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The Canadian Engineer

ESTABLISHED 1893.

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CONVICT LABOR.

It has been announced that the Ontario Government have decided that the "trusties" from the jails and prisons of Northern Ontario are to be employed on colonization roads.

From the movement in the United States we are under the impression that convict labor is on the decrease. We recognize the difficulty of combining correction and useful employment, but we cannot see any excuse for taking the convict on to the highway and exposing him to the glance and chance remarks of the passerby. Nothing will break a man's spirit quicker than humiliating him, and the released prisoner who has lost pride and spirit and self-respect is not a corrected man.

More than this, convict labor is a menace to legitimate business. It should not be the aim of the Government to make the criminals profitable to the State. They are sentenced for correction, and the community which deprives them of their liberty should not attempt to escape the cost of correction. Legitimate business of the free workman should not be called in competition with criminal labor.

There is a vast difference between the experiment at the Guelph prison farm, where the prisoner will be a self-contained community, and the utilization of prisoners on colonization roads, where they will have to be removed from camp to camp, and transported in some cases considerable distances on the railways.

If it is necessary to employ the prisoners of Northern Ontario in Northern Ontario, get another farm, but keep them off the highway.

SUBAQUEOUS CONCRETE CONSTRUCTION.

An example of the successful replacing of wood by concrete was manifest last week at Goderich, Ont., where pontoons of reinforced concrete construction were built half a mile from their position, floated across the bay, and weighted with sand and lowered into position.

The advantages of concrete for subaqueous work has long been recognized, but the difficulty of cofferdamming, or of placing concrete under water, has limited the use of this material for such work. It has, for some years, been customary to build crib work to a foot or two of the low-water level, to cap the timber with concrete, carrying the superstructure of concrete up to the required level. By the method adopted at Goderich concrete work is done above water, and the wharf or foundations completed in still water, and kept dry until properly set. It was then floated into place, submerged, weighted, and the superstructure carried on above the water line. This method eliminates almost entirely timber construction.

As far as Canada is concerned, we believe this to be the first attempt at this method of construction. At Kewaunee and Algoma Harbors, Wisconsin, a somewhat

similar method of construction was employed as early as 1908, where the work was carried along on somewhat similar lines, but differing on one or two important points from the methods adopted at Goderich, Ont. In the work at Wisconsin the concrete superstructures were built on shore, launched, towed to position and sunk. The design and dimensions varied somewhat from the method employed here.

Because of the increased price of timber, the scarcity of large quantities of sound timber, because of the permanent efficiency of concrete work, and because of the difficulty of working in open water on wharf and breakwater construction in stormy weather, this experiment of using concrete and building it up in sheltered harbors will be watched with special interest by those having to do with river, lake, and harbor extension and protection works.

FIRE HYDRANT STANDARDS.

A few weeks ago we referred to the matter of uniform sizes of fire hydrant connections. We again draw the attention of our readers, and particularly the Canadian Society of Civil Engineers, to these matters, urging upon them the necessity of prompt enquiry into this matter.

The Canadian Society of Civil Engineers has done good work in adopting uniform specifications for various classes of work. At the last annual meeting a committee was appointed to prepare standard specifications for cast-iron pipe, and it is expected that their report will be printed and ready for distribution in good time for adoption at the next annual meeting. This should be followed up by a report on the standardization of fire hydrants and fire hose connection. At the time of the last big fire on Parliament Hill, Ottawa, it was found that there was one-quarter of an inch difference in size between the fittings for hose in Parliament Buildings and the city of Ottawa fire equipments.

At the present time cities so close together as Toronto, Hamilton and London have fittings different in size and different thread number. Establishments that are to-day supplying these fittings require many patterns, differing sometimes by very little in size and number of threads, yet making it necessary that their order shall be handled as separate orders.

Standard sizes and standard specifications will lessen the cost to the manufacturer and the consumer, and would make it possible to stock the goods and ship promptly, lessen the confusion that now occurs in ordering, and make possible, in cases of serious fires, the using of equipment from other cities.

THE TECHNICAL EDUCATION COMMISSION.

The Dominion Government have announced the personnel of the Commission on Technical Education. The men who will compose the Commission are:—

James W. Robertson, C.M.G., LL.D., of Montreal, Que., chairman.

Hon. John N. Armstrong, of North Sydney, N.S.
George Bryce, LL.D., F.R.S.C., of Winnipeg, Man.
M. Gaspard DeSerres, of Montreal, Que.
Gilbert M. Murray, B.A., of Toronto, Ont.
David Forsyth, M.A., of Berlin, Ont.
James Simpson, of Toronto, Ont.

Secretary and reporter to the Commission, Thomas Bengough, C.S.R.

It is fortunate that the Government have been able to secure for the work men who have taken such an interest in educational matters and who at the same time are so representative of the various phases of the educational and industrial interests of Canada.

Matters of education are under Provincial control, and it is not to be expected that this inquiry, being carried forward by the Dominion Government, will in any way interfere with the relation of the Provinces to educational affairs, but it is felt that the information which the various Provinces require, and which they might be called upon to secure separately, could be secured at less expense by the Dominion, the Provinces accepting and acting upon such sections of the report as would refer to their own particular conditions.

The appointment of this Commission was in response to a widespread and persistent desire for fuller information on what was being done in the way of technical education in other countries and what might be accomplished in our own Dominion. The Manufacturers' Association, the labor organizations, the technical schools and colleges and the educationalists of the Dominion have repeatedly made representation on this question.

For a number of years the movement in favor of providing educational advantages such as those following industrial pursuits would appreciate has been very strong. In the matter of educational training Canada has not made the most of her opportunity.

Experiments in modern technical education have been carried on for years in Germany, France, United States and Great Britain. As is usual with new movements, there has been considerable groping for best methods, and, whether our Canadian Commission are familiar enough with industrial conditions and educational methods now in vogue in Canada, to make definite, strong and convincing recommendations without befogging the discussion that those having the training of young people and the industrial future of the country at heart will expect, will depend as much upon their conception of present conditions and their knowledge of the educational value of various kinds of training as upon the time and energy they may put upon the task.

Frequently we are disappointed that on this Commission there was not appointed a Commissioner familiar with the methods employed and the work done in the Applied Science Faculties of our Canadian Universities and Canadian Technical Colleges. A representation of the Applied Science Faculties would be more than a teacher or college professor in our large industrial enterprises. His early training would be brought more in close touch with these workmen. He would know not only what assistance men require, but he would know how it might be most easily given.

Labor is well represented. The manufacturers are well represented. Educational ideals are well represented. The junior schools are well represented, but the men who make the bridge between the junior schools and the industrial life of Canada; the men who come in close touch with the young man as he enters upon his life work; the men who, from their training, are called upon to look at the broader questions—these men and the step in industrial developments which they represent do not find a place on the Commission.

CANADA'S BORROWING IN LONDON, ENG., FOR ENGINEERING WORKS.

The Monetary Times, in last week's issue, gives a summary of Canada's public borrowing in London from Jan. 1st to date. The amount totals over £22,000,000. Of this amount almost £8,000,000 was borrowed for railways, mining and municipal work. The several items are as follows:—

Municipal:—	
Calgary city	£ 325,400
Montreal city	123,800
Winnipeg city	500,000
	£ 949,200
Mining:—	
Canada Cement Company	£ 205,500
West Canadian Collieries	200,000
Amalgamated Asbestos	624,484
Standard Oil Company of Canada	160,000
Oklahoma Oil Company	67,000
Canadian Oil Company	75,000
Dunsmuir Collieries	2,054,800
Railways:—	
Grand Trunk Pacific	£1,000,000
British Columbia Electric	530,000
Canadian Northern	1,000,000
Grand Trunk Pacific	125,000
Central Counties Railway	97,500
Duluth, Winnipeg and Pacific	950,000
	£3,702,500

For the last five years Canada's borrowing in London, England, has been very heavy, the public flotations alone during that time amounting to over £121,000,000.

EDITORIAL NOTE.

Chief J. E. Buchanan, of Winnipeg, in a report on the fire service of that city suggests that lights be installed, designating the location of fire alarm boxes at night. At recent fires people have wasted time looking for telephones when fire alarm boxes were convenient. He suggests that such directing lights would call the brigade quicker, thus preventing the fire gaining great headway.

PRECIPITATION FOR MAY.

Over the larger part of the Dominion the rainfall was something less than average, but in the Province of Quebec and in parts of Southwestern Ontario and Southern Saskatchewan the average was exceeded by a small quantity. The largest deficiency occurred in the southern portions of Alberta and in the Ottawa Valley, but nowhere were departures from the normal sufficient to lead to injurious results.

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

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.	0.9	— 1.6
Edmonton, Alta.	1.2	— 0.6
Swift Current, Sask.	0.8	— 1.3
Winnipeg, Man.	1.7	— 0.3
Port Stanley, Ont.	4.5	+ 1.1
Toronto, Ont.	2.7	— 0.2
Parry Sound, Ont.	3.3	+ 0.2
Ottawa, Ont.	1.9	— 0.6
Kingston, Ont.	3.1	+ 0.6
Montreal, Que.	3.7	+ 0.9
Quebec, Que.	4.0	+ 0.8
Chatham, N.B.	4.4	+ 1.6
Halifax, N.S.	3.3	— 0.4
Victoria, B.C.	1.8	+ 0.5
Kamloops, B.C.	0.6	— 0.4

LOCAL IMPROVEMENTS.*

By Geo. Ross, O.L.S., Welland.

The Municipal Councils of townships, cities, towns and incorporated villages are authorized by the Consolidated Municipal Act of 1903 to pass by-laws for the purpose of effecting local improvements and works, the whole or a part of the cost of which may be assessed upon the real property especially benefited thereby.

These works or improvements are enumerated in Subsections 1, 2 and 3 of Section 664, and not only include the opening, widening, straightening or extension of streets, making, enlarging or prolonging any common sewer, macadamizing, grading, levelling any street or lane, for constructing sidewalks or footways in, upon and along any public street, lane, alley or place; curbing, sodding, planting, maintaining and caring for trees and plants, upon and in any public street, square or other public place; but provision is also made for the extension of water works, gas works or electric light, heat and power works, when the system is owned by the Municipal Corporation.

Besides the above, there are also provisions laid down for the construction or re-construction of other works, or improvements. However, the works most commonly taken up under the Local Improvement sections of the Municipal Act, in towns and villages, are the construction of sewers and sidewalks, and in this paper I shall confine myself to these.

The provisions according to which by-laws governing the construction of local improvements are to be drawn up are given in considerable detail in the Municipal Act, and it is essential that the procedure laid down in the by-laws be strictly adhered to, especially the formalities required in holding the Court of Revision, and in giving the proper notices to the parties assessed, as all these particulars will be enquired into when the debentures to cover the cost of the work are offered for sale, by the solicitors of the parties who may desire to purchase such debentures, and a little care as to some minor details would save the cost of having said by-laws confirmed by a special Act of Legislation.

The by-laws of many cities and towns relating to local improvements are very similar. The following extracts are taken from the by-laws of the City of Toronto:

"All future expenditure in the city for the several classes of improvements, works and services hereafter mentioned for which special provisions are made in Section 664 of the Consolidated Municipal Act, 1903, that is to say:

1. Making, enlarging or prolonging any common sewer.

*Paper read before the Ontario Land Surveyors.

2. Opening, widening, prolonging or altering, macadamizing, grading, levelling, paving or planking any street, lane, alley, public way, place, sidewalk or bridge forming part of a highway.
3. Curbing, sodding or planting any street, land, alley, square, or other public place.
4. Reconstructing as well as constructing any of the said works or improvements.

shall be by special assessment on the property benefited and not exempt by law from assessment."

"In making every such assessment to defray the cost of sewers, pavements and sidewalks, the Engineer, Assessment Commissioner or other officer charged with that duty shall make an allowance of sixty feet upon the flank or side of all corner lots when the depth of a lot equals or exceeds one hundred and twenty feet; but if the depth of such lot is less than one hundred and twenty feet, the allowance shall be one-half of such depth."

"Any allowance made in pursuance of the last preceding section in respect of pavements and sidewalks shall be assumed as a portion of the city's share of the cost of such local improvements, but any such allowance in respect of sewers shall be charged on the other real property assessed for the said sewers."

"The Corporation will provide out of the general funds of the Corporation the cost of such parts of local improvement pavement and sidewalk works as are situate upon or in that part of any street which is intersected by any other street, or as would otherwise fall on property exempt from assessment, and in the case of sewers will also provide out of the general funds the cost of all culverts and other works necessary for street surface drainage, and the cost of those parts of sewers constructed opposite real property exempt from assessment, the part to be provided by the Corporation to be so provided by debentures."

Applications for Local Improvements and Proceedings Thereon.

"All works or improvements for any part of the cost of which it is proposed to assess the real property immediately benefited thereby, are herein called 'local improvements,' and shall, unless authorized by special by-law, and except in the case of sidewalks laid down under the authority of Section 677 of the Consolidated Municipal Act, 1903, be initiated in one of the modes hereinafter mentioned."

1. Petition.

"By petition, signed by two-thirds in number of the owners, according to the last revised assessment roll, representing at least one-half in value of the real property to be benefited by the proposed work or improvement."

2. Initiative.

"By the report of the City Engineer, approved of by the Committee on Works and adopted by the Council."

3. Drainage.

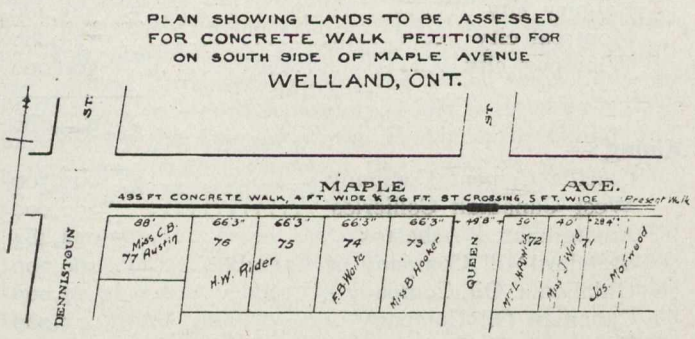
"In the case of works undertaken under the authority of Section 668 (4) of the Consolidated Municipal Act, 1903, for the purpose of draining any locality for sanitary purposes by a recommendation of the Local Board of Health, and the City Engineer, affirmed by a vote of two-thirds of all the members of the Council, at any regular meeting thereof."

1. Petition.

"Every petition for a local improvement may have attached thereto a diagram showing each parcel or property to be assessed, together with the frontage of each such parcel, and the street numbers of any buildings thereon."

"Every such petition, after being received by the Council or the City Clerk, shall be forthwith examined by the City Clerk, who shall ascertain and determine whether the same is sufficiently signed as hereinbefore required, and shall endorse thereon his certificate as to whether the same is or is not sufficiently signed as above provided, and shall forthwith transmit the same to the City Engineer."

"Upon receipt of a sufficiently signed petition for any such work or improvement, the City Engineer shall examine into the subject-matter of the petition and report to the Committee on Works with as little delay as possible as to the



necessity for, or advisability of, undertaking the proposed work of improvement. If he reports in favor of undertaking the proposed work or improvement, he shall also report after due and proper examination and inspection:

1. What real property will be immediately benefited by the proposed work or improvement.
2. The probable lifetime of the work or improvement.
3. An estimate of the probable cost of the proposed work or improvement, and the share thereof which should be assessed against the property to be immediately benefited.
4. The proportion in which the assessment thereof should be made on the various portions of the real estate so benefited, and showing by measurement the frontage exempt from taxation therefor."

"In the event of the adoption of the report of the said Engineer recommending the undertaking of such work or improvement, the said Committee on Works shall report the same to the Council for its approval and adoption."

"In the case of the adoption by the Council of the said report, it shall be the duty of the City Engineer to cause the said report (as so adopted) to be forwarded without delay to the Assessment Commissioner, to be brought before the Court of Revision."

The following are the extracts from the by-laws of another city:

"Whereas it is desirable to provide a uniform frontage tax throughout the city for the construction of sewers, and to provide an equitable mode of assessing corner lots:

"Every owner of property which is drained into any of the main sewers which are constructed wholly at the expense of the city, and every owner of property in front of which a sewer is constructed as a local improvement, shall pay a uniform frontage tax of 79 1/10 cents per foot frontage of the property so drained, to be assessed on each assessable foot of frontage property so drained. Such amount shall be paid in 40 equal annual instalments of four cents each per foot frontage, being a sum sufficient to pay both interest and sinking fund for that amount, and the said instalments shall be payable at the same time as ordinary taxes are payable in the said city, but the City Treasurer may accept payment down of the amount."

(Continued on page 588).

THE
Sanitary Review
SEWERAGE, SEWAGE DISPOSAL, WATER SUPPLY AND WATER PURIFICATION

THE TOWN OF LINDSAY AND ITS WATER PROBLEM.

According to reports which reach us, the town of Lindsay has no water problem.

"By faith you can remove mountains"; and by faith the citizens of Lindsay have solved their water problem.

Water filtration has not solved the problem, and by no means has ozone touched it.

The water in its raw state is a fair sample of the general character of water met with in sluggish Ontario streams, which abound with vegetable growth, with the exception that this particular water is very hard—200 parts in 1,000,000 (or 14 degrees of hardness).

The excess in hardness points to spring supply, and compares generally with the spring waters which flow from the gravel beds rising from the north shores of Lake Ontario.

The turbidity is low, judging by the amount of total solids, viz., .021 per 1,000,000. The Provincial Board of Health does not determine between organic and inorganic solids, and suspended and soluble solids; but it is apparent that there is little apart from weedy matter which requires straining or filtering from this water.

The organic content in solution is extremely high, and the water may be said to be almost putrescible. The oxygen consumed test (the measure of organic matter in solution), viz., 5-6, taken with the excessive content of albuminoid ammonia, point to grave suspicion as to the quality of this water. The oxygen consumed test is generally applied to treated sewage effluents as a test of further tendency to putrefaction, and the Royal Commission on Sewage Disposal advise a standard for sewage effluents of five parts in 1,000,000. It is, therefore, apparent that the ozonized Lindsay water, which contains 5-6 parts, does not come up to even this standard for sewage effluents.

The above test is the measurement of the amount of oxygen required to oxidize the vegetable matter contained. It means that there is not a sufficient amount of available oxygen in the water, and that it has to absorb a certain amount of oxygen from the atmosphere in order to render the organic matter inorganic. Consequently, the more oxygen that a water can absorb, the greater the organic impurity.

A useful test which the Board might have made would have been the "methylene blue test," which would have given the time necessary for the water to absorb the whole of its contained oxygen, when putrefaction would commence if sufficient oxygen was not available to complete non-putrescibility.

The content of .238 albuminoid ammonia is in excess of the amount generally permissible in good water, which should not exceed, other things being equal, .1 part. The comparatively small amount of nitrates, viz., .238, compared with a permissible amount of 15 parts in 1,000,000, prove that little oxidation takes place in the water itself, and that it is fairly depleted of available oxygen.

In judging of the purity or otherwise of a water it must be understood that the chemical contents have little significance, except when considered in relation to one another, and all the factors in the case, such as source of supply, character of surface of land, strata and general environment.

The amount of chlorine, for instance, 1.5 parts in 1,000,000, conveys no information whatever, unless we also know the normal chlorine content in the water. Chlorine is always present in solution in small quantities. It may be derived from salts in the strata, brine springs, or exist in sea water in the form of chloride of sodium (common salt). Sea water contains 28,000 parts of chlorine per 1,000,000, and this, of course, does not prove sewage pollution. Fifty parts in 1,000,000 of chlorine may not be sufficient to condemn a drinking water. On the other hand, if the chlorine content is in excess of the normal, and is accompanied with organic matter and excess of free and albuminoid ammonia, then the water is subject to grave suspicion.

It is, however, when we come to consider the chemical analysis of the Lindsay water in its relation to the bacteriological that we do not know whether to admire or deplore the faith of this simple people. "B. coli," an intestinal type of bacteria, are generally found in the water, the raw water containing 60 per cent. positive results in cubic centimeter tests, the filtered water 41 per cent., and the ozonized water 37 per cent.

With 112 samples the average counts show 827 total bacteria per c.c. in the raw water, 577 in the filtered water, and 531 in the ozonized water, the percentage reduction being by filtration 30.23, by ozone 7.97, and the combined processes 35.78.

The tap water contains 528 bacteria per c.c., while the recognized standard for filtered water only allows 100 per c.c.

If the percentage reduction of bacteria had been even equal to that generally obtained in sewage treatment by sedimentation and percolating filters, viz., 80 per cent., the resultant number would have been 166 per c.c.

Reviewing the general character of the raw Lindsay water, taking into account the fact that the main chemical content is organic matter in solution and the evident pollution by intestinal bacteria, it is evident that we have a water which lends itself particularly to rough filtration and treatment by ozone or some other disinfectant. If the aspirators had performed the work required by them and ozone had actually come into complete contact with this water, there is no doubt but that the organic matter would have been burnt up, the bacteria destroyed and the color removed.

On the other hand, we find that the filters in themselves have been insufficient, and that practically no work has been done by ozone. Whereas the filters show 41 per cent. positive samples, the ozone shows 37 per cent.

The almost continuous presence of B. coli entirely demolishes any other conclusion but that the Lindsay people, in spite of their great faith, are drinking a form of dilute sewage; and one cannot conclude but that, if they had only adopted simple oxidizing or nitrifying filters, followed by a small slow sand filter or disinfection by calcium hypochlorite, they would have had a water both organically and bacteriologically pure.

"FOOLS RUSH IN WHERE ANGELS FEAR TO TREAD."

The average engineer prefers to remember his chemistry as something of the past belonging to his school days.

Chemical formulæ, chemical actions and chemical reactions become, as a rule, hidden in mystery by the lack of constant familiarity.

Although the average engineer may feel somewhat shy of chemical deductions, not so with the average daily newspaper.

Give the newspaper man, the maker of press stories, the chance of putting on the armor of science and handling the deadly weapon of cause and effect. Send him on a "Holy Grail" mission to procure and unravel chemical data, and the result, while it may startle and alarm the groundlings, will at any rate provide recreative interest to a few.

The sand filtration plant of Toledo is visited. The knight-errant of modern science is loaded with data relating to "turbidity," "oxygen consumed," "ammonias," free and albuminoid, **and "chlorine."**

The knight returns to his castle, speaks of his adventures, and tells of the foolishness of a people who spend their gold to filter out chlorine from water which won't filter. Here is this large and costly plant laid down, and behold the same amount of chlorine in the water before and after filtration.

Are not the waters of our city charged with this deadly chlorine, which carries disease on its wings?

Will our city spend gold to lay down a similar plant to remove the chlorine from our waters when this plant at Toledo absolutely ignores chlorine?

Truly, those who dreamt of filtration forgot chlorine.

Recreative Note on above.—Chlorine is in solution in water. There are 28,000 parts of chlorine in 1,000,000 in sea water. Why not pass sea water through a sand filter in order to make it fresh water?

Engineers who remember their chemistry please answer.

A further recreative note may be added.

Yet a second daily paper must needs plunge into the chemical chaos. With an instinctive perception that there may be some reason for the Toledo filters ignoring chlorine, they at once commence a wholesale mixture of chlorine, chlorides, chlorites, hypochlorites and all the other combinations of Cl; and, having rammed them into one jar, labelling the mixture "Chlorine," they say, behold the thing which kills the germs!

STERILIZATION OF WATER.*

By Walden and Powell, Baltimore County Water and Electric Co., Baltimore, Md.

The sterilization of public water supplies has been the subject of careful investigation by many municipal and private corporations for the last two or three years, and more so in the past year, owing to the shortage of water and the fact that many supplies, including wells, reservoirs and small streams became badly polluted due to wash when there were rains and at other times when there was not sufficient water to properly flush the streams or surface to prevent pollution from such wells through the sand strata. These investigations have invariably met with the obstacle which has been the stumbling block in all such enterprises, that is, first cost and operating cost of the purification system.

The Baltimore County Water and Electric Company have been operating a filter plant for a number of years and being desirous of obtaining a cheaper method of sterilization, have from time to time been investigating the various methods of filtration, namely, slow sand, American or rapid sand, and the up-draught system of sand filtration here, as well as the European. This company has also experimented for several years with the application of alum and hypochlorite of lime applied directly in the reservoirs or storage basins themselves, with considerable success, as will be shown in this paper.

In addition to the above-mentioned careful investigations, the sterilization of water by ozone was considered about two years ago. The United Water Improvement Company controlling the James H. Bridge patents, submitted a sample 3,000-gallon ozone sterilization plant for test, which was placed alongside the American or rapid, and slow sand filters, handling raw water directly without sedimentation. Some of the results obtained from this sample plant have already been reported in a paper on the use of hypochlorite of lime, which has also been in use both in the American and English filters for some two years. In addition to these tests, a rough determination of the amount of nascent oxygen in a grain of chloride of lime has been made, and the approximate calculation of the volume of gas on a basis of .1 grain per gallon, to get an approximation for the volume of ozone, which was roughly .00096 cubic inch per gallon, but this depends upon the concentration and will vary with the condition of operation and temperance. The specific gravity of ozone throughout the test has been taken at 1.65, as compared with air as 1.

With the data at hand, the ozone plant at Lindsay, which had just been started, was investigated, and it was decided to install a sterilization plant at the Herring Run Station of the Baltimore County Water and Electric Company, to have an ultimate capacity of 10,000,000 gallons in twenty-four hours with roughing filters to remove the suspended matter, to handle the raw water at double or triple the usual rates per unit area in rapid or American sand filters. Plans were gotten out and work started, but considerable difficulty was met with owing to quick-sands. The sterilization pit was thirty feet deep and within twenty-five feet of the river bank. The walls were not completed until it was late in the fall. Work had to be abandoned during the winter other than to test the many different kinds of mixing head or aspirators, including various nozzles, converging tubes, orifices, etc.

As it was important to get information as to the amount of air that could be mixed with a given volume of water under our low head, it was found that under low heads some aspirators would not give a continuous draught of ozone or air, and when the draught was heavy the specific gravity of the mixture would become so light that there would be a blow-back, which would momentarily blow the ozone input back. and while it was possible with low heads to get about one-third ozone to water in volume, the lowest point or head

*Read at Thirtieth Annual Meeting of the American Water-works Association, New Orleans, La., April 25-30, 1910.

that should be considered is about twelve feet. Though some changes which were made in the design of this plant and adopted at Ann Arbor, Mich., will allow the use of heads of from six to ten feet, same will not give a steady input of ozone, as it is intermittent. This, together with the use of a small blower, seems so far to be satisfactory.

The area required for plant of size installed is only about one-tenth that required for American plant, and is not to be compared with the area required for slow sand filters. The sterilization plant proper constitutes raw water chamber, aspirator heads, ozone chambers, ozone generator, as well as time contact basin or mixing cell. The latter compels the water to travel horizontally as well as vertically, so as to give water the benefit of as long contact as is possible with ozone.

The ozone generator consists of boiler plate, shell and head, containing each 109 two-inch aluminum tubes, inside of which are micanite tubes or dielectrics, inside of which is another tube or cylinder which rests on a tray, which is connected to one terminal of a special 10,000 to 15,000 volt static transformer. The other terminal, which is a ground terminal, is connected to boiler plate shell; inner and outer tubes being so close and only separated by micanite tube, allows a continuous violent discharge to take place through the dielectrics, and the passage of air through this discharge produces the ozone, the production running from eighty to one hundred grammes per kilowatt, and the concentration of five or less, depending upon the condition, velocity and the temperature of the air discharged.

Sparks must be prohibited, as when a sparking condition takes place nitrous oxide is generated, and also high temperature should be provided against in the generators.

There is under construction another type of ozone generator, which from test on a small experimental unit has given as high as sixty grammes of ozone, with concentration of twenty, but it is too soon to say how this will work out in much larger sizes. This company expects, however, to have one of these generators in use soon for test, and more definite results will be obtained. The ozone generator may be either water, oil or air cooled. If it is air cooled, the outer shell has to be removed and the top and bottom heads supported by four rods, or a frame used, and air caused to circulate by any means between and around the outside of the fixed tubes.

The ozone generator in use here will be cooled by oil, to prevent, if possible, the sweating of the tubes when water is the cooling medium, as the oil will remain for some time after current is cut off, preventing moisture collecting and giving trouble at starting. The only trouble to be feared with oil cooled system is leakage, owing to the fact that it is a hard matter to get joints that will stay tight under oil pressure, although the pressure will not exceed from two to three pounds under any condition. Oil is circulated by means of ½ h.p. motor belted to rotary pump, the oil being passed through copper coils in a tank or cylinder through which water is flowing continuously. Each generator has its thermometer for determining the temperatures, and a controlling panel on which will be mounted indicating wattmeter, potential transformer plug, high tension switch, voltage regulating head which will permit of handling 2,300 volt current on the primary side of the transformer in such a manner as will give voltage of the secondary side of the transformer range from 7,500 volts to 15,000, or to be varied to intermediate volts. In addition to this there is a voltmeter reading to 15,000 volts, power factor meter, and frequency indicator. These panels are located over a concrete vault in which are located the transformers. Each million gallons unit requires 5 kilowatts in transformer capacity. All the switching is done at 2,000 volts on the primary side, and the high tension side is connected directly to the ozone generator through varnished cambric lead-incased cable two-conductor, placed in bituminized fibre tubes, encased in concrete.

Owing to the weather conditions and the fact that some of the apparatus for this plant, such as insulators, etc., were special, and the departure from the original design, continuous tests have only just begun on this plant.

Considerable information was obtained, on some of which further experiments will be carried out, to determine what would appear to be the slip of the bubbles of ozone or air, and the fact that they do not seem to fall at the same velocity with the water, or for some reason do not receive or hold the kinetic energy imparted to them, and the fact that the bubbles seem to rise at about .75 of a foot per second, this together with the fact that the specific gravity of the air bubbles and water, when the amount of ozone or air reaches certain entrainment, is so low that it loses its kinetic energy and the blow-off is caused, previously mentioned, and is similar to the action of the air lift, the mixture looking like soap bubbles in the down pipes momentarily.

When the temperature of the atmosphere is at or below zero, the strength of the ozone seems to be greater, and the absorption by the water varies, as the strength of the ozone given off by the water in the relief chamber over the time contact basin or pit is noticeably less to the smell, and a longer or shorter time is required in high temperatures or extremely cold weather before the ozone is noticeable. But the ozone in this relief chamber becomes noticeably thin when the temperature is high, but varies. Bunsen and Carius found that one hundred volumes of water near freezing absorb four volumes of oxygen and two volumes of nitrogen; and the absorption is quickened by stirring or mixing. Tests are under way to ascertain more fully this relation to the absorption of ozone, as water absorbs more air, and the more of it the lower the temperature; also it absorbs more oxygen than nitrogen. It is to determine this relation when ozone is mixed with water, as no data are available at the present time, that experiments are being made. From this, it seems that these gases, when absorbed, are given up as pressure lessons, that is, given up in minute bubbles, similarly to water which is highly charged with air and allowed to stand in a glass, which gradually becomes clear at atmospheric pressure. A cubic foot of water holds in solution about 0.029 cubic foot of air at about freezing point, and it is possible that the absorption or change increases or decreases the CO_2 in the water when ozone is applied.

The generators require about eighteen watts per square foot surface in the electrodes at sixty cycles, and twenty-one watts per square foot at one hundred cycles, but it is hoped to materially reduce the wattage with the new form of generators.

The tests below, which have been carried on under Mr. Powell's supervision, will undoubtedly prove very interesting.

OZONE RESULTS.

	Date	Bacteria Raw	Bacteria Oz'n	Coli Raw	Coli Oz'n	Color Raw	Color Oz'n	Turbidity Raw	Turbidity Oz'n
December.	10-09	1840	6	2/4	0/4	20	15	15	15
	11-09	1800	8	4/4	0/4	20	14	16	14
	13-09	15000	80	4/4	0/4	45	12	180	180
	14-09	4000	1620	3/3	1/4	35	28	80	80
	14-09	4000	1410	2/4	0/4	34	30	80	80
	15-09	1950	22	1/4	0/4	16	11	20	20
	16-09	1500	960	1/4	0/4	16	10	18	18
	17-09	1120	870	1/4	0/4	16	12	18	18
	18-09	1960	1500	2/4	0/4	17	12	20	20

14th, 16th, 17th and 18th shows the effect of moisture on the tubes.

The company's filtration plant at Avalon, Md., which has already been mentioned, consists of slow sand and mechanical filters, and an experimental ozone apparatus. Since the construction of the rapid filters, about two years ago, hypochlorite of calcium has been used for sterilizing the water in connection with filtration at this plant. The hypochlorite has not been used continuously, as at times the raw water contains but a few hundred bacteria per cubic centimeter. The object in using the bleach has not been necessary because of the failure of either system of filtration, but to lessen the cost of operation and at the same time to deliver water which was practically sterile.

Experiments also were carried on in the laboratory for a better knowledge of the action of the bleach upon the raw water, and to determine the bacterial efficiency under abnormal conditions.

The hypochlorite of lime used was received in 750 sheet iron drums. Only a small opening was cut in the drum so that it could be tightly sealed to prevent rapid deterioration of the chemical. Average analyses of the bleaching powder contained 34.2 per cent. of available chlorine. A 0.5 per cent. solution was used and was applied to the water through a graduated orifice. The storage solution tanks are of reinforced concrete and have a capacity of 41.5 gallons. The solution flows from the storage tanks to the orifice boxes which also are made of reinforced concrete. The head of solution upon the orifice is kept constant by a valve controlled by a ball float. The tanks and boxes before being used were painted on the inside with elaterite paint, so there has been no trouble from leaking. The orifices were graduated at the plant and have been checked from time to time as to their accuracy.

In making up the solution, the required amount of bleaching powder is first dissolved in a small quantity of water to insure thorough breaking up of all lumps. This solution is then put in the storage tank and the required quantity of water run in.

Under ordinary conditions the capacity of each tank is sufficient for four or five hours' supply. By making up the solution so often, the hypochlorite does not lose its strength to any appreciable degree, and it is not necessary to change the setting of the orifice unless there is a change in the character of the raw water.

The table given here shows the amount of bleach in grains per gallon applied to the water at different settings of the orifice. It will be noted that the chemical is given in grains per gallon, and not as parts per million of available chlorine or oxygen. The only object in doing this is that grains per gallon is more easily understood by the filter operators than the other terms mentioned.

There was an apparent increase in the bacterial reductions from the bleach when used in connection with sulphate of alumina, over the reduction obtained when bleach only was used. Experiments were undertaken in the laboratory to determine if this condition existed. Tests were made upon the raw water with conditions as near those at the filtration plant as was possible to obtain. One set of samples was treated with various amounts of bleach from 0.05 to 0.5 grains per gallon of water. To another set of samples were applied the same amounts of bleach, but to each jar of water was added sulphate of alumina at the rate of 0.5 grain per gallon. Several of these tests were made during the year and the curves here given were plotted from an average of these tests.

Although there was not a great difference in these results, still it is interesting to note that the curve plotted from the results when alum and bleach were used runs uniformly below the curve when bleach only was used. With highly polluted water this condition would no doubt be more pronounced than it has been here.

The color of the raw water at Avalon ranges from 5 to 65 parts per million, most of which is not in true solution, but in a collodial state. The water is more highly colored during the spring and fall floods than at other times of the year. The effluent from the mechanical filters is colorless at all times, also the effluent from the slow-sand beds, when the color of the applied water is below 20 parts per million. When the color of the raw water is greater than this, there is always some color in the filtered water from these beds.

By the use of hypochlorite of lime it has been possible to reduce this organic stain from 5 to 15 per cent., the percentage reduction depending on the character of the color, the amount present, and the quantity of bleach used.

Table to be used in the application of hypochlorite of lime.

Capacity of storage tank, 41.55 gallons.
Charge of bleach, 2 pounds.
Orifice graduated in inches.
Rate of filtration, 1,025,000 gallons per 24 hours.

Graduation on Orifice Scale.	Drop of Solution in Tank in Inches per Hour.	Hypochlorite of Lime. Grains of Hypochlorite of Lime Delivered per Hour	Grains per Gallon of Water Filtered, One Filter in Operation.	Grains per Gallon of Water Filtered, Two Filters in Operation.
1	1 in.	583	.026	.013
2	2 in.	1166	.032	.026
3	3 in.	1749	.078	.039
4	4 in.	2332	.104	.052
5	5 in.	2915	.130	.065
6	6 in.	3498	.156	.078
7	7 in.	4081	.182	.091
8	8 in.	4664	.208	.104
9	9 in.	5247	.234	.117
10	10 in.	5830	.260	.130

An attempt was also made to determine the effect of hypochlorite upon organic matter as measured by the required oxygen. These experiments, as those upon color, were done at the laboratory and consisted of treating liter samples of raw water with bleach varying from 0.05 to 0.5 of a grain per gallon and determining the organic matter before and after treatment.

From the data at hand, the reduction of organic matter by the use of hypochlorite was hardly noticeable even with water high in organic matter, and when comparatively large quantities of the chemical were used.

To determine the efficiency of the bleach on the operation of the mechanical filters, a two months' test was run. The filters were operated during the month of November, using only alum. During December, from the fourth to the end of the month, hypochlorite of lime was applied with the coagulant. There was but little change in the character of the raw water during this period, so the results can be compared fairly well. By the use of a very small amount of the hypochlorite (averaging 0.087 grains per gallon) it was possible to reduce the alum from 0.87 to 0.58 of a grain per gallon.

The percentage of water used in washing the filters was reduced from 4.1 per cent. to 2.9 per cent., at the same time

increasing the length of time between changing the filters one hour and ten minutes. This reduction in coagulant of 0.22 of a grain per gallon amounts to 31 pounds per million gallons; with the cost of alum at 1 3-10 cents per pound f.o.b. Avalon, the saving was 41 cents per million. Deducting from this amount 11 cents for the amount of hypochlorite used, leaves a net saving in the cost of coagulant of 30 cents per million gallons. The actual saving in the operating expenses really amounts to much more, as to this must be added the saving in wash water and the increased amount of water passing through the filter between cleaning.

The average number of bacteria of all samples of filtered water taken during November was 18 per cubic centimeter, while in December, when the bleach was applied with the coagulant, the average was 8 per cubic centimeter.

Tests were also made to determine the effect of hypochlorite of lime upon water of high turbidity. The results from these experiments have shown that as the turbidity increases, the bacterial efficiency of the hypochlorite decreases. This is partly due to the increase in organic, which invariably increase with the turbidity, and partly to the bacteria being mechanically protected by the particles of matter in suspension. With water having a turbidity greater than fifty parts per million, the hypochlorite of lime gave better bacterial results, when part or all of the turbidity was removed before treating with the chemical. This work has also shown that with the raw water at Avalon, increasing the dose of hypochlorite about 0.10 of a grain per gallon, but slightly increased the percentage reduction in the number of bacteria.

The use of hypochlorite of lime at this plant has shown that:

The effluent from both the slow sand and mechanical filters can be made practically sterile, with the total elimination of B. coli, reducing the color from 5 to 15 per cent.

To reduce the amount of alum and to increase the length of runs between changing the filters, and at the same time reducing the amount of wash water.

Also that hypochlorite of lime is more efficient when used with alum than when used alone.

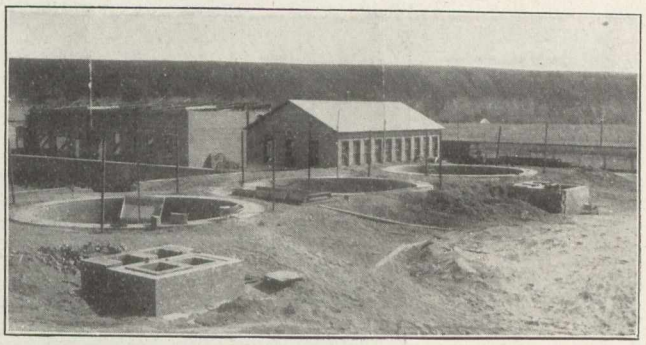
That high turbidity in the raw water reduces the bacterial efficiency of the hypochlorite of lime.

And that the hypochlorite of lime even when used in large quantities causes but a slight reduction in organic matter.

CLAY PRODUCTS INDUSTRY AT MEDICINE HAT, ALTA.

The city of Medicine Hat, some time ago, gave to the Alberta Clay Products Company, their largest gas well, and provided pipe to bring the gas from the well to the company's plant. In addition to the gift of the well, and its equipment, which cost about $10,000, they presented the company with some thirteen acres of ground, and gave them exemption from taxes.

The main drier is 80 x 256—4 storeys beside the 10 ft. basement. In this building there are 4 elevators. The sewer pipe press room is designed for 2 presses, wet pans and 2 dry pans, and is 80 x 100—4 storeys high. Dry press brick plant is 40 x 80—3 storeys high with 2 dry pans and 4 dry presses. The clay room is 48 x 140 with elevated tracks to accommodate railroad cars with 20-ft. elevation. The engine room is 32 x 50, boiler room 48 x 50, machine shop 30 x 50. The machine shop is equipped with gas engine, gap lathe, engine lathe, iron planer, drill tools and other tools as are necessary to take care of our machinery equipment. The sewer pipe machinery at this date is not installed, but will be furnished by The Taplin Rice Clerkin Company, Akron, Ohio. The dry press brick machinery, the dry press and one dry pan which is now in operation, was furnished by the Chicago Brick Machinery Company, Chicago, Illinois. This machinery was installed last fall and commenced making brick December 21st, running night and day, making brick



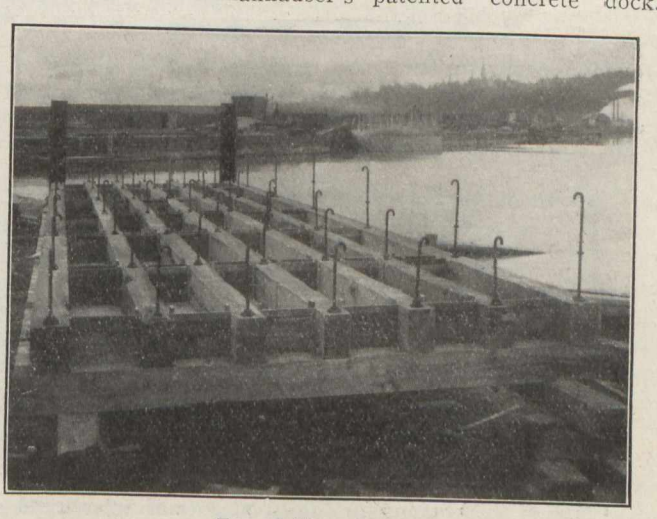
for the market and also to take care of our building requirements. We put out on an average of 2,000 brick per hour. The temporary power is furnished by portable Nichols & Shephard Engine. The engine which will operate our plant is the Murray, 24 x 48, weighing 72,000 lbs., boilers are being furnished by E. Leonard & Son, London, Ontario, being 3 in number and 72 x 18, carrying 150 lb. working pressure for our present accommodations for the brick. There are 2 scove kilns, each being 200 feet long, 24 feet wide on the inside, each kiln holding 1,000,000 brick.

There will be 10 30-ft. kilns and 8 40-ft. kilns inside diameter. 12 of these kilns are up to the floor level. The main drier is ready for the first floor. Engine and boiler room is completed. The machine room is completed and the machinery is installed.

With the operation of this plant, western municipalities will be in a position to secure clay products, which, in the past, they have had to secure from the south and east. It is but natural to expect that the ouput of this plant will be very large, as just now, quick growth in Western Canada is making a large demand for their materials, both by private individuals and corporations.

PONTOON METHOD OF SUBAQUEOUS, CONCRETE CONSTRUCTION.*

On June the 1st, there was sunk at Goderich, Ont., the first section of Tromanhauser's patented concrete dock.



Foundation Form.

The Goderich Elevator and Transit Co., wishing to double the capacity of their elevator (present elevator may be seen in Fig. 2), called in J. H. Tromanhauser, Consulting Engineer, Temple Building, Toronto. After examining the

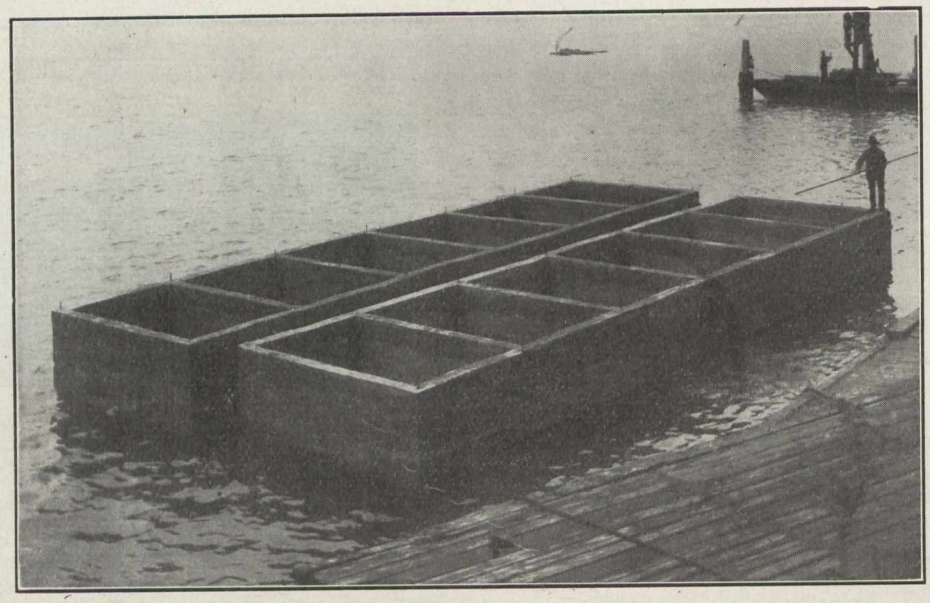
*See also Canadian Engineer, Vol. 15, page 520.

location, Mr. Tromanhauser decided that the dock work would be most economically carried out by constructing concrete pontoons, floating them into place, sinking them, filling them with sand and gravel, and through the pontoon compartments drive piling, upon which to erect the superstructure.

The superiority of reinforced monolithic concrete, over other materials, for under-water construction, has been frequently demonstrated. The strength and durability of the concrete, its resistance to destructive teredo worms, and its reasonable cost, indicate that its use for this purpose will greatly increase.

One of the reasons for the great cost of submerged concrete construction in exposed water has been the difficulty of placing material when there is the slightest sea. To build cofferdams, or to build blocks and then sink them, has been found expensive.

The method adopted at Goderich to lessen the expense of construction and hasten completion of the work, is well illustrated in the series of photographs and diagrams given herewith.



Concrete Pontoons Floating to Place.

This particular work entailed the construction of a piece of dock 216 feet long. This was put together in four sections, of 54 feet each. All sections were 14 feet wide, and consist of six compartments, the centre measurement of which is 9 ft. x 14 ft. The dock will be sunk in about 20 feet 6 inches of water. The Figures 4, 5, 6, and 7, give an idea of the construction.

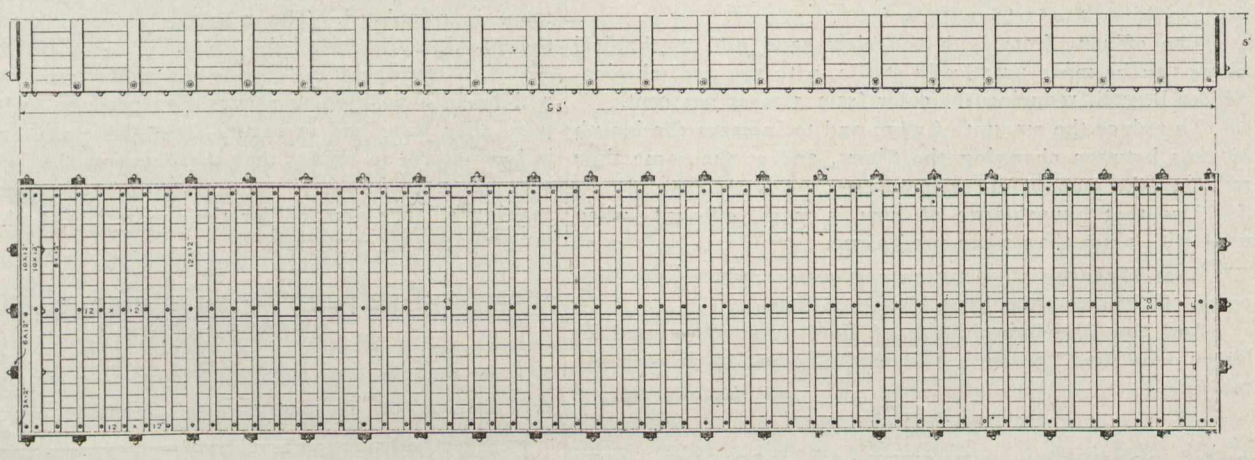
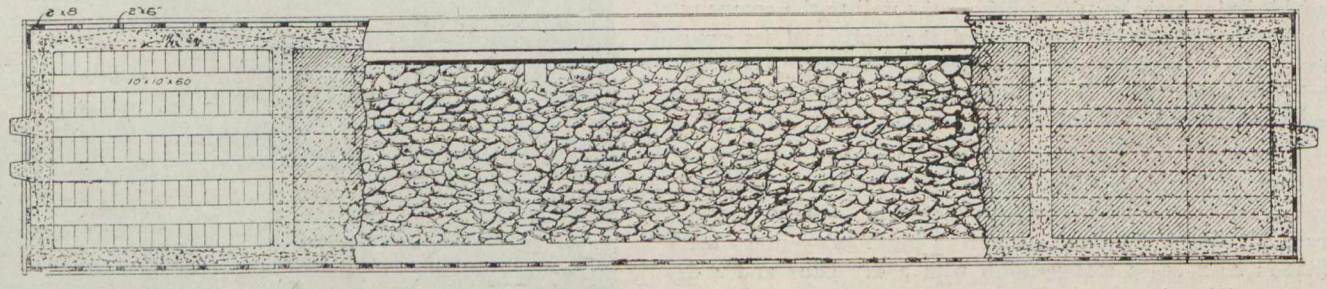
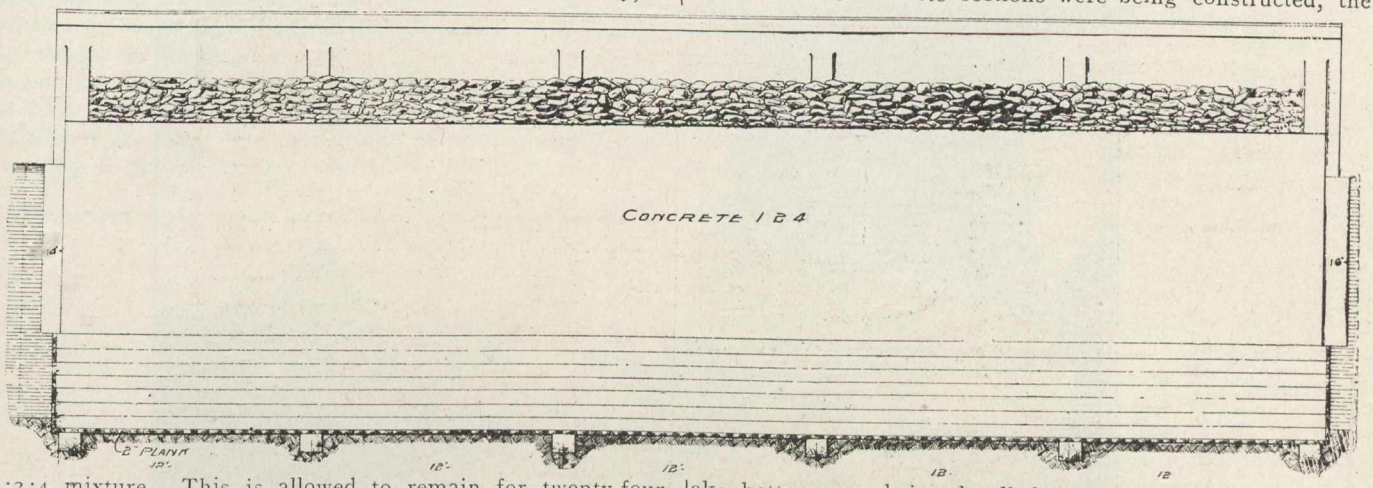


Fig. 1 shows the foundation of the wooden pontoon on shore. It will be noticed that in addition to the firm base on which the concrete is constructed, there have been inserted a number of iron hooks, the purpose of which is to anchor the wooden base to the concrete. On this wooden base, wooden forms are erected and made water-tight to

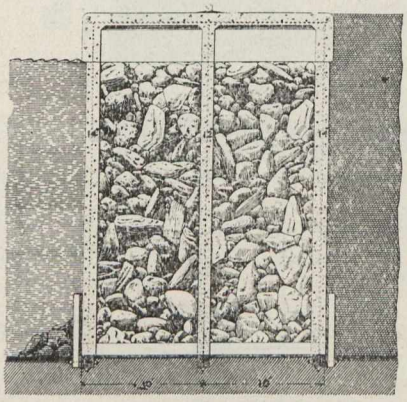


PLAN VIEW.

about 4 feet high. This crib is then launched and brought along the dock to a concrete mixer, and in Fig. 1 may be seen a second crib, close to the dock receiving the concrete. The concrete is filled in at a rate of about 2 feet a day, of



1:2:4 mixture. This is allowed to remain for twenty-four hours, when another 2 feet is added. No difficulty was experienced in securing water-tight walls. The weight of the concrete walls sinking the pontoon, when the pontoon, which is about 20 feet deep, is completed, it is about 6 feet out of water.



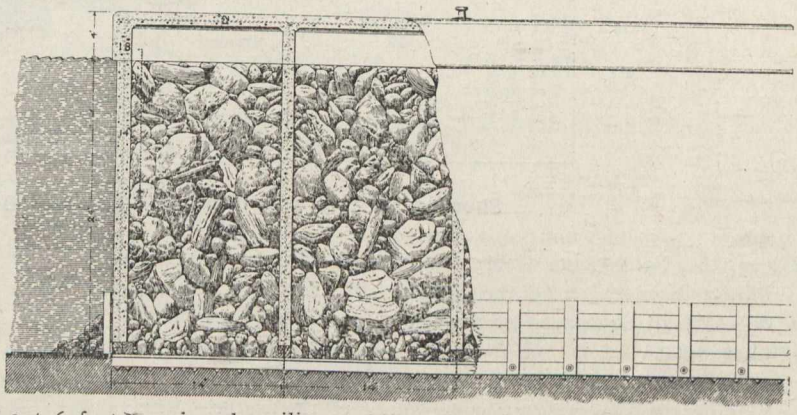
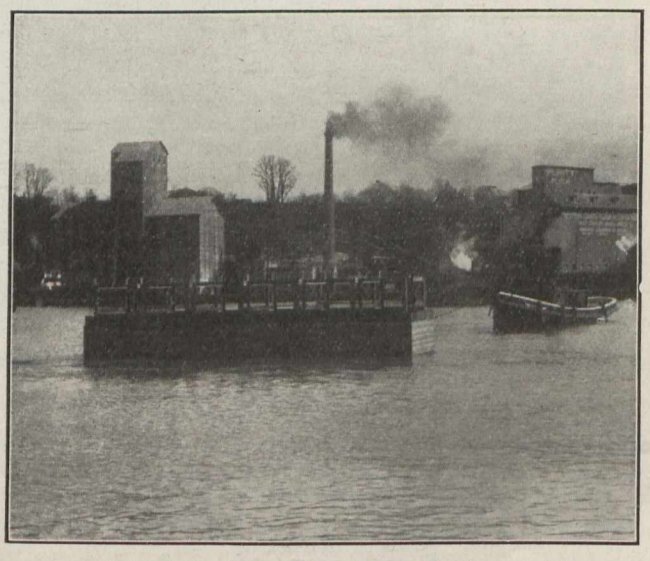


Fig. 2 shows the crib work being floated to the dock to receive concrete.



Completed Forms Launched.

Fig. 3 shows concrete sections floating, ready to be sunk in position. In Fig. 2, to the left of the picture, may be seen the present elevator of the Goderich Elevator and Transit Co. It is easterly from this building that the new dock is being constructed.

While the concrete sections were being constructed, the lake bottom was being levelled to receive them. The sections were then floated into position, lined and filled with water, when they sunk gradually into position. They were partly filled with sand and gravel and were then ready to receive the piling, which will be driven through the wooden pontoon bottoms, to the solid rock on which the sections rest; after the piling is driven, the compartments will be completely filled with sand and gravel, to give weight and stability to the dock. This timely experiment will be watched with considerabe interest by engineers interested in river, lake and harbor improvement. Mr. J. H. Tromanhauser is to be congratulated upon the completion and design, to which he has given much attention.

WINDSOR STATION EXTENSION, MONTREAL, P.Q.

The new addition to the present Windsor Station of the Canadian Pacific Railway, and on which the work is proceeding rapidly, covers a territory equal to if not larger than the existing station, and testifies to Montreal's ever-increasing growth. The foundations for the train-shed and the station proper, consisting of 245 circular piers, were completed the latter part of March, and those for the viaduct, namely, over 50 piers, will be finished about the first of June. This is particularly noteworthy because of the work receiving a severe setback in the beginning.

The first contractor, not realizing the magnitude of the work, nor its numerous difficulties, opened up many excavations for the piers, but after struggling on for about two months finally gave up the job. This disturbance of the ground at the pier sites over a large area of the lot added greatly to the difficulty of the succeeding contractors.

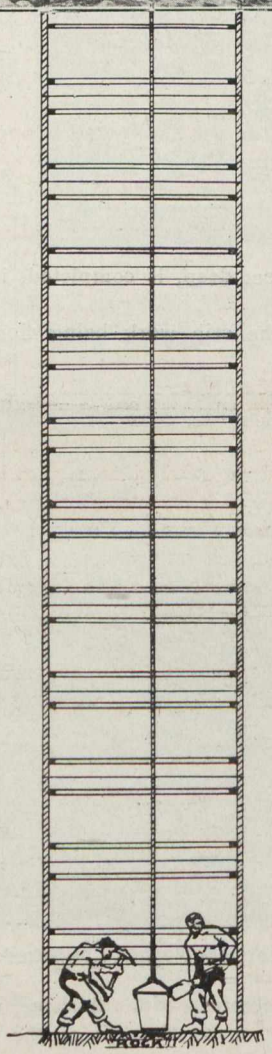
Showing Surface and Underground Workings.

These, the Foundation Company, Limited, Bank of Ottawa Building, Montreal; and the Bishop Construction Company, 3 Beaver Hall Square, started work on the latter part of November, 1909.

The new contractors realized that one of the most important features would be the handling of the water. Their first step, therefore, was to sink a sump in the lowest end of the lot close to St. Antoine St. The contour of the rock was partially known as a result of borings having been previously taken. The rock having been estimated to slope towards this point it was figured that a sump located there would tend to drain the surrounding soil.

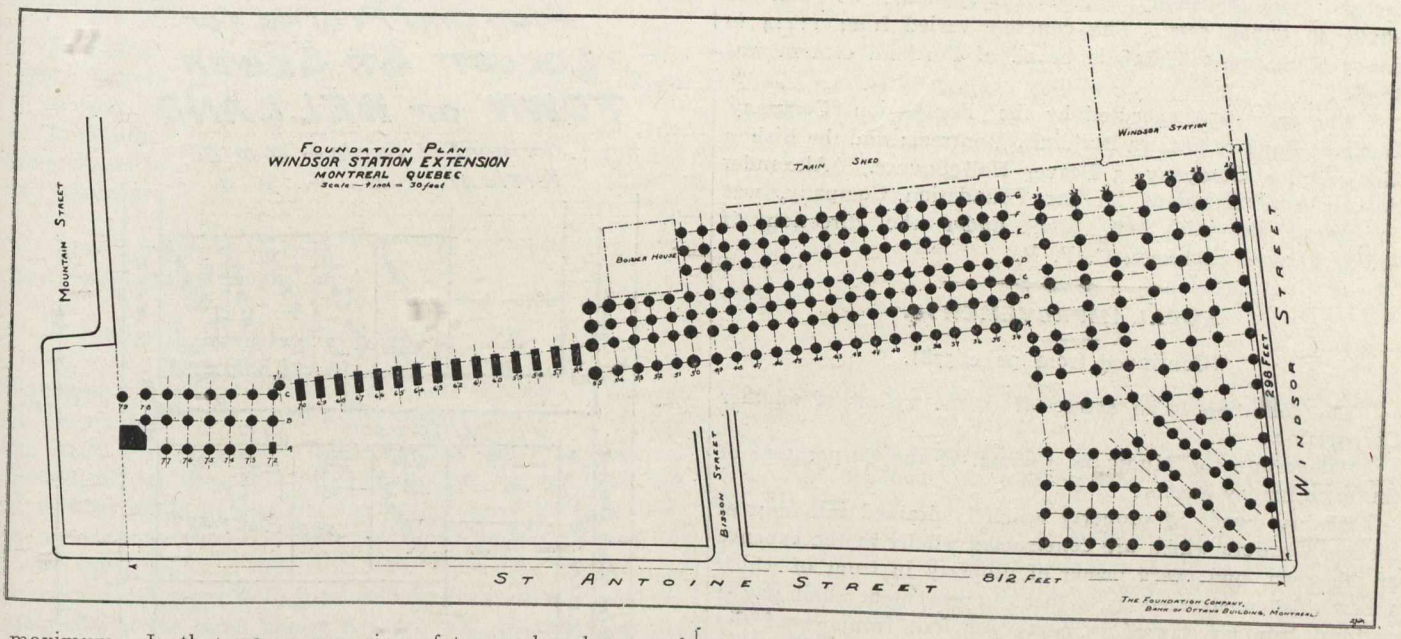
The sump was so placed that it included two of the column piers, Nos. 14 and 15, and the rock was reached by means of two drives of sheet piling. The piers were formed in each end of the box by building up wooden partitions and concreting. This left an open space which was used as a pump well. Between the pier footings the rock had been blasted out for several feet to determine its nature. This formed a very efficient sump. A three-inch suction Cameron pump, working night and day, held the water down to such a level that the sinking of the surrounding piers was greatly facilitated. This idea of draining the lot was further carried out by leaving as sumps numerous pier excavations at different points in the lot. The pumping in the pier wells was done by means of two-inch syphons and Nos. 3 and 4 pulsometers; these, because of their adaptability to being quickly installed and taken out, were much preferred to any other type of pump.

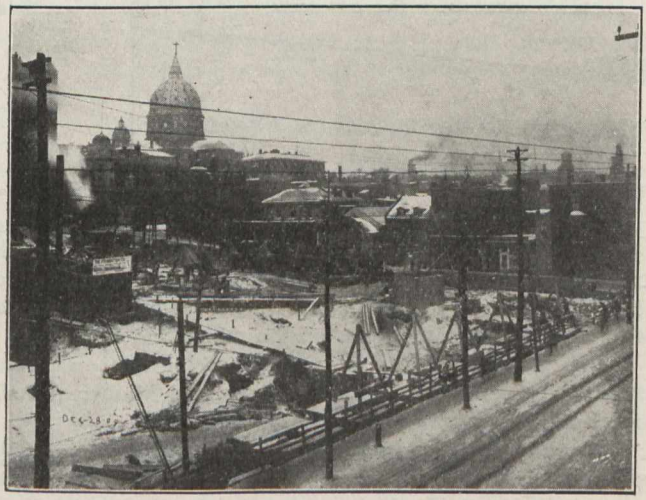
At the completion of the foundation work at the station proper, the excavation in the rock at the bottom of the sump between the piers was filled with concrete, thus insuring the stability of piers 14 and 15.



The contractors next turned their attention to the piers in which excavation had been begun and abandoned by the previous contractor. It was here that the most difficulty was encountered, for having been insufficiently sustained the banks were, in most cases, in very bad shape. In the cases of holes in which there was not exceptionally great danger of collapse, the lagging used by the previous contractor was cut out, one piece at a time, from behind his rangers, and the bank excavated sufficiently to set up two-inch tongue and groove lagging. The height of the new lagging varied according to the condition of the bank, six feet being a maximum. In that way a new ring of tongued and grooved lagging was erected behind the old ring of boards. This was held in place by iron bands. This process was repeated for the next set of boards underneath, the underpinning method continuing to rock. In the case of holes where serious trouble was expected, sheet piling was set up around the hole; the old boards being cut out as the sheeting was driven. The ground varied materially in different parts of the lot—quicksand, clay of a very soft consistency, gravel and hardpan were encountered. These classes of material when properly handled, of course, presented no serious difficulties in the piers, which were started from the surface by means of sheet piling. In the case of those which were sunk by the underpinning process, where it was found necessary, sheeting was set up inside of the lagging and driven down in advance of the excavation. Rock was found to vary in depth from thirty to forty feet below the lot level, the inclination being toward the south. This rock was, in a good many cases, of very poor quality; full of water and mud seams. Excavations varied in same from one to five feet. In one case about fifteen feet had to be taken out before solid rock was reached.

The hoisting arrangements were very complete and were essentially as follows: Holes were dug and lagged to a depth of about six feet, over these were laid platforms with a hole cut in each to permit men, buckets, etc., to pass through. On these platforms were erected tripods, each carrying a shaft with a niggerhead on one end, and a sheave on the other. These were driven by means of an endless cable from a hoisting engine set up at the head of a row of holes. The rows consisted of from 8 to 10 holes each. The plant furnished by the contractors was ample so that four rows of holes could be operated at one time, and at the same time a new row be prepared. This did away with any loss of time, as the gangs coming out of the completed piers immediately started in on the row of holes which had been gotten ready.





View Showing Old Station and New Work Commenced.

The original contract included the shifting of 20-inch and 12-inch sewer lines. This was occasioned by the fact that the sewers ran through a number of piers to be sunk. The work, however, presented no great difficulty; the 12-inch sewer was only about 12 feet deep, the 20-inch about 16 feet down. The 12-inch was handled by means of an open cut, and the 20-inch, by cut and cover down to St. Antoine St., where a tunnel was driven out under the street to the main sewer.

A number of piers were sunk close to the stack of the old power house. Extreme caution was exercised, with the result that not the slightest settlement took place.

About the middle of March, the same contractors were awarded an additional contract for the piers, over fifty in number, for under the viaduct and new power-house. About thirty-five of these were circular in form, the same as the first contract, the balance being rectangular, with one large square pier, approximately twenty feet square, for the new boiler-house stack. The contract also included the driving of a tunnel between the fifteen rectangular piers to form a steam pipe gallery from the new power-house to the other parts of the building. The work here was carried on after

essentially the same methods as on the first contract. In this case, however, on account of the sinking through what was apparently an old river bed, a great deal of water was encountered. This water was taken care of by additional pumps. Rock was also found to lie at a lower elevation, the sinking depth being from forty-three to forty-five feet.

On account of the great amount of steam required, some was piped directly from the C. P. R. boiler-house. In addition the contractors furnished the following plant: 5 20-h.p. hoisting engines, 1 50 and 1 20-h.p. horizontal boiler, 1 Ransome and 1 Smith mixer, 1 stiff leg derrick, pulsometers, Cameron pumps and steam syphons, as well as about 40 tripod sets. The concrete varied from 1:2:4 to a 1:3:6 mixture. Lakefield brand of Portland cement was used.

The work was executed by the Foundation Company, Limited, Bank of Ottawa Building, Montreal; and the Bishop Construction Company, 3 Beaver Hall Square. Alexander Allaire, superintendent for the Foundation Company, was in charge, the work being done under the direction of W. S. Painter, architect, C. P. R.

LOCAL IMPROVEMENTS.

(Continued from page 578).

The following is an extract from the by-law of another Corporation:

"Therefore the Municipal Council of the Corporation of the town hereby enacts:

"Every owner of property which is drained into any of the main sewers which are constructed wholly at the expense of the town, and every owner of property in front of which a sewer is constructed as a local improvement shall pay a uniform frontage tax of 70 cents per foot frontage of the property so drained, to be assessed on each assessable foot of frontage property so drained. Such amount shall be paid in 40 equal annual instalments of four cents each per foot frontage, being a sum sufficient to pay both interest and sinking fund for that amount, and the said instalment shall be payable at the same time as ordinary taxes are payable in the said town, but the Town Treasurer may accept payment down of the amount."

"Any property thus assessed for the privileges of connecting with any sewer shall be exempt from any assessment for any sewer construction on the street in front of such property."

"That corner lots shall be assessed for sewers constructed under by-laws for local improvements in the following manner:

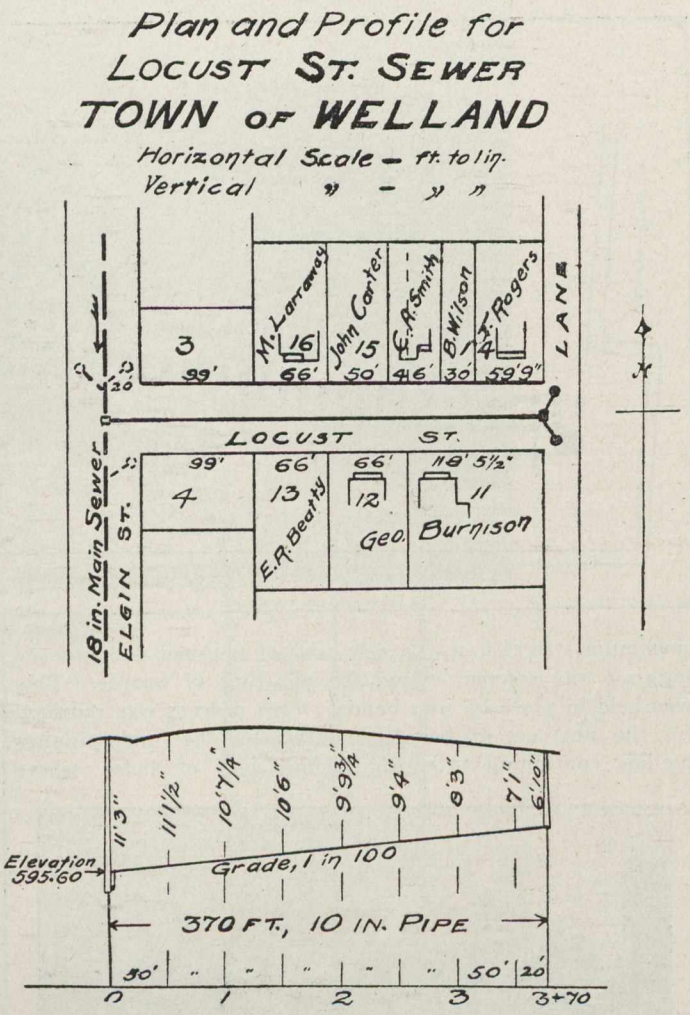
(A) Every corner lot shall be entitled to the exemption of one-half the total frontage on the two streets, not exceeding one hundred feet total exemption, except as hereinafter mentioned in Clauses "B" and "C."

(B) In cases where corner lots are built upon on more than one side of the lot, each separate owner or tenement shall pay frontage assessment, as in Clause 8, whether such tenement be on the front or side of the lot, but no such tenement shall pay for more than one street frontage.

(C) If a corner lot is a triangular or irregular shaped piece of land, or otherwise so situated as to make portions of the same unfit for building purposes, such allowance shall be made, having due regard to the situation, value and superficial area of such lot as compared with the adjoining lots or pieces of land, as the Town Engineer may deem just and equitable."

"That the cost of any sewer in excess of the total amount assessed on abutting properties shall be borne by the town."

I consider that a uniform frontage rate for the construction of sewers, mains as well as branches, should be generally adopted, but there does not seem to be any provision made for this in the Municipal Act, and requires a special Act of the Legislature. My own experience has been in cases where the frontage rate has varied according to the cost of the work, running from about forty cents to one dollar and thirty-five cents per foot. When making an assessment for main sewers, an outlet rate was levied on all lots that would ultimately be served by branch sewers leading into said mains, as the mains are not only constructed



of larger size, but generally have to be laid at a much greater depth than the branches. The idea I have attempted to carry out is to levy such an assessment for outlet as would finally equalize the assessment on the mains and branches.

Provision is made for an assessment for outlet in Subsection 2 of Section 673 of the Consolidated Municipal Act, which reads as follows:

"Where in order to afford an outlet for the sewerage and drainage of real property other than that fronting or abutting upon the street in which a sewer is proposed to be or is constructed, such sewer is proposed to be or has been constructed of a larger capacity than that required for the efficient sewerage and drainage of the real property fronting or abutting upon the street, the Council may impose a special assessment upon any other real property benefited by the construction of such sewer in the manner provided by Sections 674 and 675 of this Act."

Where the rate of assessment runs at about seventy cents per foot, I have found that the property owners generally prefer to pay the assessment in about ten equal annual in-

ASSESSMENT FOR BRANCH SEWER ON LOCUST STREET.

Owners.	Lot and Street.	Frontage.	Assessments.	To cover interest for 10 years at 5 per cent.	Total special rate.	Annual assessment during each year for 10 years.
			$ c.	$ c.	$ c.	$ c.
Geo. Burnison 11	S. S. Locust	119′ 5½″	63 56	18 75	82 31	8 23
" 12	"	66′	35 11	10 36	45 47	4 55
E. R. Beatty 13	"	66′	35 11	10 26	45 47	4 55
Thos. Rogers ..... E. pt. 14	N. S. Locust	59′ 9″	31 79	9 38	41 17	4 12
B. Wilson ..... C. pt. 14	"	30′	15 96	4 71	20 67	2 07
C. A. Smith ..... W. pt. 14 & E. pt. 15	"	46′	24 47	7 23	31 70	3 17
John Carter ..... W. pt. 15	"	50′	26 60	7 85	34 45	3 44
M. Larraway 16	"	66′	35 11	10 36	45 47	4 55
Total assessment on lots		.....	267 71	79 00	346 71	34 68
Assessment on Municipality		.....	94 05	27 74	121 79	12 18
Total		.....	361 76	106 74	468 50	46 86

stalments. The total amount that would be paid for interest on an assessment of one hundred dollars at the rate of five per cent. per annum would be $29,504. In fifteen annual instalments at the same rate of interest, the total amount of interest would be $44,513. In twenty equal annual instalments the interest at the same rate would be $60,485, and for thirty equal annual instalments at the same rate the total interest would amount to $95,154, and for forty equal annual instalments at the same rate of five per cent. the total interest would amount to $133,113. Where a frontage rate of seventy-nine and one-tenth cents per foot is made payable in forty equal annual instalments of four cents per foot, as mentioned in the by-law referred to above, the rate of interest would be four per cent., and in the case quoted, where the assessment is rated at seventy cents per foot, payable in forty equal annual instalments of four cents per foot, the interest is calculated at the rate of about five per cent., in which case the interest alone will amount to about one-third more than the original assessment.

Section 664a, referring to the cost of the part of the work to be borne by the municipality, is an important section. It reads as follows:

"If the contemplated work or improvement is the construction of a common sewer having a sectional area of more than four feet, one-third of the whole cost thereof shall be provided for by the Council. The Council of every municipality shall also provide, in connection with all sewers and roadways, the cost of all culverts and other works necessary for street surface drainage, and may also in the case of roadways and sidewalks provide the cost of that part of every work, improvement or service which is incurred at and is chargeable in respect of street intersections, and also that part thereof done or made opposite real property which by any general or special Act is exempt from special or local assessment."

ASSESSMENT FOR CONCRETE SIDEWALK ON THE SOUTH SIDE MAPLE AVENUE.

Owners.	Lot and Street.	Frontage.	Assessment.	To cover interest for 10 years at 5 per cent.	Total special rate.	Annual assessment during each year for 10 years.
			$ c.	$ c.	$ c.	$ c.
Mrs. L. H. Puttick ...77	S. S. Maple Ave.....	88′	36 95	10 91	47 86	4 79
Miss C. B. Austin ...76 & 75	"	132′6″	55 65	16 42	72 07	7 21
H. W. Rider 74	"	66′3″	27 83	8 21	36 04	3 60
F. B. Waite 73	"	66′3″	27 83	8 21	36 04	3 60
Bertha Hooker .....Pt. 72	"	50′	21 00	6 19	27 19	2 72
Miss J. Ward .....Pts. 71 & 72	"	40′	16 80	4 95	21 75	2 17
J. Morwood ..... Pt. 71	"	28′4″	11 90	3 51	15 41	1 54
Total assessment on lots		.....	197 96	58 40	256 36	25 63
Assessment on Municipality— 1/3 cost of lot frontage .. $84 84; Street intersections..... 36 30		.....	121 14	35 73	156 87	15 69
Total		.....	319 10	94 13	413 23	41 32

The duties of the municipal engineer are clearly laid down in the Act as well as in the extracts from the by-law already quoted, but I will here append plans and schedule of assessment for a small branch sewer, the lots fronting on which were previously assessed twenty cents per foot as an outlet rate towards the construction of the main sewer.

With regard to the Court of Revision, I may refer to the notices required, although this is no part of the duties of the Engineer.

Notices must be sent to each person assessed, at least fifteen days before the sitting of the Court of Revision, and ten days' notice of the sitting of said court must also be given by an advertisement in at least one newspaper published in the city or town.

Should the actual cost of the work exceed the estimated cost by over ten per cent., it will be necessary to hold another Court of Revision after the completion of the work.

In the construction of sewers where the depth does not exceed about eighteen feet, I find that it is more economical to have the corporation do the work by day labor, in charge of a competent foreman, instead of by contract.

Section 682 of the Consolidated Municipal Act provides for the passing of a by-law with the assent of the electors, directing that all future expenditure in the municipality for the improvements and services, for which special provisions are made in Sections 682 and 686, shall be by special assessment on the property benefited.

Section 679 authorizes a Municipal Council (if they think fit) to provide for constructing, at the expense of the general funds of the municipality, such part of the local improvements as is situate upon or in that part of any public street, lane or square which is intersected by any other public street, lane or square, or as would otherwise fall on property exempt from assessment.

Sections 676, 677 and 678 provide for the construction of sidewalks as local improvements, either with or without a petition on two-thirds or a three-fourths vote of the Council, without the assent of the electors, and to provide for the cost of forty per cent. or any other percentage of the cost of the work in front of the lots, out of the general funds of the municipality, in addition to the cost of street intersections and of the assessment that would otherwise fall on exempt property.

I will give here a plan and schedule, showing assessment for a four-foot concrete sidewalk, seventy per cent. of the cost of which is to be borne by the lot owners, fronting it on the same side of the street, and thirty per cent., in addition to the cost of street intersections is to be borne by the municipality. The street crossing is five feet in width.

The contract price of the walk was thirteen and a half cents per square foot, and fifteen and a half cents per square foot for street crossings.

This work was constructed along with other walks costing about twelve thousand dollars. One and one-half cents per square foot covered the cost of engineering, superintendence, and incidental expenses.

The schedules given above show the assessment to be levied as ascertained, after the construction of the works, with added interest calculated for a certain number of equal annual instalments.

In the original report containing the assessment based on the estimated cost, the names of the owners of lots to be assessed, the number of their lots, the frontages and the total assessment, are given, but the interest is not added nor the yearly instalments struck.

ELEMENTARY ELECTRICAL ENGINEERING.

CHAPTER III.

MAGNETO-ELECTROMOTIVE FORCE.

Generated Electromotive Force—Induced Electromotive Force—Self-induction—Mutual Induction.

L. W. Gill, M.Sc.

This series of articles will be continued for some months. They will be of particular interest to the student of electrical work and the civil engineer anxious to secure some knowledge of the simpler electrical problems.

Generated Electromotive Force.—It was noted in Chapter I. that an e.m.f. may be obtained in various ways, but that when a large quantity of electricity is to be handled as in the case of most commercial operations, the e.m.f. is always generated through the agency of magnetism. Any e.m.f. obtained in this way may be referred to as a magneto-electromotive force. This method of obtaining an e.m.f. will be considered in this chapter.

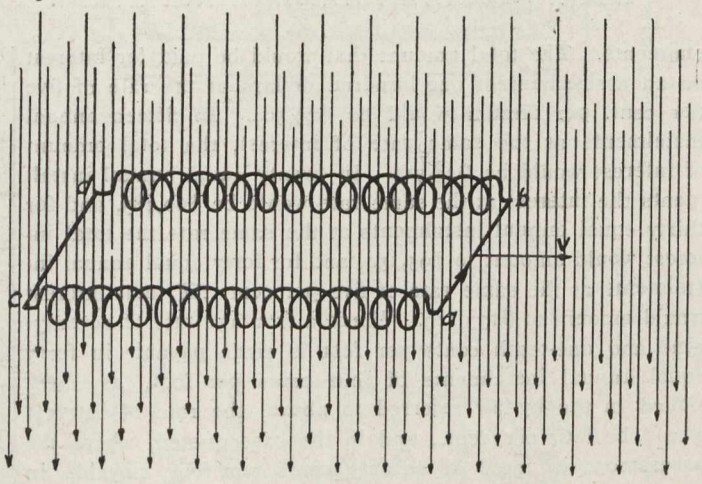


FIG. 26

If a body is moved across the streams of magnetic flux in any magnetic field so that it "cuts" the lines of force, an e.m.f. will be generated in it. If the body is a conductor, this e.m.f. will set up a difference of potential between the two sides of the body. For example, let two wires or conductors, **ab** and **cd**, of length **l**, be connected together at the ends with extensible connections and placed in a magnetic field of strength H,

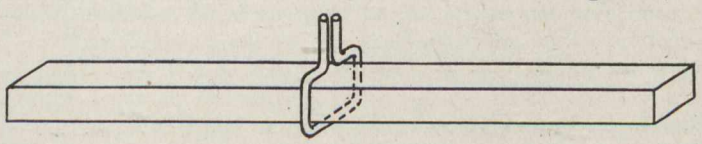


FIG. 27

with the lines of force at right angles to the wires, as shown in Fig. 26. If **cd** is fixed and **ab** moved so that it cuts the lines of force at right angles with a velocity of **v** feet per second, an e.m.f. will be generated in it. This e.m.f. will cause a current to flow around the circuit formed by the two wires and the extensible connections. Experiment has proved that this e.m.f. is proportional to the strength of the field, to the velocity of the wire, and to the length of the wire. The expression for this

e.m.f. will thus be, $E = KHvl$, K being a constant depending on the unit selected for e.m.f. The simplest unit is obviously that which makes K equal to unity. This unit, which is known as the "electromagnetic unit of e.m.f.", has been adopted by international agreement as the absolute unit of e.m.f Since K is equal to unity, $E = l$ when the product $Hvl = l$, but the latter represents the number of lines of force cut per second by the wire. It thus follows that **the absolute unit of e.m.f. is that which is generated in a conductor when the latter is cutting one line of force per second.** In commercial work this unit has been found to be too small for convenience, and consequently a "practical unit," 108 times as large as the absolute unit, has been adopted. This unit, which has been referred to in Chapter I., is known as the "volt." From the above it is obvious that one volt will be generated in a conductor which is cutting 108 lines of force per second.

The direction of the e.m.f. generated in the conductor **ab** (Fig. 26) is indicated by the arrowhead. It may always be determined by the following rule: Arrange the thumb and first two fingers of the right hand so that each points at right angles to the other two; if the first finger is now made to point in the direction of the magnetic force, and the thumb in the direction of motion of the conductor, the second finger will point in the direction of the generated e.m.f. If the conductor is stationary and the magnetic field moving, an e.m.f. will be generated in the conductor the same as if the field were stationary and the conductor moving. The e.m.f. thus depends on the relative motion of the two.

Example 8.—A wire is passed across the opening (air-gap) of the magnetic circuit shown in Fig. 25 in 1/10 second. The magnetic flux is 60,000 maxwells. To determine the e.m.f. generated in the wire:—

Lines of force cut per second by wire = 60,000 ÷ 1/10 = 600,000.

E.m.f. generated in the wire ÷ 600,000 ÷ 10^8 = .006 volt.

The generation of an e.m.f. by the agency of magnetism is further illustrated by the arrangement shown in Fig. 27. A wire is bent into the form of a loop, which may be easily slipped over a bar magnet. When the loop is in the position shown in the figure, practically all the lines of force connected with the magnet pass through it; i.e. are linked with it. When the loop is slipped off or unto the magnet the lines of force are cut by the wire, and an e.m.f. will be generated in it which at any instant will be equal to the number of lines of force being cut per second. If the loop is joined together at the ends so that a complete circuit is formed, a current will flow in one direction around this circuit when the loop is slipped off the magnet, and in the opposite direction when the loop is slipped unto the magnet. If the wire is formed into a coil of N loops or turns, an e.m.f. will be generated in each turn, making the total e.m.f. N times as great as it would be with only one loop. In this case each line of force is linked with each turn; i.e., it is linked with the wire circuit N times. A line of force may make any number of "linkages" with an electric circuit. The total linkages is the sum of the linkages made by each line of force. When each line of force links with the circuit N times, as in Fig. 27, the total linkages is equal to N times the magnetic flux.

Referring to the circuit formed by the wires and connections shown in Fig. 26, and also to the loop in Fig. 27, it will be noted that in both cases **the number of lines of force cut in any given time is exactly equal to the change of linkages in the same time.** The e.m.f. is thus equal at any instant to the change of magnetic linkages per second, or, more strictly, to the rate of change of linkages. For example, if there are 100,000 lines of force linked with a circuit at any instant, and this number is changed at a uniform rate to 20,000 in .5 second, the e.m.f. acting in the circuit during this time will be (100,000 — 20,000) ÷ .5 = 160,000 absolute units, or .0016 volt. If the rate of change of linkages is not uniform, the e.m.f. will not be uniform, but will change as the former varies.

Example 9.—A coil of wire, composed of 500 turns, is slipped unto a bar magnet in 1/5 second. If the magnetic flux is 80,000 maxwells, to determine the mean e.m.f. generated in the coil:—

$$\text{Change of linkages per second} = 80{,}000 \div \frac{1}{5} = 400{,}000.$$

Mean e.m.f. generated = 400,000 ÷ 10 = .004 volt.

Induced Electromotive Force.—The change of magnetic linkages in the case of the arrangement shown in Fig. 27 may be effected by changing the quantity of magnetic flux without moving the loop of wire; i.e., by changing the strength of the magnet. When an e.m.f. is obtained by changing the quantity of magnetic flux without relative motion, it is referred to as an "induced" e.m.f., to distinguish it from an e.m.f. which is caused by relative motion between magnetic field and conductor, this being referred to as a "generated" e.m.f. It must be clearly understood, however, that the two are identical in character, and are distinguished only with respect to the conditions under which they are obtained.

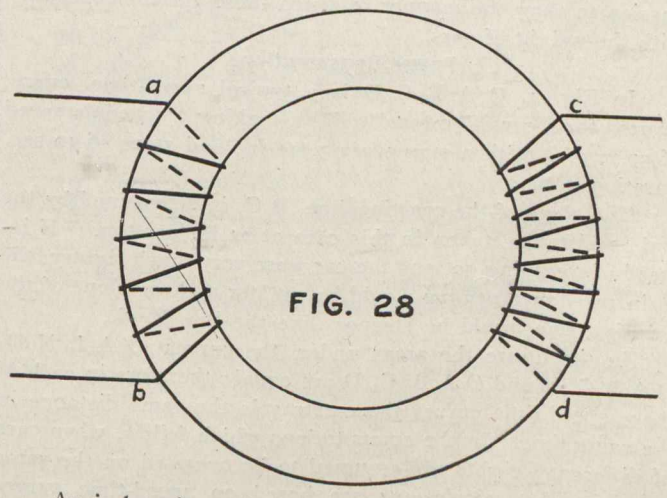


FIG. 28

An induced e.m.f. may be easily obtained by winding a coil of wire **ab** around one side of an iron ring, as shown in Fig. 28. If a current is passed through this coil a magnetic flux is set up in the iron ring, and the magnitude of this flux can be varied simply by varying the strength of the current. If a second coil **cd** is wound on the other side of the ring, any variation in the quantity of the flux in the ring will induce an e.m.f. in this coil, because of the change of magnetic linkages. Since the number of linkages depends on the number of turns of wire, it follows that the greater the number of turns the greater the change of linkages for a given change of flux, and the greater the induced e.m.f.

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CAR WEIGHTS AS AFFECTING OPERATING COST.*

By M. V. Ayres, Electrical Engineer, Boston & Worcester Street Railway.

When it is suggested that a decrease in the weight of cars might be brought about without sacrificing carrying capacity or safety, the question is at once raised: "Will it pay?" In other words, will not the increased cost of building such lighter cars more than offset any saving to be effected in operating expenses?

This investigation was undertaken with the hope of throwing some light on the question of the relation between the weight of cars and operating expenses. It has been conducted by means of correspondence with car manufacturing companies, operating companies, and various gentlemen who were known to be interested in the subject; also by the consultation of text books and authorities in the effort to obtain theoretical data applicable to the matter.

The effort to obtain information based on actual tests or operating data has been largely barren, and therefore the theoretical discussion occupies the larger part of the paper.

Probably no argument is needed to show that an increase of car weights will cause an increase in the following items of expense:

(1) Cost of power; (2) cost of car repairs; (3) cost of track repairs; (4) fixed charges of power plant, and (5) fixed charges of distribution system.

While it is evident that these items will increase with car weights, it is not obvious that they will increase proportionately thereto. An attempt has been made in the following discussion to show the manner in which these various costs vary with the weight of cars.

Power Consumption.

In Fig. 1, O A B C D is a typical speed-time curve, figured for a car of 50 tons' weight, making a schedule speed of 30 m.p.h., with a stop every 5,710 ft., and stops of 10 sec. duration.

The slope of the coasting line, B C, is determined by the train resistance, taken in this case at 14 lb. per ton. If instead of weighing 50 tons the car were very much lighter, the train resistance per ton would be greater and the slope of the coasting line would be steeper, like the line B_1 C_1.

In the figure the areas under the curves O A L N D, O A B C D, and O A B_1 C_1 D are equal; therefore in each of these speed-time curves the car travels the same distance in the same time. In the computations which follow, when cars of different weights are assumed to be operated on the same schedule, the calculations are based on speed-time curves like O A B C D and O A B_1 C_1 D; that is to say, the curves of acceleration and braking are kept the same, but the slope of the coasting line is changed to correspond with the calculated train resistance.

The energy required to propel the car on the speed-time curve O A B C D is equal to:

(1) The energy to accelerate to the speed at the point B.

(2) The energy to overcome train resistance to the point B.

(3) Motor and rheostatic losses, proportional to (1) and (2).

The energy used in accelerating from point L to point B is all used in overcoming train resistance to point M, at which the speed is the same as at point L. Therefore, the energy required for this speed-time curve may be re-stated, as equal to:

(1) Energy to accelerate to point L.

(2) Energy to overcome train resistance to point M.

(3) Motor and rheostatic losses, proportional to (1) and (2).

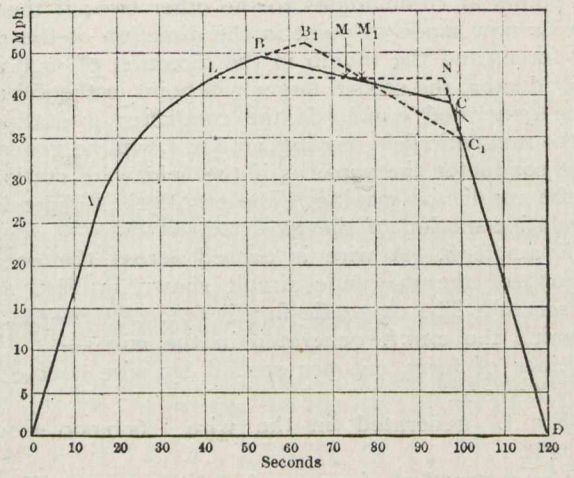
If we draw a series of speed-time curves for the same schedule, for cars of different weights, the point M shifts, as shown by the distance between M and M_1, but the total movement of this point is small, and in the computations which follow the point M is assumed constant for all cars on the same schedule. In computing the power consumption for cars of various weights, operating on the schedule, Fig. 1, the following quantities are calculated:

(1) Energy required to accelerate one ton to speed of point L, 7 per cent. being added to allow for the effect of rotating parts. The formula for this calculation is

$$E = .0205\ S^2$$

where E = energy in watt hours, and S = speed in miles per hour.

(2) Distance traveled by car before reaching point M.



Car Weights—Fig. 1.—Typical Speed-time Curves for 50-Ton Cars, Speed 30 M.P.H., 10-Second Stops Every 5,710 Feet.

(3) Average effective train resistance for the car in question. Then (2) × (3) × .000278 = energy in watt hours to overcome train resistance. These figures give the energy per ton for the schedule in question, for the distance covered by the speed-time curve.

The curves of Fig. 2 are calculated for cars of various weights operating on the schedule of Fig. 1. Vertical distances correspond to watt hours per car mile and horizontal distances and to ton weight of cars. Curve A shows the energy required for acceleration only, for cars of all weights up to 50 tons. Curve B shows corresponding values of energy to overcome train resistance only. Curve C is the sum of A and B. Curve D shows the total energy including motor losses to operate cars of all weights up to 50 tons on the schedule in question.

Curve B is calculated with the aid of Armstrong's formula for train resistance:

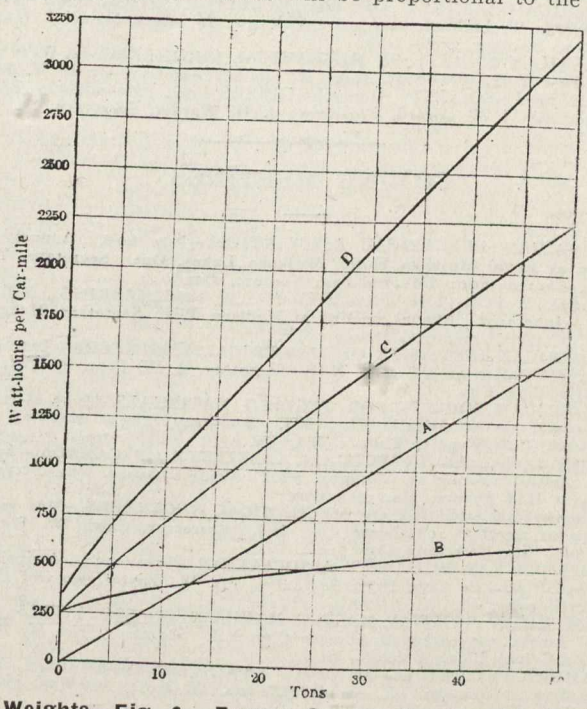
$$F = \frac{50}{\sqrt{W}} + .03\ S + \frac{.002\ a\ S^2}{W}$$

Where W = weight of car in tons; S = speed in miles per hour; a = area of car end in sq. ft. Throughout these computations a is taken at 92 sq. ft.

*Abstract of paper presented before the American Street and Interurban Railway Engineering Association.

The important thing to notice about curve D is that it is substantially a straight line. If the energy were proportional to weight it would be a straight line through the origin, like line A. To show how closely this form of curve is followed under varying conditions, other schedules have been calculated.

Starting with Fig. 1 as a basis, other speed-time curves can be assumed, of the same shape, but of different sizes. Then all speeds and times will be proportional to the linear



Car Weights—Fig. 2.—Energy Curves for Cars of Various Weights Operating on Schedules Shown in Fig. 1.

dimensions, and all distances to the squares of the linear dimensions. By the aid of this proportionality, and a special calculation in each case for the train resistance, energy curves can be calculated for other schedules, corresponding to speed-time curves of the same shape. By assuming new speed-time curves of different shapes, further series of energy curves can be calculated in the same manner.

Such energy curves have been calculated for speed-time curves of the three shapes in Fig. 3. These were taken as illustrating widely differing characters of service, curve X requiring one stop every 3 minutes, curve Y one every 90 seconds, and curve Z one stop every 70 seconds, allowing 10 seconds duration for each stop. On the basis of these three curves, changing the dimensions in the manner above described, the energy curves of Fig. 4 have been obtained. These show the energy in watt hours per ton mile required for cars of various weights from 12.5 to 50 tons, operating on various schedule speeds, and on speed-time curves of shapes similar to the curves X, Y and Z of Fig. 3.

These curves are all very nearly straight lines represented by the equation

$$E = a + bW,$$

when E = the energy per car mile, a is the intercept of the curve on the Y axis, and b is the slope of the curve.

This equation will, therefore, be adopted as correctly representing the relation of weights of car to power consumption in all cases of like schedule, the constants a and b being dependent upon the frequency of stops and schedule speed attained.

This formula may be expressed:

$$P = \frac{p}{n}(ap + bpW).$$

where P = cost of power per car mile in cents; p = cost of power per kw-hour in cents; and n = efficiency of transmission, power house to car.

For ordinary frequent stop service, when the schedule speed is forced up to about the highest point permitted by frequency of stops, probably conditions intermediate between those of curves Y and Z would obtain, and the power consumption would be about that indicated by the broken line on Fig. 4. The equation of this line is:

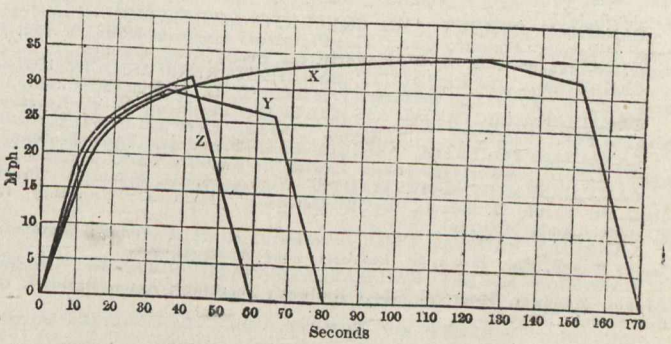
$$E = .500 + .075 = W$$

If we assume that the cost of power per kw-hour is one cent, and the efficiency of transmission to the car 75 per cent., this becomes:—

$$P = .667 + .1\ W,$$

which is believed to fairly represent the cost of power in cents per car mile under average conditions.

These equations indicate that the cost of power is divided into two portions, one of which is independent of the weight of car, and the other proportional thereto. In the case assumed the cost is 0.667 cent per car mile, irrespective of weight of car, plus 0.1 cent per ton of car weight. The value of both the constants a and b in the general formula is dependent upon the formula used in calculating train resistance. If train resistance were proportional to weight the constant a would disappear, making the power cost exactly proportional to weight. The formula used is believed to represent average conditions, as near as present information will permit, but would not be correct in some special cases.



Car Weights—Fig. 3.—Calculated Speed-time Curves for Various Kinds of Service.

The use of ball bearings, for instance, would give rise to a different formula, and would reduce the value of the quantity a. The figure 0.667 for a is undoubtedly too high for ordinary city conditions, which are more nearly represented by the line corresponding to the schedule of 10 m.p.h., curve Y, Fig. 4. This indicates but about 0.28 cent per car mile as the part of power cost independent of car weight. The curve chosen (the broken line) is more nearly that of elevated railway or frequent stop interurban service.

Cost of Car Repairs.

An increase in car weight involves an increase in the weight and cost of all replacement parts, this cost being nearly but not quite proportional to the weight. If the increase of weight is accompanied by proportional increase of strength and bearing surfaces, the life of parts should not be decreased, the sole increased cost of repairs being due to the greater cost of replacement parts. However, such proportional increase is not possible in many parts, such as trolley wheels, gears, brakeshoes and wheels, all of which wear out much faster with heavy cars than with light ones. On the other hand, some items of car repairs are independent of weight, such as painting and replacing broken glass.

(Concluded next week).

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; S. J. Chapleau, Resident Engineer's Office, Department of Public Works.

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ONTARIO MUNICIPAL ASSOCIATION.—President, Mr. George Geddes, Mayor, St. Thomas, Ont.; Secretary-Treasurer, Mr. K. W. McKay, County Clerk, St. Thomas, Ontario.

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

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CANADIAN SOCIETY OF FOREST ENGINEERS.—President, Dr. Fernow, Toronto; Secretary, F. 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.

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INSTITUTION OF ELECTRICAL ENGINEERS.—President, Dr. G. Kapp; Secretary, P. F. Rowell, 92 Victoria Street, London, S.W.; 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.

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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, Ont.

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 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 ELECTRICAL ASSOCIATION.—July 6-7-8. Annual convention at Royal Muskoka Hotel, Muskoka Lakes, Ont. Secretary, T. S. Young, Confederation Life Building, Toronto, Ont.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION.—June 23-25. Annual meeting at Madison, Wis. Secretary, Henry H. Norris, Cornell University, Ithaca, N.Y.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—June 27-30. Annual convention at Jefferson, N.H. Secretary, R. W. Pope, 33 West 39th St., New York City.

AMERICAN SOCIETY FOR TESTING MATERIALS.—June 28-July 2. Annual meeting at Atlantic City, N.J. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

THE ROYAL ARCHITECTURAL INSTITUTE OF CANADA.—August 24-27. Annual meeting at Winnipeg, Man. Alcide Chausse, Hon. Secretary, 5 Beaver Hall Square, Montreal, Que.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. —May 31-June 3. Spring meeting at Atlantic City, N.J. Secretary, Calvin W. Rice, 29 West 39th St., New York City.

MASTER CAR BUILDERS' ASSOCIATION.—June 15-17. Annual convention at Atlantic City, N.J. Secretary, Jos. W. Taylor, 390 Old Colony Bldg., Chicago, Ill.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—June 20-22. Annual convention at Atlantic City, N.J. Secretary, Jos. W. Taylor, 390 Old Colony Bldg., Chicago, Ill.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—June 21-24. Annual convention at Chicago, Ill. Secretary, Chas. W. Hunt, 220 West 57th St., New York City.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS.—June 22-24. Semi-annual meeting at Niagara Falls, N.Y. Secretary, J. C. Olsen, Polytechnic Institute, Brooklyn, N.Y.

CANADIAN GAS ASSOCIATION will meet at Hamilton, Ont., on June 9-10-11th. Secretary, Mr. A. W. Moore, Woodstock, Ont.

CANADIAN GAS EXHIBITORS will meet in the Alexandria Rink, Hamilton, Ont., June 6th to 11th. Secretary, A. W. Smith, 52 Adelaide Street East, Toronto.

THE AMERICAN PEAT SOCIETY will meet at Ottawa, Ont., July 25-26-27, 1910.

NEW ENGLAND WATER WORKS ASSOCIATION.—September 21-23. Annual meeting, Rochester, N.Y. Willard Kent, Secretary, Narragansett Pier, R.I.

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

NATIONAL MUNICIPAL LEAGUE.—November 14-18. Annual meeting, Buffalo, N.Y. Clinton Rogers Woodruff, Secretary, North American Building, Philadelphia, Pa.

TORONTO, CANADA, JUNE 10, 1910.

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RAILWAY EARNINGS; STOCK QUOTATIONS.

Figures for the Past Week and from Beginning of Year, with Comparisons and Stock Prices.

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.	May 31	$2,754,000	$1,812,900	$2,139,000
G. T. R.	" 31	1,208,103	851,044	1,031,108
C. N. R.	" 31	359,300	286,600	213,200
T. & N. O.	" 31	41,756	25,247	37,878
Mont. St.	June 4	83,563	85,075	77,178
Halifax Elec.	May 31	5,155	3,497	4,684

Week ended May 31st is for ten days, from May 22nd.

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

Road.	Mileage.	Jan. 1st to	1910.	1909.
C. P. R.	10,276	May 31	$35,578,000	$30,047,000
G. T. R.	3,536	" 31	17,691,074	14,713,807
C. N. R.	3,180	" 31	4,727,100	3,434,800
T. & N. O.	264.74	" 31	499,649	414,886
Mtl. St.	141.79	June 4	1,758,233	1,519,415
Toronto St.	114.	Mch. 31	974,264	861,768
Hlfx. St.	13.3	May 31	77.280	67,987
London St.	33.25	" 31	91,714	86,975

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.	Capitals 000's omitted.	Price June 3 1909.	Price May 26 1910.	Price June 2 1910.	Sales last week.
C. P. R.	$150,000	184½-182½	-197	... .	535
Mtl. St.	18.000	214-213¼	244¾-244	242-241½	1,278
T'nto St.	8,000	-125	.....	-119¼	497
Hlfx. Elec.	1,400	114-113	125-123	125-123	7
G. T. R.	226,000	1st pfd. 110¾; 3rd pfd. 67⅛; com. 32⅜			

CANADIAN PACIFIC.

April Net $2,981,111 Against $2,143,508 Year Ago; Ten Months $9,425,489 Increase.

The report of the Canadian Pacific Railroad Company for the month of April and ten months ended April 30th compares as follows:—

	1910.	1909.	1908.	1907.
April gross.	$7,985,230	$6,384,038	$5,497,736	$6,391,561
Expenses ..	5,004,119	4,240,530	3,775,501	4,024,635
April net ..	2,981,111	2,143,508	1,722,235	2,366,026
10 mos. gr..	77,803,558	63,342,523	60,435,768	58,462,678
Expenses .	49,237,782	44,202,236	42,000,393	38,093,834
10 mos. net.	28,565,776	19,140,287	18,435,375	20,368,844

GRAND TRUNK RAILWAY.

April Net $793,188 Against $757,188 Year Ago; Four Months $292,911 Increase.

The report of the Grand Trunk of Canada for the month of April and four months ended April 30th, 1910, compares as follows:—

	1910.	1909.	1908.	1907.
April gross.	$2,689,610	$2,374,110	$2,277,035	$2,961,752
Expenses ..	1,896,422	1,616,922	1,622,491	2,006,458
April net ..	793,188	757,188	654,544	955,294
4 mos. gr...	10,210,298	8,755,320	8,420,992	10,273,667
Expenses ..	7,913,362	6,751,295	6,865,172	7,581,520
4 mos. net .	2,296,936	2,004,025	1,555,820	2,692,147

The April net earnings of the Canada Atlantic increased $11.650, those of the Grand Trunk Western decreased $33,500. and the net earnings of the Detroit, Grand Haven & Milwaukee increased $5.000. The April net earnings of the entire system increased $19,150.

LONDON STREET RAILWAY

Earnings of the London Street Railway compare as follows: 1910, $17,850; 1909, $17,648.

ONTARIO ELECTRIC RAILWAYS.

From week to week we propose to give, on our page devoted to transportation interests, particulars of the equipment, mileage, and other information regarding the railways of Canada, together with a list of the officials. This series of articles commenced in our issue of October 1st.

Previously given:—

Brantford and Hamilton Railway.
Chatham, Wallaceburg and Erie Railway.
Cornwall Street Railway.
Guelph Radial Railway.
Galt, Preston and Hespeler Railway.
London Street Railway.
International Transit Co., Sault Ste. Marie.
Kingston, Portsmouth & Cataraqui Elec. Ry., Kingston.
Toronto and York Radial Railway.
Windsor, Essex and Lake Shore Railway.
Ottawa Electric Railway.
Southwestern Traction Co., London.
Toronto Street Railway.
Niagara, St. Catharines and Toronto Railway.
Peterborough Radial Railway.
Berlin and Waterloo.
Sarnia St. Ry. Co.
Toronto Suburban St. Ry. Co.
Hamilton Street Railway.
Port Arthur and Fort William Electric Railway.

MONTREAL STREET RAILWAY COMPANY

Managing Director, W. G. Ross.
Purchasing Agent, W. A. McNaught.
General Office, 78 Craig St. W., Montreal, Que.
Chief Engineer, R. M. Hannaford.

Kind of Road: Electric.

Length of Road: Single track, 30.55 miles.
Double track, 55.62 miles.
Total in single miles, 141.79.

Character of Service: Passenger.
Number of cars, 505 closed, 342 open.
Type,
Number of motors, 1,905.
Power of motors, 30-50 h.p.
Method of controlling, hand control.
Method of braking, hand and air brake.
Gauge of track, 4 ft. 8 ½ inches.
Weight of rails, 56-80-87 tee; 72-83-87-90-96 girder.

Power:
Direct Current.
Trolley voltage, 575.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

10681—May 26—Ordering that the Railway Company concerned in the crossing at the following point be relieved for the present from providing further protection at the crossing named, it appearing from an inspection made by the Board's Engineer and Operating Department, and from plans furnished, that the view at the crossing is excellent, from both directions; that the crossing signboard is properly placed, and that there are whistling posts on the railway: G.T.R. crossing second highway west of Nelles' Corners passenger station, Ontario.

10682—May 26—Directing that the C.P.R. shall, within sixty days from the date of this Order, install a Whyte Signal Electric Bell at the crossing of its railway on Foundry Street, Woodstock, Ontario.

10683—May 26—Ordering that the Railway Company concerned in the crossing at the following point be relieved, for the present, from providing further protection at the crossing named, it appearing from an inspection made by the Board's Engineer and Operating Department, and from plans furnished, that the view at the crossing is excellent from both directions; that the crossing signboard is properly placed, and that there are whistling posts on the railway: G.T.R. crossing highway four miles south of Elora, Ontario.

10684—May 26—Approving location of the C.P.R. Company's station at Cache Bay, on Cartier Section of its line of railway.

(Continued on Page 600).

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.
Winnipeg, Man., railway bridge work	June 28.	May 6.	457
Girvin, Sask., telephone line	July 15.	May 20.	514
Florenceville, N.B., bridge	June 13.	May 20.	514
Ottawa, Ont., departmental building	June 14.	May 27.	546
Sault Ste. Marie, Ont., wharf extension	June 20.	May 27.	540
Maria, Que., wharf extension	June 20.	May 27.	540
Fraserville, Que., armory	June 13.	May 27.	540
Angers, Que., wharf construction	June 17.	May 27.	540
Kingsport, N.S., pier extension	June 13.	May 27.	540
Winnipeg, Man., High schools	June 14.	June 3.	569
St. Catharines, Ont., hospital	June 15.	June 3.	569
Chatham, Ont., iron and concrete bridges	June 15.	June 3.	569
Coldwater, Ont., waterworks supplies	June 18.	June 3.	52
Moncton, N.B., brick and stone school	June 17.	June 3.	569
Lennox Island, P.E.I., wharf construction	June 27.	June 3.	569
Liscomb, N.S., wharf extension	June 24.	June 3.	569
Dublin Shore, N.S., breakwater	June 17.	June 3.	569

TENDERS.

St. John, N.B.—Tenders will be received until June 15th for an automatic sprinkler system at Sand Point. Wm. Murdoch, City Engineer.

Little Tancook Island, N.S.—Tenders will be received until July 4th for the construction of a breakwater. Secretary, Department of Public Works, Ottawa.

Halifax, N.S.—Tenders will be received until June 18th for a supply of paint. Hiram Donkin, Road Commissioner, Department Public Works, and Mines.

Stellarton, N.S.—Tenders will be received until June 25th for the erection of fifty double tenement houses. Acadia Coal Co., Limited.

Levis, Que.—Tenders will be received until July 5th for the construction of a deep-water wharf. Secretary, Department of Public Works, Ottawa.

Montmagny, Que.—Tenders will be received until June 15th for dredging. The Secretary, Department of Public Works, Ottawa.

St. Alban, P.Q.—Tenders will be received until June 10th for the construction of a concrete dam on River Ste. Anne. J. F. Guay, Consulting Engineer, Morin Building, Quebec.

Tadousac Harbor, Que.—Tenders will be received until June 29th for the construction of a wharf and approach. Secretary, Department of Public Works, Ottawa.

Brampton, Ont.—Tenders will be received until June 13th for the construction of approximately 7,200 square yards of roadway, 5,000 feet of concrete curb and 2,500 feet of macadam road. Thomas Thauburn, Mayor.

Brantford, Ont.—Tenders will be received until June 20th for the erection of a six-roomed Separate School. F. C. Waller, Chairman, Buildings and Grounds Committee, Brantford Separate School Board.

Burlington, Ont.—Tenders will be received until June 15th for building cement walks. O. T. Springer, Clerk.

Cornwall, Ont.—Tenders will be received until June 20th for the construction of five reinforced concrete bridges. John Mullin, Clerk.

Fergus, Ont.—Tenders will be received until June 22nd for the constructian of 9 reinforced concrete bridges and culverts, and for abutments, steel deck and concrete floor on the Moorefield bridge. Bowman & Connor, County Engineers, 36 Toronto St., Toronto. (Adv. in The Canadian Engineer.)

Guelph, Ont.—Tenders will be received until Friday, June 10th, for the construction of 11,700 square yards of bituminous pavement. James Hutcheon, City Engineer.

Leamington, Ont.—Tenders will be received until June 20th for west part Point Pelee drainage. Alex. Baird, C.E. and O.L.S., Engineer-in-charge.

Newmarket, Ont.—Tenders will be invited at once for the construction of a $15,000 High School for which the ratepayers passed a by-law on Monday.

Oshawa, Ont.—Tenders will be received until June 13th for the construction of 5,500 lineal feet of concrete sidewalks. Frank Chappell, Town Engineer.

Parry Sound, Ont.—Tenders will be received until June 10th for a brick-veneered Sunday School. Geo. Rawlinson.

Port Hope, Ont.—Tenders will be received until June 13th for the construction of five lineal miles of concrete sidewalks and crossings. J. W. Sanders, Town Clerk.

St. Thomas, Ont.—Tenders will be received until June 11th for improvements to the Fulton Bridge in Southwold. This contract includes considerable concrete work and finishing and driving of piles. Jas. A. Bell, City Engineer.

Toronto, Ont.—Tenders will be received until June 10th and 13th for school enlargements. W. C. Wilkinson, Secretary-treasurer, Board of Education, City Hall.

Toronto, Ont.—Tenders will be received until June 14th for the construction of asphalt pavements, bitulithic pavements, treated wood block pavements, brick pavements, concrete curbs, concrete walks and sewers. G. R. Geary (Mayor), Chairman Board of Control, City Hall.

Toronto, Ont.—Tenders will be received until June 14th for a small hand fire engine. G. R. Geary (Mayor), Chairman, Board of Control, City Hall.

Toronto, Ont.—Tenders will be received until June 11th for additions and alterations to the engine and pump-houses at foot of John Street. G. R. Geary (Mayor), Chairman, Board of Control.

Welland, Ont.—Tenders will be received until June 14th for widening of canal. L. K. Jones, Secretary, Dept. of Railways and Canals, Ottawa. (Adv. in The Canadian Engineer.)

Wingham, Ont.—Tenders will be received until June 21st for the construction of sewers and sewage disposal works. John F. Groves, Town Clerk. (Adv. in The Canadian Engineer.)

Lethbridge, Alta.—Tenders will be received until June 10th for grading streets and roads, amounting to approximately 130,000 cubic yards. C. M. Arnold, City Engineer.

Vancouver, B.C.—Tenders will be received until July 20th for the construction of a steel bow-well, twin-screw, barge-loading dredge. Secretary, Department of Public Works, Ottawa, Ont.

Victoria, B.C.—Tenders will be received until June 11th for furnishing steel shelving, etc., for vaults, Parliament Buildings. F. C. Gamble, Public Works Engineer.

Saskatoon, Sask.—Tenders will be received until June 30th for addition to city hospital, erection of a nurses' home and isolation hospital. J. H. Trusdale, City Clerk. (Advertisement in The Canadian Engineer.)

Edmonton, Alta.—Tenders will be received until June 30th for plumbing, heating, ventilation and mechanical equipment required in connection with an asylum building. John Stocks, Deputy Minister of Public Works.

Winnipeg, Man.—Tenders will shortly be invited for 30,000 barrels of cement. M. Peterson, Secretary, Board of Control.

THE PARSONS TRACTION TRENCH EXCAVATOR

is guaranteed to work most economically and satisfactorily in any kind of soil (except rock), cutting any width from 28 to 78 inches and any depth to 20 feet, with one set of buckets, no change of parts.

If you have sewer, waterworks, drainage, irrigation or any kind of ditch work, it will pay you to write us. We make excavators to dig any width and any depth desired.

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GEORGE A. LAMBERT
SALES MANAGER
THE G. A. PARSONS CO., NEWTON, IOWA, U.S.A.

Saskatoon, Sask.—Tenders will be received until June 13th for extensions to fair grounds. Geo. T. Clark, City Engineer.

CONTRACTS AWARDED.

Moncton, N.B.—August F. Govang, of Moncton, was given a contract for 1,568 feet 18 x 12 pipe sewer and eight catch basins at $2,984.18. Other bids were: Amos Govang, Moncton, N.B., $3,440.10, manhole covers and catch basin traps; John Abrams & Sons, Moncton, $2.20 per 100 lbs. (this tender accepted); The Canada Iron Corporation, Limited, Londonderry, $2.45 per 100 lbs.; Record Foundry and Machine Co., Limited, Moncton, 2¼ cts. per lb. and 3½ cts. per lb.

St. John, N.B.—Tenders for 500 barrels of English Portland cement were as follows: C. H. Peters' Sons, $1.97 per barrel; W. H. Thorne & Co., Ltd., $1.75 per barrel; A. M. Rowan, $1.85 per barrel; Chas. Nevins, $1.95 per barrel; Gandy & Allison, $1.89 per barrel; Gandy & Allison (casks, 35 lbs.), $1.94. That of W. H. Thorne & Co. was accepted. The only tender received for 100,000 brick was that of John Lee & Co., and it was accepted. Tenders for castings for 40 stop-cock vault tops, 60 cast iron sewer man-holes, and 20 catch-basin frames were received as follows: McLean, Holt & Co., $6.69, $6.44 and $2.59 each; John E. Wilson Co., $6.45, $6.25 and $2.45 each; James Fleming, $6.80, $6.40 and $3.20 each; St. John Iron Works, Ltd., $6.45, $6.45 and $3.59 each. The tender of John E. Wilson Co. was accepted. Tenders for cord castings were received as follows: John E. Wilson Co., Ltd., 3¼ cents per pound; St. John Iron Works, 3½; McLean, Holt & Co., 3½; James Fleming, 3 2-5 cents. The contract was awarded to John E. Wilson Co., Ltd.

Contracts for permanent street pavements costing $85,772 have been awarded to the Hassam Paving Company of Boston.

Hull, Que.—The Waterous Engine Works Co., of Brantford, will supply this city with a new $5,300 fire engine.

There were three tenders for the construction of the new sewer on Champlain Avenue, Messrs. Carriere and Wilson, $2,850; Malette and Lambert, $3,403, and Jas. Thomas, $2,948. The contract was awarded to the first. Only one tender was received for the construction of new concrete side-walks, that of Ed. Thomas, of Hull, at 19½ cents per square foot, which was accepted.

Montreal, Que.—Following contracts were awarded: Bitulithic Paving Co., 20,000 yards asphalt sidewalks at $1.83; F. D. Lawrence, four million scoria blocks at $42.50 per M.; Laurin & Leitch, laying paving blocks.

Montreal, Que.—Tenders for the supply of 10,000 tons of steam coal to be supplied the Lower Level pumping station of the Water Works were as follows: L. Cohen, $3.85; Geo. Hall Co., $4.05; J. O. Lebrecque, $3.85; W. Muir & Son, $3.68; Andrew Baile, $3.85. Messrs. Wm. Muir were awarded the contract.

Montreal, Que.—The Canadian Pacific Railway are reported to have placed with the American Locomotive Co. an order for ten 217,000 lb. consolidation locomotives.

Montreal, Que.—Peter Lyall & Sons have been awarded the contract for the erection of the Yorkshire Insurance Building.

Montreal, Que.—Board of Control recommended that the lowest tenderer be given the contract for cast iron pipe: The Stanton Iron Works Company, of Nottingham, England, will be accepted for four and twelve-inch pipe, at $29.50 and $27.50 per ton respectively, while the tender of Robert McLaren & Co., a Scottish firm, will be accepted for 6, 8, 10, 16 and 20-inch pipe, at the following prices: 6-inch, $29; 8-inch, $27; 10-inch, $27.70; 16-inch, $27.35; 20-inch, $27.90. For the two largest sizes of mains, the 24 and 30-inch pipes, the lowest tender was submitted by the Canada Iron Corporation, of Three Rivers, at $27.50 and $27 respectively.

Brockville, Ont.—In accordance with the by-law recently passed by the ratepayers providing for an expenditure of $50,000 for improvements and extensions to the light and power plant, the commissioners have awarded tenders for two new steam engines and electrical equipment. Laurie & Lamb, of Montreal, were the successful tenderers for the steam engines, which are manufactured by Belliss & Morcom, of Birmingham, England. The figures for this contract are $10,770.

Kilmer, Pullen & Burnham, of Toronto, will supply the electrical equipment, consisting of two dynamos, switchboards, etc., manufactured by the General Electric Company in Sweden. Their price is $5,948. Architect Dillon is at present engaged in preparing plans for the new building to be erected adjacent to the pumping station.

Finch, Ont.—D. G. McMillan of Finch, was given the contract for the construction of the Johnston drain at the following prices: Earth, 17 15/16 cents per cu. yd.; hard pan, 90 cents; rock, $2; reinforced concrete culverts, $13.69 a cu. yard.

Kingston, Ont.—The British American Oil Co. were given the contract of this city for road oil at 5 cents a gallon, in barrels, f.o.b. Toronto.

London, Ont. — Contract for an asphalt pavement on Ridout Street from King to York, was given to the Barber Asphalt Paving Company, at $2.50 a sq. yard, including six-inch tile.

Narva, Ont.—C. S. Wood, of Tiverton, Ont., was awarded the contract for the construction of a two-span flat arch bridge, eighty feet long, by the Township of Greenock, at $2,779. Other tenders were:

A. Knox, Pinkerton	$1,950
Wm. Wittman, Chepstow	2,741
John Coumans, Chepstow	2,787
David Keyes, Kincardine	2,762
Hunter Bridge Co., Kincardine	2,945
John Reid, Brantford	3,375

Ottawa, Ont.—The Board of Control recommended that the contract for 1,000 tons of coal be given to J. G. Butterworth & Co., at $7.24 a ton for stove and nut coal, and $5.40 a ton for steam coal. The tenders received were: The Connell Anthracite Mining Co., Ltd., Connell Colliery, $6 a ton; steam coal, $4.85. J. G. Butterworth & Co., Lehigh Valley or Susquehanna, $7.24; steam coal, $5.40; Northern anthracite or Bernice, $6.15; steam coal, $5.40; C. C. Ray Co., Susquehanna, Lackawanna or Scranton, $7.29; steam coal, $5.45. Hall and Holcomb, Lackawanna, $7.30; steam coal, $5.50. W. D. Morris, Ltd., Lackawanna, $7.30; steam coal, $5.30; Lopez, $5.95; steam coal, $5.50. John Heney and Son, Lackawanna, $7.32; steam coal, $5.45.

The General Supply Co. were given a contract for a Turnbull elevator at $3,225.

Ottawa, Ont.—The Barber Asphalt Paving Co. secured large paving contracts here on Friday. Bids were as follows: St. Patrick Street: City engineer, $59,522.70; Union Construction Company, $50,750; Ottawa Construction Company, $49,495; Barber Asphalt Company, $45,750. Bank Street: City engineer, $47,673; Union Construction Company, $41,764.55; Ottawa Construction Company, $37,989; Barber Company, $37,565.

Ottawa, Ont.—Tenders for supplying the civic corporation with an incinerator and garbage destroyer were referred to a sub-committee. There were several offers. C. L. Trinimingham, of Montreal, quoted $40,000 for a 75-ton-a-day incinerator of the Hughes and Sterling type. The General Supply Company, of Ottawa, put in eight bills for a 75 ton Horsfall incinerator. The prices varying according to the style of feed, etc., were: $63,792, $72,503, $41,401, $44,044, $53,484, $30,429, and $39,869. Laurie and Lamb, Montreal, for the Heenan Froude style offered to furnish incinerators, 50 ton capacity, at $27,400 and $29,900, and 75 ton capacity at $32,150 and $34,658.

Meldrum Bros., of Timperley, near Manchester, Eng., offered to install a plant for $29,935.

Weston, Ont.—E. C. Lewis, of Toronto, was given a contract by this municipality for the construction of a 118-foot span concrete arch bridge. Barber & Young, Toronto, are the consulting engineers.

Virden, Man.—For 800 barrels of cement, f.o.b. cars, Virden, the Manitoba Hardware and Lumber Co. were given a contract by this town at $2.91 a barrel, with sacks. Other bids were: A. B. A. Cunningham, Melville, Sask., at $2.99 per barrel, with sacks; the Rat Portage Lumber Co., Virden, at $2.90 per barrel, net, without sacks.

Winnipeg, Man.—Ferdinand Bower, of St. Louis, will probably receive the contract for a casting tower required at the power plant terminal station, at $3,380.

Winnipeg, Man.—A contract was let to Foley, Welch and Stewart, for filling two miles of Rainy Lake with solid rock, bank wide, enough to carry double tracks, doing away with the old wooden trestle bridge. Several million dollars are involved.

Winnipeg, Man.—Chas. W. Sharp & Son were given the contract for the erection of the Farmer Block, at $125,000. W. W. Blair, Architect.

Regina, Sask.—S. T. Ross has been awarded a contract for the construction of sixteen miles of rural telephone system at the following prices: Cross-arm, $66 a mile; bracket, $58, by the Francis Rural Telephone Company.

Regina, Sask.—After going carefully into the tenders submitted for the construction of the north portion of the trunk sewer to be undertaken this year, the city council recommended that in view of the great difference between the estimate of the consulting engineer, A. L. McPherson, and the tenders, the city through its engineering department undertake the construction of this portion of the sewer. Mr. McPherson's esimate for this work was $187,000, and a by-law providing for this amount is passed. The tenders submitted were:

Parsons Construction Co., total amount	$271,466.10
Parsons Construction Co., Meriwether Construction.	226,657.91
Wm. Newman & Company	250,481.70
Wm. Newman & Company, Meriwether Construction	261,451.15
A. C. Stewart & Co. (Winnipeg)	239,638.65
Wm. Hurst (Winnipeg)	208,463.14

Meriwether Construction the same.

Estimated total cost of work by figures to date for cement and reinforcement.

Monolithic Construction—	
Construction Contract, Wm. Hurst	$208,463.14
Cement, 11,500 bbls.	31,050.00
Reinforcement	12,300.00
Junctions	536.64
Total	$252,349.78
Meriwether Construction—	
Construction Contract, Wm. Hurst	$208,463.14
Cement, 7,750 bbls.	20,925.00
Reinforcement	17,220.00
Junctions	536.64
Total	$247,144.78

The tender of R. S. Blome & Co., Chicago, was accepted for the granatoid paving of the area from Albert Street subway, on Albert Street, to Dewdney Street, on Dewdney from Albert to Toronto Street, on Broad and Rose Streets, from Dewdney to Eleventh Avenue at $2.99 per sq. yd., complete pavement and curb and gutter, with base at 70c. per sq. yd. on the same area. While the tender of the National Pavement and Construction Co., Winnipeg, was accepted for the paving with asphalt of McIntyre Street from South Railway to Victoria Avenue at $3.00 per sq. yd. complete pavement, and curb and gutter at 60c. per sq. yd. on the same area. There was only one tender for the supply of 700 cords of field boulders, that of Lecky & Palmer, of Chamberlain, at $12.50 per cord, which was accepted. These stones are required for the filter beds. The tender of the Western Pavers Co., Ltd., of $90,000 for 50,000 sq. yds. of cement sidewalks was accepted.

Nanaimo, B.C.—W. H. Worswick, of Victoria, B.C., was given the contract for constructing eight miles of concrete walks in this city at the following prices: Retaining

Re-Rolled Steel Rails

200 tons - - 56 lbs
100 tons - - 70 lbs. (Seconds)

FOR SALE

Provincial Steel Co.
COBOURG, - - ONTARIO

walls, per yard cube, $4.50; filling, per yard cube, 45c.; cement concrete sidewalks, 1 in. finish, $1.33 per square yard; cement concrete sidewalks, ¾ in. finish, $1.24 per square yard; ordinary excavation, per yard cube, 20c.; rock excavation, per yard cube, $1.50; laying and jointing 4 in. vitrified pipes, 30c. (up to 4 feet in depth); laying 4 tile drain, 10c.

New Westminster, B.C.—The Pacific Contracting and Investment Company were awarded a $13,297 contract for cement walks in this city.

Vancouver, B.C.—Contracts for three new schools were awarded to Baynes & Horie. The structures will be fireproof, the reinforced concrete work to be done by the Ferro-Concrete Construction Company. The buildings at the corner of Tenth and Eleventh Avenues and Cypress Street, and at the corner of Fourteenth and Fifteenth Avenues and Alder Street, will cost $50,000 each, while that to be erected at the corner of Bismark and Templeton Drive will cost $24,000. They are to be completed by December 1 next.

Vancouver, B.C.—The Pacific Coast Pipe Co., of Vancouver, were awarded a contract for supply and laying in the municipality of Richmond about 72 miles of wire-wound wood pipes, at $69,931.86. Other bids were as follows:

Municipal Construction Co., Vancouver	$76,670
Dominion Pipe Co., New Westminster, B.C.	78,624
Canadian Pipe Co., Vancouver, B.C.	80,500

The following tenders were received for 2½ miles of lap-welded 12-inch steel water pipe: Evans, Coleman & Evans, $16,745; Crane & Joy, $15,315, $17,087, $17,121; Robertson, Godson Co., $17,388, $17,121; 12-inch cast-iron pipe, A. C. Forsyth, $19,761. Cleveland & Cameron, of this city, are the consulting engineers.

Vancouver, B.C.—The following is a summary of the tenders received for the concrete and brick sewers, together with the estimate of the cost of the work prepared by the engineer's department:—

City yard to Dufferin Street—Palmer Bros. & Henning, $26,000; M. P. Cotton Co., Ltd., $24,000; engineer's estimate, $12,000. Seventh Avenue—Palmer Bros. & Henning, $64,155; M. P. Cotton Co., Ltd., $57,200; La Placa Bros., $39,721; engineer's estimate, $37,000. Tenth Avenue to Sixteenth Avenue—Palmer Bros. & Henning, $69,750; M. P. Cotton Co., Ltd., $79,294; engineer's estimate, $46,000. It was decided to award the contract for the Seventh Avenue sewer to La Placa Bros., but to have the engineer do the others by day labor.

Vancouver, B.C.—Tenders for the construction of the new incinerator to be built near the end of Cambie Street bridge were considered. The Public Works Engineering Company, of Portland, Ore., had four tenders for different types, ranging from $63,000 to approximately $70,000. Other tenders were: Dundon Excelsior Furnace Co., $69,000; Heenan & Froude, incinerator with front feed, $54,968; with back feed, $46,131; Dixon Engineering Co., $49,500; J. W. McFarlane, $82,357. Board of Works will decide at the next meeting.

Vancouver, B.C.—The contract for 5,000 feet of 2½-inch rubber-lined cotton hose for the fire department was divided as follows: 2,000 ft. "Eureka" brand, at $1.25 per foot, to Vancouver Rubber Co.; 1,500 ft. "Keystone" brand, at $1.10 per foot, to Canadian Rubber Co.; 1,500 ft. "Dunlop" brand, at $1.10 per foot, to Dunlop Tire and Rubber Goods Co.

Victoria, B.C.—W. J. Anderson secured the contract for 4,000 tile letters at 19 cents each.

Victoria, B.C.—City Engineer Smith has recommended the acceptance of the Worswick Paving Company's tender at $92,002.40, for paving work on four city streets mentioned in the following statement of the bids considered:

Street.	City Engr.	Pacific Paving Co., alternative.	Barber Asphalt alternative.	Worswick Paving Co.	Worswick Paving Co., alternative.
Linden	$45,475	$52,938	$54,957	$50,888	$42,566
Cook	34,312	36,751	38,731	35,863	30,850
Southgate	7,330	6,629	6,944	6,872	5,681
St. Charles	16,997	15,406	15,708	15,716	12,904
	$104,115	$111,725	$116,340	$109,290	$92,002

RAILWAYS—STEAM AND ELECTRIC.

Hull, Que.—The Hull Electric Railway Company are extending their line to Wrightville.

Strathcona, Alta.—Construction will be started in a few days on the new C.N.R. line from this city to Camrose, which will join Strathcona and Calgary next summer.

Calgary, Alta.—After going over the proposed extensions to the street railway system, the commissioners and superintendent McCauley accepted the routes, and when an estimate of the cost of construction is furnished by the city engineer, a recommendation will be made to the council asking that a by-law to raise money for the extensions be submitted to the ratepayers. If the extensions pass it will mean that two new bridges will have to be constructed, one across the Elbow at the end of Second Street east and the other across the Elbow at the east end of Twelfth Avenue.

LIGHT, HEAT AND POWER.

Belleville, Ont.—Last Tuesday afternoon a meeting was held here for the purpose of forming a municipal power union for the distribution of electric power from the Trent River. W. B. Deacon, of Belleville, presided and delegates of councils and boards of trade of a number of municipalities were present, including Port Hope, Cobourg, Brighton, Belleville, Napanee, Deseronto, Picton and Kingston, and also representatives of the two power companies of the district, the Trenton Electric and Seymour Power Company, represented by J. G. G. Kerry of Toronto, and A. B. Colville of Campbellford, and also J A. Culverwell of Port Hope, managing director of the Northumberland & Durham Power Co. Upon the announcement of Mr. Culverwell that his company was ready to develop power on the Trent River and the intimation of the Seymour Power Co. that they were also making preparations, a resolution to form a municipal power union similar to that in Western Ontario was withdrawn.

Calgary, Alta.—The city will probably establish an $80,000 power plant in Victoria Park. Plans are being prepared.

BY-LAWS AND FINANCE.

Lachine, Que.—The $125,000 by-law carried.

Longueuil, Que.—Debentures will be issued to cover the cost of the proposed $35,000 municipal electric light system.

Belleville, Ont.—The Board of Education have requested the city council to issue a $50,000 by-law and an $18,000 by-law for school purposes.

Ridgeville, Ont.—Tenders are invited for $9,000 school debentures. A. N. Armhurst, township clerk.

London, Ont.—Tenders are invited for $357,882 artesian well system, waterworks and Niagara power debentures.

Newmarket, Ont.—Ratepayers carried a $15,000 High school by-law.

North Toronto, Ont.—The $25,000 waterworks by-law was defeated.

Oxford County, Ont.—Until June 6th, tenders are invited for $50,000 road improvement debentures. N. E. Birtch, county clerk, Woodstock.

St. Thomas, Ont.—Board of Water Commissioners decided to ask council to issue debentures for $40,000 to cover proposed extensions.

The following municipalities recently sold debentures:

Huntsville, Ont., $12,000.
Victoria B.C., $169,856.
Brampton, Ont.—$75,073.
Southampton, Ont.—$12,000.

Woodstock, Ont.—The ratepayers will be asked to vote on an $85,000 city hall by-law in July or August.

Winnipeg, Man.—On Thursday the ratepayers voted on the following by-laws, carrying all but the general hospital measures: Grant to Canada's International Exhibition and Selkirk Centennial Corporation, $500,000; to establish an isolated hospital, $100,000; to establish a tuberculosis hospital, $75,000; to establish a city morgue, $25,000; to aid the Winnipeg General hospital, $400,000.

Dauphin, Man.—Tenders will be received up to June 15, for $75,000 waterworks and sewerage debentures. J. W. Johnston, secretary-treasurer.

Gretna, Man.—Ratepayers have carried a $12,000 school by-law.

Melville, Sask.—Until June 15th, tenders are invited for $16,500 debentures. H. D. Wilson, secretary-treasurer

Medicine Hat, Alta.—Until June 20th, tenders are invited for $125,000 local improvement debentures. E. Roberts, secretary-treasurer.

Calgary, Alta.—The horse show building will ask the city council to submit a by-law to the ratepayers for the expenditure of $55,000 for the erection of a first-class building and for the improvement of the present stabling accommodation.

Alberta Municipality, B.C.—Until June 10th, tenders are invited for $135,000 waterworks debentures. N. A. McDiarmid, C.M.C., Ladner.

South Vancouver, B.C. — The $179,000 schools by-law was carried.

Nanaimo, B.C.—A by-law will be introduced to borrow $25,000 for waterworks extensions, chiefly new pipe lines.

SEWERS, SEWAGE AND WATERWORKS.

Toronto, Ont. — Council decided to extend the waterworks intake pipe 500 feet into the lake.

Oakville, Ont.—The Corporation have commissioned T. Aird Murray to prepare complete plans for sewerage and sewage disposal for the town.

Prince Rupert, B.C.—Council is arranging for a permanent water supply.

MISCELLANEOUS.

Chilliwack, B.C.—Council is considering the construction of a city hall.

CURRENT NEWS.

Sydney, N.S.—The output of the Dominion Iron & Steel Company for the fiscal year ending May 31st, will show considerable improvement over that of the previous like period. Following are the comparative figures:—

	—Gross Tons—	
	1908-9.	1909-10.
Pig iron	248,097	255,932
Steel ingots	273,040	302,701
Blooms	240,323	209,810
Rails	133,004	147,948
Rods	50,554	81,001

Fredericton, N.B.—The following have received the degree of B. Sc. this year at the University of New Brunswick. The degree was given in two departments, civil and electrical engineering. In civil engineering, the following were successful: J. B. Alexander, R. F. Armstrong, A. R. Babbit, G. F. Baird, N. E. Cook, J. C. Dever, J. H. Feeney, J. T. Gibson, F. Graham, H. E. McKeen, G. H. Patterson, D. R. Smith, R. R. Stevenson, F. Tingley, W. I. Young. In electrical engineering, C. H. Lank.

Hamilton, Ont.—Negotiations which have been pending for several months have resulted in the formation of the Canada Steel Company, capitalized at $25,000,000. It is said to be the first move in a merger which will eventually control every steel manufacturing plant in the Dominion. Promoters of the consolidation say that it will only be a short time before a merger capitalized for a least $100,000,000 will be a reality.

The Canada Steel Company now embraces several of Canada's largest plants, including the Hamilton Steel & Iron Works, Canada Screw Co., Montreal Rolling Mills, and Canada nut and bolt factories, scattered over the country. Hamilton is to be the headquarters of the company.

OBITUARY.

Mr. Napoleon Tessier, secretary of the Department of Public Works at Ottawa, died on Friday, June 3rd. Mr. Tessier was born at St. Cesaire, thirty-seven years ago, and was graduated from St. Laurent College, Montreal, and received his degree of LL.B. at Laval University. He had been secretary and director of contracts of the Department of Public Works since the appointment of Hon. Mr. Pugsley as Minister.

PERSONAL.

Readers are invited to forward notes of staff changes and new appointments for publication in this column.

Mr. Wm. Mahlon Davis, M. Can. Soc. C.E., of Davis & Johnson, consulting engineers, Berlin, Ontario, has been appointed city engineer of Prince Rupert, B.C.

Mr. Sam. J. Kearns, a former Londoner, has been promoted to the position of superintendent of the Ontario division of the New York Central Railway, with head offices at Oswego, N.Y. Mr. Kearns has been for some time assistant superintendent of the N.Y.C. at Syracuse. The Michigan Central in Canada now comes under his jurisdiction.

Mr. D. Chene has been appointed city engineer of Hull, Que., succeeding Mr. R. E. Farley, who resigned a short time ago to devote the whole of his time to his consulting practice.

Mr. H. R. Rindal, assistant engineer of the Central division of the C.P.R., with headquarters in Winnipeg, is to be chief engineer of the Pacific division, vice, Mr. C. E. Cartwright, resigned.

Mr. H. D. Johnston, E.E., C.E., has been appointed Toronto representative of the Canadian British Insulated Company. Mr. Johnston was formerly connected with the National Electric Construction Company of England. Although the head office of the Canadian British Insulated Company is in Montreal the managing director, Mr. Lawford Grant, E.E., spends considerable time in Toronto, having completed several large cable installations in that city.

Mr. Noel Woodhouse an electrical contractor, of Liverpool, England, is in Montreal. Mr. Woodhouse is looking over the Canadian field with a view to enlarged business.

Mr. R. M. Wilson, chief engineer of the Montreal Light, Heat and Power Company, was elected third vice-president of the Power Transmission Section of the National Electric Light Association at the convention of that association in St. Louis last week.

Mr. J. Darlington Whitmore, consulting engineer, Regina, has been commissioned by the town of Melville to do the engineering work there, which includes the installation of sewage and disposal waterworks.

Mr. Patrick J. L. Lynch, assistant superintendent on the northern division of the Grand Trunk Railway has been appointed successor to the late superintendent W. R. Tiffin. The position of assistant superintendent has been abolished, and W. J. Piggott, chief despatcher at Allandale, has been appointed trainmaster. Superintendent Lynch began railroading on the northern division as a brakeman 30 years ago. In 1898 he was appointed trainmaster at Stratford. For a time he served in a similar capacity at Belleville, but returned to Stratford, where he was trainmaster for the territory from Toronto to Sarnia and between Buffalo and Goderich till 1904, when he was made assistant superintendent at Allandale.

Mr. Frank R. Dark, at present with the Detroit United Railway, has been appointed power solicitor and business manager of the city of London's sales department.

Mr. A. J. McPherson of the Provincial Public Works Department, Regina, and for some time past consulting engineer to the city, has been appointed by the city council one of the new municipal commissioners.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

(Continued from Page 595).

10685—May 26—Approving location of the C.P.R. Company's Regina, Sask., and North Saskatchewan Branch from mile 132 at a point on the northern boundary of Section 35, Tp. 34, R. 28, W. 2nd M. to mile 148, at the northern boundary of Section 14, Tp. 37, R. 28, W. 2nd M.; and from mile 168, at the northern boundary of the S.-E. quarter of Section 17, Tp. 40, R. 27, W. 2nd M., to mile 199.6 in the S.-E. quarter of Section 2, Tp. 45A, R. 27, W. 2nd M.

10686—May 26—Approving, subject to reconsideration on the receipt by the Board, of a copy of the 1st annual report furnished by the company to the Minister of Railways and Canals, the Standard Passenger Tariff C.R.C. No. 2, of the Montreal and Southern Cos. Ry. Co.; the company to publish the same, with a copy of this Order, in at least two consecutive weekly issues of "The Canada Gazette."

10687—May 26—Amending Order No. 10237, dated April 19th, 1910, approving location of M.C.R. station at Tecumseh Road, Ontario, by striking out the word "easterly" where it occurs in the 2nd line of the 3rd paragraph of

NOVA SCOTIA STEEL & COAL COMPANY
LIMITED

Manufacturers of

STEEL

MERCHANT BARS

SHEETS AND PLATES—From 12 gauge up to 1 inch thick. Any Widths up to 50 inches.

HEAVY FORGINGS HAMMERED SHAFTS

Nothing Required in Canada too Large for Us

Steam and Electric Car Axles Fish Plates and Other Railway Materials

Tee Rails, 12, 18 and 28 lbs. per yard

Scotia Pig Iron for Foundry Use

Also Miners and Shippers of

The Famous Old Mines "SYDNEY"

Collieries
SYDNEY MINES

COAL

Shipping Port
NORTH SYDNEY

An Unsurpassed Evaporating Coal.
Highest in Carbon, Lowest in Ash.
Unrivalled Facilities for Bunkering at North Sydney.

THE BEST HOUSE COAL THE BEST STEAM COAL

QUICK DISPATCH LOADING BEST RESULTS STEAMING

Two points that always appeal to Shipowners

SAILING VESSELS LOADED PROMPTLY

For Prices and Other Particulars, Apply to

Head Office, New Glasgow, N.S.

said Order, and substituting therefor the word "westerly;" and by striking out the word "east" in the 5th line of the 3rd paragraph of said Order and substituting therefor the word "west."

10688—May 27—Approving the revised location of the C.N.O.R. Company's line of railway through the town of Cobourg, Township Hamilton, mile 170.66 to 172.58 from Ottawa.

10689—May 26—Approving the diversion of the highway crossing of the G.T.R. in the south half of Sec. 18, Tp. 12, R. 20, W. 1st M., Dist. of Brandon, Province Manitoba.

10690—May 26—Authorizing the Consolidated Mining and Smelting Company, of Canada, Limited, to lay a sixteen-inch pipe under the track of the C.P.R. at Smelter Junction, B.C.

10691—May 25—Authorizing the Superior Portland Cement Company, Limited, to lay a water pipe under the track of the C.P.R. opposite Margaret Street, Orangeville, Ontario.

10692—May 26—Authorizing the Bell Telephone Company to erect wires across the track of the C.N.O.R. at ½ mile south of Beaverton Station, Ontario.

10693—May 26—Authorizing the Manitoba Government Telephones to erect wires across the track of the C.P.R. at public crossing ⅛ mile east of Strathclair Station, Man.

10694—May 26—Ordering the Railway Company concerned in the crossing at the following point be relieved, for the present, from providing further protection at the crossing named, it appearing from an inspection made by the Board's Engineer and Operating Department, and from plans furnished, that the view at the crossing is excellent from both directions; that the crossing signboard is properly placed, and that there are whistling posts on the railway: C.P.R. crossing public road 2½ miles west of MacGregor, at west boundary of Sec. 31, Tp. 10, R. 11, Manitoba.

10695—May 27—Approving location of the C.P.R. Company's station at Mile End.

10696—May 27—Authorizing the city of London, Ont., to lay a storm drain under the track of the C.P.R. Company where the same crosses George Street, London.

10697-8-9—May 27—Authorizing the C.N.O.R. to cross with its tracks the public road between Lots 6 and 7, Concession A., Tp. Murray, County Northumberland, Ont.; and public road between Lots 18 and 19, Con. 1, Tp. Cramahe, County Northumberland, Ontario; and to cross and divert public road across Lots 3, 4 and 5, Con. 5, Tp. Darlington, County Durham, Ont.

10700—May 27—Authorizing the C.P.R. to move its station at Shawville, to the new location as applied for by that company.

10701-10702—May 30—Authorizing the Norfolk Gas Company, Limited, to lay a gas pipe under the track of the G.T.R. at St. Patrick Street, Port Dover, and at Nelson Street, Port Dover.

10703-4-5—May 30—Authorizing the St. Francis Hydraulic Company to erect its transmission lines across the wires of the Bell Telephone Company at three different points in Thetford Mines, Que.

10706—May 30—Authorizing the Kaministiquia Power Company to erect its power line across the track of C.P.R. on Yonge Street, Fort William, Ontario.

10707—May 21—Directing that, within sixty days from the date of this Order, the C.P.R. shall install a Whyte Signal Electric Bell at the crossing on Maple Street, (formerly known as Curtis' crossing), Hartland, N.B.

10708-10709—May 23—Temporarily approving, pending the final determination by the Board, of the tariff of tolls which the Bell Telephone Company shall be authorized to charge, and the form of agreement with other companies to be approved by the Board, the agreement entered into by the Bell Telephone Company and the Municipal Corporation of the Township of Chingucousy, dated the 18th of April, 1910; and the agreement entered into by the Bell Telephone Company and the Monk Rural Telephone Company, dated March 29th, 1910: Providing these Orders be not taken to authorize the Bell Telephone Company to charge any higher toll or tolls than it was previous to the 13th of May, 1910, authorized by law to charge.

10710—May 27—Authorizing the G.T.R. to construct its railway across the road between Lots 85, in the 2nd, and Lot 9, in the 3rd Concession, Township of Tiny.

10711—May 25—Authorizing the C.P.R. to construct an industrial spur to the premises of the Pigeon River Lumber Company, in Port Arthur, Ontario.

10712—May 25—Authorizing the C.P.R. to construct an industrial spur to the premises of the Eastern Canada Steel & Iron Works, Limited, in Lot 2345, County Quebec, Parish of St. Sauveur, Quebec.

10713—May 25—Authorizing the C.P.R. to construct an industrial spur to the premises of G. F. & J. Galt, Limited, Camrose, Alberta.

10714—May 19—Refusing application of the Township of Woolwich for authority to open up a new road between Lots 85 and 86, in the Township of Woolwich, across the G.T.R.

10715—May 26—Directing that the time within which the electric bell was required by Order No. 10000, dated March 23rd, 1910, to be installed at the C.P.R. crossing at Zorra Street, village of Beachville, be extended for one month from the date of this Order.

10716—May 19—Directing that in all switching movements over Grey Street, London, the M.C. and P.M.R. Companies shall have a watchman on the street during the movements; no cars shall be left standing by either company within 50 feet of either side of the street line of Grey Street, in order that the view may not be obscured.

10717—May 23—Approving the Standard Specifications for Bridges and Viaducts which the railway companies are authorized to construct under Section 257 of the Railway Act, and declaring them to be the Standard Specifications of the Board for Steel Bridges and Viaducts, and rescinding Order of the Board 921, dated February 9th, 1906, approving the Standard Specifications for Bridges and Viaducts authorized to be constructed under Section 203 of the Railway Act, 1903.

10718—May 26—Approving plans and specifications for the construction of a bridge across a drain known as the Maxwell Creek Drain, in Township of Dover, where the C. W. & L. E. Railway will intersect said drain on Baldoon Street, in the Township of Dover, Ont.

10719—May 19—Authorizing the C.N.O.R. to construct a spur to connect with the meeting siding of the G.T.R. in Brighton, and to construct said spur across public road between Lots 4 and 5, Con. 1, Brighton, Ontario.

10720—May 25—Authorizing the C.N.O.R. to connect its lines and tracks with the C.O.R. at Trenton, Ontario.

10721-2—May 27—Temporarily approving, pending the final determination by the Board, of the tariffs of tolls which the Bell Telephone Company shall be authorized to charge, and the form of agreement with other companies to be approved by the Board, the agreement entered into between the N. A. Telegraph Co. and the Ernestown Tel. Co., on the 1st of December, 1909; and the agreement between the N. A. Telegraph Co., and the Heckston Rural Tel. Co., dated the 16th of April, 1909; provided that these Orders shall not be taken to authorize the Bell Company to charge any higher toll or tolls than it was previous to May 13th, 1906, authorized to charge.

10723—May 30—Approving the location of the C.N.O.R. Company's line of railway through Trenton, Ontario, mile 145.43 to mile 145.76.

10724—May 30—Directing that the C.P.R. provide and construct a crossing over the track of its Stobie Branch in the lane between Durham and Elgin Streets, Sudbury.

10725 to 10730 Inc.—May 30—Authorizing the Hydro-Electric Power Commission to erect transmission lines across the wires of the Bell Telephone Company, at six different points in Ontario.

MARKET CONDITIONS.

Following the quotations of the various articles listed in the markets will be found in brackets numbers, thus (10). These numbers refer to the list number of advertisers on page 3 of this issue and will assist the reader to quickly find the name and address of a firm handling any particular article. Buyers not able to secure articles from these firms at the prices mentioned will confer a favor by letting us know.

Montreal, June 9th, 1910.

The entire Iron and Steel markets in the United States have been greatly upset over the statement made by different railways to the effect that the refusal of the Government to permit them to advance rates on the 1st of June, would have the effect of holding back much of the industrial expansion which they had been looking forward to for some time previously. This expansion, so far as the railways are concerned, would, of course, have reference to rails, bridges, cars, locomotives, and similar equipment, all of which call for the use of an enormous quantity of iron and steel. It is only to be expected that an announcement of this nature would have a most disconcerting effect upon the iron and steel trade of the country. It is believed, however, that the situation is not as bad as described, and that a refusal to grant advanced rates cannot hold back necessary expansion.

So far as the pig-iron market is concerned, it is claimed that there would be no difficulty in obtaining all the orders which are required if furnace interests were only prepared to accept present prices. In this matter, however, the furnaces take different views, some being prepared to accept present figures and some absolutely refusing to do so, believing that an improvement in the situation is at hand. The most important feature of the week in the Eastern district has been the necessity to meet prices made by Western purchasers to hold the trade of their own locality. Virginia purchasers have been taking a fair tonnage of business at $14, at the furnace, for No. 2 foundry, for shipment, carrying a freight rate of $2.45 to $3 per ton. Alabama interests have been holding firm. New England consumers have bought quite freely the past few days, and purchasing has also been good in the Central West, South West, and Lake territory.

It is claimed that railways have been very parsimonious with their orders for rails for months past, and have only placed orders for cars where such has absolutely been necessary. As a whole, the volume of business in various lines of finished steel has been good, and has increased materially since the beginning of the year. Were it not for the great expansion, and the capacity of the shops to turn out more work, the activity would look greater than it looks at the moment. Some heavy buying was indulged in last week, but this will now subside until the question of the dispute between the railways and the Government assumes a more definite appearance.

The English market is practically unchanged. Makers are looking forward to better things, but there is a good deal of iron in second-hands which is being sacrificed. The position is no stronger. The whole situation is depending considerably on the United States. As soon as the United States shows an improvement, there will undoubtedly be material recovery in England.

In the local market there is a very fair buying movement at the prices now being offered at United States points. Also the fear of English and Scotch metals being sacrificed here is occasioning rather more activity in some cases. This enables Canadian consumers to cover requirements at prices which seem low. Taking advantage of the fact that small steamers intended for lake trade were available for carrying cargo from Middlesbrough to Western interior ports, a number of speculators decided to purchase English iron without having found a market for the same, in advance. It now seems that there are two or three thousand tons of this metal lying on the docks at Toronto and Hamilton, and that buyers are being sought. Since these purchases were made, the English market has shown some de-