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The Canadian Engineer

ESTABLISHED 1893.

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PUBLIC OWNERSHIP DISTRIBUTION OF HYDRO-ELECTRIC POWER.

In January, 1906, the Lieutenant-Governor of Ontario appointed a commission, with the Hon. Adam Beck as chairman, to inquire into and report upon the possibilities of generating and distributing as a public ownership scheme, electric energy. Their first report was distributed in April of that year.

The Commission considered the present probable demand for hydro-electric power in the various districts capable of being supplied from the different water-powers within the Province of Ontario. Special attention was given to the condition of affairs in South-Western Ontario and in that section referred to usually as the Niagara district.

The Commission decided at this time that there was a market for at least 50,000 horse-power within a reasonable radius of Niagara Falls, and that if trunk transmission lines capable of carrying large quantities were constructed, the demand would increase to at least 100,000 horse-power.

The consideration of the conditions existing at Niagara Falls led the Commissioners latterly to recommend the purchasing of electrical energy in a large block from one of the existing companies rather than erecting a new power-house along the Gorge. Prices were submitted, and it was decided that the Union of Municipalities, under the direction and advice of the Hydro-Electric Commission, would attain better results by buying their power and transmitting it than by generating and transmitting. Accordingly, trunk transmission lines were constructed to Dundas, Toronto, Guelph, Galt, Berlin, Woodstock, and lines are planned as far west as Windsor. Work was commenced, and this week there was celebrated at Berlin, Ont., the inauguration of one of the most extensive, intricate, and yet successful public. ownership schemes that this continent has or may expect to see.

Ontario, and especially Ontario bordering on the lakes, has been a manufacturing district. The electric companies have in a number of cases made contracts at very low prices for the supply of electric energy, but the supply at low prices has been very limited. Cost of manufacturing was increasing. The possibilities of cheap manufacturing in other centres was becoming greater; in fact, for a time, even in the Niagara district, the cost of electricity to the customer from the largest power plant was just a fraction under what it would cost him to produce the same amount of energy by steam or gas, or other local sources of power.

These municipal-owned power lines have placed the manufacturers of the towns along the trunk transmission lines in a position to compete with the most favored plants close to Niagara Falls. Even if the cost of electric energy is slightly more than is paid at Niagara, transportation and labor conditions in their locality are so much superior that they are easy competitors.

This large claim will test the possibilities of successful operation of Government ownership of utilities. The wide distribution of the system will make it susceptible to all the abuses that such a scheme may be subject to. The partnership is so large and varied that the adjustment of capital and maintenance charges will entail much patience and skilful handling.

The Commission, the Government and the engineering staff are to be congratulated that they have so quickly completed the building of this system, and we trust that its maintenance and operation will be as successful as has been the construction and inauguration.

TORONTO'S BUILDING BY-LAWS.

The building code of any city is likely to be unsatisfactory to a few. As a usual thing building codes are too lenient in the restrictions they place upon the individual builders.

In the city of Toronto it has long been felt that the building codes were unnecessarily strict, and because of the expensive construction required the builders had to sink large sums unnecessarily in the structure or choose less permanent design.

The Engineers' Club, of Toronto, are endeavoring to bring together the various technical societies of the city with the object in view of preparing a new building code such as, they hope, will receive the approval of the city architect.

This will require long and careful consideration, and much careful computation and calculation will have to be made, and we think that as soon as the club has organized, the interested societies would be justified in approaching the Board of Control of the city of Toronto and asking for a special grant that they might employ a person or persons to give some months to the tabulating of information in the carrying on of experiments such as will be necessary to convince that a newer and less strict code is in the interests of the city as a community.

THE ART OF LAYING OUT CITIES.

In 1903 a public exhibition of city building in its various forms was held in Dresden, Germany. Since that time the subject has received very great attention from the technical, artistic, social, economical and sanitary societies of continental Europe and Great Britain. During the past year the engineering societies and the technical press have discussed the matter at great length and in almost all its phases.

This summer in Berlin another and larger international exhibition was held, and visitors from Great Britain, France, Canada, the United States and Japan came to examine the models and to discuss this new movement. So great has been the interest in this second that the models were transferred to Antwerp, London and Düsseldorf.

In the newer centres of Canada the difficulty and expenditure of city planning are small compared with the great work of rebuilding and remodelling the old cities. with their narrow, crooked streets and substantially built, if unsanitary, dwellings, shops and factories.

The demand for quick transportation almost necessitates radiating streets. The high speed developed by automobiles requires wide avenues and the directing of traffic in certain limits. The wide avenue would be as picturesque as the narrow street, but with squares and monuments and carefully-kept boulevards it can be a thing of beauty as well as an avenue of utility. If our Canadian architects, park commissioners and city engineers would learn and profit by the experience of older centres, they would plan their city so that the future generations would not find it necessary to tear down and waste the work of the present years.

THE CIVIL ENGINEER'S OPPORTUNITY.

The value of an engineer's service does not depend upon the amount of work he personally performs, but upon his ability to secure good work from others. It is for his executive more than for his professional ability that he receives his remuneration.

An engineer must first make a fair start in the practice of his profession; he must be familiar with the details of various kinds of work, but continuous performance will not necessarily bring advancement. Advancement comes with opportunity combined with energy, intelligence and good judgment.

Usually an engineer's opportunity is the result of the confidence and loyalty he has been able to establish with and among men who have been his fellow-workers. It is working together as one unit, of a body of men that accomplishes results. Disasters in work are usually more frequently the result of disloyalty than of errors in judgment. The effort of some members of the staff to absorb all the credit and their activity in underestimating the good judgment of others leads to more engineering failures than bad design.

The student at the engineering college must not imagine that a university diploma is the key that will open the door to professional success. Success in engineering is a slow process of absorption. Experience is that which classifies engineers; even the literature in engineering reference books should not have too much weight attached to it.

Not more than fifty per cent. of the students who enter upon a course in engineering graduate and enter the engineering profession. Of this fifty per cent. it will only be for a few to become prominent in their profession. Aside from this, however, they will become prominent in walks of life that their engineering training will fit them for.

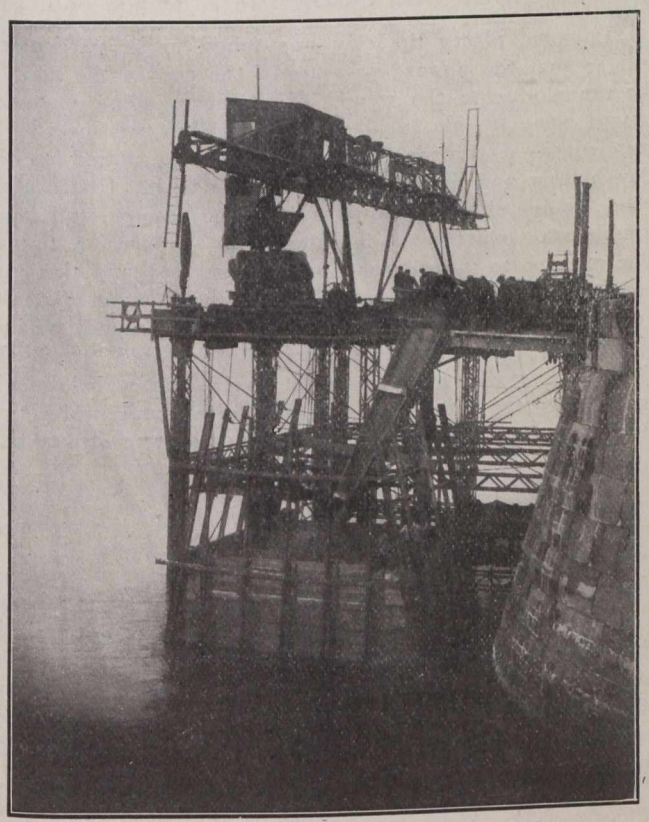
Whether times are good or times are bad, there will always be openings for young graduates full of life and energy who are content to lead the life of a Bohemian. His place in the profession will be largely governed by the opportunities of his early experience and his liking for the life.

PERCY'S PATENT LOCOMOTIVE STAGE.

A want which has been felt by contractors for years seems to have been met in the invention of a locomotive stage for marine and river work. The invention provides a rigid self-contained stage which can be made to any shape, design or strength to meet the requirements of any possible kind of work or site. This stage takes the place of expen-

sive temporary stagings on false works and can also take the place of costly floating plant required for carrying any sort of appliances used in such work.

This locomotive stage rests firmly on the sea or river bed on hard bottom under silt or sand and can be easily moved without removing a single bolt or connection in all



Locomotive Stage made secure and carrying temporary staging.

directions—ahead, backwards, sideways and around corners. Though so mobile it is perfectly safe and rigid under all conditions of weather and is neither affected by heavy waves, strong tidal or other currents, nor by the swell of the tide and is not affected by blasting or other disturbance immediately below it.

This result is obtained by supporting the stage on two or more pairs of spuds. Normally, while work is proceeding, or when stage is made secure, all the spuds are down and so contribute to the support of the stage. When it is required to move, each group of spuds is successively lifted and moved horizontally, while the whole structure rests on the other group or groups of spuds. The horizontal movement of the spuds is made possible by the special construction of the stage, which consists of a number of parts, never less than two, movable relatively to each other in a horizontal direction, but immovable vertically and therefore supporting each other in any position. Both parts if there be only two, or not less than two parts if there are more than two, are provided by spuds worked in the ordinary way. With a few rollers, pulleys and ropes, a number of hand wrenches or crabs, the necessary timber and bolts, a cheap stage can be rigged up on shore in the dry and then marched out to its position in the water and subsequently moved from time to time as may be necessary. For large works, where specially heavy and durable plant is essential, the most elaborate, mechanically perfect and well equipped power-driven stages can be constructed and moved within limits with almost the same ease as a floating plant. Any amount of variations can be made in the general form and arrangement of the stages.

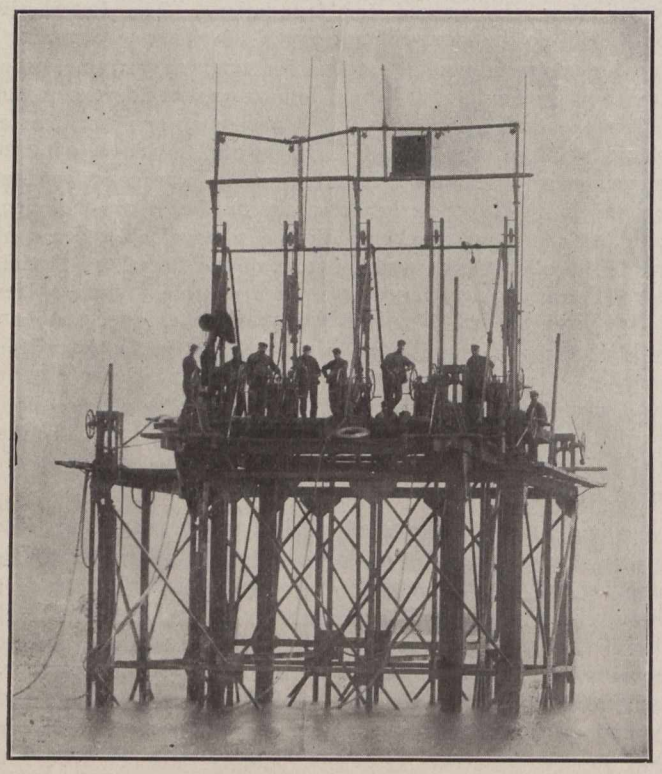
The Locomotive Stage will carry sea dredges, excavators, steam shovels, submarine rock boxing and blasting plant, rock breakers, diving bells, pile drivers, cranes, conveyers and materials for building breakwaters, piers and getties. By means of it caissons, dolphins and stages can be moved out to sea or into the middle of a river and placed exactly where they are wanted for foundations. The Locomotive Stage will do the most difficult wreck salvaging work and will provide movable landing stages for temporary traffic, troop transport or ferries. Its great advantages beside the matter of cost lie in the facts that it will not sink when run into, as would a barge, and it will not sway up and down with the movement of the water. The first stage was conceived and erected in 1908 at Peterhead, on the northeast coast of Scotland, to carry out a scheme for the removal of 10,000 cubic yards of solid granite rock in front of the Peterhead Harbor, spread over a fairly large area, to a depth of about 24 feet below high water. The position was so exposed that any slight change in the wind would bring up a heavy sea quickly. During nearly a year's work, in which no expense was spared to hustle the work, little more than 1,000 cubic yards were removed. It was then that Mr. Percy invented the Locomotive Stage and it was brought into operation with most successful results.

This first stage was of a size as follows: The outer frame was about 35′ 0″ x 24′ 0″ and the inner frame was about 24′ 0″ x 15′ 0″ and these frames or stages were 26′ 0″ high. The spuds were 45′ 0″ long by 14″ x 14″. Five heavy Ingersoll drills were mounted on the inner frame and the total weight of the frame with the boring gear complete was 55 tons. Holes were drilled five feet apart each way, eight pounds of dynamite was used for each charge and fired without moving the stage. The saving in cost and time at Peterhead is represented by the following figures: When using barges and etc. 1,500 cubic yards of rock was moved in 18

Men may be conveyed in baskets to the stage in rough weather.

months, cost $15,000.00; when using locomotive stage 8,500 cubic yards of rock was moved in 8 months, cost $20,000.00 This stage at Peterhead cost $3,000.00 so the saving effected was over $35,000.00.

Two larger stages are now in use at Whitby on the north-east coast of England for the work of extending two piers or breakwaters. The estimated cost of ordinary stages for this job was $35,000.00, whereas, the cost of the two locomotive stages was only $18,000.00, showing a saving in cost of staging alone of $17,000.00 apart from doing the work better and quicker.



Locomotive Stage with Working Appliances and Crew.

Mr. Chas. Guest Norris of Manchester, England, brought a working model of the stage complete with winches, etc., and is negotiating for working of the invention both in Canada and the United States. Mr. Norris has been staying at the Russell House, Ottawa, and has brought the matter before the government engineers who consider the invention may be of material service to them.

MANAGING A CLAY BOTTOM IN A TUNNEL.

Tunnel work for sewers, being usually near the surface, often encounters very troublesome obstacles in a combination of different materials, and sometimes in clays which seem to leave no foundation fit, or possible, to work on.

An interesting example from a piece of tunnel work in connection with the new sewerage work in Louisville, Ky., is given in the report of the chief engineer, J. B. F. Breed, and Harrison P. Eddy of Boston, consulting engineer.

This was a tunnel nearly 1,300 feet long, the driving of which was made difficult, among other causes, by the variation in the depth of rock. In some places the headings were entirely in rock, in others, entirely earth, while for about one-fourth of the distance the roof was in earth and the lower part of the tunnel was in rock. The method of construction adopted by the contractor was to first drive the entire length of tunnel between two shafts, then to start the concrete in the centre of the drift, working in each direction toward the shafts. In the headings, which were wholly in earth, the wet, blue clay encountered was rendered soft and unstable by the continual disturbance caused by working upon it and by the passage of men and cars over it. This condition was avoided by building a sub-invert of concrete five inches in thickness as fast as the tunnel was driven and upon and over which the employees could work and pass back and forth without causing any softening of the material underneath.

In some places the clay was found to be particularly soft so that the upward pressure of the clay in the floor of the tunnel due to the weight of the surrounding material, caused some trouble in placing the concrete sub-invert. In such places a three-inch oak platform was placed on the clay bottom and on this the sewer was built. Under Mellwood Avenue similar conditions were encountered, and much trouble was experienced in attempting to drive a tunnel. The attempt to tunnel was finally abandoned and this portion was built in open cut, by which method no difficulty was experienced, apparently because of the reduced amount of walking over the clay bottom. In the open trench the clay was removed to a depth of twelve inches below subgrade, this excavation being refilled with gravel which provided a satisfactory foundation for the concrete structure.

RODGERS vs. C.P.R.

This was an action tried at London on October 3rd, before Mr. Justice Teetzel and a jury, in which the plaintiff claimed $20,000 damages for injuries received through the negligence of the defendant company in maintaining, at Ayr station of the line of the company, a stand pipe in such close proximity to the track as to endanger the employees of the company.

It was shown in evidence that the plaintiff was fireman on the engine of a passenger train running between London and Toronto, on the day of the accident; that as the train was approaching Ayr station an explosion was heard under the engine; that the fireman, who was standing between the engine and the tender, leant out to look under the engine to see what the trouble was; that he was struck by a stand pipe placed between the main line and the passing track, and that he was thrown from the engine to the ground, and that the distance between the cab of engine and stand pipe was 18 inches. Evidence was given by the plaintiff who described his actions prior to the accident, by the Hon. Adam Beck, who was on the train, and helped to lift the plaintiff, by the surgeon of the hospital at Ayr, who described the injuries as being a severe wound on the head, and the fracture of two vertebrae of the back-bone and injury to the spinal column, and who also described the operation he has performed to reduce the fracture which had caused severe paralysis of a large part of the body, but which as a result of the operation was now confined to the legs. He and other surgeons who had examined the plaintiff doubted whether he would ever be able to use his legs, the most optimistic saying that perhaps he might at some time be able to move for short distances assisted by crutches.

Evidence was also given by Mr. Hall, superintendent of water service on the M.C.R., and by Mr. F. L. Somerville, consulting engineer of Toronto, as to the distance other railways placed water columns away from the tracks.

After addresses by Mr. G. E. Gibbons, K.C., for the plaintiff, Mr. Hellmuth for the defendant company, and by the judge, the jury returned a verdict for the plaintiff assessing the damages at $13,500.

REPORT OF THE METROPOLITAN SEWERAGE COMMISSION OF NEW YORK.

In 1906 the Legislature directed the city of New York to appoint a Metropolitan Sewerage Commission. The Commission has recently issued a most complete report dealing with the whole subject of sewage pollution of the waters in the vicinity of New York city.

The report at once constitutes a "**classic**" in sanitary literature. The character of the data collected with reference to studies of tidal phenomena in harbor waters and the influence of sewage pollution upon shellfish, bathing and general local nuisances affecting the public health will be read and studied with great interest by sanitary engineers throughout the world.

The most important feature of the report is at once apparent in that the question of sewage pollution, or possible sewage purification, is intimately connected with the principle of dilution, or the capacity of the waters of New York harbor to assimilate sewage.

In Canada, in connection with the Great Lakes, the problem of the ability of large bodies of water to successfully take care of sewage effluents is most important.

In connection with the city of Toronto there exists an excellent example of the clear failure of the waters of Toronto Bay to assimilate the sewage of the city without danger to public health. Lake Ontario, viewed as a whole, with its hundreds of square miles of water surface, has the undoubted capacity of assimilating the sewage of many hundred cities without producing apparent change of character. The difficulty, however, is the impossibility of obtaining general diffusion.

It would appear, and more especially so with quiescent bodies of water, unaffected by tidal influence, that only a comparatively small or local portion of any large body of water, no matter what the extent of the whole, can be relied upon for assimilating sewage.

Although the above deduction applies more acutely to inland waters than to tidal, it also applies to the latter to a degree, depending upon the extent of drainage area and population.

Referring to New York harbor, the Commission states:—

"The growth of this enormous population, with its manufactories, markets and industries along the borders of the harbor, has gradually resulted in polluting the harbor water sufficiently to attract public notice. The more important communities which lie about the larger bodies of water, such as the five boroughs of New York, Newark, and Jersey City, have heretofore given little attention to the question of the ultimate disposal of their sewage except in the manner practised since the earliest times: that of dumping it into the harbors and rivers. The larger communities, however, are now approaching the time when their local waters are becoming overpolluted, just as the smaller districts reached this situation some years ago."

The history of other large centres is repeating itself at New York. The situation is neither unique nor exceptional. Large centres of population in other parts of the world situate at or near large bodies of water have had similar histories.

Sewage disposal by dilution, more so in its earlier stages, lays popular claim to perpetual efficiency. The amount of sewage at first appears so small, and the body of water receiving it so great, that any future occurrence of nuisance is not even considered. London, however, has now her main drainage works; Chicago has diverted her sewage from Lake Michigan to the Mississippi River through an artificial canal of size comparable with a ship canal; Marseilles takes her sewage to the sea through a large tunnel; the city of Mexico has extensive works to conduct her sewage from the centres of population; Boston has her metropolitan main drainage works to abate nuisances in her harbors and inland waters; Baltimore is building extensive works for sewage purification; and Hamburg, Glasgow, Dublin and Belfast have elaborate systems to secure the satisfactory disposal of their sewage. There may also be added the large number of seaside resorts, which, although they have the wide expanse of ocean at their feet, have been compelled to treat sewage in order to avoid local nuisance. The experiences which the cities around New York harbor are undergoing contains nothing new.

The following are among the main questions and answers dealt with by the Commission:—

Question—What methods of collecting and disposing of the sewage and other wastes which pollute, or may eventually pollute, the waters are most worthy of consideration?

Answer—The methods of collecting and disposing of sewage in the metropolitan district most worthy of consideration are district collecting sewers leading to local works for purifying the sewage to a greater or lesser degree, depending upon the facility with which the effluent can then be disposed of without injury to the public welfare. The principles of purification most worthy of consideration are sedimentation, screening, filtration and sterilization, applied with such modifications as experience in other places and local circumstances indicate.

Question—Is it desirable to establish a sewerage district in order properly to dispose of the wastes and adequately protect the purity of the waters, and, if so, what should be the limits and boundaries of this sewerage district?

Answer—It is desirable to establish a sewerage district in order properly to dispose of the wastes, and the Commission believes that this would be the best way in which the sanitary condition of the harbor could be conserved. The most desirable limits for the sewerage district would include a territory of about seven hundred square miles, about half of which would be in New York and half in New Jersey.

Here we have recommended an interstate metropolitan sewerage district, with a further recommendation of an interstate sewerage commission to be established by Acts of the Legislatures of New York and New Jersey, these Acts to be confirmed by Congress, the purpose of this commission being to effectually guard the tidal waters around and about New York from sewage pollution.

The policy of creating drainage areas, under controlling central authorities, independent of the chance boundaries of provinces, states, or municipalities, is the only one by which the conservation of the purity of the lake and river waters of this continent can be maintained efficiently. The subject is not only interstatal and interprovincial, but it is also international.

In England the policy of forming Conservancy Boards in connection with the larger rivers has been in vogue for some time, as instanced in the Thames, Mersey and Irwell, and Yorkshire Rivers' Boards.

It simply amounts to this: **Unfortunately, geographical boundaries, as between separate states, or separating municipalities, do not conform to watershed or drainage areas.** Consequently, separate action is ineffectual, and only by joint action can efficient administration and results be obtained. Consider the case of Ottawa, located in Ontario, and polluting a river which is enjoyed both by the inhabitants of Quebec and Ontario. Here interprovincial legislation is surely necessary in order to form a Joint Commission or Rivers Board, representing both provinces, to administrate conservancy regulations for the Ottawa River and its tributaries.

Again, taking into consideration the location of the city of Toronto. The whole of the lake water in the vicinity of the city shows varying degrees of pollution. Pure Lake Ontario water contains about ten bacteria per cubic centimetre, but the water at the location of the water supply intake may contain as many or more than 5,000 bacteria per cubic centimetre, the difference representing the amount of pollution due to the harbor or bay receiving the city sewage, and also due to the discharges from the Rivers Humber and Don, which are both highly sewage contaminated.

In order to redeem the purity of Lake Ontario water in the vicinity of Toronto it will be necessary to form a Sewerage Commission, controlling not only the sewage discharges from the city itself, but also all the other influences which are calculated to pollute the lake in the neighborhood of Toronto. Such a commission would control the conservation of the watersheds of the Don and Humber, and also regulate the sanitary arrangements in connection with shipping.

In the case of the city of Winnipeg, most of the raw sewage discharges into the rivers untreated. If the question, "Why is this permitted?" is asked, it is answered: Brandon and Portage la Prairie do the same further up stream, and the Red River flows from over the States boundary. In the case of the Red River, only by international legislation and intervention could the purity of the river be maintained, while in the case of the Assiniboine, a Provincial Rivers Board is required, which will commence at the upper reaches of the river and gradually redeem the purity of the water from the source downwards.

The prevention of pollution of waters by sewage cannot efficiently be left to the administration of local authorities, but must be controlled by representation of all those interested in the prevention.

We strongly recommend a study of the report of the Metropolitan Sewerage Commission of New York to all who are interested in the problem of the conservation of the purity of Canadian waters.

THE STERILIZATION OF WATER AND SEWAGE EFFLUENTS.

By Mr. H. C. H. Shenton, F.S.E., M. I. Mun. E.

There is some difference of opinion among chemists and bacteriologists as to the method of application of a sterilizing agent, especially in the case of hypochlorite of lime, and the author would urge the necessity of settling, once and for all, whether the sterilizing agent should be added before or after the organic matters have been filtered or settled from the water. The author suggests that sterilization should be limited to the removal of harmful organisms, that the removal of organic matters should be effected by other means, and that in no way should sterilization be allowed to take the place of the preliminary processes. It is however, clear, on the other hand, that if the preliminary processes are used for the physical and chemical purification of the water only, and do not have to deal with bacteria, they may be worked at an increased rate, and consequently their area or extent may be reduced. A sand filter, for instance, may deal with the organic matters in suspension satisfactorily, but may fail to remove the bacteria satisfactorily till a thick scum has formed on its surface, causing a very slow rate of filtration. The size of the filter has to be in proportion to the slow rate of the flow. There appears to be excellent authority for saying that the proportion of chlorine required to remove the harmful organisms from water or from sewage effluent is very small, provided that the water is free from organic matter. Again, it should be noted that as the water becomes worse the larger is the amount of chlorine required. Thus, in the case of sewage effluents, the Guildford experiments showed that the effluent from a very fine third contact bed treated with .5 part of available chlorine per million, contained less than .2 coli per cubic centimetre, the initial content being from 1,000 to 10,000. The effluent from the second contact bed, however, which would contain very much more organic matter, required 10.6 parts of available chlorine per million. Similarly, the effluent from the first contact bed required 20 parts per million, and the septic tank effluent required from 25 to 44 parts of available chlorine per million, while the sewage itself required from 50 to 70 parts of available chlorine per million. All evidence appears to point to the fact that it is possible to deal with the coli in a well filtered water or sewage effluent with a very small dose of available chlorine, but that if the effluent is not well filtered, or if it contains organic matter in suspension, the quantity of chlorine must be enormously increased. It is admitted that the amount of organic matter present in sewage effluents practically determines the amount of chlorine which it is necessary to use, a fact which has been amply borne out in other cases. The Boston effluent (which was recently reported upon by Mr. E. B. Phelps) contained, on an average, about .213 parts of organic matter per million before it entered the tank, and about 124 parts per million after treatment. It is clear, therefore, that this effluent contained an enormous quantity of organic matter, which might have been intercepted with comparative ease, and that though excellent results were obtained, about 3.5 parts per million of available chlorine being sufficient for the treatment, yet the proportion of chlorine required would obviously be much less in the case of a well-filtered effluent, and the cost of treatment would be reduced in proportion. This same state of affairs appears to have existed at almost all places where sterilization experiments with sewage have been carried out. The chemist has tried to make the sterilizing agent do the work of the filter. After describing several experiments in the United States on water purification, Mr. Shenton said: The object of adding hypochlorite to the water with the coagulants has been to reduce the quantity of the coagulant required, and consequently to reduce the cost of working. The desired result has been obtained, but the question arises whether it would not also have been obtained with greater saving by adding the hypochlorite at the end of the process instead of at the beginning. It was possible to reduce the amount of coagulation, not because the hypochlorite acted as a coagulant, and apparently not even because it attacked the organic matter; the reduction was effected because the bacteria being de-

stroyed by the hypochlorite it became unnecessary to remove so much organic matter from the water. There may be some advantage which is not apparent to the author in adding the sterilizing agent to the water before filtration with the coagulants, but evidently authorities are not agreed upon the point, as is shown by the different methods adopted, it being clear that it has been considered desirable to add the sterilizing agent with the coagulant after coagulation and before filtration and also after filtration in various cases. The settlement of this point as to the best condition of the water for receiving the sterilizing agent is much to be desired. If it is established that everything should be done that is practically possible to remove the organic matters from water before it is sterilized, the work of the engineer will be much clearer; the removal of organic matters in suspension from water or sewage being a matter which comes within the province of the engineer. In the case of sewage, whether sterilization is carried out or not, the engineer nowadays, in this country at any rate, if not in America, takes care to make the effluent as clear as possible. The author has found that this clarifying process does not involve any great expense, very simple filters filled with clinker siftings or other suitable substances will produce very good final filtration; humus tanks also are not difficult to arrange, as they require no extra fall, but it does not seem reasonable that one should use these filters or humus pits as sterilizing tanks, for the reason that they must contain an enormous amount of organic matter, which must increase the quantity of sterilizing agent required; neither does it seem in any way necessary to do so, seeing that comparatively short contact will produce the required degree of sterilization.

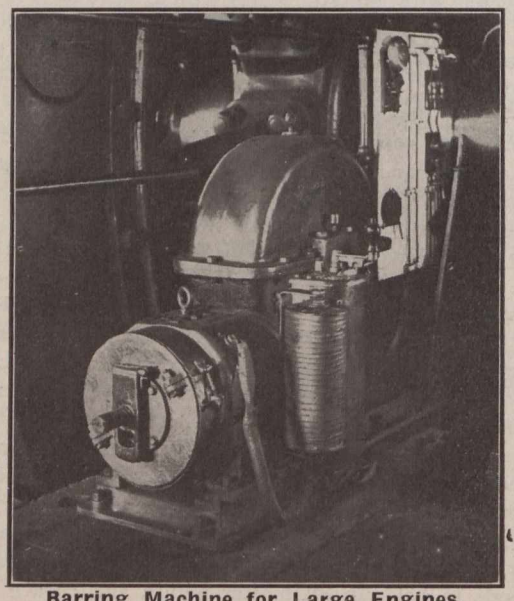
Alleged Pollution of the Sea.

"Some Dangers of Sewage Pollution in the Sea, and the Effects connected therewith," was the title of a paper by Mr. Edgar Newton, recently read before the Royal Sanitary Institute Congress. He maintained: 1. That the practice of sending untreated sewage into the sea was a danger to (a) our fisheries, as instanced by the cases of typhoid outbreaks having their origin in sewage contaminated oyster beds; (b) to our fisheries, as instanced by tendency to the depletion of fish, and to (c) sea bathing from the pollution of the water, and the offensive matter causing deposits on the foreshores. 2. That a study of the relative actions of tides suggested that at present sewage is often brought to the foreshores, instead of being carried right out to sea as is generally supposed. 3. That discharging crude sewage into the sea should be stopped before existing and increasing evils bring further trouble. The possible danger to a flourishing seaside town from an outbreak caused by sewage contamination may be conjectured from the desolation caused at Worthing by typhoid some years ago. When we consider the thousands that are spent to make seaside towns attractive, one is surprised that the dangers arising from sending the filth, consisting of many forms from domestic uses, washings and refuse of chemical works, gasworks, institutions, stables &c., of these large towns into the sea, is so lightly thought of. A further danger now presents itself from the use of tar, &c., on roads, which proves fatal to fish-life in our rivers, unless carried out with great caution. The author admitted that the sea water had its purifying effect on sewage to a certain extent, not only from its composition, but by the action of the waves in aerating it. When on the surface the sewage can be plainly seen, indicated by large floating patches of a brownish oily coloring at certain times, often accompanied by flocks of sea-gulls and other birds, who follow it along on the water. Here, again, the angler in his boat has opportunity for realization. In the case of low-lying towns, where there is but little pressure or fall in the mains to break it up, in addition to loss of velocity by friction, before being discharged into the sea; and that all excreta contains gases from the body until broken up; in addition to this, the higher temperature of the sewage itself, often above that of the sea; also the fact of varying atmospheric pressure, all aid it in rising to the surface, diffusing impurity as it does so. When it is broken up the heavier matter sinks, again distributing itself, is carried by the flow of the tide, and as all floating bodies displace their own weight of the liquid in which they float, it is evident that they will not sink so rapidly in the denser sea water as in fresh, therefore it is reasonable to suppose that whilst these deposits are in process of sinking (from the surface to which they have been born in their gaseous state), being carried by the tide at the same time, they gradually come shorewards, and in the more shallow waters are there deposited. We often see in rivers during hot weather the surface covered with a fermenting scum which, during its process of rising, permeates the whole body of water to the surface, arising as it does from the deposits and organic matter below in contact with the warmer water. A Government inquiry in the case of typhoid outbreak held about two years ago at certain barracks on the coast, after a full and exhaustive inquiry, finding no reason elsewhere, turned full attention to the Marine Swimming Baths, the supply of which was take directly from the sea, where there is a deep water and a fast flow of tide, and which pipe acts as an outlet also. This pipe was then to be seen on the beach at low tides, but now it is no longer visible, being covered with shingle, which has to be dug away from it on the days of emptying, which again shows how the tides deposit all material shorewards. The extract from the report reads thus: "In endeavoring to ascertain whence the greenish black deposit was derived, holes were dug in the beach near the seaward end of this pipe. After digging through a few feet of shingle, a layer of mixed shingle and sand was met with at a lower level than the orifice of the pipe. This layer was only a few inches in thickness, but it was very hard, having almost the appearance of a layer of concrete. Below this the sea sand was clean. A similar hole dug by the sewage outfall showed clean shingle, but below the concrete like layer the sand was black and smelt offensively. The swimming bath is emptied twice a week, on which days it is washed out with fresh water from the fire-hose with considerable force. In addition, the bath is scrubbed out on Saturdays." It is said that since the time previously referred to this bath has been filled with fresh water only, and not a single fresh case has occurred. Then again, the flow of the tides often forms at a certain distance out, a compression of the inner waters (similar to that produced at Bournemouth), which tends to hold up all matter within such space and so further assisting deposit to come inshore. This being the case, the tidal flow at the bottom being comparatively sluggish, and the various deposits being there also, may not this tend to account for depleting the species of fish known as flatfish and shellfish, combined with the various forms of life that form the food of these creatures in their infancy, whilst the products from tar, &c., in its various forms may tend to drive away from our shores, if not to kill, certain of them, as by poisoning the ground the various forms of life that form their natural food are prevented, to an extent anyhow, as well as injury to ova deposited. A further point of great importance is, that certain kinds of fish, including prawns and shrimps, whilst not feeding directly on sewage themselves, do so on other smaller forms of life that do, and are so infected. The sewers also emptying at the lowest levels, the impurities are constantly rising and diffusing in the body of water above,

where the fish known as round fish or those frequenting the higher waters, as well as the shellfish supported on piers and the like often exist. It is well known that the waters containing chemical solutions kill off other fish. May not this and the sewage water afford some explanation to this problem? Why should our coast towns be treated differently from our inland towns? Many of them have the main sewers falling on to, often, waste land, and by intercepting these at a suitable point and inserting some system of tank treatment for the precipitation of this sewage, before passing it into the sea, might, in many cases, be carried out at a comparatively small cost, compared with what an epidemic would. The paper concluded with a reference to the recent discussion at the Plymouth meeting of the Institution of Municipal and and County Engineers.

A CONVENIENT APPLIANCE FOR BARRING OVER LARGE ENGINES.

The operation of barring over an engine, when it becomes necessary to change without steam the position of the piston for the purpose of making repairs, setting the valves, or any other such purpose, is often a very hard task. In the case of large engines the acceleration of all the parts that move, and sometimes of several driven machines as well, requires the combined efforts of several men applied with a large leverage. The time of these men can be saved by a motor-driven appliance such as the American Ship Windlass



Barring Machine for Large Engines.

Company, Providence, R.I., designed to do away with the difficulty attending the turning over of a large engine at the works of the Stanley Company, Bridgewater, Mass.

The illustration shows the barring machine geared to the flywheel of a 32 and 36-inch by 60-inch engine, nominally rated at 2,000 horse-power, and running at 75 revolutions per minute. The engine drives seven pairs of rolls for sheet steel—four pairs of 14-inch and three pairs of 10-inch. The motor drives the spur gear shown in the cut through the spur-gear reduction, and the worm gear, which are enclosed in the housing. The pinion shown engages an internal rack on the inner rim of the 20-foot, 75-ton flywheel. When the machine is not in use, the housing and pinion are drawn out of contact with the rack by means of a hand lever. The entire machine is mounted on one bedplate.

The 11 horse-power Westinghouse type K. motor runs at 700 revolutions per minute on a 220-volt D.C. circuit. It turns the flywheel through one revolution in about a minute. It is especially adapted for this and similar classes of service where a heavy starting torque and a considerable variation of speed are required. The motor is controlled by a Westinghouse type R,—53 reversing controller having five forward and five reverse notches that permit the speed to be adjust d over a considerable range.

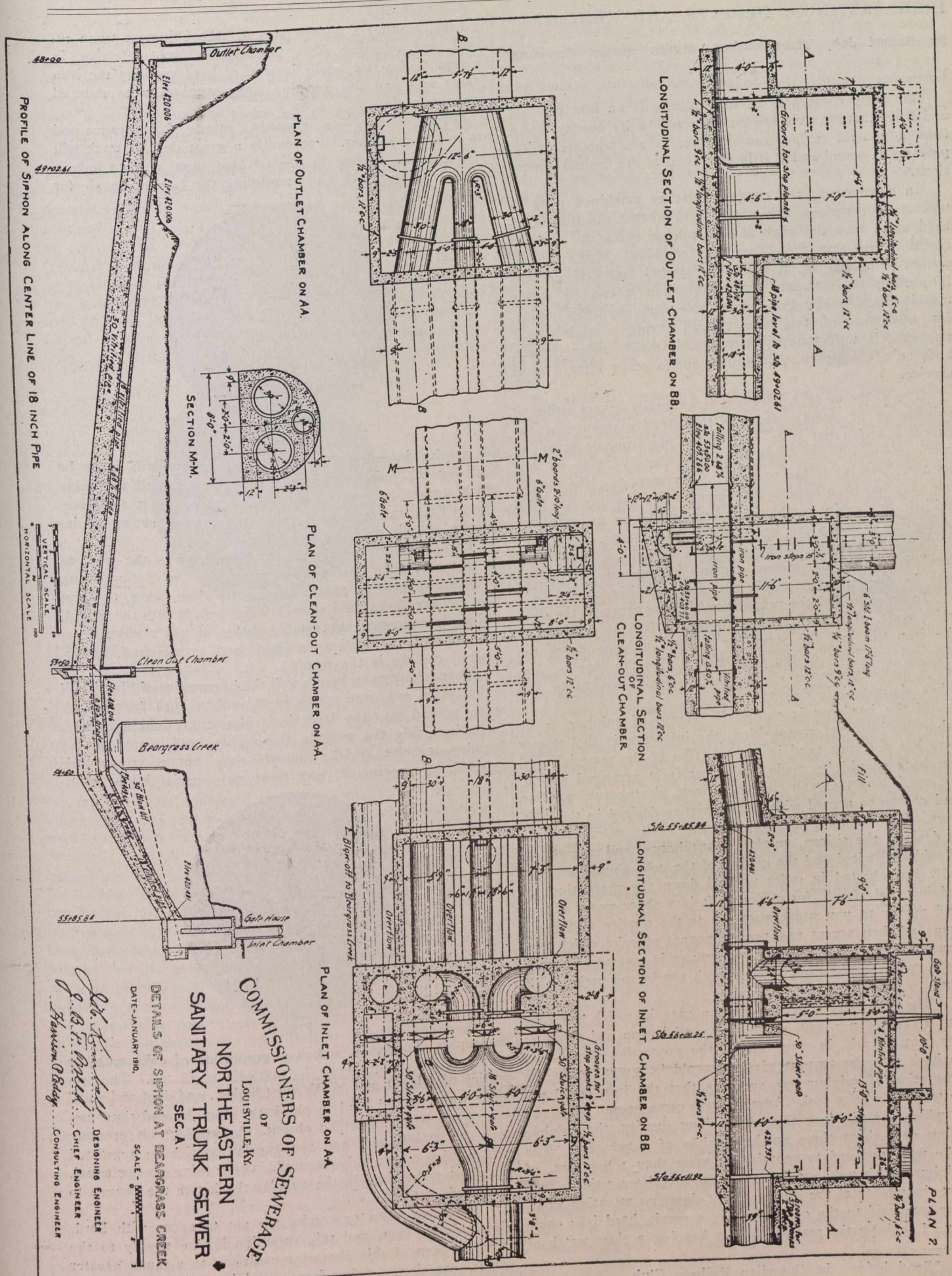
An alarm bell is so connected with the barring appliance that it rings during the entire time that the pinion is in contact with the rack on the rim of the flywheel. By reminding the operator to throw the pinion and rack out of mesh before starting the engine forward, this warning bell serves to prevent damage to the motor.

AN INVERTED SIPHON IN THE LOUISVILLE, KY., SEWERAGE SYSTEM.

An interesting example of an inverted siphon in the line of a trunk sewer is furnished by one of the main lines in the new system of Louisville, Ky., described in the report of J. B. F. Breed, chief engineer; and Harrison P. Eddy, of Boston, consulting engineer.

In this case the northeastern sanitary trunk sewer has to be sunk below its grade in order to cross beneath Beargrass Creek, the bottom of the creek being below the invert level of the sewer on each side. The sewer, forty-eight inches in diameter, is replaced for a distance of about 800 feet by a siphon composed of three pipes, two of which are thirty inches and one eighteen inches in diameter. These are vitrified clay pipes incased in a generous amount of concrete. At the eastern or inlet end of the siphon there is a chamber into which the sewage will flow, and from which it may enter the siphon pipes. The arrangement is such that any one, two or all of the pipes may be put in service according to the quantity of sewage flowing. It is intended that the entire flow shall be confined to the eighteen-inch pipe as long as the quantity of sewage does not exceed its capacity. When this quantity is exceeded one of the thirty-inch pipes will be substituted for the eighteen-inch pipe. In this way only such pipes will be in use as are required to carry the quantity of sewage flowing, changes being made from time to time to correspond with the increase in flow due to the growth of the city. The entrance to each pipe is controlled by a sluice gate set in the masonry, and also by stop planks and overflow chambers, so that in case of emergency, the sewage will flow automatically into a second or third pipe when the one in use is overcharged. Provision is also made to allow an automatic overflow into Beargrass Creek. If at any time the siphon is out of order or it needs repairs or cleaning, the entire flow may, for a short time, be turned into the creek by a special thirty-inch conduit. A concrete gate-house will be built over this chamber from which the various gates of the siphon may be opened and closed. At the outlet or western end of the siphon there is a special chamber in which any or all of the pipes may be closed by means of stop planks.

Just west of the creek and at the lowest point of the siphon a third chamber is provided for the purpose of draining and cleaning any of the pipes. Each pipe is so arranged that a section four feet long may be removed after the sewage has been emptied into a sump and pumped out into the creek. From this chamber the siphon can be thoroughly cleaned in either direction to the inlet or outlet chambers. Plan 7.


PROFILE OF SIPHON ALONG CENTER LINE OF 18 INCH PIPE
Outlet Chamber
Elev 420.00
Elev 420.006
Elev 420.000
Clean Out Chamber
Elev 418.04
Beargrass Creek
Elev 420.41
Gate House
Inlet Chamber
VERTICAL SCALE
HORIZONTAL SCALE
PLAN OF OUTLET CHAMBER ON AA.
SECTION M-M.
PLAN OF CLEAN-OUT CHAMBER ON AA.
PLAN OF INLET CHAMBER ON AA.
LONGITUDINAL SECTION OF OUTLET CHAMBER ON BB.
LONGITUDINAL SECTION OF CLEAN-OUT CHAMBER
LONGITUDINAL SECTION OF INLET CHAMBER ON BB
PLAN
Overflow
Fill
Grooves for stop planks
Iron steps
Vitrified pipe
Gate Stand
COMMISSIONERS OF SEWERAGE
OF
LOUISVILLE, KY.
NORTHEASTERN
SANITARY TRUNK SEWER
SEC. A.
DETAILS OF SIPHON AT BEARGRASS CREEK
DATE-JANUARY 1910.
SCALE -
DESIGNING ENGINEER
CHIEF ENGINEER
CONSULTING ENGINEER

IRON CASTINGS: DEFECTS AND REMEDIES.*

By Robert Job, Vice-president, Milton Hersey Company, Limited.

To many consumers an iron casting is an iron casting, and little thought or attention is given to its quality, apart from a general surface examination, to see whether it appears to be sound and if it is clean and of the desired dimensions.

In some cases, the casting must be machined prior to use, and the serious defect may develop that the iron is so hard as to turn the edge of the tool, or make the work of machining so slow that labor costs are high. If the casting cannot be machined, it must be rejected and delay occurs in getting replacement; and even when it can be slowly machined and finally gets into service, difficulty soon begins, for a casting of this type though having a high tensile strength, is unfortunately brittle and fragile under impact, and, as a consequence, failure is apt to occur after a short service.

The cause of such hardness is generally excess either of sulphur or of manganese, due to defective quality of the cupola charge, that is to say, of the pig iron, or scrap, or coke, one or all. In some cases also the silicon is too low for the character of the casting. Sometimes, too, the moulding sand has been improperly tempered and the iron has been chilled, or, again, perhaps a poor grade or an excessive proportion of scrap has been used in the charge.

From this brief statement it will be evident that "hard iron" is not by any means a result of any one cause, but may be due to many widely differing conditions.

In order to find the proper remedy, the cause of the difficulty must, of course, be determined. Often an analysis of the iron will tell the story, or again, in some cases the physical condition of the casting will give the clue by presence and appearance of blow-holes, shrinkage-cracks and other characteristic defects.

If the hardness is caused by excess of sulphur or by otherwise incorrect composition, the inference is that proper care has not been used in the selection of the material, and purchase should be made under carefully arranged specifications, fixing the proportion of silicon, phosphorus, sulphur, and carbon to accord with the properties desired in the castings. For instance, if tough, strong easily machined iron is desired, the silicon, sulphur, phosphorus, and manganese should be limited and the quality of the coke should be carefully investigated in order to hold down the proportions of sulphur and of ash, for obviously it is a sheer waste of time and money to pay great attention to the quality of the pig iron and then accept and use shipments of coke which may contain thirty times as much sulphur as is present in even a poor grade of pig iron. Under such conditions nothing but hard castings may be expected.

The other day I came across a case in which the coke run up to 1½ per cent. of sulphur, and it also had about 15 per cent. of ash, in other words, the proportion of ash was so high that the amount of slag would be great, while the proportion of sulphur was so large that the iron could not be touched with a tool. Another case came up not long ago in which the pig iron was of excellent quality, the sulphur being only about three one-hundredths of 1 per cent. The coke was supposed to contain not more than 1 per cent. of sulphur. Although careful attention had been paid to see that the quality of the iron was first-class, no attention whatever was paid to the coke, and, as a result, hard iron came out. I took up the matter, and by keeping a close watch of the coke, making a regular test of each shipment when received, and rejecting when the shipment was defective, in the course of a few weeks instead of hard castings the iron became soft and the machine shop expenses were reduced correspondingly.

Porous, spongy iron is another source of annoyance and loss to the consumer. Frequently a great deal of work will be put upon a casting in the machine shop, only to have a large cavity finally develop, rendering the casting unsafe for

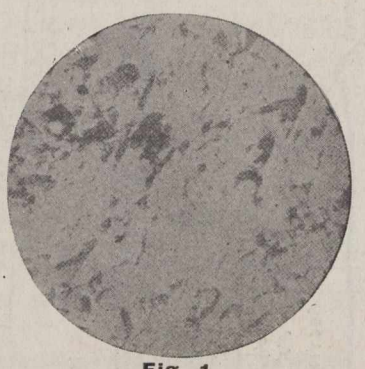


Fig. 1.

the service intended. In such case, replacement must be made by the foundry, but the labor is lost and the delay which occurs in replacement often causes great inconvenience.—Frequently the surface of the casting shows no indication of this defective condition.

Porosity is frequently due to blow-holes in the iron, as for instance, when gas has been trapped in the casting owing to failure to provide proper vents. In some cases, the iron may not have been fluid enough when poured into the mould, and in consequence, the small bubbles of gas could not escape before solidification occurred, and an unsound, honeycombed casting is the result.

Every foundryman knows well the importance of "hot-iron" —that is to say, iron which is at such a high temperature when poured into the ladle it is almost as fluid as water. Such iron fills the moulds thoroughly, and many of the foundry troubles which otherwise are apt to result are avoided. To secure it, one must pay special attention to

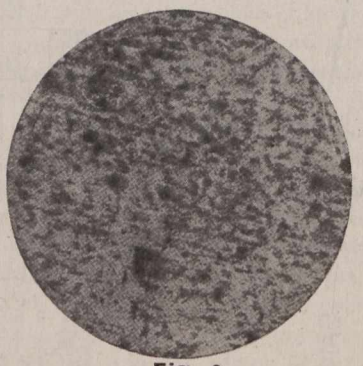


Fig. 2.

the cupola charge. A sufficient proportion of coke must be used, and its quality must be carefully regulated. The proportion of sulphur and of ash must be low, and dust and small piece which would tend to check the draught and thus prevent free-burning must be absent. A sufficient air pressure must be maintained, and the cupola practice so regulated that a quick melt will be secured. Other things being equal, the shorter the time in the cupola, the better the chance to get good castings.

Shrinkage holes or cracks are apt to occur with hard, high sulphur iron, and this condition is due simply to the fact that iron of this character contracts to a much greater extent than does a softer iron containing a large proportion of graphitic carbon. Shrinkage holes are a fruitful cause

*Read before the Canadian Railway Club.

of failure, and they are particularly objectionable owing to the fact that they frequently do not appear upon the surface, and hence the weakness may not be suspected until failure occurs. The remedy for such condition, obviously, is to keep at a minimum the proportion of sulphur in each constituent of the foundry charge, and take proper precautions to keep the iron soft.

Defects of castings are, unfortunately, of so many varieties that any attempt to cover the subject even in a brief description, would weary your patience, and I have, therefore, confined myself to a few of the typical cases which are seen all too often in service. "Strong as iron" is an axiom, but frequently the appearance of the metal belies the truth. As an instance of this, we have in mind, a heavy, massive cast iron base weighing many tons which supported a large shop tool. After a short service cracks began to develop, necessitating the removal of the tool and the replacement of the base. A careful investigation was made to determine the

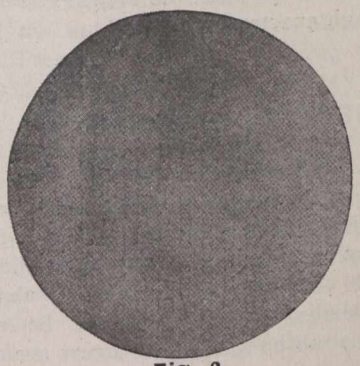


Fig. 3.

cause of failure and it was found that the proportion of phosphorus and of silicon in the iron was excessive, causing the metal to be exceedingly weak, and hence resulting in fracture. In other words the proportion of phosphorus was about 1¼ per cent. and the silicon was about 3 per cent., the phosphorus, of course, made the iron weak and the silicon had the same effect, although in a much less extent. High phosphorus is particularly objectionable when the casting is subjected to impact, as, for instance, in wheel-centres, cylinders, columns, etc., and unluckily for the consumer such iron can generally be obtained at a considerably lower cost than can a stronger, tougher grade, and consequently, unless each shipment is systematically tested before use the better quality cannot be expected. Many cases have come under our observation in which wheel-centres and cylinders containing about one per cent. of phosphorus have cracked after a service of only a few weeks, or even days, while with the phosphorus reduced to about one-half of one per cent. and with the other elements properly proportioned the castings would give good service for years under the same conditions.

I remember particularly a case which came up several years ago. At that time a great deal of difficulty occurred in railroad practice with cylinders and wheel-centres, due to fracture of the castings. We investigated the quality of the iron from which the cylinders and wheel-centres were made and found it contained about 2½ to 3 per cent. of silicon. It was what was known as No. 1 anthracite foundry iron, and supposed to be first-class for that purpose. It contained about 1 per cent. of phosphorus and the sulphur was low. As a result of the investigation, we found that when the proportion of phosphorus exceeded about 0.60 per cent. the iron became too weak for this class of service, especially when the silicon was high. In the above case the castings sometimes failed after a few days' service. To remedy the condition, we drew up specifications placing the limit of phosphorus at 0.50 per cent., with silicon at about 1.50 per cent. The sulphur, of course, was held low, not exceeding 0.03 per cent. Each car of pig iron was tested upon receipt and coke was rejected if the sulphur exceeded 1 per cent. or if more than 10 per cent. of ash were present. In order to keep record of the service rendered, we began dating each of the wheel-centres, since we had had most trouble with these, but not a single one came back broken within three years, and we then discontinued the practice of dating.

At that time we were using 50 per cent. of scrap in our cupola mixture, and at the end of about six months we found that the supply of scrap was running short, and after nine months we got in very little excepting when locomotives were run in for overhauling, and after a year we practically had to depend upon outside scrap, or to use common car scrap and treat it so that we could get castings soft enough to machine. The effect in the machine shop was very marked, and under the new regime hard castings were very seldom found.

In cylinders, radiators, and other castings, very close texture is essential in order to avoid leakage. Often there is little or no indication to the eye that holes exist in the iron, and yet under test the pressure gauge falls, showing that the iron is porous. Such character may be due to the presence of slag and oxide in the casting, or, in other words, the continuity of the iron may be broken up by fine particles of foreign matter. This condition may be caused by over-blowing the iron in the cupola, or it may result from the impurities in the scrap, and in order to remove it thorough deoxidation is essential.

From what has been said, it will be readily understood that radical differences exist in the structure of the metal of castings, and within recent years great strides have been taken in the development and microscopic study of the characteristic forms, and it has become possible to identify many causes of difficulty by the appearance of polished or etched sections cut from the castings. As examples, we will, in closing, throw upon the screen a few photo-micrographs, the originals being magnified fifty diameters—showing typical forms which may make or mar the service. All of the sections were cut from the sides of automobile cylinders where the metal was about one-quarter inch thick. The metal is polished, but not etched.

Figure 1 shows a very open structure with large areas of graphite. A structure of this kind is relatively weak, and not well adapted to withstand impacts. To show what a marked difference the structure of cast iron makes upon its strength, I may state that iron in the condition shown in Figure 3 was found to have about one-third greater strength on transverse test than iron of the character shown in Figure 1, the composition in both cases being closely alike.

In Figure 2 the iron is porous and contains considerable oxidized metal, a consequence of defective foundry practice In other words, in a structure of that kind we can see there are little dark spots representing small portions of oxide of iron. These break up the continuity of the iron, and instead of having a clean, solid iron throughout the casting, we have many specks of oxide of iron scattered through it, in that way causing weakness and hardness.

In Figure 3 the metal as a whole has a close texture, and is strong and well adapted for the service intended. The iron is largely free from slag and oxides and the graphite, although present in even larger proportion than in Figure 1, is distributed in fine lines throughout the metal, greatly increasing the strength. The analysis of this iron showed that the constituents had been carefully selected, and its structure proves that correct methods of foundry practice have been

used. I may say, in connection with the last figure, that the phosphorus averaged a little over one-half of one per cent., the silicon was about one and a half per cent., and the sulphur was low, that is, in the casting it averaged about .07 per cent., the manganese was about one-half per cent.

THE DECIMAL SCALE FOR CONSTRUCTION WORK.

It is generally conceded that the adoption of a single unit of measurement for engineering, architectural and construction work would not only facilitate the work of engineers, architects and contractors, but would also eliminate the chance of making errors in the transference from the engineers to the architect's scale, and vice versa. In the office of a prominent engineer in Boston, for estimating all dimensions are converted from inches to decimals, this involving, of course, a considerable amount of work, but it is proven that it pays to do this both from the avoidance of errors and in the shortening of the actual arithmetical work by using a decimal system rather than our present system of feet and inches.

It is interesting to note the opinions of prominent men connected with engineering, designing and building operations. Mr. F. W. Reynolds, of Lockwood, Greene & Co., mill engineers and architects, Boston, Mass., says: "We believe that from the engineer's standpoint the decimal scale could be very well adopted for construction work. By this we mean that all measurements could be taken and expressed according to the decimal scale with quite as little trouble and confusion as follows the use of the scale of feet and inches. Drawings would be just as easily made and read if the decimal system was followed as under the present system. We fear, however, that unless the adoption of this system could be made compulsory, it would be the source of many errors from the confusion which would arise after drawings were sent out and into the hands of persons more familiar with the scale of feet and inches than with the decimal system."

Mr. F. W. Dean, the engineer and designer of industrial plants, gives as his opinion that the decimal scale would be a good thing if once introduced and established, but that he would hate to be the one to attempt bringing about the change.

The point of view of the civil engineer is well expressed by Mr. Leonard Metcalf, of the firm of Metcalf & Eddy, Boston, Mass. He says: "The difficulty comes essentially from educating the contractor's foreman and men, rather than the inspectors and engineering corps, as the latter are, of course, accustomed to the use of the engineer's decimal scale in all their surveying operations. I believe that in the majority of cases—more particularly large and important works—the use of the decimal scale would be possible, but greater difficulty would be encountered in its introduction in the smaller works. The fact must also be overlooked that in such works as involve building—in iron work, castings, structural material, etc., the manufacturers and machine shops still adhere to the English "feet and inch" scale. Under such circumstances either separate plans for details would have to be used, or the two different scales would appear upon the same drawing, or dimensions would be stated for both purposes in one set only. This again would be disadvantageous from the point of view of the mechanic who has become thoroughly accustomed to the foot and inch scale, and in the majority of cases knows little of the engineer's decimal scale. You will see, therefore, that while from the engineer's point of view, the change would, broadly speaking, be advantageous, from the practical point of view I fear there would be serious difficulty in its general introduction, except perhaps, in general classes of work."

The opinion of Mr. L. C. Wason, president of the Aberthaw Construction Company, Boston, Mass., is interesting as being that of a man intimately connected with actual conditions in the field. His opinion follows: "In designing and figuring we work in the decimal system, later converting the measurements into feet, and fractions, to correspond with the dimensions given by engineers. If engineers and architects could be induced to use decimals it would be a great boon to the profession in general, and of assistance in the execution of work. I think co-operation could be obtained from the manufacturers of rules, who would make it more difficult to get rules divided in fractions of an inch, and turn out more of these in decimals, and also who would send out advertising literature showing the advantages of the decimal system. By the co-operation of the manufacturers and the engineers and architects, I believe a result could be accomplished which would be very desirable. I am looking forward with interest to the time when the Metric system will become necessary through enactment of law."

THE ENGINEERING FEATURES OF HOLLAND.

(Continued from Last Week).

Workmen's return tickets are issued for 6 cents (2½ cents currency), available during the date of issue, but not later than 8 o'clock in the evening. Only a specified number are allowed in each car, the maximum being about 35 on the largest cars, including standing room on the front and back balconies. No 'strap hanging' passengers are allowed in the interior of cars.

Wages of Employees.

Motormen receive 14.40 gulden to 16.80 gulden ($5.76 to $6.72) per week, and conductors 13.20 gulden to 15.60 ($5.28 to $6.24 currency) per week.

Cost of Construction.

The total expenditure on the Amsterdam street railway, including the cost of the purchase of the rights of a private horse car system, amounts to 13,581,000 gulden ($5,432,400) towards the redemption of which the sum of 2,554,211 gulden ($1,021,685) is represented by a sinking fund derived from ordinary revenue.

Construction of Buildings.

In the construction of buildings in Amsterdam bricks are mostly used, although in the business sections a great deal of reinforced concrete has been introduced. A foundation has always to be prepared by pile-driving, the piles varying from 16 to 24 yards. On the tops of these the hard brick foundation is laid with cement.

Bricklayers are therefore in active demand. Their wages are now from 35 cents (14 cents currency) to 45 cents (18 cents currency) per hour. They lay down about 2,500 rough bricks, or about 400 smooth surface bricks, per day. Workmen commence at 6 o'clock a.m., and finish at 6 p.m., two hours being allowed for meals and recreation.

Relationship of Capital and Labor.

Capital and labor are not well organized in Holland, with the single exception of the diamond polishing industry. In this there are probably the model organizations of the world. So complete is the organization that neither party is anxious to force a fight. Each understands the strength of the other, consequently all possible differences are settled by mutual concessions at friendly conferences. Neither party can afford to stand out. Beyond a certain point the other ceases to surrender, and that means a "walk-out" or a "lock-out." In all other industries or labor no unity of action can be looked for.

ROADS AND PAVEMENTS

MODERN ROAD CONSTRUCTION PRACTICE.*

By Major W. W. Crosby.†

Since 1894, when the States of Massachusetts and New Jersey began their modern road construction, the development of such work in this country has been rapid. New Jersey had first provided for State aid in highway improvement by an Act passed in 1891, but this was inoperative from various causes until June, 1894, when work was begun. Connecticut began in 1895; Maryland, in 1896; New York in 1898; and other states have followed from time to time until now, in 1910, over thirty are engaged in this work.

When the work began in this country, skilled highway engineers were scarce. M'Adam quite naturally was the "Mentor" of the engineers attempting highway work—his predecessors, Tresaguet and Telford, being overlooked.

The Massachusetts authorities seemed to comprehend perhaps most clearly, the principles laid down by M'Adam and all their work has been based on these axioms. Of course, differing conditions, new machinery and varying requirements compelled some changes in the application of the principles, but the latter were as closely adhered to as possible under the conditions. The results show plainly that Massachusetts was particularly fortunate not only in the broad-mindedness and far-sightedness of her men in charge of the work, but also in the clearness with which they understood the principles at the bottom of macadam construction.

As the extent of the work increased, the highway engineering branch of the profession developed. The ranks were recruited from young, energetic, and ambitious members, the opportunities afforded being attractive to such men. Consequently, to-day, some of the brightest engineers are following it and their work is leading the world.

The earlier highway engineers came in the main from those previously employed on steam railroad work, which work had reached here a development far ahead of that in any other country, and very naturally many of the details of highway construction were worked out according to railway ideas. For instance, in grading a road anew, the inclination was to establish long tangents and easy vertical curves in the profile, and with as far as possible an absolute avoidance of reverse curves in both the profile and the plan. Undoubtedly the results so secured were good, but it is doubtful if they were always worth the cost, and unquestionably the following of such a program did result in many cases in an unnecessary disturbance of local conditions, and in friction with adjacent property owners. Later, as a better appreciation of the greater flexibility of the vehicles traveling a highway over those using the railway has been had, as well as the increased necessity for economy, wherever possible to offset as far as might be the higher cost of other details, has appeared, highway engineers have been modifying somewhat the rigidity of their earlier ideas regarding the grades. It is no longer considered bad practice to adjust the new grades to meet, as far as practicable, the topography of the country traversed, but rather the contrary. The "humping" of a grade over a culvert or bridge is no longer considered objectionable, provided an appreciable saving can be made in the cost of grading, and the changes in grade are not too abrupt for modern traffic. On the other hand, rough and raw "railroad cuts and fills," with barely sufficient slopes are now frowned upon by all, and considerable effort is made to increase, by proper sloping, the attractiveness as well as safety of the slopes.

In the matter of culverts and bridges, it was early recognized that the more permanent forms of construction were the more desirable from every point of view. At that time, reinforced concrete was scarcely known here. The attempt was made to use brick and stone masonry as far as possible, though considerable steel work seemed necessary in most cases of over four feet span, owing to the cost of masonry arches. With the advent of reinforced concrete, the ability of the engineers to still further reduce the use of perishable steel trusses and girders was greatly increased and the opportunity was immediately seized.

At first, in the use of concrete, too little thought was given to the appearance of such structures. As their permanency impressed itself, and with the growing appreciation of the value of considering the aesthetic side of highway work, much improvement in the design of such structures has resulted. There is room, however, for further improvement and the engineers of this country would do well to study the examples set in this matter by the foreign authorities.

In this study, there should be no cause for discouragement. The states are now trying to accomplish even more in one-fourth the time than foreign countries have accomplished in a century. The magnitude of the field of operations here, the necessity for haste, the meagerness of funds for the immense work, and the deplorable lack, until recently at least, of a proper general appreciation of the value of modern roads by the public generally, offer an explanation, if not an excuse, for the present backwardness of the states, as a whole, on this question. Many other causes or factors might be cited, but suffice it to say that, while this country is behind in results at the present time, the prospect is clear that it will not remain so long.

As regards the highway engineers themselves; the writer firmly believes that while, as referred to above, some of their practices are not up to the best foreign ideas, in some others the American highway engineers are far ahead of the rest of the world.

In the matter of road surface construction, the best practice in the states is away in advance of the foreign. In the variety of materials used, in the development of methods for using the same, and in the recognition of the proper principles to be followed, the engineers of the states can give points to the foreign engineers. So far as the writer knows, there is but one item of construction on which we should pattern after foreign practice, and that is in the use of machinery.

Owing to the diversity of our resources and conditions, the American road surfaces built offer an immense variety of results. By no means all of them are satisfactory, nor, undoubtedly, the best that could have been obtained by better methods. But the variety of materials and conditions has probably, in the short period of their use, interfered with, in many cases, a proper recognition of the best methods of use. Unwise conservatism and adherence to old practices, as well as rash and unjustifiable ignoring of well established principles, have been naturally followed by failures or unsatisfactory results. The advent of a new material for use on the roads, or the conception of a new method, perhaps induced by local

*A paper read at the Third National Good Roads' Convention of the American Automobile Association, St. Louis, September, 28-30, 1910.

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conditons, has too often tempted highway authorities, and even the younger highway engineers to ignore or abandon the proved principles underlying such work, and to "rush after false gods" to their own (or others) destruction.

As stone macadam forms the greater part of modern road surfaces, in expatiating somewhat on the above, it will probably be well to do so on that form of surfacing and briefly refer afterward to the others.

Stone, broken by hand or by machinery, is probably the oldest and most universal of road surfacing materials. Certain well-developed principles have been established, concerning its use in macadam that ought to be so well recognized that their repetition would be trite and unnecessary. The writer regrets that such does not seem the case and therefore feels impelled to state as follows:—

(a) The macadam surfacing is but a roof, a wearing surface over the foundation, without which latter it cannot support a load nor in which can it remedy defects of sustaining power. It is true that to some extent the macadam may effect a distribution over the foundation of the strains coming on the surface of the former, but in the design of the foundation, great care should be had in allowing for such distribution.

(b) The macadam should be planned as, and built, separate and distinct from the foundation. Any merging or lack of distinctness between the two, except possibly in the cases of sandy or sand-gravelly foundations, can only result in a weakening of the macadam without a corresponding increase in the strength of the foundation.

(c) The particles forming the macadam itself should be packed as closely as possible together. There should be an actual interlocking of the pieces of stone. No macadam is worthy of the name that does not contain this interlocking and the more perfect the latter is the better will be the macadam. This necessarily means that, in the laying of the macadam, screening to prevent improper proportions or too great variation in the sizes of the pieces being used is required, as are also the spreading and compacting of the stone in layers of only such thickness as the roller can be relied upon to compact to the utmost; the exclusion of such an excess of fine or foreign material from the mass of broken stone as will prevent the proper compaction of the latter; the reduction of the voids in the mass of broken stone to the utmost possible minimum, and the after filling of those voids by finer material to complete the compaction of the mass.

Only too often has the writer noticed in this country the ignoring of one or more of the principles expressed in the above paragraphs, but he has been impressed with the far more prevalent ignoring of them elsewhere, especially those principles mentioned under "c." Good results, where these latter have been ignored, are evidently not worse only because of the maintenance accorded after construction. That the cost of such maintenance could be materially reduced or that better results with the same maintenance could be secured by recognizing the principles mentioned has apparently been lost sight of, with the principles themselves, by the foreign engineers. No one who has the opportunity to examine carefully the foreign construction of road surfaces can fail to be impressed with its inferiority compared with that of the best of the states—as it has been styled "the McClintock road."

The writer has been regretfully impressed with an apparent tendency, more especially perhaps among novices in road building and with sugggested new materials to ignore in their work the points referred to above. For instance, with the use of pitch compounds (bituminous cements) in road surfacing, some sort of results can be secured even if the stone is not thoroughly compacted. Usually, however, as the more experienced engineer fully realizes, the absence of the proper interlocking quickly makes itself manifest—especially in cases where a short lived cement has been used—and such a surface readily succumbs to severe strains. It, of course, takes some time frequently to demonstrate the expensiveness of inferior construction, and by that time often the same authorities as were responsible for such construction are chasing new butterflies.

Much might be written concerning the details of ordinary macadam work, but the discussion, while interesting, perhaps, would largely resolve itself into that of consideration for local conditions. For instance, the ideal macadam is built of proper trap rock with an utter absence of anything in the shape of clay or earth. Many engineers prefer for convenience in some way to add clay or similar material for the "binder." The writer is fully aware of all the discussion that has been had on this point, but retains his conviction that such a practice is only a makeshift and is not justified in principle.

Some localities are devoid of trap and local conditions may seem to compel the use of even a soft limestone. Undoubtedly this makes a better macadam than many other local stones and its results may be improved by "reversing" the courses, i.e., by using the No. 2's in the first course, and the No. 1's in the second course as laid. The results, however, are even then usually inferior to those of the ordinary methods using suitable stone, though the "reversed" macadam may be a locally satisfactory, and indeed necessary, makeshift.

The writer has even "reversed" excellent trap rock, where severe traffic conditions seemed to call for such a procedure, with satisfactory results by the addition of a bituminous cement. The main objections to a "reversed" macadam are a resulting excessive roughness of surface in ordinary water-bound work, and a tendency of the macadam to ravel. Both of these can be largely overcome by the use of a suitable pitch in the surface. This reversal of the courses seems to violate another principle of ordinary macadam, namely:—

(d) The sizes of the pieces of stone forming a course of macadam should be as large as practicable, and, at the same time, no larger than will retain their position in the completed road despite the ordinary tendencies to dislodgement. The presence of a proper binder may justify the apparent violation.

M'Adam found that 1-inch cube was about the maximum that could be relied upon to retain its position in the road surface under the tilting tendencies of the loads and with the support of the adjacent pieces interlocked with it. It has, in our modern work, been demonstrated that the cementing action of the stone dust may aid the interlocking somewhat and under certain circumstances considerably. In some cases even as large as the "3-inch size" of soft limestones have done very well in the surface of the road because of their high cementing qualities. In fact, in any macadam, it seems desirable to use a stone whose dust has at least a certain cementing value (a makeshift is the addition of clay, before referred to). Especially is this true under modern traffic.

Page has shown that the cementing powers of many rocks can be greatly increased by the use of limestone screenings with them, and this has greatly increased the number of available stones. There are many localities, however, where suitable stone is not available and local conditions require substitutes of various kinds of macadam. Among such may be mentioned gravel, shells, marl, burnt clay, slag, coquina, etc. To the use of these, the principles of ordinary macadam operate in full. The application of these principles

has not been as generally careful as might be wished. For instance, in the use of shells, frequently too much reliance has been placed on the mortar formed by the sand and shell dust to hold the shells themselves in place, and not enough compaction has been secured in the shells themselves to secure the best results from them.

In many instances, local conditions have caused the abandonment of macadam entirely and instead, the use of block pavements, such as brick, or sheet pavements, such as asphalt mixtures, sand, clay, etc. Some experiments also have been tried with small blocks of both natural and artificial stone. While undoubtedly the variety of experiments has been much greater in this country, it cannot yet be said that all have been successes. Nor have all been failures by any means. There is much hope for ultimate success in perhaps the majority of cases.

For the greater part of the modern highway work in this country, "macadam" can still be considered as a standard surfacing. The writer does not consider that macadam loses its character as such by the mere substitution of a bituminous cement for the mineral colloid cement of earlier results. When, however, the before-mentioned principles of macadam are ignored, especially the one concerning the interlocking of the pieces of stone, he believes the resulting mass is no longer entitled to be called macadam. Perhaps "bituminous concrete" would apply to such a mass, whose main reliance for integrity under stress must then come from bituminous cement in the mass. If the cement happens to be and remains a strong one, the results may be satisfactory and perhaps even more so than the best ordinary macadam could provide under the conditions. But they cannot ipso facto be as good even then as if the mass were a real macadam reinforced by the addition of bitumen to its interstices. The writer believes that the truth of the above will soon be more widely recognized than it is at present perhaps, and that instead of it being considered that "the macadam road is a thing of the past," it will be acknowledged that properly built and cemented macadam has a greater future than ever before. In fact, until recently, vitrified brick, sheet asphalt and some other pavements were largely used to fill in the gap between ordinary macadam and stone blocks. With the development of a standard bituminous macadam, their use is constantly becoming more limited and dependent upon favoring local conditions.

Page has shown the horizontally shearing effect of the traffic so fatal to the life of ordinary macadam, and it was quickly seen by engineers that successful resistance to such shear could be in many cases given to macadam by the addition of some form of bituminous cement. As a corollary, it was also quickly apparent that the supply of available materials for use in macadam was contemporaneously enlarged —another factor tending toward an increase in the use of macadam strengthened by a bituminous cement. In short, the writer believes that the use of macadam properly treated to meet the conditions, should be and is on the increase instead of passing away.

The fact that under certain conditions the existence of a thin carpet of pitch and sand over the surface of the macadam seems desirable, in no way lessens the requirements for proper macadam underneath, and the desirability for such a carpet generally is as yet by no means satisfactorily proved. However, it may be expected that valuable evidence will be forthcoming on this, as well as on numerous other points now in question, in the near future, and in the production of such evidence again, the engineers of this country are leading by months, if not years. The "standardization" pleaded for by a prominent English engineer in the spring of 1910 was actually begun a year earlier in the United States. Such standardization is undoubtedly the now most pressing consideration for us. We are at work upon the question in advance of the rest of the world and will undoubtedly soon accomplish conclusions of benefit to all.

Highway engineering is no longer the work of a skillful, if ignorant, laborer. It has become an intricate science calling for deep thought and high art to meet successfully the demands on its followers. The engineers of this country have, above all others, responded successfully to these demands, and in greater variety and profusion of results. They have fallen behind on one point alone. We have not, as a whole, as yet—be it from lack of sufficient demand and opportunity; be it from lack of popular appreciation and support; or from even lack of ourselves of proper recognition of our duty—developed a system of maintenance—a regard for maintenance approaching the foreign or beginning to meet our needs. But "maintenance" is a subject worthy of consideration by itself.

THE BERLIN CELEBRATION.

The civil authorities of Berlin, Ontario, planned to hold a celebration for the turning on of Niagara power.

Four days, October 11th, 12th, 13th and 14th, were given over to this celebration and municipal councillors, municipal officials and engineers from all parts of Ontario gathered to mark public interest in this epoch-marking event. The Berlin Light Commission, which has charge of the power enterprise in the municipality, consists of Mr. A. L. Breithaup, chairman; Mr. August Lang, Mr. George Lippert, sen., Dr. J. J. Walters, and Mayor Hahn. The superintendent of the light and power plant is Mr. E. J. Philip.

The power project is essentially a people's, rather than a party, one. Its inception was under Liberal auspices; its culmination comes within the jurisdiction of a Conservative regime. That is a mere matter of circumstances. The Hydro-electric Power Commission of Ontario was born of a widespread public demand that steps should be taken by the province to preserve and develop the people's rights in the provincial waterpowers and to protect them from the baneful effects of monopoly prices. The harnessing of Niagara Falls had been the dream of engineers for half a century. Like other dreams of the leaders of thought and progress among the people on questions of national import, it interested the public by slow degrees. The various efforts that were made from time to time to form companies for the generation of electric power at the Falls stimulated interest, and when at last the manufacture of electrical transmission apparatus had sufficiently advanced to permit of the commencement of the large hydro-electrical instalments the economic possibilities of the Falls took a stronger hold on the public mind. The value of cheap electric power to a province dependent upon the coal fields of Pennsylvania and its trusts was, and is, sufficiently obvious.

The First Steps

One of the first definite expressions of public interest in the question occurred in the spring of 1900, when the Toronto Board of Trade appointed a committee to investigate and report upon the power question. The committee, which was presided over by the late Mr. W. E. H. Massey, reported that the manufacturers' hope for cheap power in the southwestern portion of the province depended for realization upon the utilization of the resources of Niagara Falls. The report of this committee was followed by increasing public interest, and in the early part of 1902 voluntary meetings were held in

many cities of the province, which, together with the support of the Canadian Manufacturers' Association and of numerous Boards of Trade, served to rivet public attention on the matter.

The Meeting at Berlin

A meeting of manufacturers was held at Berlin in June, 1902, at which representatives from Toronto, Galt, Guelph, London, and a number of other centres were present to discuss the best method of securing electric powers from the Falls. It is consequently interesting and appropriate that Berlin which was the scene of the first organized move in the enterprise, eight years ago, should now be the first centre to enjoy the finished product of the project. Early in 1903 the city of Toronto made application to the Legislature for authority to generate and transmit Niagara Falls power for the users in the city, but the application was refused at that time. As a result, however, of the representations of many municipalities, an act was passed by the Ontario Legislature the following year (1903) which authorized the municipalities to appoint a commission to inquire into the desirability of securing the establishment and operation of municipal light, heat and power works and to establish the same. The commission was composed of Messrs. E. W. B. Snider, St. Jacob's (Chairman); Adam Beck, London; P. W. Ellis, Toronto; W. F. Cockshutt, Brantford; R. A. Fessenden, a Canadian electrical engineer then residing in Washington.

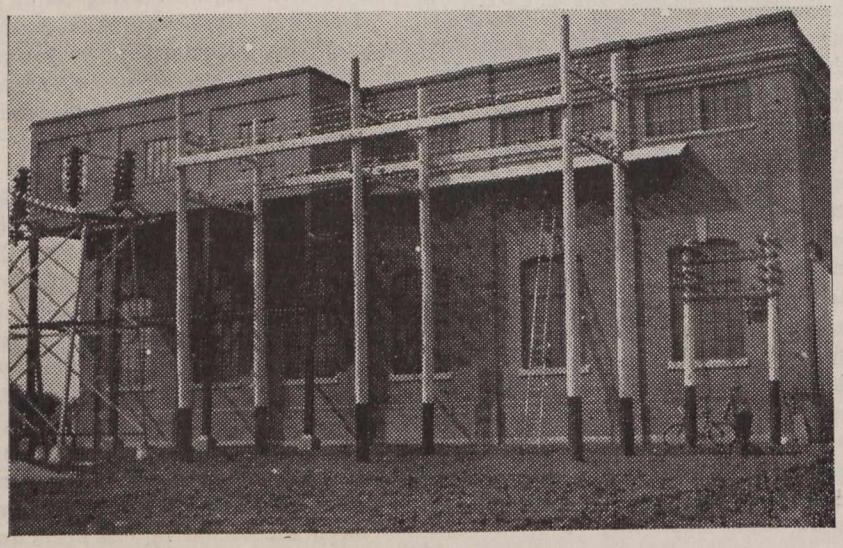
Acting on Commission's Report

The report of this commission, issued March 28th, 1906, set forth an estimate of the power consumed, the cost when produced from coal and steam and the saving which would accrue from generation and transmission of power from Niagara. Upon this report, and in obedience to growing public sentiment, the Government appointed a new commission, consisting of Hon. Adam Beck, chairman; and Messrs. Geo. Pattinson, M.P.P., Preston, and P. W. Ellis, Toronto, to make further investigation. The ultimate result was the formation, under statute of May, 1906, of the Hydro-electric Power Commission of Ontario, consisting of Hon. Adam Beck, Hon. J. S. Hendrie and Mr. C. B. Smith, who subsequently resigned and was succeeded by Mr. W. K. McNaught, M.P.P. To the commission thus constituted with Mr. P. W. Sothman as chief engineer, was confided the task of carrying out the great project.

Powers of Commission

The powers conferred by Legislative authority upon the commission may be broadly described as follows:—

It is duly authorized to investigate and report to the Lieutenant-Governor-in-Council upon any and all hydraulic hydro-electric and other power undertakings, whether developed or undeveloped throughout the province; to inquire and report upon the Ontario branches of power undertakings originating outside, but bringing power within, the boundaries of the province; to inquire and report upon the power and lighting needs of the province in all its parts, and, upon the authority of the Lieutenant-Governor-in-Council, to purchase, lease expropriate or otherwise acquire lands, water-powers and water privileges; to purchase, lease, expropriate, construct or otherwise acquire generating, transmitting and distributing plants and works, and to operate the same; to expropriate the power product of, or to contract with, any person, firm or corporation for a supply thereof; and to enter into all necessary arrangements with Ontario municipalities or other corporations, including railway and distributing companies, for the fullest exercise of these powers, with the object of providing adequately for the supply of the power and lighting needs of the province at the lowest possible cost. Authority was also given to the commission to control the rates charged by municipalities upon the sale of power purchased from it, with the object of preventing excessive charges to the public, or the veiled bonusing of favored undertakings, and to the Lieutenant-Governor-in-Council to borrow on the credit of the province all moneys required to carry on the various objects of the commission.



Transformer Station, Berlin.

Buying the Power

The commission, under the guidance of Hon. Adam Beck, proceeded with its work. To serve the Niagara peninsula and western Ontario it entered into a contract with the Ontario Power Company to purchase not less than 8,000 horsepower, and as much more as it requires, up to 100,000 horsepower, for a term of ten years, with the provision for three extensions of additional periods of ten years each, at the price of $9.40 per horsepower per annum up to 25,000 horsepower, and $9.00 per horsepower per annum if the quantity taken exceeds 25,000 horsepower. The power is to be delivered to the commission at Niagara Falls at 12,000 volts, and the prices cover a 24-hour continuous service.

Distributing Electricity

The physical project begins with a transformer station at Niagara Falls to take the power on delivery at 12,000 volts. Thence, a 60,000 horsepower double transmission line operating at 110,000 volts conveys the current to a controlling station at Dundas, whence the line is continued east to the city of Toronto without—in the meantime—any intermediate station. From the controlling station at Dundas a double line of the same capacity and voltage is continued via Woodstock and London to St. Thomas, with local transformer stations at these points. From the same central controlling station at Dundas a similar line proceeds north and west via Guelph, Preston, Berlin, Stratford, St. Marys, and on to London, with local transformer stations at each of these points, the whole high-voltage line thus described comprising about 300 miles. At each of these local transformer stations the voltage is reduced to 13,000 for the purpose of supplying, by additional local feeder lines, the different municipalities in the vicinity thereof. The effect of this method of distribution is to make it possible, from the high-voltage circuit before described, in combination with the low-voltage local distributing lines, to supply the needs of practically every municipality within the district at the four corners of which are Toronto, Niagara Falls, St. Thomas and Stratford.

What Municipalities Do

The present arrangements of the commission include the supplying of 34 municipal corporations with their respective power needs, for which the municipalities agree to pay the commission on the following basis:—

(1) The contract price of the Ontario Power Company at Niagara Falls, plus

(2) Four per cent. per annum upon that part of the construction cost which is properly applicable to each participating municipality, plus

(3) An annual amount sufficient to create a sinking fund which in 30 years shall completely pay for that portion of the cost of construction which is applicable to each municipality, plus

(4) That portion of the line loss and the general operating and maintenance charges which is properly applicable to each municipality.

The progress of the work to date may be rapidly described. The sub-stations are all practically completed, so far as the buildings are concerned. Over two-thirds of the transmission towers are erected and the balance will be erected within about a month. The electrical equipment construction is completed and installed, and all municipal distributing plants are under construction or arranged for. Meetings of the municipal engineers concerned have been held at frequent intervals with the object of standardizing all possible features of the undertaking. The total estimated cost of the finished project was $3,500,000, and the actual cost, as determined by the contracts let, comes well within that figure.

THE HYDRO-ELECTRIC PLANT OF THE COBALT POWER COMPANY AT HOUND CHUTE.

By A. Vonaesch, M.E., Hydraulic Engineer, Owen Sound.

In 1906, the early days of the Cobalt camp, but 3 years since the discovery by the blacksmith La Rose, and while yet even mining experts had their doubts as to the permanency of the camp, some far-seeing men, recognizing the great value of the unharnessed water power in the vicinity of Cobalt, secured leases from the government to develop power on the Montreal River and elsewhere.

Steam power was costing the mining men considerably over $100 per h.p. per annum, and as the boiler horsepower capacity of the district had rapidly increased to 3,000 h.p. (1909 to 11,000 h.p.), it was evident that a market for the hydro-electric power would not have to be created.

Among the early pioneers were Messrs. C. A. and B. C. Bead, incorporating the Cobalt Power Company, Limited, in December, 1906, under the laws of the Province of Ontario, with an authorized capital of $500,000. The company had permission to construct, maintain, complete, and operate

Showing forms for power house.

works for the production, sale and distribution of electricity for the purposes of light, heat, and power, a lease of a water power on the Montreal River known as Hound Chute Falls, together with a tract of land comprising about seventy acres, having been acquired.

The Hound Chute Falls are six miles below Gillies' Depot on the Temiskaming and Northern Ontario Railway, six miles south of Cobalt as the crow flies, and four miles from the centre of mining activity.

Preliminary investigations and plans had been made in 1906 and 1907, but on account of the uncertainty with regard to the infant mining camp, nothing further was done

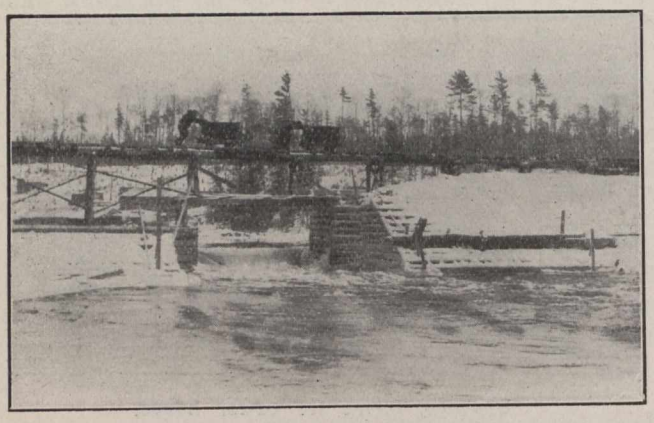
Timber dam and canal intake.

until the fall of 1908, when the final plans were made and construction started.

The Montreal River is in the district of Nipissing, Province of Ontario, (see Fig. 1), a tributary to the Ottawa, having its head waters on the heights of land between Hudson Bay and River St. Lawrence, 1,250 feet above sea level. The length of the river is about 175 miles with a drainage area tributary to Hound Chute of approximately 2,750 square miles. The head waters include Shining Tree, Sams, Pigeon and Duncan Lakes, and the larger tributaries are Montreal River, east branch, with Smooth Water Lake, Bear River with Bear Lake, the Matawapike with Lady Evelyn, and

Diamond Lakes and part of Temagami Lake, and as a tributary to the Matawapike, Lady Evelyn River with Lake Florence and Gray's Lake. The land is mostly forest-covered with comparatively gentle slopes and a rocky base, so well known to the public at large from the descriptions of the prospector, mining expert and newspaper reporter.

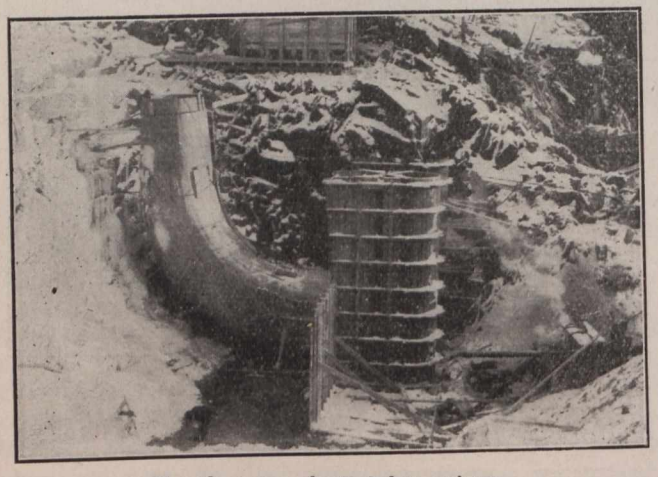
Records of the river discharge over a sufficient period of years to forecast the minimum flow with any degree of certainty could not be obtained. The low water discharge of the Montreal River as estimated in the Georgian Bay Ship



Showing timber dam north side.

Canal report is 800 c.f.s., generally reached in the month of September, and the high water discharge 17,000 c.f.s. at the end of May or beginning of June. In the report of the Hydro-Electric Power Commission of the Province of Ontario (fourth report), the low water discharge is estimated at 720 c.f.s. The river was gauged by Sinclair and Smith, engineers, New Liskeard, in September, 1906, one of the driest years on record, and found to discharge 1,000 c.f.s.

The minimum precipitation in territory adjacent to the Montreal River watersheds during the 10 years preceding 1906 was 26.21 inches (Mattawa, 1897), taking the run-off

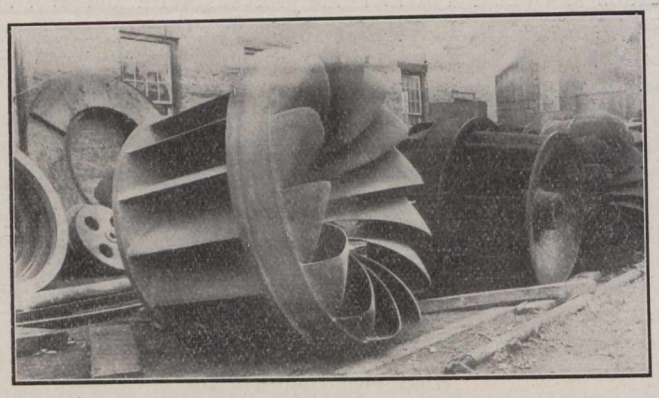


Showing one draft tube, set up.

at 30 per cent. of the precipitation the average discharge would be 0.58 c.f.s. per square mile area, or 1,600 c.f.s. at Hound Chute. The low water discharge should not be less than one half of the average discharge or 0.29 c.f.s. per square mile or 800 c.f.s. at Hound Chute. The average low water discharge of the watersheds adjacent to the Montreal River as published in the Georgian Bay Canal report is 0.38 c.f.s. per square mile, and the lowest 0.2725 c.f.s., which would give at Hound Chute 1,050 and 750 c.f.s. respectively.

It is not likely that any material change will take place in the character of the watershed, and we can therefore assume that the average low water discharge will not be less than 1,000 c.f.s., and the very lowest not less than 750 c.f.s. However, the great storage possibilities on the Montreal River lakes being estimated at over 600 sq.m.f. and which will, there is no doubt, be taken advantage of in the future, should at least double the present low water flow.

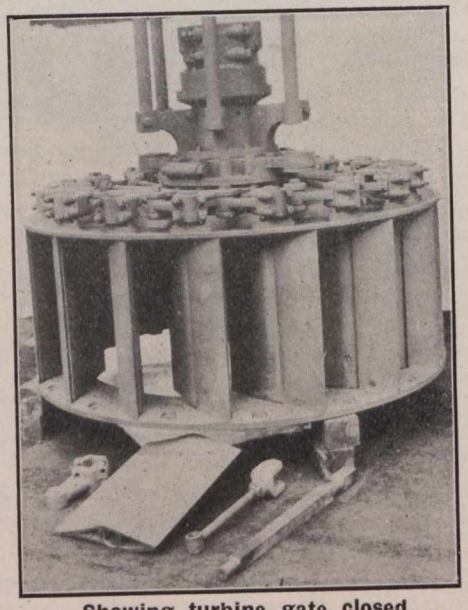
The natural head at the Hound Chute Falls was found to be 16 feet at the average low water discharge, and by going down stream 1,400 feet it was increased to 18 feet 4



Showing turbine runner.

inches. Up stream from the falls, as far as Latchford, the river banks are high and a careful survey showed that the water level above the falls could be raised 15 feet without affecting the water power at Latchford by back swell.

At some time the river seems to have been diverted from its original course just above the falls, the water taking its way through a narrow channel to the south-west, and after tumbling over the rocks, finding the old bed again about 1,400 feet to the south. (Figs. 2 and 3.) The deserted river bed was gradually filled with humus; trees were growing upon it, and only the close observer could notice its course by the slightly lower level.



Showing turbine gate closed.

To find a proper foundation for a dam, soundings were taken in the river above the falls, and also in the old river bed to ascertain its depth. The Montreal River traversing a great forested area, its lumbering operation had to be considered. During the winter logs are piled 30 feet deep

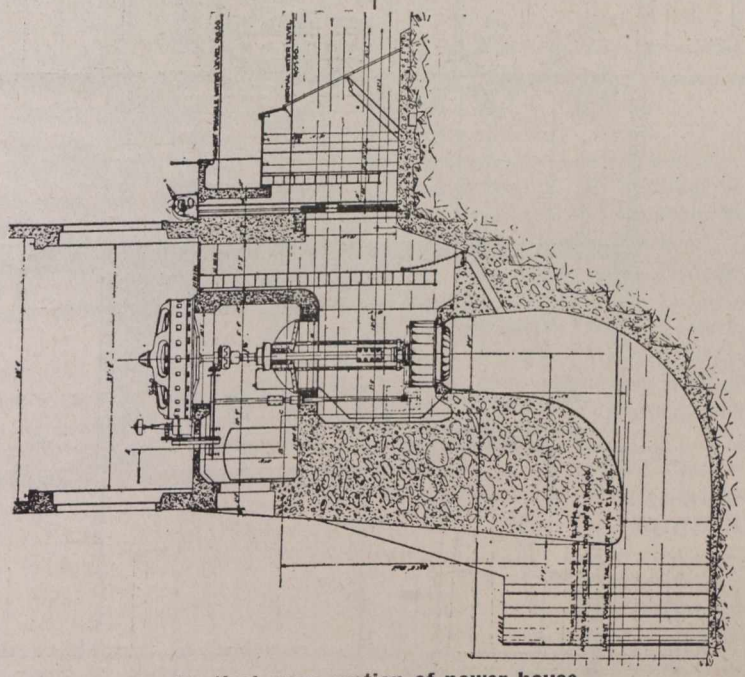
on the ice between the high river banks, and when the spring freshet comes on they start down the river all at once, and it is therefore not at all surprising that log jams are quite a common occurrence in that section of the country. Local conditions having been carefully considered, the following programme was decided upon:

A timber dam was to be built at the narrows just above the falls (see Fig. 2) of sufficient height to raise the water level 15 feet. A head race following the old river bed was to be cut for a flow of 2,000 c.f.s., corresponding to a maximum capacity of the plant of 5,700 h.p. at the turbine shafts under a head of 33.4 feet. The power house was to be built on the river bank about 1,400 feet below the head race intake.

The dam (Figs. 4, 5 and 6) is a rock fill timber dam 34 feet wide, 200 feet long, and 27 feet high in the centre. The foundation is hard rock in the river bed proper and on the north bank, while the east side extends 60 feet into a clay and gravel bank. Double planks reach closely jointed from crest to lower edge at the back, special care having been taken to have them scribed down to the rock. The cribs were built in the usual way at convenient places along the river bank and then floated into place and sunk by filling them with rock hauled to the side from the canal and power house cuts. A log slide is provided for lumbering operations at low water time. *This dam is to serve as a temporary crib work only and a concrete spillway will be put in in the near future.

At the intake for the head race two stop log piers and abutments of concrete were built, the piers being reinforced with steel rods. They are well anchored to rock and have a sill elevation of 893.23. The tops of the piers and the abutments are elevated 912.23, 5 feet higher than the crest of the dam. This intake was built right at the beginning as a protection against high water during construction time, and, of course, it will also make future repair in canal and power house possible at any time. The distance between piers and abutments is 16 feet, the intake area at normal water level elevation 907.23, being 67 square feet, the maximum speed of the water with ice 2 feet thick is 3.5 feet per second. Provision has been made for a course rock to be put in between piers and abutments. From the abutment core walls rock-filled cribs were built, extending to rock bottom, into both sides and the canal banks were protected by cribs wherever found necessary. The east bank of the canal was rip-rapped 1:1, the west side, being rock, was left in its natural shape. The river bed was followed as far as possible, and consequently little blasting had to be done except near the power house, and at that point the cross section was reduced from 80 sq. ft. to 60 sq. ft. at the normal water level elevation 907.23. The canal excavation amounted to 22,000 cubic yards of earth and 200 cubic yards of rock.

The power house, (Figs. 7 to 12), is 130 feet long, of which 15 feet are taken up by the switch-board room, and 31 feet 6 inches wide. The building rests on solid rock and has been built of concrete, partly reinforced. The draft tubes for the four single vertical units (see Figs. 8 to 10) are made of concrete with 20 feet draft, while the exciter units have steel draft tubes of approximately the same length. Vertically the power house might be divided into the following four sections making a total of 82 feet in height: The foundation with the draft tubes, the wheel chambers, the thrust and the generator decks. The thrust deck has not been built the full width of the power house in order to get a clear opening of 5.25 x 15 feet from the generator floor direct into the wheel chamber through which any part of the turbine might be lifted up onto the generator deck by means of the crane without removing either the thrust deck cover or the generator. At the intake of each turbine chamber there is a gate 10 feet high by 15 feet wide with by pass and gate lifting apparatus as well as two stop log checks. This renders the turbines very much more accessible for inspection and repair, a factor just as essential in a hydro-electric plant as the accessibility of the dynamo. Provision is also made to take care of the leakage through the intake gate by a ditch and drain pipe with valve leading into the draft tube. At the head of each intake there is the usual rack with special platform. The canal and turbine intake are connected by a large forebay, the bottom of which has been arranged a foot deeper than the intake. Two under-flow sluices large enough to take care of all the water at low water time have been built at the south end of the power house. The calculations for the



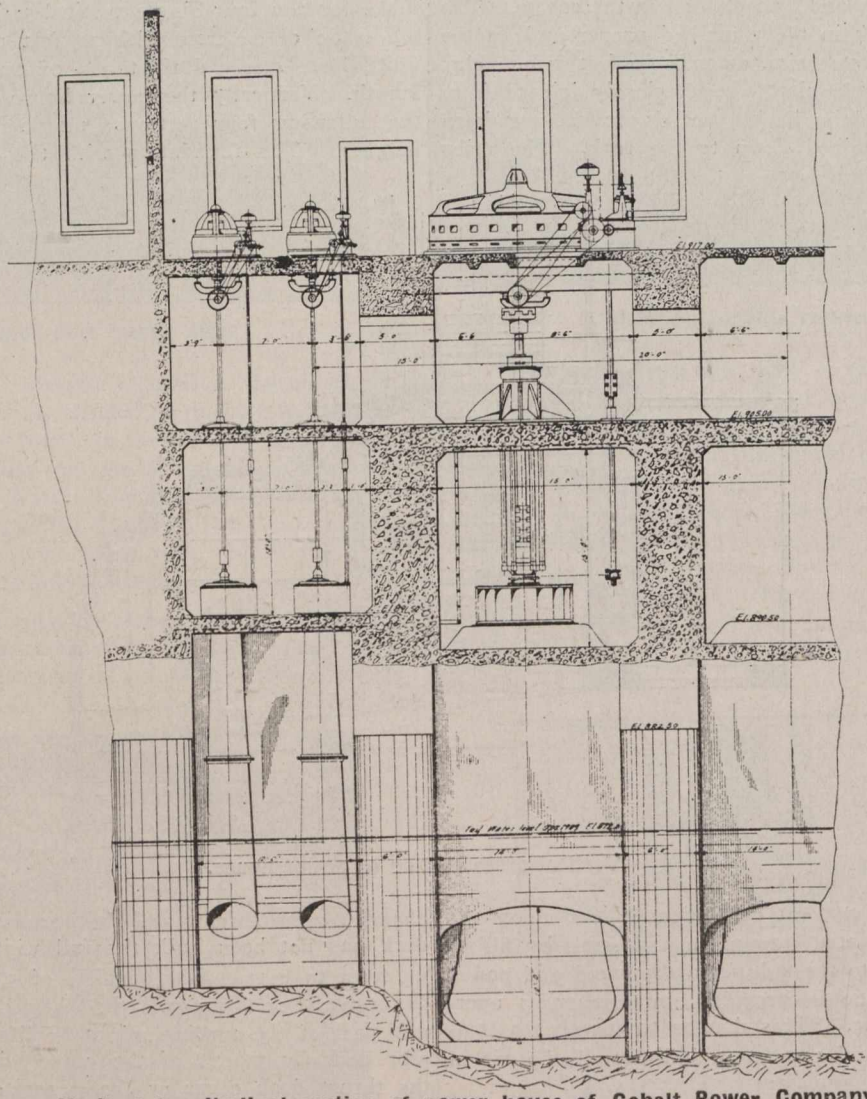
Vertical cross section of power house.

stability of the building were made by assuming the highest possible water level at elevation 915.00, a wind pressure of 25 lbs. per square foot, and a snow pressure on the roof of 20 lbs. per square foot, and it was found that the maximum compression at the piers in the tail race is 132 lbs. per square inch. It further showed that the intake piers are under certain conditions subjected to tension and to take this up they were anchored to the rock with 2 steel rods, 2 inches diameter, in each pier.

Forebay and power house required the excavation of 7,600 cubic yards of rock. 6,000 cubic yards of concrete were used.

In selecting the type of a turbine to be installed, among other considerations the possibility of high water in spring freshets and especially in case of a log jam, was a very important one. It was found that under existing conditions the vertical turbine, direct coupled to a vertical type dynamo was the most suitable, as in this way the dynamo could be set above the highest possible head water level. A single turbine was chosen in order to have as simple an outfit as possible consistent with good efficiency, and thus to reduce to a minimum the chances for break downs. The capacity of the four generator turbines of which three are installed at present, is guaranteed to be 1,335 H.P. under 32.5 feet head. running at 150 R.P.M. Fig. 14 shows the runner which is of the Francis high speed type, the characteristic being 71. (Characteristic—Number of revolutions per minute of a runner developing 1 h.p. under one foot head).

Figs. 15 and 16 show the gate case; bottom plate, pillars, and cover are one solid casting, the pillars being of such a shape as to form part of the gate when the latter is open. The movable gate is held in place by the gate shaft; this shaft is made of a square steel bar turned at the lower end and near the top, where resting in the brass bushed bearings in cover and bottom plate. The square section passing through the gate is tapered and fits closely to the gate. A cast iron lever is clamped to the top of the gate shaft, this lever in turn being connected to the gate ring by means of the gate rod. All bushings are brass lined to minimize wear and consequent play as excessive play causes the governor to race. There are 16 gates in each turbine case. Two regulating rods attach the gate ring to the regulating shaft, and two machine dressed bevel gear segments make up the connection to the horizontal governor shaft.



Vertical longitudinal section of power house of Cobalt Power Company.

An important factor in the design of this type of a turbine is to take proper care of the downward thrust. All turbines at the Hound Chute plant are provided with ring oil step bearings, those of the main units being water-cooled. The rotating weights of the generators and exciters are taken up by ball bearings resting on the top of the frames. In order to prevent the turbine from putting additional weight onto the generator thrust bearing, in case the turbine thrust bearing should wear too fast or settle, or vice versa, clutch couplings have been used to connect the two shafts. The turbine thrust bearing is supported by the penstock cover on the thrust deck, and can therefore

be constantly watched by the operator. It is designed for a pressure of 12 tons and a speed of 150 R.P.M. The oil is fed into the bearing through a drop oiler; a pump pressing it between the two thrust rings, as used at the vertical bearings at the Niagara Falls plants, is therefore not required. The penstock cover, of course, is made in halves, and the hole which it covers, large enough to let the whole turbine pass through it. A lignum vital safety step rests on the turbine cover. The exciter turbines are built in steel penstocks, but are otherwise very similar to the generator turbines.

Each unit is regulated by a governor of the oil pressure type manufactured by the well-known firm Riva & Company, Milano, Italy, of which the Wm. Kennedy & Sons, Limited, are the sole agents on this continent. Fig. 17 shows a section through the governor and Fig. 19 the machine erected. A rotary pump furnishes oil into two cylinders, the one for opening and the other for closing the gates. The supply to the cylinders is controlled by a valve which in turn receives its impulse from an unusually strong tachometer, mounted on a vertical shaft. The two pistons form one solid casting with two bars as separators; a pin is put through these bars holding a brass block between them, and this block is fitted into the fork of a lever, keyed onto the governor shaft. When the equilibrium is disturbed by a higher pressure on one side or the other, piston, pin, and block are pushed horizontally, the block sliding in the fork, at the same time taking the lever with it and turning the governor shaft. The usual relay and dash pot prevent the governor from racing or hunting. Oil pump, cylinders, piston, control valve, a safety valve and the oil reservoir are all contained in one chamber, and the whole governor presents a very compact, substantial and neat design, and is of first-class workmanship.

The Hound Chute plant has been in operation since April, 1910. The plant including the hydraulic machinery was designed by the writer as engineer of the Wm. Kennedy & Sons, Limited, Owen Sound. Resident engineer was Mr. A. Gillies, B.A. Sc. The hydraulic machinery was furnished by the Wm. Kennedy & Sons, Limited, Owen Sound, and the electrical equipment by the General Electric Company of Sweden, dealers Kilmer, Pullen and Burnham, Toronto.

NEW INCORPORATIONS.

Blackville, N.B.—Morehouse, Blackville Telephone Company, $2,000, H. Morehouse, D. Morehouse, J. Morehouse.

Joliette, Que.—Joliette Steel & Iron Foundry, $250,000, S. Vessot, A. Durand, E. Hebert.

Montreal.—Vulcan Tube Cleaning Systems, $149,000, W. W. Marshall, H. W. Beauclerk, A. G. B. Claxton. British Empire Bridge Company, $5,000,000, R. C. Smith, F. H. Markey, W. W. Skinner. Canadian Tube & Iron Company, $1,000,000, G. V. Cousins, P. F. Brown, W. R. Ford. Blaines, Limited, $50,000, A. G. Blaine, W. G. Martin, H. E. Barry. Anglo-Canadian Securities Corporation, $50,000, G. V. Cousins, P. F. Brown, S. T. Mains. Progressive Investment Association, $20,000, F. Dorwich, A. Potter, E. W. O'Neal. Porcupine Exploration Company, $100,000, C. G. Greenshields, E. Languedoc, E. R. Parkins. Montreal Concrete Tile, $50,000, A. Desjardins, A. Leblanc, A. F. Vincent. Canadian Sand Blast Company, $50,000, A. Stewart, M. Alexander, D. B. Smith. Ogilvy Realties, $500,000, J. A. Ogilvy, sr., J. A. Ogilvy, jr., J. Ogilvy. Ozone Process, $50,000, G. Laurendeau, J. Melancon, B. Melancon.

Belleville, Ont.—Greenleaf and Son, $40,000, H. W. Greenleaf, C. O. Greenleaf, J. F. Wills.

London, Ont.—Dorchester Peat Company, $75,000, J. McWilliam, J. McEvoy.

Hamilton, Ont.—Armstrong Cartage and Warehouse Co., $100,000, J. Milne, R. C. Fearman, C. Armstrong.

Thoroid, Ont.—Foley, Rieger Pulp & Paper Company, $50,000, E. P. Foley, J. Foley, Thorold; H. M. Rieger, Niagara Falls, N.Y.

Toronto.—Ojaipee Silica-Feldspar, $40,000, E. W. J. Owens, W. A. Proudfoot, H. E. Johnston. Canadian Geographic Society, H. J. Macdonald, F. H. Lytle, H. C. Macdonald. Bolsby Manufacturing Company, $40,000, J. D. Montgomery, R. A. Montgomery, E. R. Lynch. Interurban Telephone Company, $200,000, J. S. Lovell, W. Bain, R. Gowans.

Windsor, Ont.—Ontario Gravel Freighting Company, $50,000, O. E. Fleming, C. W. Cadwell, Windsor; H. K. Oakes, Detroit. Windsor Overall Company, $30,000, C. Thibault, F. Miner, E. C. Kenning.

Winnipeg, Man.—Excel Fuel Oil Burner Company of Manitoba, $60,000, C. E. Simonite, H. A. Dangerfield, A. R. Bredin. Matheson, McLaren & Company, $250,000, W. J. McLaren, Edinburgh, Scotland; E. M. Catchpole, G. C. Hislop, Winnipeg. Winnipeg Sandstone Brick Company, $400,000, R. B. Eadie, R. Siderfin, G. Murray. Rawhide Leather Goods, $5,000, F. E. Hatch, R. R. Kinread, M. Finklestein. Lake Winnipeg Shipping & Supply Company. $1,000,000, E. Bickerdike, R. Siderfin, W. D. Robertson. Cattley Loans and Finance, $150,000, J. F. McCallum A. B. McAllister, L. D. Smith.

Olds, Alta.—Olds Farmers' Independent Telephone Co., $5,025.

Edmonton, Alta.—Edmonton & Clover Bar Sand Company, $25,000. Western Asphalt & Oil Company, $500,000.

British Columbia.—Empress Electrical Works, $700. Hose Investment Company, $250,000.

COST OF SPRINKLING FILTER SEWAGE PURIFICATION.

In a report recommending to the city council of East Orange, N.J., the building of a sprinkling filter plant for purifying the sewage of the city, Harrison P. Eddy, of Boston, the consulting engineer, presents the following statement of costs.

In considering the size of purification plant to be provided, the calculations were based on the estimated average flow in 1920, and three different schemes were estimated for, the first being a plan for handling the sewage of East Orange alone; the second for taking the sewage of East Orange and Montclair; and the third including these two cities and Orange, Bloomfield and Glen Ridge. Estimates were also made for the additions to the plant which would be necessary and should be made in 1920 for the estimated flow of 1930, and in 1930 for the estimated flow of 1940.

Sufficient preliminary tanks have been provided to permit of a period of sedimentation of eight hours. These tanks should be constructed of masonry and need not be covered. They should be located upon hard ground so as not to require expensive foundations. There is no necessity of having the tanks close to the filters, although such an arrangement would be advantageous. If, however, the filters are located at some distance out in the meadows, it will be advisable to secure a small tract of land on the border of the meadows where a suitable foundation can be had. These tanks should be so constructed as to facilitate speedy subsidence of the

suspended matter, and ample provision should be made to facilitate the removal of sludge.

The estimates of costs of the sprinkling filters have been based upon the use of broken stone as a filtering medium, and upon the assumption that one acre of filters will provide for the purification of the sewage from 15,000 persons. This rate will require the treatment of about 2,000,000 gallons of sewage per acre of filter, although the quantity varies somewhat according to the various assumptions which have been made as to flow. The filters as planned will be seven and one-half feet in depth. This provision is conservative, in view of the fact that filters five feet in depth are now in use and doing satisfactory work. Experience seems to indicate, however, that a more than proportionately greater quantity of sewage can be filtered by a bed seven and one-half feet in depth than one five feet in depth. While it is possible that filters five feet in depth could be used, the estimates have been based on the greater depth of filtering material so that the results may be beyond question and the estimates conservative.

The number of acres of filters to be provided at the outset and in 1920 and 1930 are given as follows:—

Number of Acres of Sprinkling Filters Required.

Project.	1910.	1920.	1930.
(1)	(2)	(3)	(4)
East Orange	2.5	3.5	4.5
East Orange and Montclair	4.5	6.	8.
Five Municipalities	9.	12.	16.

The quantity of sewage to be filtered per acre, based upon the estimated quantities, are as follows:—

Quantity of Sewage to be Filtered,
(Gallons per Acre per Day).

Project.	1920.	1930.	1940.
(1)	(2)	(3)	(4)
East Orange	2,150,000	1,922,000	1,900,000
East Orange and Montclair	2,280,000	2,123,000	1,960,000
Five Municipalities	2,410,000	2,220,000	2,045,000

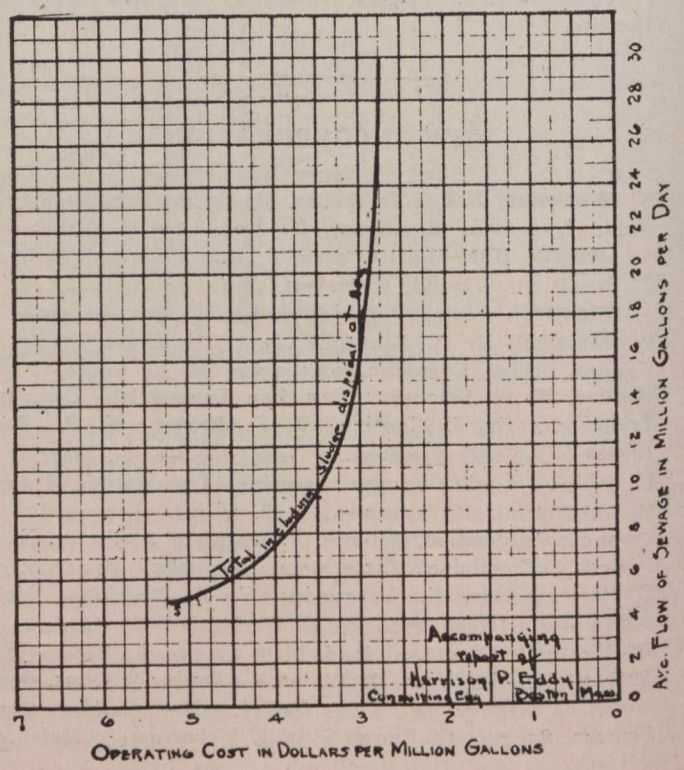
More or less sludge will be produced by the preliminary sedimentation, whether the process be that known as "sedimentation" or the "septic" treatment. These estimates have been based upon a reduction of the quantity of sludge by fermentation, either in septic tanks or special sludge tanks built for the purpose. The quantity of sludge which will be produced by the preliminary sedimentation process has been estimated at 550 gallons per million gallons of sewage.

A larger volume of sludge, although much less dense, will be produced by the process of secondary sedimentation. While the sludge produced by the septic tanks will probably contain at least 10 per cent. solids, that produced in the secondary tanks will not contain over 5 per cent. of solid matter. It is possible that a saving might result from the construction of secondary sludge tanks which could be used for concentrating the sludge produced in the secondary sedimentation tanks. These, however, have not been included in the estimates and such tanks would be constructed only in case a saving over the cost herein estimated could be realized. The quantity of sludge produced in the secondary tanks, used as a basis of these estimates, is 750 gallons per million gallons of sewage. The total quantity of sludge produced by the plant will be about 1,300 gallons per million gallons of sewage. This sludge can be transported to sea in tank barges and there dumped at comparatively small expense. If, on the other hand, such a course should seem inadvisable, a small area of land in the vicinity of the sprinkling filters can be prepared with suitable material and the sludge dumped on it and allowed to drain and dry. The semi-dry sludge resulting from this process can be hauled to suitable places for dumping and thus disposed of.

The estimates of the cost of constructing the purification plant are given as follows: The amounts given in columns 3 and 4 represent the expenditures which will be necessary for increasing the size of the plant in those years, and the aggregate costs on dates given.

Estimates of Cost of Purification Plant and Extensions.

East Orange	Additional Expenditures in 1910	1920	1930
(1)	(2)	(3)	(4)
Primary and Secondary Tanks	$ 53,300	$ 65,400	$ 81,800
Sprinkling Filters and Appurtenances	116,000	161,000	206,000
Effluent Drain and Sludge Disposal	34,200	34,200	48,950
	$203,500	$260,600	$336,750
East Orange and Montclair			
Primary and Secondary Tanks	$ 97,100	$119,200	$145,800
Sprinkling Filters and Appurtenances	206,100	273,500	363,500
Effluent Drain and Sludge Disposal	35,700	35,700	53,450
	$338,900	$428,400	$562,750
Five Municipalities			
Primary and Secondary Tanks	$202,300	$246,500	$301,000
Sprinkling Filters and Appurtenances	410,000	545,000	725,000
Effluent Drain and Sludge Disposal	62,500	62,500	67,500
	$674,800	$854,000	$1,093,500



PRECIPITATION FOR SEPTEMBER.

The rainfall was below the usual amount throughout British Columbia, also in the Western Provinces, except locally in the latter, the localities departing from the rule being a few points in Alberta, Northwestern Saskatchewan and Eastern Manitoba. In Ontario the rainfall was locally above the average in a few districts, otherwise everywhere below. In Quebec it was either average or below, and in the Maritime Provinces below in all localities, except in Cape Breton, where in some parts a small positive departure was recorded. The largest rainfall reported for the month was 3.97 inches at Toronto, and the smallest 0.40 inches at Kamloops.

The table shows for fifteen stations included in the report of the Meteorological Office, Toronto, the total precipitation of these stations for September.

Ten inches of snow is calculated as being the equivalent of one inch of rain:—

Station.	Depth in inches.	Departure from the average of twenty years.
Calgary, Alta.	1.60	+ 0.36
Edmonton, Alta.	2.00	+ 0.50
Swift Current, Sask.	0.90	— 0.40
Winnipeg, Man.	2.70	+ 0.80
Port Stanley, Ont.	3.00	+ 0.20
Toronto, Ont.	3.97	+ 1.12
Parry Sound, Ont.	2.40	+ 1.16
Ottawa, Ont.	2.00	— 0.68
Kingston, Ont.	1.70	— 0.90
Montreal, Que.	3.30	— 0.10
Quebec, Que.	3.60	— 0.15
Chatham, N.B.	1.70	— 1.40
Halifax, N.S.	3.90	— 0.10
Victoria, B.C.	1.60	— 0.50
Kamloops, B.C.	0.40	— 0.60

PATENTS.

The following is a list of Canadian Patents, granted on September 20, 1910, relating to contractor's appliances and building trades, and furnished by Fetherstonhaugh & Co., 5 Elgin Street, Ottawa, Canada, Russel S. Smart, Resident, from whom all information concerning same may be granted.

128, 216, H. C. Barnett, Jefferson, Ga., road graders and smoothers.

128, 220, Jno. Crity Grenshaw, Riverston, Ala., excavating buckets.

128, 255, Jno. McCallum, Gladstone, Ont., cement or concrete land rollers.

COMING MEETINGS.

(Continued from page 506).

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—October 10-14. Annual convention at Atlantic City, N.J. Secretary, H. C. Donecker, 29 West 39th Street, New York City.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.—October 11-14. Annual convention at Erie, Pa. Secretary, A. P. Folwell, 239 West 39th Street, New York City.

AMERICAN ELECTROCHEMICAL SOCIETY.—October 13-15. Annual meeting at Chicago, Ill. Secretary, Jos. W. Richards, Lehigh University, South Bethlehem, Pa.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—October 18-20. Annual convention at Denver, Colo. Secretary, C. A. Lichty, Chicago and North western Railway, Chicago, Ill.

AMERICAN GAS INSTITUTE.—October 19-21. Annual meeting at New York City. Secretary, A. B. Beadle, 29 West 39th Street, New York City.

AMERICAN INSTITUTE OF MINING ENGINEERS.—October 21-November 15. Canal Zone meeting. Secretary, R. W. Raymond, 29 West 39th Street, New York City.

ILLUMINATING ENGINEERING SOCIETY.—October 24. Annual convention at Baltimore, Md. Secretary, P. S. Millar, 29 West 39th Street, New York City.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

Copies of these orders may be secured from the Canadian Engineer for a small fee.

cent. of such cost shall be paid to the said Railway Company by said city of Medicine Hat, and the Railway Company shall bear the remainder of said cost; said railway to see that the said gates are properly maintained and at a joint expense of the said Railway Company and the city of Medicine Hat.

11825—September 26—Amending Order No. 11605, which provided for the installation of an interlocking plant where the railway of the National Transcontinental Railway crosses, at grade, the railway of the C.N.R. Company's Dundee Branch at mileage 246, near the town of St. Boniface, by providing that the interlocking plant be installed at the expense of the National Transcontinental Railway, and maintained and operated by the C.N.R., at the expense of the National Transcontinental Railway; rescinding Order No. 11735, dated September 20th, 1910.

11826—September 29—Temporarily approving of an agreement entered into with the Manitoulin & North Shore Railway Company, for the interchange of telephone messages or service passing to or from their respective telephone systems and lines, the division or apportionment of telephone tolls, and the management, working, or operation of their respective telephone systems or lines, provided that this Order be not taken to authorize the Bell Telephone Company to charge higher toll than it was, immediately previous to May 13th, 1906, authorized by law to charge.

11827—September 29—Temporarily approving of the agreement between the municipal corporation of the Township of Sandwich South, and the Bell Telephone Company, for the interchange of telephone messages or service passing to or from their respective telephone systems and lines, the division or apportionment of telephone tolls, and the management, working or operation of their respective telephone system or lines; provided that this Order be not taken to authorize the Bell Company to charge any higher toll than it was immediately previous to May 13th, 1906, authorized by law to charge.

11828—September 29—Temporarily approving of the agreement between the Bell Telephone Company and the Rural Telephone Company of Kitley, for the interchange of telephone messages or service passing to or from their respective telephone systems and line, the division or apportionment of telephone tolls, and the management, working, or operation of their respective telephone systems or lines; provided that this Order be not taken to authorize the Bell Company to charge any higher toll than it was previous to the 13th May, 1906, authorized by law to charge.

11829—September 29—Temporarily approving of the agreement between the Bell Telephone Company and H. H. Coffey and J. A. M. Armstrong, for the interchange of telephone messages or service passing to or from their respective telephone systems and lines, the division or apportionment of telephone tolls, and the management, working, or operation of their respective telephone systems or lines; provided that this Order be not taken to authorize the Bell Company to charge any higher toll than it was, previous to the 13th May, 1906, authorized by law to charge.

11830—September 1—Ordering the Government of the Province of British Columbia to construct a level crossing over the right-of-way of the Esquimalt and Nanaimo Railway Company at a point shown upon the plan, described as "proposed new road at railway crossing," at the expense of the said Government.

11831—September 30—Authorizing the Hydro-Electric Power Commission of Ontario to erect, place and maintain transmission line across the track of the Toronto, Hamilton and Buffalo Railway Company, at Hunt Street, in the city of Hamilton, Ont.

11832—September 30—Authorizing the Montreal Light, Heat and Power Company to lay and thereafter maintain a gas pipe under the track of the C.P.R. on St. Denis Street, Montreal, Que.

11833 and 11834—September 30—Authorizing the Shawinigan Water & Power Company to erect, place and maintain wires across the track of the C.P.R. near Three Rivers, P.Q., and across the track of the St. Maurice Valley Railway at Mont Carmel.

11835-36—Sept. 30—Authorizing the Erindale Power Co., to erect, place and maintain electric transmission line across the wires of the Bell Telephone Company at the intersection of Birmingham Avenue and Sixth Street at New Toronto, in the Township of Etobicoke, County York, Ontario, and at the intersection of the Middle Road and Centre Road, in the Township of Toronto, County Peel, Province of Ontario.

11837—September 30—Authorizing the Shawinigan Water & Power Company to erect, place and maintain wires across the track of the St. Maurice Valley Railway Company at Marchand's Station.

11838 to 11841 Inc.—September 30—Authorizing the Erindale Power Company to erect, place and maintain electric transmission line across the wires of the Bell Telephone, at the intersection of Evans Avenue and Church Street, in the village of Mimico, Township of Etobicoke, County York, Ont.; at the intersection of New Toronto Street and Sixth Street at New Toronto, in the Township of Etobicoke, County York, Ont.; at the intersection of Church Street and New Toronto Street at Mimico, in the Township of Etobicoke, County York, Province of Ontario.; and at the intersection of Evans Avenue and Mimico Avenue, at Mimico, in the Township of Etobicoke, County York, Ontario.

11842—September 30—Relieving, for the present, the G.T.R. from providing further protection at the crossing of the first highway south of St. Jacob's Station, at Lot 8, German Company Tract, Township Woolwick, County Waterloo, Ontario, at mileage 7¼ from Berlin.

11843—September 27—Authorizing the C.N.O.R. to divert Princess Street, in the village of Orono, County Durham, as shown on plan and profile on file with the Board under file No. 3878.280.

11844—September 30—Temporarily approving of an agreement entered into between the Bell Telephone Company and the municipal corporation of the Township of McKillop, for the interchange of telephone messages or service passing to or from their respective telephone systems and lines, the division or apportionment of telephone tolls, and the management, working or operation of their respective telephone systems or lines; provided that this Order be not taken to authorize the Bell Telephone Company to charge higher toll than it was, previous to May 13th, 1906, authorized by law to charge.

(Continued on page 507).

ENGINEERING SOCIETIES.

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

Chairman, L. A. Vallee; Secretary, Hugh O'Donnell, P.O. Box 115, Quebec. Meetings held twice a month at Room 40, City Hall.

TORONTO BRANCH—
96 King Street West, Toronto. Chairman, A. W. Campbell; Secretary, P. Gillespie, Engineering Building, Toronto University, Toronto. Meets last Thursday of the month.

MANITOBA BRANCH—
Chairman, J. E. Schwitzer; Secretary, E. Brydone Jack. Meets 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, 40-41 Flack Block, Vancouver. Meets in Engineering Department, University

OTTAWA BRANCH—
Chairman, W. J. Stewart, Ottawa; Secretary, S. J. Chapleau, Resident Engineer's Office, Department of Public Works.

MUNICIPAL ASSOCIATIONS.

ONTARIO MUNICIPAL ASSOCIATION.—President, Mr. George Geddes, Mayor, St. Thomas, Ont.; 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, Mayor Reilly, Moncton; 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 Hopkins, Saskatoon; Secretary, Mr. J. Kelso Hunter, City Clerk, Regina, Sask.

CANADIAN TECHNICAL SOCIETIES.

ALBERTA ASSOCIATION OF ARCHITECTS.—President, E. C. Hopkins, Edmonton; Secretary, H. M. Widdington, Strathcona, Alberta.

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.

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.; Vice-President, Gustave Kahn, Toronto; Secretary-Treasurer, R. E. W. Hagarty, 662 Euclid Ave., Toronto.

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, 11 Queen's Park, Toronto.

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

CANADIAN GAS EXHIBITORS' ASSOCIATION.—Secretary-Treasurer, A. W. Smith, 52 Adelaide Street East, Toronto.

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, 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, 157 Bay Street, Toronto.

CANADIAN SOCIETY OF FOREST ENGINEERS.—President, Dr. Fernow, Toronto; Secretary, J. W. H. Jacombe, Ottawa.

CENTRAL RAILWAY AND ENGINEERING CLUB.—Toronto, President, J. Duguid; 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, Dr. Martin Murphy; Secretary, B. F. Mitchell, City Engineer's Office, Edmonton. Alberta.

ENGINEERING SOCIETY, TORONTO UNIVERSITY.—President, A. D. Campbell; Corresponding Secretary, A. H. Munroe.

ENGINEER'S CLUB OF TORONTO.—96 King Street West. President, C. M. Canniff; 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.

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, S. Fenn; Secretary, J. Lorne Allan, 15 Victoria Road, 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, H. W. Selby; Secretary, Killaly Gamble, 703 Temple Building, Toronto.

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.

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

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

WESTERN CANADA RAILWAY CLUB.—President, Grant Hall; Secretary, W. H. Rosevear, 199 Chestnut Street, Winnipeg, Man. Second Monday, except June, July and August, at Winnipeg.

AMERICAN TECHNICAL SOCIETIES.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS (TORONTO BRANCH).—W. H. Eisenbeis, Secretary, 1207 Traders' Bank Building.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—President, John P. Canty, Fitchburg, Mass.; Secretary, T. F. Patterson, Boston & Maine Railway, Concord, N.H.

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION.—President, L. C. Fritch, Chief Engineer, Chicago G. W. Railway; Secretary, E. H. Fritch, 962-3 Monadnock Block, Chicago, Ill.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Secretary, C. W. Hunt, 220 West 57th Street, New York, N.Y. First and third Wednesday, except July and August, at New York.

AMERICAN SOCIETY OF ENGINEERING-CONTRACTORS.—President, George W. Jackson, contractor, Chicago; Secretary, Daniel J. Hauer, Park Row Building, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—29 West 39th Street, New York. President, Jesse M. Smith; Secretary, Calvin W. Rice.

WESTERN SOCIETY OF ENGINEERS.—1735 Monadnock Block, Chicago, Ill. J. W. Alvord, President; J. H. Warder, Secretary.

COMING MEETINGS.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Ottawa Branch, 177 Sparks Street, October 20, 1910. Programme, S. B. Johnson, A.M., Can. Soc., C.E., Subject: Stream Metering. Secretary, S. J. Chapleau, Resident Engineer's Office, Department of Public Works.

NEW YORK CEMENT SHOW.—December 14-20, 1910. First annual convention in Madison Square Garden, New York. Under the management of the Cement Products Exhibition Company, 115 Adams St., Chicago.

CHICAGO CEMENT SHOW.—February 15-23, 1911. Fourth annual exhibition, at the Coliseum, Chicago, Ill. Under the management of the Cement Products Exhibition Company, 115 Adams St., Chicago.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.—October 11-16. Seventeenth annual convention, Erie, Pa. Prescott Folwell, Secretary, 239 W. 39th Street, New York, N.Y.

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TORONTO, CANADA,, OCT. 13,, 1910.

CONTENTS OF THIS ISSUE.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

(Continued from Page 505.)

11801—September 24—Amending Order No. 9900, which authorized the C.P.R. to open for traffic that portion of its Langdon North Branch from mileage 0 to 38.88; and imposing a speed limit of fifteen miles an hour, by deleting the clause limiting the rate of speed the C.P.R. shall operate its trains over the said line of railway.

11802—September 13—Authorizing the G.T.R. to construct, maintain and operate a branch line of railway, or siding, from a point on the siding on Mowat Avenue, Toronto, which the C.P.R. was authorized to construct by Order No. 4816, thence extending southerly along, upon, and across Mowat Avenue, and upon Lots 44, 43, 42, 41, 40, 39, 38, and 37, on the east side thereof, to and into the premises of H. Disston & Sons; that the C.P.R. have the right to use and operate jointly and on equal terms with the G.T.R. the said branch line or siding; G.T.R. to construct and complete said branch line within three months from date of this Order; that Order No. 11783 be rescinded.

11803—September 28—Ordering that, for the present, the G.T.R. be relieved from providing further protection at the crossing of the first highway north of Longford Station, Concession Given Road, Lot 18, Township Rama, County Ontario, mileage 94, from Toronto.

11804—September 27—Authorizing the C.P.R. to construct, maintain and operate industrial spurs for Metals, Limited, and Messrs. Tees & Persse, in Block 65; and for Messrs. Campbell & Griffin, in Block 67, in the city of Calgary.

11805—September 28—Authorizing the C.P.R. to construct, maintain and operate its tracks under the power wires of the municipality of the town of Orillia, at the railway crossing of the Concession Road between Concessions 4 and 5, in the Township North Orillia; and to deviate said power line as shown in red on the plan and profile on file with the Board under file No. 15716, and in accordance with and subject to the "Standard Conditions and Specifications for Wire Crossings."

11806—September 13—Authorizing the C.P.R. to use and operate jointly and on equal terms with the G.T.R. the branch line of railway, or spur, which the G.T.R. was authorized by Order No. 11802, to construct, from a point on the Mowat Avenue siding, Toronto, used jointly by the said Railway Companies, to and into the premises of Henry Disston & Sons, on the east side of Mowat Avenue; that the C.P.R. pay to the G.T.R. half the cost of the construction of said branch line, or spur; that the C.P.R. pay half-yearly to the G.T.R. half the cost of the maintenance of the said spur; that the cost of the construction and maintenance of said spur be established by the certificate of the Division Engineer of the G.T.R. at Toronto, subject, in case of dispute, to the decision of the Chief Engineer of the Board; and rescinding Order No. 11741, dated 13th September, 1910.

11807—September 29—Authorizing the Water Commissioners for the city of London to erect, place and maintain electric wires across the wires of the G.N.W. Telegraph Company, in the city of London, at the intersection of Beaconsfield Avenue, and Wharrencliffe Road.

11808—September 19—Authorizing the G.T.P. to complete the construction of the bridge on the G.T.P. in East Clover Bar District, situate about two miles west of Ardrossan Station, between Sections 4 and 5, in the Township 53, Range 22, west of the 4th Meridian, Ontario.

11809—September 19—Granting leave to the Local Improvement District 24-S-4 to extend Alexandra Street across the right-of-way of the Calgary and Edmonton Railway (C.P.R.) at a point shown upon the plan attached to the file, said applicant to complete the work according to the Standard Regulations of the Board affecting Highway Crossings as amended May 4th, 1910, at its own expense; and to the Calgary and Edmonton Railway Company to remove the switch at the south end of the business track to a point outside the limit of the said crossing.

11810—September 17—Granting leave to the city of Calgary to erect an overhead bridge across the right-of-way of the Macleod Branch of the C.P.R., at a point shown upon the plan attached to the file; the expense in connection with the erection and maintenance of said bridge shall be borne by the city of Calgary.

11811—September 19—Adding the Clover Bar Sand and Gravel Company as a party to the application of William Humberstone, of Edmonton, Alta., for an Order directing the G.T.P. to construct a branch line to the shaft of his mine, situate on the N.W. ¼ of Sec. 7, Tp. 53, Range 23, west of the 4th Meridian, adjoining the Clover Bar Coal Company lands.

11812—September 19—Granting leave to the G.T.P. to expropriate Lots 36, 37, 38, and 46, in Dwyer Subdivision, in the city of Edmonton; the G.T.P. to, within ten days, file with the Board a plan for carrying the line of the said railway over Norton Street, in the city of Edmonton, and upon approval of such plan the G.T.P. to complete all work necessary for the said crossing in accordance with the said plan, and to the satisfaction of an Engineer of the Board, on or before the first day of July, 1911; G.T.P. to complete all the necessary work to properly connect Nanton Street and Fort Saskatchewan Trail in accordance with the Standard Regulations of the Board affecting Highway Crossings, as amended May 4th, 1910, and to the satisfaction of an Engineer of the Board within one month from this date; the Saskatchewan Trail shall not be closed for public travel until after the completion of the Norton Street Bridge.

11813—September 19—Adding the C.P.R. as a party to the complaint of the North Battleford Lumber Company, of North Battleford, Sask., on behalf of the Retail Lumbermen of that place, alleging discrimination in lumber rates between Warman and Lloydminster by the C.N.R., and postponing the hearing of this application until after the answer of the C.P.R. is filed, or the time for filing such answer has elapsed.

11814—September 8—Authorizing the G.N.R. to extend the siding shown in red upon the plan filed, commencing at Station 277-46, south and parallel to the track, for a distance of three hundred feet, upon the Prudential Builders, Vancouver, entering into the usual siding agreement with the Railway Company regarding the construction of the said spur; the G.N.R. to prepare and submit to the Prudential Builders the siding agreement; in the event of there being any dispute between the parties as to the terms thereof, same to be at once referred to the Board; said work to be finished within thirty days after the execution of the said siding agreement, or the terms thereof have been settled by the Board.

11815—September 12—Dismissing the application of the Board of Trade of Greenwood, B.C., and Donald O. McKay, for operation by the V. V. & E. R. and Nav. Co., of a branch line at or near Myncaster.

11816—September 19—Authorizing the G.T.P. to, within thirty days, construct a highway crossing upon the road allowance between Sections 25 and 30, in accordance with the Standard Regulations of the Board affecting Highway Crossings as amended May 4th, 1910, upon the complaint of Donald MacKenzie, of Kirk, Alberta.

11817—September 1—Dismissing the application of the Esquimalt & Nanaimo Railway Company, for leave to maintain in its present condition a passage for foot passengers only, at point of crossing of Old Esquimalt Road, or in alternative, to divert Old Esquimalt Road between William Street and Dalton Street, upon and along Dalton Street, in the city of Victoria, B.C.

11818—September 6—Dismissing the application of C. J. Piper, of Piper Siding, B.C., for an Order directing the G.N.R. to construct a siding at Piper Siding, B.C.

11819—September 7—Ordering the British Yukon Railway Company, the British Columbia Yukon Railway Company, the Pacific and Arctic Railway and Navigation Company, and the White Pass and Yukon Railway Company, to cease discriminating against J. H. Conrad and in favor of the locality in which the Atlas Mining properties are located; and that the Railway Companies file tariffs showing rates granted the Atlas Mining Company, and amending Supplemental Tariff giving carload rates of $1.75 per ton on ore, and concentrates from Caribou to Skaguay; further ordering the Railway Companies to grant all ore shippers proportionate rates and privileges at least as those granted to the Atlas Mining Company; also to obtain for J. H. Conrad as favorable ocean rates and treatment as to wharfage as given the Atlas Mining Company.

11820—September 19—Granting leave to the Department of the Attorney-General of the Province of Alberta, to cross the right-of-way of the Calgary & Edmonton Railway at a point shown on the plan attached to file; said crossing to be in all respects in accordance with the Standard Regulations of the Board affecting Highway Crossings, as amended May 4th, 1910; directing that if the old crossing was one which the Calgary & Edmonton Railway was bound to maintain, it shall maintain the new crossing; if there be any dispute as to the maintenance of said crossing, either party may submit such evidence as it desires to the Board as to the liability of the company to maintain the said crossing.

11821—September 16—Granting leave to the C.P.R. to file a plan showing the location of a spur leading into the premises of S. Houlton, Calgary, Alta., along the lane in Block 69, across Fourth St., to Lots 46 and 48, in Block 67, in Calgary; after approval of said plan the said Railway Company to construct said spur, as shown on said plan, across Fourth St., in the event of it becoming necessary to protect said crossing, S. Houlton to bear such portion of the expense of such protection as the Board may determine.

11822—September 17—Postponing the question of the construction of a subway under the tracks of the C.P.R. on Fourth Street West, in the city of Calgary; ordering that (the C.P.R. consenting) the C.P.R. file a plan with the Board within thirty days showing the location of gates on Fourth Street West; that within 60 days after the approval of said plan the Railway Company do erect and maintain the said gates, operating the same day and night at its own expense; that the erection and maintenance of the said gates shall in no way prejudice or change the rights of the parties under Agreement, bearing date the 14th September, 1906.

11823—September 19—Authorizing the Grand Trunk Pacific Branch Lines Company' to file within thirty days, for approval, a plan providing for an overhead bridge for the carrying of the highway over the railway at the point in question; the Local Improvement District and the Government of the Province of Alberta to pay $200 and $500 respectively into the Canadian Bank of Commerce at Edmonton on or before the 1st December, 1910, as their contribution towards the construction of the work hereinafter directed, to the joint credit of the District Council, the Government of the Province of Alberta and the Grand Trunk Pacific Branch Lines Company, said Railway Company to complete such work provided for by plan, on or before June 15th, 1911; the Local Improvement District to complete the approaches at both ends of the bridge; upon the completion of the work the sum of seven hundred dollars, together with accrued interest thereon, to be paid out of the said bank to the Grand Trunk Pacific Branch Lines Company.

11824—September 16—Ordering the C.P.R. to file, within thirty days from the issue of this Order, a plan showing the location of gates where Main Street, Medicine Hat, crosses the right-of-way of the said railway; within sixty days after the approval of the said plan, said Railway Company shall construct and complete said gates in accordance with said plan; upon completion of this work, twenty per cent. of the cost thereof shall be paid to the Railway Company out of the Railway Grade Crossing Fund, 40 per

(Continued on page 514).

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.
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Hartland, N.B., public buildings.	Oct. 19.	Oct. 6.	476
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Vancouver, B.C., warehouse	Oct. 26.	Oct. 6.	476
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TENDERS.

Duncan's Cove, N.S.—Tenders will be received until Nov. 7th, for the construction of a breakwater. R. C. Desrochers, secretary, Department of Public Works, Ottawa.

Three Fathom Harbor, N.S.—Tenders will be received until Nov. 7th for beach protection work. R. C. Desrochers, Secretary, Department of Public Works, Ottawa..

Cartierville, Que.—Tenders will be received until October 13th for the stone covering of the streets situated within the limits of the village. J. Honore Jeanette, Secretary-treasurer, Municipality of Cartierville, 80 St. Gabriel Street, Montreal.

Ste. Croix, Que.—Tenders will be received until November 2nd for the construction of a landing pier. R. C. Desrochers, Secretary, Department of Public Works, Ottawa, Ont.

Niagara Falls, Ont.—Tenders will be received until Oct. 17th for the erection of a fire-hall. W. J. Seymour, city clerk.

Providence Bay, Ont.—Tenders will be received until November 7th for the construction of an extension to the wharf. R. C. Desrochers, Secretary, Department of Public Works, Ottawa.

Toronto, Ont.—Tenders will be received until October 12th for grading the approaches to Wadsworth Bridge, Weston. The amount to fill will be approximately 2,000 cubic yards. Barber & Young. County Engineers.

Toronto, Ont.—Tenders will be received until October 18th for the construction of asphalt, bitulithic, concrete and asphalt block pavements; also concrete curbing, concrete walks and sewers. G. R. Geary (Mayor), Chairman Board of Control.

Winnipeg, Man.—Tenders will be received until Oct 17th for the supply of one million feet of B.M. lumber. M. Peterson, secretary, board of control.

Winnipeg, Man.—Tenders will be received until Nov 2nd for the construction of a pile protection pier. R. C Desrochers, secretary, Department of Public Works, Ottawa.

Winnipeg, Man.—Tenders are invited for the erection of four steel tanks, at stations between Winnipeg and Brandon, during November and December. Box 868, The Manitoba Free Press.

Grand Forks, B.C.—Tenders will be received until October 25th for the erection and completion of a brick and stone courthouse building. F. C. Gamble, Public Works Engineer, Department of Public Works, Victoria, B.C.

Nelson, B.C.—Tenders will be received until October 15th for the construction of a rifle range. Plans and specifications may be seen and full information obtained at the offices of the District Officer commanding Military District No. 11, Victoria, B.C.; the Director of Engineer Services, Headquarters, Ottawa, and the Officer Commanding 102nd Regiment, Nelson, B.C.

Prince Rupert, B.C.—The city engineer invites tenders for grading, tenders closing October 19th.

Vancouver, B.C.—Tenders will be received until Oct. 18th for the construction of a wood block pavement running from Granville to Howe street. Wm. McQueen, City Clerk.

Vancouver, B.C.—Tenders will be received until Oct. 18th for the resurfacing of Abbot street, with bitulithic or asphalt pavement. Wm. McQueen, city clerk.

CONTRACTS AWARDED.

St. John's, Que.—F. Lemoine & Son, Montreal, received the contract for the construction of concrete in connection with the piers, abutments and approaches at $13 per cubic yard and $4.50 for piling per pier; total amount of contract, $28,700. Other bidders were: The Harris Construction Company, Limited, at $16.90 per cubic yard, $52.60 for piling; Quinlan & Robertson Company, of Montreal, at $15.50 per cubic yard and $32 for piling.

Montreal, Que.—Contracts for the Y.M.C.A. buildings were awarded as follows: Messrs. Robertson Bros. got the contract for the brickwork, the D. M. Long Company the carpentering; structural steel, the Calkins Tile and Marble Company the marble and tile work, and R. D. Clark & Sons the plastering. These buildings are each to be three storeys high, with basement, and will cost between $60,000 and $70,000 each.

Almonte, Ont.—A. C. Gilmour and Geo. Bradford received the contract for the erection of concrete dams at the outlets of Lakes Gull and Cross, at the head waters of the Mississippi River.

Fort William, Ont.—The fire hall annex contract was given to Mr. H. Braden.

London, Ont.—The contract for preparing part of the station for the transformers was awarded to E. W. Hyde, Toronto, at $1,416.

New Liskeard, Ont.—Mr. Proctor received the contract for the laying of the sewers on Wellington Street at 75 cents a foot, on Mary Street at 80 cents per foot, and on John Street at $1.10 per foot; also for the supply of the necessary manholes at $40 each. Another tender was received from Mr. George Hansman as follows, John Street, $1.45; Mary Street, $1.35, and Wellington Street, $1.30, and the manholes at $55. These figures, however, include the supplying of pipe and manhole castings, which are not covered by the Proctor tender, but the committee reckoned that the Proctor tender was considerably the cheaper.

Toronto, Ont.—The Norcross Bros. Company has been awarded the contract for the construction of the head office building of the Bank of Toronto. The cost will be about $1,000,000.

Winnipeg, Man.—Contract for the erection of a signal station was given to D. D. Wood, at $62,771, being the lowest tender.

Regina, Sask.—The contract for the laying of the first portion of the street railway system has been let. The R. S. Blome Co. is to lay ties and rails ready for the paving on Albert street from Dewdney to Eleventh avenue, and through the subway, at actual cost, plus fifteen per cent., and to place the extra concrete required at $8.50 per cubic yard, the remainder of the pavement to be put in at the usual rate of $3.00 per square yard.

Vancouver, B.C.—The Simon Shipbuilding Co., of Glasgow, was awarded the contract for a deep water dredge, at a cost of $210,000, to be used in the improvement of the First Narrows.

Vancouver, B.C.—Contract for the Dewdney dyke was awarded to Geo. H. Webster, a local contractor. This dyke will be six or seven miles in length, and will cost about $80,000. C. E. Cartwright, engineer and commissioner.

Vancouver, B.C.—The board of works accepted the tender of Evans, Coleman & Evans, for the laying of sewerage pipes, excepting those of 24-inch circumference, which was given to the Dominion Glazed Pipe Co.

Vancouver, B.C.—The contract for grading Westminster avenue was awarded to G. B. Henderson & Co., at $5,250.

Vancouver, B.C.—Mr. W. S. Painter, chief architect of the Canadian Pacific Railway, announced that the contract for the construction of the proposed Howe street six-storey addition to the Hotel Vancouver had been awarded to Mr. J. L. Skene, a well-known building contractor.

RAILWAYS—STEAM AND ELECTRIC.

St. John, N.B.—It is announced that two railways expect to develop St. John and establish extensive terminals there. The council of St. John has transferred certain shore lands to the C.P.R., and Mr. C. M. Hays has arranged to go to St. John, in regard to negotiations for the establishment of the G. T. Pacific terminals on the east side of Courtenay Bay.

Montreal, Que.—At the annual meeting of the shareholders of the Canadian Pacific Railway, the lease of the New Brunswick Southern Railway was approved. It will in future be operated as a branch of the C.P.R. A resolution to purchase the stock of the Dominion Atlantic Railway was also approved. The lease of the St. Maurice Valley Railway, which extends from the main line of the C.P.R. up the St. Maurice Valley leaving the main line at Three Rivers, Quebec, was also approved. The irrigation of the Company's land in Alberta was authorized at a cost of $8,500,000.

Cobourg, Ont.—Mr. N. Dell, of Cobourg, has invented an apparatus for the better protection of level railway crossings. A feature is the dropping of an upright arm to such a position as to indicate the direction of the oncoming train, and at night a signal lights up as the train approaches. The signal has the usual gates attached, which are operated at about the same speed as are the hand gates, but this speed may be regulated according to the nature of the crossing. A bell is likewise operated with the movement of the gates. Mr. Dell says that the apparatus costs but little more than the ordinary bell signal, and that two months' trial has proved one a success.

Fort William, Ont.—Plans are being gotten in readiness for the construction of the Rainy River Radial Railway, by Engineer George A. Knowlton of this city. The surveys are made and many of the plans completed, it is understood, and active construction will be started in the early spring.

Ottawa, Ont.—The Ottawa Rideau Valley and Brockville Railway Company, which secured incorporation to build a line from here to Brockville through the south part of Carleton and Leeds counties, will begin construction at once. The Grand Trunk will operate the line, thus giving it a direct line from Toronto to Ottawa by way of Brockville.

Ottawa, Ont.—The British Columbia and Alaska Railway Company will apply to Parliament next session for incorporation. The proposed railway will run from Lytton, along the Fraser River, to Fort George, and follow the Stewart River to Port Conley, then following the valley of the Skeena River, the Stickeen and Teslin to Dawson.

Port Arthur, Ont.—Owing to the heavy grades and the competition which will ensue, following the construction of roads by the C. N. and G. T. railways, which have obtained routes of lower grade than the C.P.R., it is reported that a new route is contemplated east of here by the C.P.R. Railway. It is stated that the C.P.R. engineering staff is now working on this new route.

Toronto, Ont.—Much activity is being displayed by the C.N.R. in developing new lines in the Province of Ontario. Besides securing between two and three hundred miles of lines east of Toronto, it is rapidly pushing the construction of a new line from Toronto to Ottawa and has construction of the line well under way to Rideau Lake, within ninety miles of Ottawa. It is also known that the Toronto and Eastern Railway, incorporated at Ottawa last session, is to be connected in some way with the Toronto and Ottawa line of the Canadian Northern, and that it will be more or less of an electric trolley system. Besides this, considerable activity is being shown by the C.N.R. in western Ontario, especially in the neighborhood of London, Ont., where it is understood bids have been made for some of the radial lines.

Toronto, Ont.—The Board of Control is taking steps to find out whether the city can purchase the street railway system. President Wm. Mackenzie, of the street railway, said that a purchase largely depended upon whether the city agreed upon a price satisfactory to the shareholders.

Winnipeg, Man.—The first trains over the Grand Trunk Pacific have crossed on their way to Fort William. They were loaded with wheat from off the line west of Winnipeg. Five miles of the Canadian Northern tracks in Winnipeg were leased.

Edmonton, Alta.—The proposition which was made to establish a Union Station at Edmonton does not meet with the approval of the C.P.R., and hence is not likely to materialize at present. The officials of the C.P.R. do not see any advantage to their company from the use of a Union Station, inasmuch as they have a convenient location for passenger facilities.

Edmonton, Alta.—Every effort is being made by contractors for the Canadian Northern Railway, to rush the work on the new Brazeau branch of that road. The object is to carry the work to such a point this fall, if possible, that a very few weeks' work in the spring will carry the line into the coal regions. Work has commenced on the construction of the overhead bridge, by which the branch will cross the tracks of the C. and E. Railway, six miles south of Blackfolds.

Wetaskiwin, Alta.—It is announced that C.P.R. will construct another dam at Bigstone Creek in the spring. It is proposed to make this dam a reservoir for a million gallons of water connected up to the water tank. This announcement, coupled with the improvement in the railroad yards, may mean important progress for Wetaskiwin as a C.P.R. railway terminal.

Victoria, B.C.—The Portland Canal short-line railway, controlled by Mackenzie and Mann, will apply next session for authority to extend its line from the terminus, sixteen miles out of Stewart, in a general easterly direction to the eastern boundary of the province, at or near where the Peace River intersects the boundary, and from thence to the existing Canadian Northern at Edmonton. This road will provide for an entirely distinct route from ocean to ocean, with Stewart as the Pacific terminus.

Esquimalt, B.C.—After considerations extending over a long period of time, the C.P.R. have decided to equip the steamer Princess May as an oil burner. Many large ocean liners are now using oil for fuel and the supply of oil is to be kept at Vancouver and Seattle for the C.P.R. ships. The cost of oil fuel is practically the same as that of coal, but the fireroom staff is reduced by two-thirds. The saving of labor, weight and hauling is supposed to be from 40 to 60 per cent.

LIGHT, HEAT AND POWER.

Aylmer, Ont.—The Aylmer town council has granted a twenty-five years' franchise to the Peninsula Oil and Gas Company of Chatham. The rates agreed upon are: Householders, 25c. thousand; manufacturers, first five years, 12 cents, after, 14 cents; schools, 15 cents; municipal plant first five years, 8 cents, thereafter, 10 cents, and the town hall and library to be supplied free.

London, Ont.—It is announced by Mr. Glaubitz, engineer, that the power plant for lighting the city will be ready by December 1st. As the contract with the London Electric Company expires on November 30th it will be necessary for the city to assume the work then.

Brandon, Man.—Prof. Herdt of Montreal, says that the scheme of the Western Power and Light Company for developing power from the Assiniboine River is feasible. He believes that power in fair quantity could be developed, but is not prepared to say how much or whether it would be continuous. The city engineer advised the city to purchase the power site and is confident that 2,000 horse power could be developed. The engineer believes a saving to the city of $20,000 per annum would result if the plant was purchased.

St. Boniface, Man.—The advisability is being considered by some of the citizens, of asking the Provincial Government to take up the electric power question as a matter of public policy and evolve a scheme similar to that under the control of the Hydro-Electric Commission in Ontario.

BY-LAWS AND FINANCE.

Fort William, Ont.—The city council passed a by-law providing for the issue of debentures, to the amount of $14,000 for waterworks purposes.

Galt, Ont.—$26,000 sewer and storm-drain debentures.

London, Ont.—The ratepayers will adopt a general local improvement by-law.

Winnipeg, Man.—The hospital committee resolved to submit two by-laws at the civic elections, one for $400,000 for the General hospital, and one for $400,000 for the Municipal hospital.

South Vancouver, B.C.—The ratepayers are considering a general sewerage system by-law.

Victoria, B.C.—Mayor Morley will outline a by-law which will shortly be submitted to the ratepayers, providing for the erection of new municipal buildings to be utilized as a city hall and public auditorium.

SEWAGE AND WATER

Montreal, Que.—Plans for lateral sewers have been under consideration to drain into the trunk sewer at present under construction in west Mount Pleasant. The city engineer estimates the cost at approximately $21,480.00.

Winnipeg, Man.—City Engineer Ruttan recommended that the city proceed to sink two test wells to augment the water supply for immediate requirements. He also recommended that a main conduit system be started to provide not merely for the carrying of water supply required immediately, but also providing for future extensions. If Winnipeg adopts these recommendations she must make up her mind to adopt the wells system of supply for the future

Lethbridge, Alta.—Mr. T. Aird Murray, consulting engineer of Toronto, has submitted his report in connection with an artificial biological plant for Lethbridge sewage disposal. Mr. Murray was brought to Lethbridge when the Alberta Provincial Senate officer announced that compulsory sewage disposal work was postponed until his experimental plant was completed. It was felt that Lethbridge, because of the towns below, could not wait for the province to experiment.

Vancouver, B.C.—City engineer Clement, has prepared an estimate on the cost of lateral sewers, which will drain

into the trunk sewer, at present under construction in west Mt. Pleasant, the total cost of which will be $21,480.00. The following is a list of the sewers with connections, also the estimated cost of each, which was passed by the board of works at a recent sitting: Alberta street, from Tenth avenue to Eleventh avenue, 12-inch pipe, $1,330; Eleventh avenue, from Columbia street to Yukon street, 10-inch pipe, $2,450; Twelfth avenue, from Manitoba street to Yukon street, 10, 12 and 14-inch pipe, $5,400; Thirteenth avenue, from Columbia street to Yukon street, 10 and 12-inch pipe, $2,900; Fourteenth avenue, from Manitoba street to Alberta street, 10 and 12-inch pipe, $3,300; Fifteenth avenue, from Alberta street to Quebec street, 10 and 12-inch pipe, $6,100.

MISCELLANEOUS.

Montreal, Que.—Hon. T. P. Brodeur, Minister of Marine and Fisheries, announced that the work of securing a 35-foot channel from Montreal to the sea will be vigorously proceeded with. The channel has now a uniform depth of 30 feet. Two dredges below Quebec, seven more above and a number of others to be built will deepen the channel. It is expected that the work will take five years to complete.

Ottawa, Ont.—A contract has been let to the Symons Company, Glasgow, for a new government dredge for British Columbia waters. It will cost $210,000.

Toronto, Ont.—It is expected that contracts will be let this winter for constructing the new docks at the eastern end of Toronto harbor, so that work may be begun in the spring. The work of letting the contracts will depend on the passing of the by-laws by the people in January.

Calgary, Alberta.—J. A. Graham, one of the contractors building the Alberta Central Railway, said that the work was now in full swing. There are three outfits at work grading between Red Deer and Rocky Mountain House, 70 miles. Grading and construction is going on at Medicine River, four miles north of Evarts.

Edmonton, Alta.—According to recent advices from the Dominion Government, a $100,000 armoury will be erected here as soon as a suitable site can be secured.

Edmonton, Alta.—A new structure may have to be erected to replace the Saskatchewan bridge, which was badly damaged in a recent railway wreck. The Edmonton Street Railway will not run their cars over the bridge.

Nelson, B.C.—It is reported that the Great Northern Railway Company has purchased the Le Roy Mine, and also that orders have been given to have the roadbed and all bridges placed in a thorough state of repair between the mine and the Granby smelter.

Princeton, B.C.—C. R. Briggs, secretary-treasurer of the British Columbia Portland Cement Company, Limited, is busy getting ready for active construction of buildings on the company's property Onemile. The capital stock of the company is $500,000. Mining will be begun in due time.

Vancouver, B.C.—Plans providing for a second-class dry-dock of the commercial class have been filed for here in Ottawa. Captain N. Thompson is interested. The company will be entitled to a bonus of 3½ per cent. on an expenditure of $2,500,000 for a period of twenty-five years. The dock will be over 600 feet long.

Vancouver, B.C.—The feasibility of establishing an iron and steel industry on Vancouver Island is engaging the attention of eastern capitalists. The only obstacle in the way seems to be the question of obtaining a suitable market. There seems to be no doubt as to value of neighboring iron holdings.

Vancouver, B.C.—Messrs. Waddell and Harrington, consulting bridge engineers, Kansas City, Mo., have been recommended to council, by the finance committee, as consulting engineers, for a period of five years, on a percentage basis. It is likely that the proposition will be accepted. The city anticipates the construction of a number of large bridges, and the remuneration suggested by Dr. Waddell is 3½ per cent. of the total cost of all structures. It is believed the city will allow the engineers $50 a day whilst engaged on the work in question, as well as travelling expenses and other incidentals. Duty paid on plans coming from the United States would also be charged to the city, if the engineers' suggestions are adopted. Customs officers recently collected $1,800 duty on the Granville street bridge plans, and nearly $1,900 on drawings for the Cambie street structure.

CURRENT NEWS.

Montreal, Que.—Tenders for the construction of the superstructure of the Quebec Bridge closed at one o'clock Saturday, October 1st, 1910. Tenders were received from the following firms: 1. St. Lawrence Bridge Company, Limited, of Montreal, representing a combination of the Dominion Bridge Company, of Montreal, Canada, and the Canadian Bridge Company of Walkerville, Canada. 2. The British Empire Bridge Company, Limited, of Montreal, Canada, representing a combination of the Cleveland Bridge and Engineering Company, Limited, of Darlington, England, and the Patent Shaft and Axletree Company of Wednesbury, England. 3. The Pennsylvania Steel Company, of Steelton, Pa., U.S.A. 4. Maschinenfabrik Augsburg-Nurnberg A. G., of Gustavsburg, Germany. Most of the firms, in addition to tendering on the design of the board of engineers, have presented designs of their own and alternative tenders on same, as they were allowed to do by the specifications. The Minister of Railways and Canals has submitted the tenders and plans to the board, who will thoroughly study them and report back to the Minister. No information in regard to the prices will be given out until after the board has made its report, which, in view of the large number of plans and alternative tenders received, will probably not be for several weeks.

Goderich, Ont.—Mr. H. J. Lamb, district engineer, department of public works, London, Ont., has plans and specifications on exhibition in his office, for the construction of 600 feet of breakwater. Being the first breakwater of its character to be constructed in Canada, these plans are of interest in design. The design is of a substructure of reinforced concrete caissons 26 feet high, 35 feet wide at bottom, and 30 feet wide at the top. The structure is to have numerous cross walls. The filling between the cross walls is to be a mixture of sand and gravel, to within six feet of the water level. The work, from six feet below the water level up, will be of mass concrete, thereby providing a very strong structure, required for the extremely exposed locality in which it is to be built. The plan is to build the caissons on shore, then launch and take out to where the site of the breakwater is dredged previously for it. It is expected that this class of breakwater will make Goderich a perfectly safe harbor, and its success will be of considerable interest.

Moose Jaw, Sask.—A unique feature in the power producing plant of the Moose Jaw Street Railway Company, when complete, will be two Diesel oil engines, ordered from the manufacturers at Manchester, England. They are the only ones in Canada, and among the very few on this continent. The strongest feature of this combustion engine, it is said, lies in the economy of fuel in every respect. Heavy oils in crude state may be used, and no fuel is needed when not in operation.

Edmonton, Alta.—A rich seam of coal is said to have been discovered here by workmen excavating for bridge piers. It is announced that a hundred tons of it have been mined.

Edmonton, Alta.—A lumber merger, to include many of the lumbering concerns in British Columbia and a large number of the lumber yards in Northern Alberta, has recently taken place. It will operate under the name of the Dominion Saw Mills, Limited. It is an organization perfected by a syndicate of English capitalists, with a capitalization of $5,000,000, and Lord Desborough is at the head of it. The Globe Lumber Company, having several large yards in the Edmonton district and also the Mundy Lumber Company, will be controlled by this concern. It is said that the new syndicate is gradually gaining control of all the large lumber mills in British Columbia. It also owns 600 square miles of timber limits.

Edson, Alta.—It is declared that what is believed to be one of the richest mica mines in the world has just been discovered near Edson.

Edson, Alta.—A Dominion land surveyor has been at Edson, saying that the Brazeau coal is more nearly anthracite than bituminous. Coal is said to be right on the surface, and, it is understood, of a good quality.

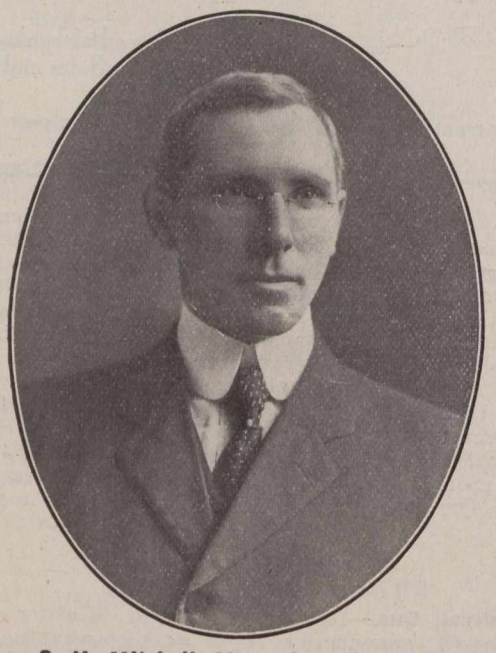
Prince Rupert, B.C.—C. A. Frost of Chicago, formerly president of the Chicago & Milwaukee street railway, through a deal just completed by Reginald Brown, will take over the Moresby Island timber limits. The area embraces about 60,000 acres of timber land. A mill is located at Queen Charlotte City.

Vancouver, B.C.—A $10,000,000 merger of all the power companies in Canada, except the Giant Powder Company's branch factory at Telegraph Bay, has been effected. Ownership will be vested in the British Canadian Explosives, Ltd., recently incorporated. It is understood that the merger will be controlled by the Nobel corporation and the du Pont Powder Company of Delaware, whose holdings in the company will be equal.

Vancouver, B.C.—Owing to the reorganization of the Vancouver Fire-clay Company, improvements are being installed at Clayburn, B.C., where the plant is located. Mr. John B. Miller, late superintendent of the Don Valley Brick Company, largest concern of its kind, is now managing-director of the company. The capital has been increased from $200,000 to $300,000, and experienced men are in charge. The property of the company consists of 750 acres of developed fireclay land, and capacity at present is 60,000 bricks a day. The company intends to extend the plant, so that it can turn out large quantities of sewer pipe, most of which at present is imported from Europe, and in production of which, the concern can thus adequately compete.

PERSONAL.

Mr. C. H. Mitchell, C.E. (Tor.), of the firm of C. H. & P. H. Mitchell, Traders Bank Bldg., Toronto, was elected, at the recent elections, to represent the graduates in engineering of the University of Toronto, on the University senate. Mr. Mitchell was first elected to the University senate some seven years ago when the graduates in Applied Science were first granted representation on that body. In addition to his work for engineers on the University senate, Mr. Mitchell has also been a member of the executive, Canadian Society of Civil Engineers, and two years ago was chairman of the Toronto Branch.



C. H. Mitchell, Mem. Can. Soc. C.E.

Mr. W. M. Currie, formerly chief inspecting engineer for the Hamilton Steel & Iron Works, has been appointed managing director of the Canadian Steel Company, Limited, of Hamilton. This is a company recently organized, worth $400,000 and are locating their works on Sherman Avenue, Hamilton. Mr. Currie was a graduate of the School of Practical Science, Toronto, and has had a long and varied experience in steel work.

Mr. Chas. Unwin, who received his certificate as provincial land surveyor in 1852, and who for over thirty years has been in the service of the city of Toronto, has resigned his position as city surveyor, but still remains on the staff of the city.

Mr. Tracy LeMay has been appointed city surveyor for the city of Toronto in place of Mr. Unwin, who has resigned.

Mr. Charles McDonald, of Gananoque, formerly one of the leading bridge engineers in the United States, has been appointed a member of the Quebec Bridge Commission in succession to Mr. Fitzmaurice, of England, who has resigned from the Commission, owing to ill-health.

Dr. Chas. J. O. Hastings, appointed M.H.O.—Doctor Chas. J. O. Hastings, after considerable discussion and some opposition, has been chosen Medical Health Officer by the city council. Attempts to make the vote unanimous, however, were not successful and it stood 16 for and 7 against. A young man of 24, he graduated from the Ontario College of Pharmacy, and started a drug store in, at that time, the east end of Toronto. He decided, however, that he wished to enter the field of the medical profession, graduated in medicine in 1885 at Toronto University and, after subsequent post-graduate work in London, Dublin and Edinburgh, he returned to Toronto in 1886. He took degrees as licentiate of the Royal College of Physicians in Dublin College. He has practised here ever since starting his medical career. Dr. Hastings is connected with many medical organizations and is in touch with the modern methods in medicine and surgery. He belongs to the British, Canadian and Ontario medical associations, and was on the executive committee at the time the British Association held its convention here. He is on the staff of the Convalescent Home, and the Muskoka Hospital for Consumptives. Dr. Hastings is also on the senate of Toronto University, and is senior physician at Grace Hospital. He, it is reported, has said that he intended to resign all other positions and give his whole time to his new duties. Inasmuch as the position is now vacant, Dr. Hastings will assume his office at once. It is expected that he will actively attack some of the unsanitary conditions now existing in certain parts of the city. Citizens will be glad that a definite arrangement has been made and that the position left vacant by the resignation of Dr. Sheard has been so ably filled after such a long period of uncertainty.

SOCIETY NOTES.

The regular monthly meeting of the Central Railway & Engineering Club of Canada, will be held in the Assembly Room, Prince George Hotel, Toronto, on Tuesday, October 18th, at 8.00 p.m., when a paper will be read on "Railway Signalling," by Mr. C. L. Hackett, Rep. General Railway Signal Company, of Rochester. A social evening will be tendered to members and prospective members by the Club in the dining room of the St. Charles hotel, corner of Yonge and Melinda Streets, at 8.00 p.m. sharp, Friday, October 28.

A meeting of the General Section of the Canadian Society of Civil Engineers, will be held this evening, at 8 p.m., in the society's rooms, 413 Dorchester Street West, Montreal. A paper by Mr. S. Blumenthal, A.M. Can. Soc. C.E., on "Traction Stresses," will be read by the author. There will be a special discussion on the paper by several bridge engineers.

At the annual meeting of the Ottawa branch of Canadian Society of Civil Engineers, held on the 5th inst., the following officers were elected: A. A. Dion, chairman; S. J. Chapleau, J. E. N. Cauchon, Gordon Grant, John B. McRae, James White, for Executive Committee; H. Victor Brayley, secretary-treasurer. At the meeting general business was discussed and the following motions were passed:—

Moved by N. J. Ker and seconded by Morley Donaldson, that a petition be forwarded to the members of the council in Montreal, requesting that whenever a member of a branch pays his fees to the parent society the branch be allotted their proportion at any time that said fees are paid. Carried.

It was resolved that the secretary send to all secretaries of branches the Resolution made by Mr. N. J. Ker and seconded by Mr. Morley Donaldson and ask it to be read before their annual meeting and ask their influence in council.

Moved by Geo. A. Mountain and seconded by Mr. C. R. Coutlee, that the treasurer's report be adopted and that the incoming managing committee tax members of the branch to cover the deficit.

The branch holds weekly meetings every Wednesday at the rooms of the branch, 177 Sparks Street, except the summer months.

The secretary's address is N.T. Ry., Cory Building.

RAILWAY EARNINGS; STOCK QUOTATIONS.

The following table gives the latest traffic returns it is possible to obtain at the time of going to press:

Road	Wk ended	1910	Previous week	1909
C. P. R.	Oct. 7	$2,243,000	$2,933,000	$2,175,000
G. T. R.	Sept. 30	1,237,013	949,498	1,179,150
C. N. R.	Oct. 7	325,900	453,300	298,200
T. & N. O.	Sept. 30	33,503	25,022	50,050
Hal. Elec.	Sept. 30	6,775	4,479	7,863

Figures showing the earnings of Canadian roads since July 1st, this year and last, are appended:

Road.	Mileage.	July 1st to	1910.	1909.
C. P. R.	10,326	Oct. 7	$28,944,000	$17,475,000
G. T. R.	3,536	Sept. 30	11,116,111	11,301,982
C. N. R.	3,180	Oct. 7	3,923,300	3,025,600
T. & N. O.	264	Sept. 30	334,589	437,527
Hal. Elec.	13.3	Sept. 30	66,093	62,500

Stock quotations on Toronto, Montreal and London exchanges, and other information relative to the companies listed in the above tables, are appended. The par value of all shares is $100.

Co.	Capital. 000's Omitted.	Price Oct. 7 1909.		Price Sept. 29 1910.		Price Oct. 6 1910.	Sales last week.
C. P. R.	$150,000	.....	187½	193	192¾	196	195¾ 1,375
Mont. St.	18,000	214⅞	214½	245	239	238	236½ 1,334
Hal. Elec.	1,400	118	115½	129	.....	130	127 12
Tor. St.	8,000	.....	124½	124½	123⅝	124	123½ 141
G. T. R.	226,000	1st pfd., 111; 2nd pfd., 56⅞; com. 26¾					

CALGARY RAILWAY SHOWS BIG EARNINGS IN SEPTEMBER'S STATEMENT.

The street railway system earned $9,189.39 for the city of Calgary during the month of September. The total revenue was $19,293.76, and the operating expenses $10,104.37.

The total number of rides taken on the cars last month was 464,543, and the cars ran a total of 60,666 miles. The hours during which the cars were running totalled 7,219 and the cars earned $31.32 a mile and $2.63 an hour per car.

The passenger earnings alone were $19,003.10, and earnings from miscellaneous sources totalled the balance, $290.66. The cost of maintenance was $10,104.37, divided between the departments as follows:

Operating expenses, $474.06.
Maintenance and equipment, $1,978.
Transportation, $7,302.03.
General expenses, $1,250.28.

The proportion of expenses to revenue was $52,371.

The red car line is the champion earner, $8,769.35 was taken in by conductors on the red cars, and the blue comes next with $7,767.70. The white cars earned $2,553.78.

The passengers carried were divided as follows: Red cars, 211,756; blue cars, 190,161; white cars, 62,626.

The miles covered by the cars on the respective routes: Blue, 29,250; red, 23,260; white, 8,156.

The above figures show that while the blue cars covered more distance than the reds, the latter cars carried more passengers. The red cars earned $3.07 per running hour, the blues $2.33, and the whites $2.41.

GRAND TRUNK'S GOOD EARNINGS.

The Grand Trunk system reports for August and two months as follows:

	1910.	1909.
Aug. gross	$3,063,744	$2,916,086
Net	852,930	815,202
2 mos. gross	5,598,720	5,663,810
Net	1,563,462	1,558,400

THE BRITISH COLUMBIA ELECTRIC RAILWAY REPORT FOR AUGUST AND EIGHT MONTHS ARE AS FOLLOWS:

	1910.	1909.
Aug. gross	$302,121.00	$242,016.00
Expenses	170,083.00	128,442.00
	$132,038.00	$113,574.00
Renewals and maintenance	22,626.00	16,394.00
	$109,412.00	$ 97,180.00
Estimated income from loans and investments	22,000.00	16,500.00
Net	$131,412.00	$113,680.00
	1910.	1909.
8 mos. gross	$585,656.00	$462,681.00
Net after dep. & amortization	$239,277.00	$211,698.00

TORONTO STREET RAILWAY.

City's Share is $34,313. Percentage of the Street Railway Company's Receipts for September.

The gross receipts of the Toronto Railway Company for September were $428,924, an increase of $47,000 over September, 1909. The city's percentage, for which the City Treasurer received the cheque, was $34,313, as compared with $30,546 last year, and $22,512 in September, 1905.

Following is the statement:

	Receipts.	Percentage.
Sept. 1910	$428,924.12	$34,313.93
Sept. 1909	381,835.97	30,546.88
Sept. 1908	356,437.85	28,515.03
Sept. 1907	337,882.00	27,030.56
Sept. 1906	312,748.53	25,019.88
Sept. 1905	281,040.19	22,512.33

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

(Continued from page 507).

11845—September 30—Relieving, for the present, the G.T.R. from providing further protection at the crossing of the highway at Mitchell, Lots 26 and 21, in 1st Concession, Township Fullerton, County Perth, and Province of Ontario, at mileage 128½ from the east, being first crossing east of Mitchell Station.

11846—September 27—Dismissing the application of George Nicholas Smith, of the Township of Clarke, in the County of Durham, Ontario, for an Order directing the C.N.O.R. to construct an overhead bridge over its line across the property of Geo. Nicholas Smith, on Lot No. 3, in the 4th Concession, Township Clarke.

11847—September 30—Approving the location of the Alberta Coal Branch of the G.T.R., mileage 0 to mileage 37, from Section 6, Township 53, Range 18, to Township 48, Range 21, west 5th Meridian, District of North Alberta, Province of Alberta.

11848—September 30—Amending Order No. 9980, made upon the application of the C.P.R., and authorizing that company to open for the carriage of traffic the extension of its Lacombe Branch from Stettler to Castor, and limiting the speed of trains to fifteen miles an hour, by substituting the word "twenty" for the word "fifteen" in the fifth line of the operative part of said Order.

11849—September 30—Authorizing the C.P.R. to construct a bridge over the South Saskatchewan River, near Outlook, Moose-Jaw North-West, Western Division, Province of Saskatchewan.

11850—October 1—Authorizing the C.P.R. to reconstruct bridge No. 42.1 on the London Subdivision, Ontario Division, of its line of railway.

11851—October 1—Authorizing the C.P.R. as lessee exercising the franchises of the Toronto, Grey and Bruce Railway to construct, maintain, and operate an industrial spur across Tucker Street, and over the lands of D. Kennedy, as shown on the plan and profile, and described in the book of reference deposited in the Registry Office for the County of Wellington.

MARKET CONDITIONS.

Montreal, October 11th, 1910.

So far as industrial conditions in the United States are indicated by the business of the United States Steel Corporation they are unfavorable. The orders taken by the United States Steel Corporation show a shrinkage of over 300,000 tons. The unfilled business is apparently about 3,200,000 tons, and it is considered that this is very near a low record level. The