Mattagami; thence in a northerly by northwesterly direction to a point near James Bay.

Victoria, B.C.—The Victoria Harbor Railway Company will apply for an extension of time.

Vancouver, B.C.—At a largely attended mass meeting held at this city recently, a resolution was passed unanimously endorsing the project for a railway from Vancouver to the Peace River country. It was also decided to send a delegation to interview Provincial Premier McBride on the subject.

Vancouver, B.C.—The Great Northern Railway Company has been asking for bids for the dredging of the slips and approaches to its proposed piers on its 1,800 feet of Burrard Inlet waterfront in this city. The management was unsuccessful in its efforts to rent the Dominion Government dredge Mastodon for the purpose of doing this work and the contract may be awarded to a United States concern as there is only one privately-owned dredge in British Columbia waters, and it is declared to be of insufficient capacity to perform the improvement. It is estimated that about 150,000 cubic yards of sand, hardpan and rock will have to be excavated.

Winnipeg, Man.—Seven new locomotives have been delivered to the Grand Trunk Pacific within the past few days. The measurements are—length, 73 feet; weight, 200 tons; track power, 31,600 pounds; water capacity, 8,000 gallons.

York County, Ont.—Plans are developing for the extension of the Toronto Suburban Railway from the town of Weston to the town of Woodbridge. This distance is eight miles.

LIGHT, HEAT AND POWER.

Fredericton, N.B.—Repairs to the municipal power plant are a necessity, the pressing requirements are fifty new lamps at $24.00 each and a new armateur at $850.00. Owing to considerable trouble of late in the street lighting the Fredericton Gas Light Company are preparing a proposition to light the highways by gas.

Galt, Ont.—A committee has been appointed to look after the improvements in the lighting system of the library. Mr. Chas. Turnbull is a member of the Board.

Kingston, Ont.—On the advice of the Hon. Adam Beck the municipality will supply the Grand Trunk Railway with 500 electrical horsepower for use in their granite quarry. This supply is temporary.

Lakefield, Ont.—The Hydro-Electric by-law having carried, the town proposes to spend $8,000 on a distributing plant and sub-station. Mr. E. A. Tanner, reeve.

Quebec, P.Q.—The Saint Maurice Hydraulic Company will apply to the Legislature of Quebec for an act to construct storage and regulating dams on the Saint Maurice River and its tributaries.

Vancouver, B.C.—An addition unit of 10,500 h.p. is now running at the plant of the B.C. Electric Railway Company. The output of the plant at present is 43,500 h.p. To accommodate the new unit a stone and concrete fireproof extension of 60 feet was made to the power house on the shore of the North Arm. The unit represents an outlay of approximately $250,000.

SEWAGE AND WATER.

Calgary, Alta.—The report of the city engineer, Mr. Childs, calls for an expenditure of $405,000.00. He recommends a filtration system:

Costing	$200,000
New intake costing	90,000
Enlargement of reservoir	85,000
Sedimentation tanks	30,000

Edmonton, Alta.—The city commissioners have decided to construct two new intakes and a well on the river bank; also to abandon the present intake. The city engineer, Mr. A. J. Latornell, has been instructed to prepare plans, etc. Ice has seriously damaged the present intake.

Galt, Ont.—Hydro-electric energy will be used to operate the pumps at the municipal waterworks. P. W. Sothmann, of the Hydro-Electric Commission, has suggested the use of a 250 K.V.A. synchronous motor running at 2,200 volts pressure as the most satisfactory method of taking care of the power factor.

Galt, Ont.—The town council has between fifty and sixty men working, mostly on sewers, at the present time and it is likely that this number will shortly be increased to one hundred.

Guelph, Ont.—The by-law providing for the election of Sewerage and Public Works Commissioners was given its third reading and passed by the council.

Ingersoll, Ont.—The late council passed a by-law to purchase the waterworks for the sum of $125,000.00.

Montreal, P.Q.—The bursting of a water main on St. Nicholas Street caused serious loss to several tenants of the Coristine building. The damages are estimated at about $2,000.

New Westminster, B.C.—The Municipal Construction Company have presented an account to the council for $3,000.00 for repairing 700 leaks in the water mains leading from Lake Coquitlam. This firm has the contract for laying the main. The pipe was purchased by the city council in 1909, and the contract let in 1910. The fault was that the collars used were of a defective design and that they were in most cases too large. The contractors had to insert a flattened wire before they could caulk the joints. 150 leaks are due to loose rivets. A strict investigation will be held.

Toronto, Ont.—The Works Committee have recommended the municipal council that a sewer be reconstructed on Sorauren Ave. The cost of the work will be about $44,077 to be assessed against the property benefited to the extent of $11,148, and against the city to the extent of $32,929.

Toronto, Ont.—A new pumping engine with a capacity of 15,000,000 gallons a day, will likely be included in the estimates of the City Engineer.

Victoria, B.C.—The municipal council have passed a resolution in favor of increasing the sewage handling facilities.

DREDGING MACHINERY.

One of our subscribers would like to be put in touch with firms who make dredges suitable for drainage work of from five hundred thousand to one million cubic yards. The widths would vary from forty to one hundred feet. He says a dipper dredge would hardly be suitable, owing to the distance the earth has to be moved to clear the banks of the cut. Any information on this subject will be appreciated by the Service Bureau, Canadian Engineer.

BUILDING.

Baden, Ont.—The Baden Board of Trade are endeavoring to secure a Carnegie library. Mr. Gideon Bechtel is chairman of the Board. (Baden is near Galt.)

Brantford, Ont.—The Cockshutt Plow Company have purchased the plant and buildings of the Brantford Carriage Company. Large additions to the buildings are among the plans of the Cockshutt Company.

Fort William, Ont.—A new hotel for the Grand Trunk Pacific, to cost $750,000.00, is among the plans of building operations for 1913.

Fort William, Ont.—Work in connection with the erection of the addition to the G.T.P. elevator has commenced. The John S. Metcalf Contracting Company, Montreal, secured the contract. The sub contracts have been awarded to an Omaha, Nebraska, firm.

Frank, Alta.—The Keystone Portland Cement Company, capitalized at $600,000.00, will begin building operations at an early date. The plans call for the employment of 100 men and a daily output of 1,000 barrels. The president is Mr. A. Muller, of Frank and Paris, general manager of the Canadian Coal Consolidated Co. of Frank.

Galt, Ont.—The Katie Foundry will erect new premises in Galt. A site has been secured on the river front. The main building will be of brick and concrete, seventy feet square and an annex, 70 × 120 feet, will be built along the full length of the building. This will be a two storey brick structure. The latest appliances, including two five ton electric cranes, will be installed and modern methods of handling and storing the raw materials will be used. Mr. J. R. Ferguson, of Galt, is president of this foundry.

Province of Ontario.—The estimates of the Dominion Government include the erection of the following public buildings:—

Athens—Public building	$18,000
Aurora—Public building	6,000
Aylmer—Public building	15,000
Barrie—Public building, improvements of grounds	1,000
Bracebridge—Public building	18,000
Campbellford—Public building	15,000
Dominion—Public building, renewals, repairs, improvements, etc.	20,000
Dresden—Public building	12,000
Dundas—Public building	31,000
Durham—Public building	10,000
Elora—Public building	8,000
Elmira—Public building	5,000
Essex—Post-office	20,000
Fergus—Public building	8,000
Fort Frances—Public building	15,000
Fort William—Public building enlargement	11,000
Gananoque—Post-office	25,000
Goderich—Public building, addition	5,000
Hamilton—Examining warehouse, additions and improvements	10,000
Hanover—Public building	10,000
Harriston—Public building	19,000
Kemptville—Public building	10,000
Kingston—Post-office, addition to building and alterations	50,000
Kingston—Royal Military College, additional dormitory accommodation for cadets	75,000
Kingston—Customs House renewals and repairs to building	1,300
Kingsville—Public building	15,000
Listowel—Public building	21,000
Midland—Public building	25,000
Milverton—Public building	10,000
Mitchell—Public building	15,000
Mount Forest—Public building	14,000
Niagara Falls—Armory	10,000
Niagara Falls—Public building, fittings, improvements, etc.	6,000
Oshawa—Public building, addition to	9,000
Ottawa—Printing Bureau, raise chimney, etc	6,000
Ottawa—Departmental buildings, fittings, etc	25,000
Ottawa—Departmental buildings, improvements in lavatories, plumbing, etc.	12,000
Ottawa—Examining warehouse	300,000

Ottawa—Fuel testing, enlargement of concentrating laboratory	10,000
Ottawa—Old Museum building, Sussex Street, alterations	25,000
Ottawa—Parliament Buildings, improvements	10,000
Ottawa—Departmental Buildings west block elevator	7,500
Ottawa—Parliament grounds driveway pavement	13,000
Ottawa—Parliament grounds, additional water service	2,000
Paris—Public building improvements	5,000
Peterboro'—Post-office building, addition to	3,500
Port Arthur—Armory	49,000
Port Arthur—Public building for Customs and Inland Revenue, etc.	15,000
Port Perry—Public building	25,000
Renfrew—Public building improvements	3,000
Seaforth—Public building	25,000
St. Catharines—Public building improvements	2,500
Sudbury—Public building	20,000
Tilbury—Public building	20,000
Tillsonburg—Public building	20,000

Todd Inlet, B.C. — The Portland Cement Contraction Company has commenced operations on the erection of a million-dollar plant at Todd Inlet, Vancouver Island.

Toronto, Ont.—The City Engineer, Mr. C. H. Rust, has been instructed to find some one willing to remove a large wooden bridge on Toronto Island. The party will have the material for his trouble. The bridge is entirely wood construction and in a fair state of preservation.

Toronto, Ont.—The $600,000 appropriation passed by the Board of Control for the supplementary building estimates include:

New Schools.

Clinton Street	$ 75,000
St. Clair Avenue	55,000
Dovercourt district	60,000
Western Avenue district	60,000
Morley Avenue	115,000
Total	$365,000

Enlargements.

Malvern High School	$ 60,000
Brock Avenue or Kent	75,000
Alterations	55,000
Purchase of sites	45,000

Vancouver, B.C.—A report states that a ten-story steel and concrete office building will be erected for Messrs. Henry Birk & Sons, of Montreal, P.Q. The total investment will be approximately $1,000,000, of which $450,000 is for land value.

Victoria, B.C.—The municipal board of health have impressed the newly formed council with the necessity of erecting an isolation hospital at an early date.

Woodstock, Ont.—The mayor recommended the council to prepare a measure for the erection of a new city hall.

ROADS AND PAVEMENTS.

Aurora, Ont.—Sir William Mulock has made an offer to the town of Aurora to contribute $3,000 towards the expense of making Yonge Street in the town limits a first-class roadway, or as good as that planned by the "good roads commission." Aurora is not in the good roads zone.

Galt, Ont.—The Board of Works has been instructed to call for tenders for a new steam road roller.

Province of Quebec.—The provincial Minister of Agriculture announces that $300,000.00 will be spent during 1912 for road improvements within the province.

Welland, Ont.—The Welland Town Council held a meeting in the Town Hall on Friday evening, the 12th inst., when they instructed the town engineer to prepare at once plans for this year's pavement, said plans to be ready in four weeks, when tenders would be called for, to allow the work being commenced not later than 1st of May. Pavements are to be laid on East Main Street from Grand Trunk Station to Canal Bridge; on South Main Street from Canal Bridge to Michigan Central Station; and on West Main Street from Canal Bridge to Niagara, St. Catharines and Toronto Railway Station. Tenders will be called for three or four different kinds of pavements, and will cover an area of 40,500 square yards. It is further expected that the residents on Hellems Avenue, Division Street, Merritt Street, part of Shotwell and part of Elgin Street will petition at an early date for pavements.

BRIDGES, DOCKS, ETC.

Province of Ontario. — The estimates of the Dominion Government include the following dock expenses for this province. The appropriation for rivers and harbors for Ontario aggregates $1,122,275, of which $547,175 is to be revoted. The details are as follows:—

Brockville—Extension of Tunnel Bay dock	$ 9,000
Cobourg—To repair and reconstruct superstructure on east pier at north end	10,000
Detroit River—Protection of east bank in the Township of Malden, to complete	2,500
French River, Lake Nipissing—Regulating works at outlets	11,200
Goderich—Harbor improvements	150,000
Gravenhurst—Wharf on Lake Muskoka	9,000
Haileybury—Harbor improvements	10,500
Hamilton—Harbor improvements	54,000
Harbors, rivers and bridges, general repairs and improvements	50,000
Huntsville—Wharf extension	1,750
Kincardine—Extension to pier and dredgnig	25,000
Kincardine—Repairs to pier	1,000
Kingston—Royal Military College, renewing wharfs	16,000
Kingston—Harbor improvements	50,000
Leamington—Repairs to wharf	1,000
Lakeport—Reconstruction of wharf	1,600
Lion's Head—Dock extension and harbor improvements	6,000
Meaford—Closing of eastern entrance and removal of L of inner check water	34,000
Montreal River—Removal of boulders in flat rapids	3,500
Montreal River—Improvements above Latchford	35,000
New Liskeard—Harbor improvements	18,000
North Bay—Breakwater	16,000
Owen Sound—Harbor improvements	36,200
Owen Sound—Harbor improvements to repair sheet piling along west side of harbor	3,500
Peterboro—Wharf	13,500
Pembroke—Repairs to wharf and approach	2,500
Port Bruce—Extension of west pier and repairs to east and west piers	1,800
Port Burwell—Improvements to harbor works	50,000
Port Colborne—Urgent repairs to east breakwater	17,000
Port Hope—Repairs to and improvements to piers	9,000
Port Stanley—Harbor improvements	100,000
Providence Bay, Manitoulin Island—Extension wharf	16,500
River St. Lawrence—Improvement of Canadian channel between Kingston and Brockville	60,000
River Thames—Removal of obstructions, etc.	4,000
Rousseau—Wharf repairs	800
Saugeen River—Repairs to north and south piers	1,000
Sault Ste. Marie—Improvements to old Plummer Wharf and approach	32,000
Sault Ste. Marie—Wharf addition to return on west side	8,000
Sturgeons Falls—Completion of dock	1,000
Southampton—Harbor improvements	1,750
Toronto—Harbor improvements	195,000
Windsor—Landing dock and improvements	50,000

TRADE ENQUIRIES.

The following were among the inquiries relating to Canadian trade received at the office of the High Commissioner for Canada, 17 Victoria Street, London, S.W., during the week ending January 1st, 1912:—

A Liverpool firm who are large buyers of dried and pickled fish are open to hear from Canadian shippers.

A Welsh firm interested in a process for utilizing sawdust are desirous of getting into touch with Canadian lumber manufacturers.

A London firm of iron, steel and metal merchants desire to appoint an agent at Calgary.

A London firm manufacturing an extract of coffee desire to open up business in Western Canada.

A Staffordshire manufacturer of fancy earthenware is desirous of appointing Canadian representatives.

A London produce importer would like to hear from Canadian buyers of tomato puree.

A German commission house wish to get into touch with some good furniture dealers in Canada open to handle Russian made bentwood furniture manufactured in the Austrian style.

A Montreal firm of lubricating oil manufacturers make inquiry for the names of United Kingdom refiners of rape oil.

A Toronto firm desire to get into touch with a United Kingdom firm able to supply large regular shipments of castor oil.

A Winnipeg firm desire to get into communication with manufacturers of twist drill bits, such as are used by woodworkers, blacksmiths, etc.

A real estate agent stated to have been established for many years in British Columbia wishes to represent a first-class fire insurance company.

A Toronto firm desire to get into touch with a United Kingdom manufacturer of gasoline road rollers.

A Canadian firm desire to take up the representation of a United Kingdom manufacturer of whiting.

A firm at Toronto are desirous of obtaining the representation of English china clay merchants.

A firm in the Province of Ontario are contemplating the export of maple and basswood last blocks, and would like to hear from United Kingdom users or manufacturers of shoe lasts open to purchase supplies.

A Toronto firm wish to secure the representation of United Kingdom chemical manufacturers, and have an immediate demand for large quantities of sulphur and borax.

A Montreal correspondent is open to take up United Kingdom agencies for inks, glues, dye-stuffs, and other lines excepting dry goods.

Inquiry is made by a Toronto firm for the names of United Kingdom manufacturers of fire engines.

A Canadian firm are open to import Portland cement, and would like to hear from United Kingdom firms open to do Canadian trade.

From the branch for City Trade Inquiries, 73 Basinghall Street, S.E.:—

A London manufacturing firm seeks supplies of special wood handles as used in the production of baby carriages, and would be glad to receive quotations from Canadian manufacturers.

A Yorkshire company manufacturing specialties in wood stains and preservatives, and also paints and enamels, ask to be placed in touch with a first-class Canadian firm who would be prepared to act as their representative.

CURRENT NEWS.

Berlin, Ont.—A society taking the name of the Great Waterways Union of Canada has been organized in this municipality. The object is for the purpose of developing the inland waterways of Canada, and the securing of navigation for ocean vessels on the Great Lakes via St. Lawrence and Welland canals route. The Mayors and Presidents of the Boards of Trade of the towns and cities of Canada will constitute the general committee, and will be invited to signify their intention of acceptance.

Calgary, Alta.—Mayor Mitchell is at present investigating the fire alarm system of some eastern Canadian cities. It is highly probable that a system costing $35,000 to $40,000 will be installed at an early date.

Sydney, C.B., N.S.—The output figures of the Dominion Iron & Steel Company's plant for December are as follows:

Coke	47,121 tons
Pig Iron	30,062 tons
Steel Ingots lb.	30,241 tons
Blooms	24,551 tons
Rails	5,014 tons
Rods	7,509 tons
Sulphate Ammonia	445 tons

BUSINESS.

Hamilton, Ont.—Fire considerably damaged the plant of the Dominion Vinegar Company. The loss is estimated at $20,000.00.

Regina, Alta.—$180,000.00 was the estimated loss to the McCarthy Supply Company when their departmental store was badly damaged by fire.

Moosejaw, Sask.—The Moosejaw Machine Works are now under the control of Saskatchewan Bridge and Iron Company.

Indian Head, Sask.—Damage amounting to $20,000 was caused by fire to the experimental farm buildings at this point.

PERSONAL.

Mr. E. Cousins has been appointed to the position of engineer of the Civic Harbor Commission of Toronto, Ont.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

Each week on this page may be found summaries of orders passed by the Board of Railway Commissioners, to date. This will facilitate ready reference and easy filing. Copies of these orders may be secured from The Canadian Engineer for small fee.

ORDER NO. 15754.

Whereas many general complaints and petitions have been made to the Board against the existing freight rates charged by the railway companies operating in Canada west of Lake Superior, and the Board had been delaying the consideration thereof until the final determination of the Regina Rate Case;

And whereas the Supreme Court of Canada, on the 6th day of December, ultimo, dismissed the appeal of the Canadian Pacific and Canadian Northern Railway Companies from the Order of the Board No. 12520, dated the 10th day of December, 1910, in the matter of the application of the city of Regina (above referred to), requiring the discrimination in favor of points in the Province of Manitoba, and against points in the Provinces of Saskatchewan and Alberta, to be removed by reducing the class freight rates from Port Arthur and Fort William, and points east thereof, to the said points in Saskatchewan and Alberta, and the said dismissal having left the Board free to undertake a wider investigation;

And whereas the tolls of the railway companies operating in the Province of British Columbia are already the subject of enquiry by the Board, upon the complaints of the Vancouver Board of Trade and the United Farmers of Alberta;

And whereas the Board is empowered by the Act, upon its own motion, to hear and determine any matter or thing which, under the Act, it might enquire into, hear and determine upon application or complaint;

Therefore it is declared to be advisable that:

(1) A general enquiry be at once undertaken by the Board into all freight tolls in effect in the Provinces of Manitoba, Saskatchewan and Alberta, and in the Province of Ontario, west of and including Port Arthur, with the view that, in the event of its being determined that the said tolls, or any of them, are excessive, the same shall be reduced as the Board may determine.

(2) A sitting of the Board will be held at the city of Ottawa on Tuesday, the 13th day of February, 1912, at ten a.m., to consider the procedure upon the said enquiry and give directions with reference thereto.

NOTE:—The Board is applying to the Minister of Justice to appoint counsel to represent the public upon the said enquiry.

15696—December 27—Authorizing C.P.R. to open for carriage of traffic its (portion of) Weyburn-Lethbridge Line from mileage 52.2 to mileage 75.85, a distance of 23.65 miles, Ogama to Viceroy.

15697—December 28—Authorizing Esquimalt & Nanaimo Railway to use and operate bridges at mileages 14.0, 54.4, 131.7 and 132.3.

15698—December 26—Relieving C.P.R. from further protection at crossing mileage 45.1 from Place Viger Station.

15699—December 29—Approving revised location of C.P.R. Swift Current to Brooks Branch at mileage 0 to 35.32, Saskatchewan.

15700—December 28—Authorizing C.P.R. to construct its Wilkie Northwesterly Branch across highway at mileage 7.64, Saskatchewan.

15701-02—December 29—Authorizing C. N. O. Ry. to cross three highways in Twp. of Trafalgar, County of Halton, Ontario, and highway in Twp. of Nelson, County of Halton, Ontario.

15703—December 27—Authorizing C.N.R. to construct spur in city of Saskatoon, Sask., north of Seventeenth Street.

15704—December 28—Authorizing G.T.R. to operate its trains through junction at Alford Jct., Ont., without stopping.

15705—December 28—Authorizing G.T.R. to construct spur for National Brick Co., Ltd., at St. Constant, Que.

15706—December 28—Approving certain changes and alteration in G.T.P. Ry.'s revised location in District of North Alberta, Alta.

15707—December 28—Authorizing C.N.O. Ry. to cross seven highways in Twps. of Nelson and Trafalgar, Counties of Peel and Halton, Ont.

15708—December 28—Approving location of C.P.R. Wilkie to Anglia Branch at mileage 24.90 to mileage 40.66 and to cross and divert fourteen highways, mileage 25.55 to 40.66, Saskatchewan.

15709—December 29—Authorizing C.P.R. to construct two spur lines for Imperial Oil Co., Ltd., near Alexander Avenue, Winnipeg, Man.

15710—December 29—Authorizing C.N.O. Ry. to cross three highways in Twp. of Nelson, County of Halton, Ont.

15711—December 30—Authorizing C.P.R. to reconstruct bridge No. 15.3 over Isaac Creek, B.C., Division, Arrow Lake Subdivision, rescinding Order 15681 of December 26, 1911.

15712—December 29—Authorizing C.P.R. to cross with its Estevan-Forward Branch thirty-nine highways in Saskatchewan.

15713—December 30—Approving revised location of C.N.O. Ry. near Nipigon, Ont., mileage 497.16 to 498 from Sudbury Jct.

15714—December 30—Authorizing C.N.O. Ry. to cross eight highways in Twp. of Toronto, County of Peel, Ont.

15715—December 19—Authorizing G.T.R. to take certain lands in city of Kingston for enlarged railway facilities.

15716—December 27—Suspending G.T.P. Local and Joint Passenger Tariff C.R.C. No. 129 relating to "baggage of excess size" until all parties can be heard.

15717—December 19—Approving C.P.R. revision of grade between St. Martin's Jct. and Ste. Therese, and to construct across with double track six highways.

15718—December 15—Amending Order 7112, May 18, 1909, re London Street bridge, Windsor, Ont., and Michigan Central Railroad Co., substituting another plan and providing that new bridge be built during 1912.

15719—January 2—Naming William M. Tisdale, attorney at law, Redlands, Cal., and J. P. Hartman, attorney at law, Seattle, Wash., as commissioners for examination of witnesses in Dawson Board of Trade vs. White Pass & Yukon Route Railways Rate Case.

15720—November 27—Dismissing application of Jos. Hoolahan, of Ste. Agatha des Monts, re rates charged on perishable shipments by C.P.R.

15721—December 30—Authorizing G.T.P. Ry. to construct transfer track to connect with C.N.R. at Portage la Prairie, Man.

15722—January 2—Authorizing Midland Railway Co. of Canada (G.N. Ry.) to operate crossing for construction purposes only until 10th March, 1912, at connection with C.N.R. and crossing of G.T.P. Parish of St. Boniface, Man.

15723—December 30—Authorizing C.N.O. Ry. to construct over Rideau Canal and Rideau River by bridge at Smith's Falls.

15724—November 21—Disallowing tariffs of G.T.R., C.P.R., C.N.O., C.N.Q.R., Quebec, Montreal & Southern, Central Vermont, Ottawa & New York, Central Ontario, 1000 Islands, and Lotbiniere & Megantic, and N.Y.C. & H.R.R. and Rutland Railroads increasing rates on hay and straw from Ontario and Quebec to eastern United States points. These rates were postponed by Order 15080, October 12, 1911, until January 1, 1912, and are now disallowed.

15725—December 16—Directing C.P.R. to, before May 1, 1912, give Samuel Plunkett, of Twp. of Vaughan, County of York, Ont., as good grade over new crossing as over old one before track was elevated.

15726—January 3—Extending until February 15, 1912, time for filing tariffs by G.N.R. on fertilizers for W. H. Haight, Piper's Siding, B.C., from Vancouver and New Westminster.

15727—December 19—Directing G.T.P. Ry. to construct station on Lot 882, Group 1, Cassiar District, B.C., and restraining said company from locating station on Lot 851, Group 1, Cassiar District, B.C. Application Robert Kelly, of Vancouver, B.C.

15728—January 3—Authorizing C.N.O. Ry. to cross public road between southeast and southwest parts of Lot 15, Con. 1, Twp. of Toronto, County of Peel, Ont.

15729—January 2—Authorizing C.P.R. to construct spur for Shawinigan Water & Power Co., Parish of Notre Dame du Mont Carmel, County of Champlain, Que.

15730—January 2—Refusing application of G.T.P. Ry. for approval of location of its Prince Rupert Westerly Line mileage 6.60 to 3.23, Range 5, Coast District, Province of British Columbia.

15731—January 3—Directing C.P.R. to, before May 1, 1912, provide a suitable farm crossing for James Connelly, of Macleod, Alta.

15732—January 3—Directing C.P.R. to, before June 1, construct cattle pass for James Smith, Wolffton, Sask.

15733—January 4—Authorizing C.P.R. to operate siding to Union Stock Yards Co., at Toronto, Ont.

15734—January 3—Amending Order 15580, December 11, 1911, costs of protection to be paid, one-third by G.T.R. and two-thirds by T., H. & B. Ry.

15735—January 2—Directing G.T.P. Ry. to remove suffcient rock fill at Cameron Bay, Prince Rupert, B.C., and to file with Board before February 15, 1912, plan showing location of opening and depth of girders for carrying track, etc. Complaint of firms of Prince Rupert, B.C., re obstruction caused navigation at Cameron Bay.

15736-37—January 5—Approving location of C.N.O. Ry. (Montreal-Port Arthur Line) through Twps. of Widdifield, Commanda, Beaucage and Pedley, District of Nipissing, mileage 346.37 to 366 from Montreal; and through Twp. of Capreol, same District, mileage 0 to 71.81 from Capreol Junction.

15738—January 4—Authorizing C.P.R. to construct two spurs to premises of Port Arthur Wagon Co., Ltd., Port Arthur, Ont.

15739—January 3—Authorizing C.N.O. Ry. to construct branch line from Oshawa station to town of Oshawa, mileage 0 to 3.95, to connect with tracks of Toronto Eastern Ry. Co.

15740—January 4—15741—January 3—15742—January 2—Authorizing C.P.R. to construct spur to premises of Strome Milling and Grain Co., Ltd., at Strome, Alta., and into premises of Swift Canadian Co., Ltd., Winnipeg, Man., also for Messrs. E. Julian Co., Ltd., city of Quebec.

15743—January 4—Authorizing C.P.R. to reconstruct bridge 63.8, Brandon Subdivision, Manitoba Division.

15744—January 3—Relieving C.P.R. from further protection at crossing in village of Campbellville, Ont.

15745—January 3—Authorizing T.H. & B. Ry. to construct spur for Armstrong Supply Co., Ltd., Hamilton, Ont.

15746—January 3—Authorizing G.T.R. to construct spur for Messrs. Schell Bros. and Blow on Lot 49, 1st Con., Twp. of North Cayuga, County of Haldimand, Ont.

15747—January 3—Relieving G.T.R. from further protection at crossing 1½ miles east of Glencoe, Ont.