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The Canadian Engineer

WEEKLY

ESTABLISHED 1893

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The Canadian Engineer

ESTABLISHED 1893.

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TORONTO, CANADA, DECEMBER 10, 1909.

CONTENTS OF THIS ISSUE.

ACCIDENTS AND INJURIES ON THE RAILROAD.

Elsewhere in this issue will be found a statement of the killed and injured on Canadian railways. By far the greater number killed were trespassers. Added to these, the forty-nine found dead on the track give one hundred and thirty-two, or almost one-third of the total killed.

The level crossing is reported as responsible for forty-one deaths and fifty-four injuries. Altogether, the report shows a falling off in killed of eighty-one and of injured one hundred and eight.

If the figures indicate anything, they indicate that for both the travelling public and the employee railway operation is becoming safer.

In Canada, there were 64 persons killed on the railway per million of population and 171 injured per million.

In the United States there were 144 per million of population killed and 1,400 per million of population injured.

The public have a duty in this matter as well as the railroads. The railway trespasser not only leads many to death in his own path, but so long as he is a large contributor to railway fatalities it will be difficult to close the lines and prevent accidents from other causes.

GOOD ROADS WITHOUT GRAFT.

The chief business of our Canadian municipal councils is to give us good roads. Highways safe and easy to travel. Roads that will bring the producer near to the consumer. Good roads are one of the best investments our rural municipalities can make.

It is unfortunate that here and there some municipal official, elected or appointed, imagines he can "graft" without meeting the grafter's fate. His petty graft may not amount to much, but it discourages the ratepayer, and in every new demand he fears that out of every dollar voted so much "sticks" where it will do no good. Worse than that, some "grafters" get bold and try to "hold up" contractors and business concerns that have made a name for themselves through honest dealing and good workmanship.

Last week Zorra—that far-famed Ontario township—had a scandal all its own. A bridge builder accused township officials of bribing him. The officials deny the charge. The judge will later give his opinion of the transactions, or the supposed transactions.

It was unfortunate that in connection with this trial there should be coupled the name of the Hamilton Bridge Works Company. Press despatches made it appear as if one of the witnesses, who said he paid money to township officials, was an agent of this company.

Such was not the case. A more careful study of the evidence goes to show that in no manner whatsoever were this firm connected with the deal.

The Hamilton Bridge Company have built up a large business by honest dealing, careful bidding and good workmanship. And it is unfortunate that their name should in any way be misreported in such a transaction. To those who know and have done business with them, the company's denial was unnecessary.

W. McLEA WALBANK.

The death of Mr. W. McLea Walbank, past president of the Canadian Society of Civil Engineers and managing director of the Montreal Light, Heat and Power Company, removes from engineering circles an active, forceful man, who, during recent years, has made himself felt among his associates in his chosen profession of engineering and in the business world.

Mr. Walbank was an enthusiast in every enterprise or organization with which he affiliated himself. No matter what the discouragement, he fought hard, and—usually won.

He was fair with his opponents, and he will be much missed from the industrial life of the city in which he lived for many years, and from the councils of the organization with which he was identified.

EDITORIAL NOTES.

This week we placed six engineers in positions such as they wished—we have openings for more. We would be pleased to have a record of your experience. You may be just the man some firm is looking for.

* * * *

The date of the annual meeting of the Canadian Society of Civil Engineers at Ottawa, Ont., has been fixed for January 25th, 26th and 27th, 1910, one day earlier than the date given last week. The annual dinner will be held on Wednesday evening, and will be especially good, as Parliament is closed that evening and many members will attend.

* * * *

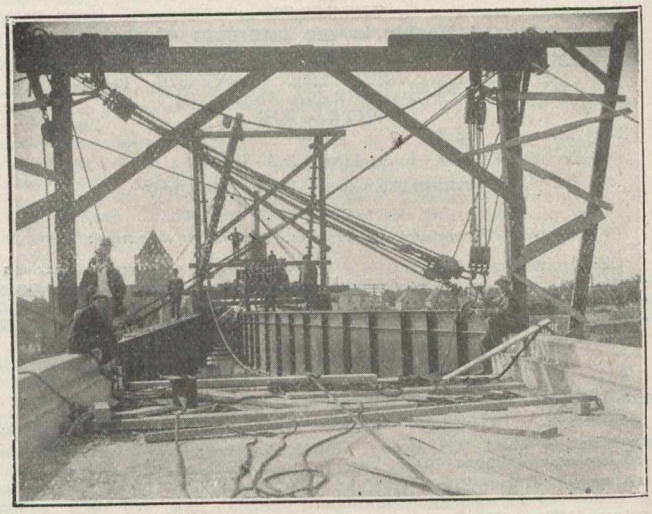
The National Society for the Promotion of Industrial Education have just closed a successful convention at Milwaukee. The objects of this association are to bring to public attention the importance of industrial education as a factor in the industrial and educational development of the country, and to promote the establishment of institutions for industrial training.

FIRST STREET BRIDGE, BRANDON, MAN.

R. E. Speakman, M. Can. Soc. C.E.*

This bridge, which is just completed, crosses the tracks of the Canadian Pacific Railway and Assiniboine River, and has been constructed jointly by the City of Brandon and the Canadian Pacific Railway Company.

The foundations of the piers and abutments, which are of very massive reinforced concrete, as well as of the concrete arches on the north of the river, are built upon piles driven to a solid bearing.



First Street Bridge, Brandon, Man.

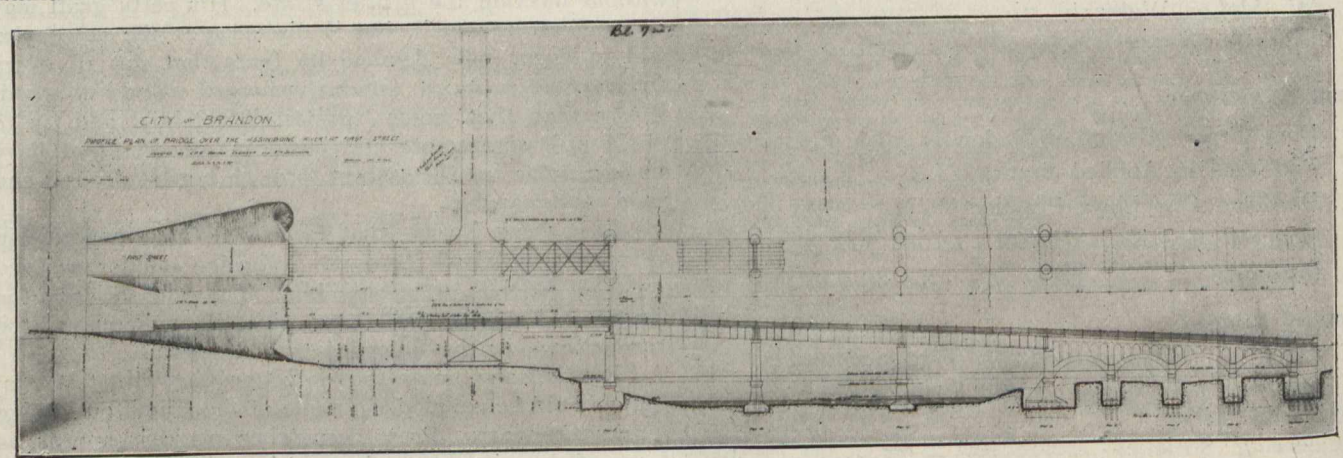
The steel superstructure was built by the Dominion Bridge Company, of Montreal, during the year 1909, and has just been satisfactorily completed.

The superstructure over the Canadian Pacific Railway consists of four spans of 35 feet 3 inches and one of 71 feet 9½ inches, supported on steel braced towers and at the north end upon one of the concrete towers, and is of plate grider construction.

The superstructure over the Assiniboine River is constructed upon reinforced braced concrete columns, at 96 feet centres, the main plate girders being 8.0¾ in depth.

The superstructure of the Assiniboine Avenue approach is supported on steel braced towers upon concrete pedestals.

The roadway throughout is covered with 6-inch reinforced concrete, upon which is laid 4-inch creosoted wood blocks, grouted in with asphalt.

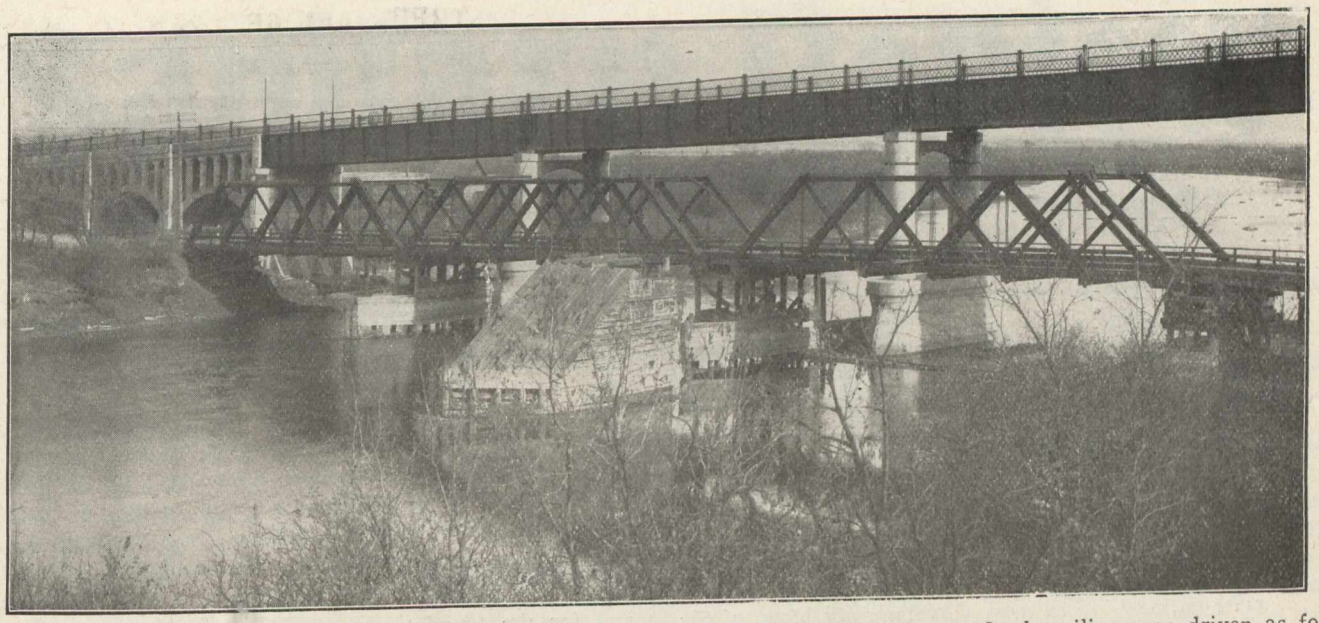


Plan of First Street Bridge, Brandon, Man.

The total length of the bridge is as follows:—

	Feet.
Earth approach south end	132
Bridge over C.P.R.	213

* [Mr. Speakman is city engineer of Brandon, Man., and engineer in charge of this work at its completion. Ed. Can. Eng.]



Over Assiniboine River, three spans 96 feet centres	288
Four reinforced concrete arches, 40 ft. centres	161
North earth approach	230
	1,024
Assiniboine Avenue approach 141, with earth embankment 250	391
Total length	1,415

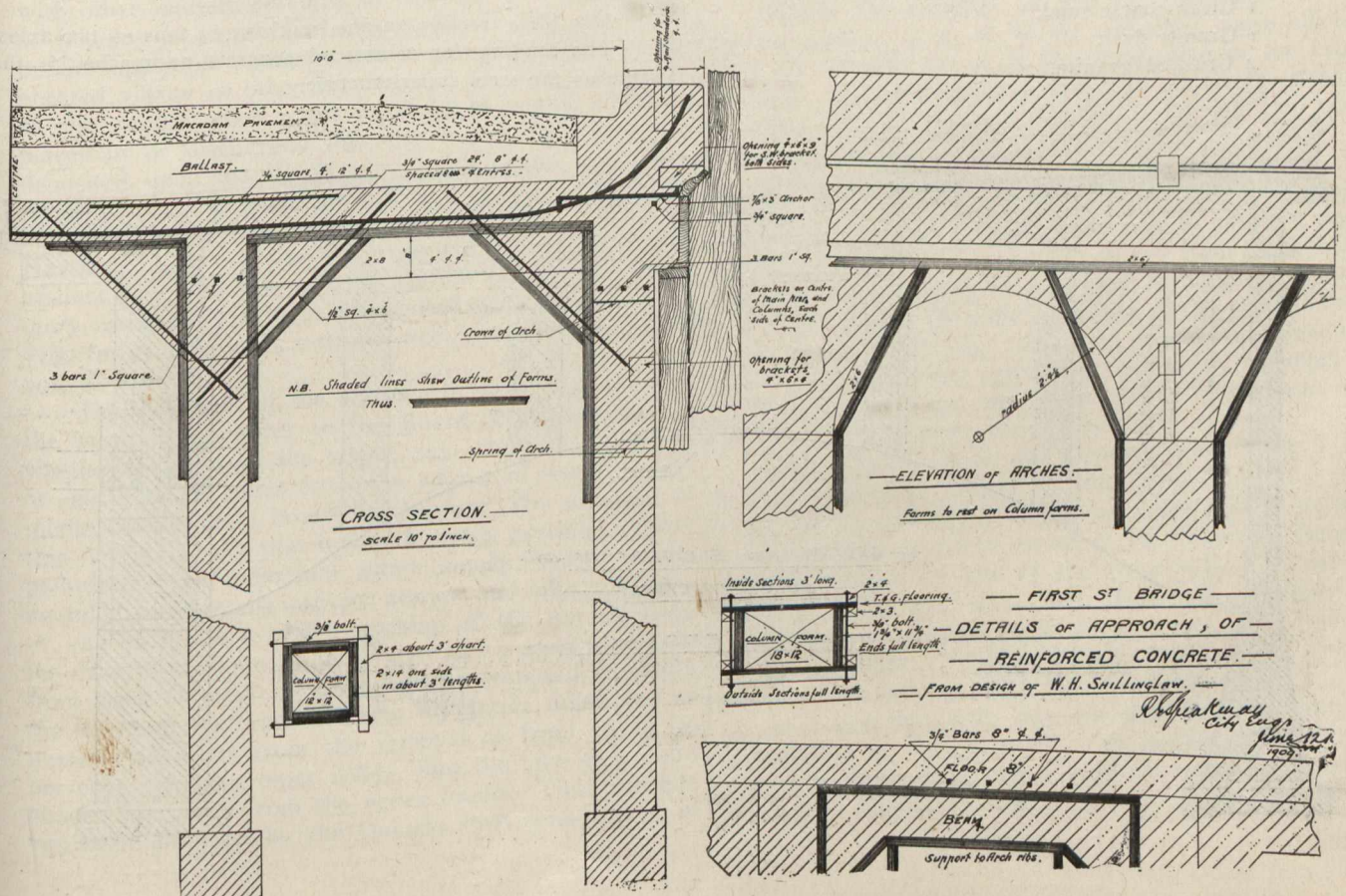
Details of Concrete Arch Construction.

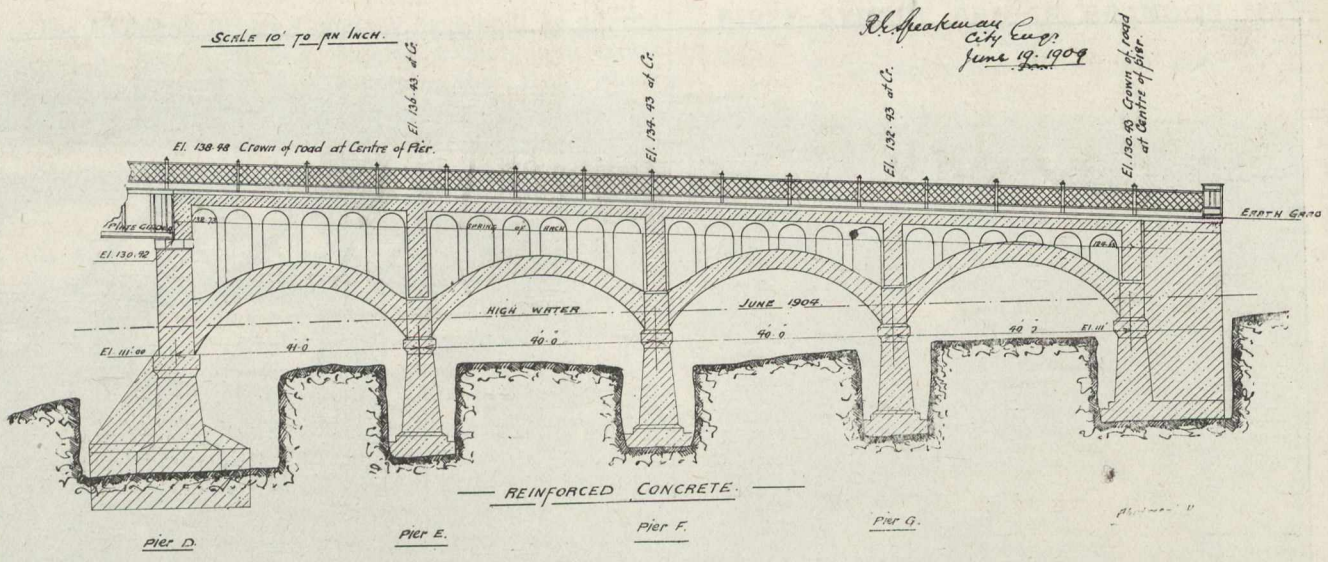
The detail plans herewith enclosed will explain the construction of the work, which was done by the city by day labor. During the year 1908, the piling was driven as follows:—

Pier A	40 Piles
" B	40 "
" C	40 "
" D	58 "
" E	24 "
" F	24 "
" G	24 "
" H	41 "
Total	291 piles driven

to solid bearing, the average depth being from 15 to 22 feet.

Test piles driven into this soil showed the following results with a 2,000 lb. drop hammer.





North Approach to First St. Bridge

51 to 60 blows 18 ft. drop. Average per blow 1′ 6″
61 to 70 blows 19 ft. drop. Average per blow 1′ 4″
71 to 80 blows 19 ft. drop. Average per blow 1′ 3″
81 to 87 blows 21 ft. drop. Average per blow 1′ 2″

The piles used were 25 foot tamarac.

The concrete foundations, piers, columns, and to the extrados of the main arches were constructed in the year 1908 by Mr. W. H. Shillinglaw, city engineer, and his assistant, Mr. N. E. Gibson, C.E., and are reinforced with the "Kahn" system obtained from the "Trussed Concrete Steel Company," of Walkerville, Ontario. The work was carried on to completion during this year by the writer, with the assistance of Mr. William Smith, city foreman.

The concrete used for the floors of the entire bridge was proportioned as follows:—

1 Portland cement.
1 Clean coarse sand.
1 Granite dust.
4 Crushed granite,

and for the foundations, piers, columns, and arches, was proportioned as follows:—

1 Portland cement, Rathbun's "Star."
3 Clean sharp sand.
6 Crushed granite,

with 6-inch facing of 1 : 2 : 4 mixture.

The floors being reinforced by ⅝-inch stel bars spaced 8-inch centres.

The bridge is designed to carry a live load of 100 lbs. per square foot.

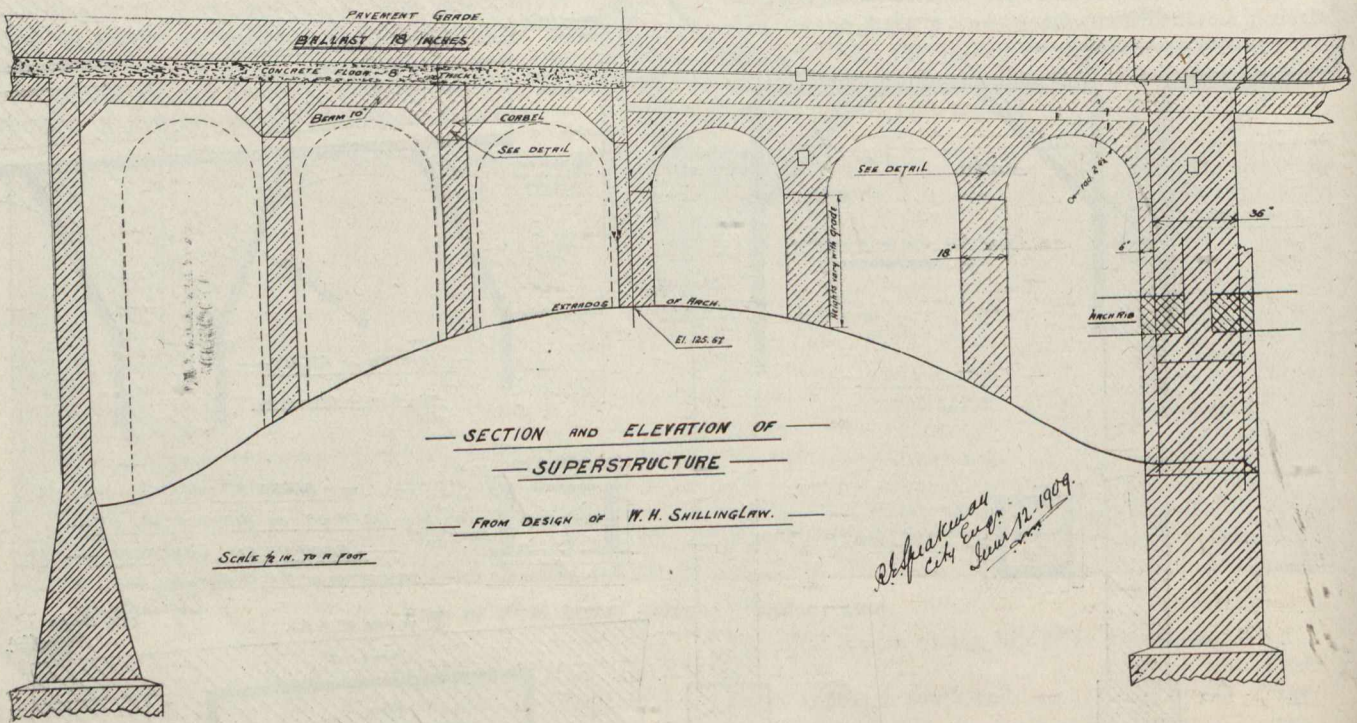
The dead load, including the weight of the bridge, and a reinforced concrete floor with creosoted wood blocks.

A concentrated load as follows:—

A 40-ft. electric motor car weighing 30 tons on four axles followed by a 40-ft .trailer weighing 20 tons on four axles.

Also for a traction engine weighing 15 tons on two axles.

The loading for reinforced concrete approaches is the same as the steel superstructure.



THE

Sanitary Review

SEWERAGE, SEWAGE DISPOSAL, WATER SUPPLY AND WATER PURIFICATION

THE CANADIAN SENATE AND RIVERS POLLUTION.

"No person shall throw or deposit, or cause or permit to be thrown or deposited, any sewage, offal or refuse, animal or vegetable matter of any kind whatsoever, into any river, stream or other water, any part of which is navigable, or which flows into any navigable water."

The above is the wording of a clause in a bill which recently received its second reading in the Senate at Ottawa.

If this Bill becomes law it will be the first acceptance by the Dominion of Canada of State responsibility in guarding the purity of Canadian waters.

The Provincial Government have in part shown some awakening to the necessity of prevention of stream pollution, but it is felt on every hand that the recognition of the principle by the Dominion Government will go a long way to strengthen the hands of the Provincial Governments in local legislation.

The Ontario Public Health Act, 1897, enacts Section 30, para. (6): "No sewage, domestic or factory refuse, excremental or other polluting matter of any kind whatsoever, which, either by itself or in connection with other matter, corrupts or impairs, or may corrupt or impair, the quality of the water of any source of public supply for domestic use in any city, town, incorporated village or other municipality, or which renders, or may render, such water injurious to health, shall be placed in or discharged into the waters, or placed or deposited upon the ice of any such source of water supply," . . . "nor within such distance thereof as may be considered unsafe by the Provincial Board of Health," . . . "and any person who shall offend against any provision of this section shall, upon summary conviction, be liable to a penalty of not more than $100 for each offence, and each week's continuation after notice."

The weakness of the above provincial clause lies in the granting of power to the Board of Health to say whether pollution of the water, say, one hundred yards or one hundred miles from the source of water supply intake constitutes a breach of the Act. The meaning of this Act is literally that it may in cases prevent a direct pollution of an individual water supply, but it is not intended to generally prevent stream and lake pollution.

As an instance of the working of the Act we have the case of Toronto, where the water supply is drawn from Lake Ontario. It is at present proposed to empty the whole of the crude sewage, absolutely unpurified or unsterilized apart from the removal of from 60 to 70 per cent. of the grosser solids, into the lake at a point about three miles from the water intake. This principle has been accepted by the Ontario Provincial Board of Health, apparently on the supposition that the point of sewage discharge is removed a sufficient distance from the water zone from which the domestic supply is drawn.

Now, the separating distance may be sufficient—we would not like to dogmatize either way. In last week's issue we published some valuable data upon the currents affecting the lake in this particular quarter, which appeared to show that the general tendency of water movement was from west to east under normal conditions, but under wind conditions the water movement was controlled by the direction of the wind. We certainly would not like to say that the water supply would never under any circumstances be affected by the sewage discharge; and it also appears that the Provincial Board of Health are also not quite certain on this point either.

The Board of Health, while allowing unpurified sewage to enter the lake, also insist that the drinking water be filtered by sand treatment, in order to guard against any chance of sewage contamination.

Where the principle of the Ontario Act appears to us to fail entirely is that it is operative only as it may, in the judgment of a few medical men, constituting a Board of Health, damage some one particular water supply. **The Broad Principle of Pure Water in Canadian Lakes and Streams is Not Recognized.**

Where the principle of the Act proposed by the Senate appears to us to be far and away more efficient than the Ontario Act is in the recognition of the broad principle of guarding from pollution all rivers, streams or other waters, either navigable or flowing into navigable waters.

We wish every success to the proposal of the Senate. The adoption of the principle as a Dominion law that it must be held illegal to pollute nature's water supply will in the end save this country from great future expenditures of money in rectifying negligence, as is so well illustrated in the older countries at the present time, when they are at their wit's end in devising methods and facing enormous monetary outlays in attempts to reclaim waters from the open sewer conditions into which they have been allowed to drift.

Saskatchewan is at the present time putting a Bill through legislative routine to guard and keep pure their water supply sources. That Government will be encouraged by the progressive action of the Dominion Senate. The recognition by law of the conservation of natural resources is always slow, and there will be plenty of kickers of the purely utilitarian school, who cannot recognize either "Godliness" or "cleanliness" when placed in the balance with the "almighty dollar."

In connection with this question of the prevention of pollution of natural waters, we publish in this issue in part an interesting paper, read the other week before the Royal Sanitary Institute, upon the "Quality of

Sewage Effluents in Relation to Standards," by Gilbert John Fowler, D.Sc., F.I.C. Mr. Fowler is superintendent and chemist of the Manchester Corporation Sewage Works. He gave much valuable evidence before the British Royal Commission on Sewage Disposal, and is recognized all the world over as an eminent authority on sewage disposal matters.

THE QUALITY OF EFFLUENTS IN RELATION TO STANDARDS.*

By Gilbert John Fowler, D.Sc., F.I.C.

At the outset it will be well to define the scope and point of view of the present paper, so as to limit the discussion within reasonable bounds. In the first place, it is assumed that rigid and universally applicable standards are impracticable. In the writer's opinion it is of the greatest importance, in view of the large sums of money which authorities must spend on works of sanitary improvement in many directions, that every effort should be made accurately to ascertain the conditions surrounding any effluent discharge in any given instance. It may be that unnecessary expenditure in the endeavor to reach an uncalled-for standard of purity may cripple the resources available for more needed reform in other directions. In saying this, one is, of course, well aware that many authorities fall far short of adopting reasonable and practicable means for the purification of their sewage. On the other hand, the natural zeal of those responsible for the treatment of the sewage may cause large sums to be lavished on the attainment of results which are more than the situation really calls for.

In this connection the following paragraph 30 of the original Interim Report of the Royal Commission, issued in 1901, may usefully be quoted:—

"We consider it of the utmost importance that the simplest possible means should be provided for adequately protecting all our rivers, and we are further of opinion that it will be desirable, probably for some time to come, that scientific experiments should be carried on in order to ascertain all the real dangers of pollution, against which they should be protected.

"In the present state of knowledge, and especially of bacteriology, it is difficult to estimate these dangers with any accuracy, and it seems quite possible that they should be either exaggerated or undervalued according to the predisposition of those who have to deal with them. An authority, guided by medical considerations, might not unnaturally be inclined to insist on a degree of purity which may ultimately prove in certain cases to be uncalled for, while another authority, with its mind fixed upon economy, might shrink from taking essential precautions."

In the second place, the present paper is not concerned to consider the rival claims of well-known methods of sewage treatment. Any suggestions which may arise are confined to dealing with the effluent as it leaves the filtration works and before it reaches the stream. The subject for discussion, therefore, falls under two heads:—

1. The actual chemical significance of the various chemical tests at present made use of by various rivers authorities for estimating the quality of effluents, with a special reference to the tests suggested by the Royal Commission.

2. The effect which certain effluents, which may comply with some, at any rate, of these standards, may have upon the streams into which they flow.

Taking these subjects, then, in order:—

1. The Chemical Meaning of Various Standard Tests.

The chemical tests which are used in estimating the purity or otherwise of an effluent are, speaking generally: The amount of oxygen absorbed from permanganate; the incubation test; albuminoid ammonia; nitrates; suspended solids; and the rate of absorption of dissolved oxygen.

One of the first questions which arise in judging of the meaning of analytical figures is whether a sewage is weak or strong; thus, for example, an 80 per cent reduction of impurity, measured by albuminoid ammonia, with a sewage of original strength of 1 part of albuminoid ammonia per 100,000, would give an effluent with an albuminoid ammonia of 0.2 parts per 100,000. If the original figure for the sewage was 0.5, the effluent would be 0.1, which would be, for instance, within the limits of the Mersey and Irwell Joint Committee. Assuming that the sewages differed only in strength, it may be taken that the character of the organic matter remaining in the effluent is the same in both cases, and thus is of equal effect from a pollution point of view, although superficially one effluent is twice as bad as the other. It has, indeed, been argued by Dunbar and Thummy on the Continent that after a certain percentage purification has been attained the residual organic matter is so altered in character as to be inoffensive.

On the other hand, it has been pointed out to me by a responsible chief inspector that the effect of the two effluents on the stream is not identical, owing to the greater volume of diluting water carried by the weaker sewage. This is a point which deserves discussion, especially in relation to the development of growths, which is the chief subject matter of the later part of this paper.

The question of suspended matter raises several points of importance. As Mr. Thompson pointed out at Leeds, much depends upon the length of time elapsing between the taking of the sample and its actual analysis. Many effluents, especially those containing iron salts, while free from visible suspended solids at the time of sampling, are capable of yielding considerable deposits on standing. The "clarification test," which was described by the present writer in a paper before the Society of Chemical Industry, 1908, affords a means of approximately estimating the character and amount of this potential deposit. It may vary very much in different classes of sewage, and in the same sewage on different days of the week. Thus, for example, the sewage of Wakefield, which has recently been submitted to thorough investigation, contains the greater part of its organic matter in the colloidal state, owing to the amount of wool-washing refuse present. The precise reverse is characteristic of Manchester sewage. Again, those who are familiar with small sewage works will have noticed the greater opalescence of the effluent on washing days; in fact, there is evidence to show that the colloidal matter in an effluent consists largely of metallic soaps.

The trade effluents in the sewage naturally greatly affect the meaning to be attached to the different analytical figures. Mention has already been made of Wakefield. Even after the removal of the grease, the residual organic matter from the wool contains a high proportion of organic nitrogen, which there is reason to believe oxidizes much more slowly than the nitrogenous organic matter of ordinary sewage.

What has been said with regard to Wakefield sewage applies even more noticeably to the sewage of Bradford. It

* Extracted from paper read before the Royal Sanitary Institute.

is to be expected, therefore, that effluents from such towns will contain high figures for albuminoid ammonia, which are not derived necessarily from "excrementitious matter."

In the case of Manchester, the albuminoid ammonia figure, and to a greater extent the oxygen absorbed figure, is affected by trade effluent, more particularly by phenolic compounds and by sulpho-cyanates contained in the ammonia recovery liquors, which are turned into the sewers in large quantities by the gas works, and by manufacturers, who work up the liquors from other towns.

It is the custom of the rivers authorities in the northern manufacturing centres to adopt different standards, in the case of manufacturers' effluents, from those employed in judging the effluents from sewage works. Provided suspended solids are removed, much higher figures are allowed for oxygen absorption and for albuminoid ammonia in the former than in the latter case.

It is no doubt rightly considered that, apart from the inherent difficulties of treatment, manufacturers' effluents are less dangerous—from the point of view at any rate of producing nuisance—than the effluents from sewage works. It should, however, easily be possible to determine within limits what proportion, say, of the oxygen absorbed figure is due to trade refuse, and what proportion to sewage proper, by comparison—e.g., with purely domestic sewage of corresponding strength or by special methods of analysis. Thus it has been possible, by means of the "clarification test," to show that Manchester sewage contains an abnormal proportion of oxidizable matter in true or "crystalloidal" solution, which diminishes at times when ammonia recovery liquor is not present in the sewage.

All these and other difficulties in interpretation of the various analytical figures made use of as provisional standards, are sought to be overcome by the two simple tests suggested by the Royal Commission which may usually be here mentioned in full. The Royal Commission state that an effluent would generally be satisfactory if it complied with the following conditions:—

(1) That it should not contain more than three parts per 100,000 of suspended matter; and (2) that after being filtered through filter paper it should not absorb more than (a) 0.5 parts by weight per 100,000 of dissolved or atmospheric oxygen in twenty-four hours; (b) 1.0 part by weight per 100,000 of dissolved or atmospheric oxygen in forty-eight hours, or (c) 1.5 parts by weight per 100,000 of dissolved or atmospheric oxygen in five days.

In connection with the suspended matter determinations Mr. Thompson has pointed out the differences already mentioned due to the presence of colloidal matter, apparently fearing that the estimation of suspended solids is likely to be unfairly high unless the sample is analyzed at once after collection. The danger would seem to be rather in the other direction. On the other hand, the filtration through paper, which is recommended, is likely to cause retention of colloidal matter, and consequently diminution in the amount of dissolved oxygen ultimately taken up.

It might be suggested that the dissolved oxygen should be determined after the sample has been allowed to settle, say, for one hour. In the case of a bright effluent from a percolating filter this would afford time for the humus to deposit, the absorption of dissolved oxygen could then be determined in the decanted liquid, when, if colloidal matters were present, the oxygen absorbed by these would be taken into account. It may be objected that this method is less precise than the one given by the Royal Commission, but with reasonable care it would appear likely more truly to indicate the real nature of the effluent.

Mr. Thompson's suggestion that one determination of the dissolved oxygen absorbed after twenty-four hours would be sufficient would certainly result in saving of time, and probably in the majority of cases would be adequate. In presence of antiseptic substances, or of difficult oxidisable matter, a possibility of error might arise. On the whole, however, the Royal Commission tests, especially if slightly modified as suggested, should distinguish between weak and strong sewage, and generally enable a fair conclusion to be drawn as to the probable effect of the effluent upon the stream into which it flows.

The test is ultimately based on the careful researches of Adeney, who has shown that when organic matter of various sorts is submitted to the action of dissolved oxygen in presence of bacteria oxidation takes place in two well-defined stages, viz., the oxidation of carbon to carbon dioxide, and of nitrogen to nitric acid. It may, however, be questioned whether this sequence, which holds for mixtures of polluted matter and water containing an excess of dissolved oxygen, exists equally under the conditions of purification of a sewage works. There are reasons for thinking, in the writer's opinion, that, e.g., in high-speed percolating filters the ammonia in the sewage may be oxidized in large measure to nitrates, while the more resistant organic matter is far from completely attacked.

In the case of contact beds, moreover, the first portion of the discharge is certainly less well ozidized than the last drainings, and, while the average effluent may fulfil all requirements, a portion, at any rate, of the albuminoid ammonia may be due to less perfectly oxidized organic matter. Although this may not absorb a great amount of dissolved oxygen, it may make its presence felt in the encouragement of certain kinds of growth which become apparent at the outlet of the filters, or in the stream below the effluent outfall.

This leads up to the second part of this paper, viz.:—

2. The Effect of Effluents upon Streams.

Just as the efforts of what may be called the chemical era of sewage purification were directed to clarification, with little regard to the chemical composition of the clarified liquid, so the activity of the last decade has been in the direction of the mineralization of dissolved organic matter, with production—e.g., of nitrates, without much consideration of the possibilities of re-absorption of these products into the cycle of organic life. Where final land treatment is resorted to these mineral constituents are usefully absorbed. In the majority of cases, however, such effluents, if non-putrefactive, are allowed by the Rivers Board to pass into streams without further treatment. If thorough mixing takes place with a large body of water, no detrimental effects are, as a rule, observable, even if purification is not carried to the fullest possible extent.

On the other hand, cases are accumulating where effluents, satisfactory from the point of view of mineralization of the greater part of the organic matter, and consequent non-putrescibility, are yet capable of causing considerable growth of organic life, which subsequently may enter into decomposition with production of nuisance. The mineralized matter has, in fact, again become organic.

A classic instance, is of course, Belfast, where the researches of Dr. Letts have shown that the seaweed ulva latissima is capable of absorbing nitrogen, not only from crude sewage, but also from the ammonia and nitrates present in effluents from ordinary filter beds. The subsequent decomposition of the ulva is the cause of very serious nuisance, owing to the development especially of sulphuretted hydrogen. . . .

(To Be Continued.)

PROBLEMS IN APPLIED STATICS.

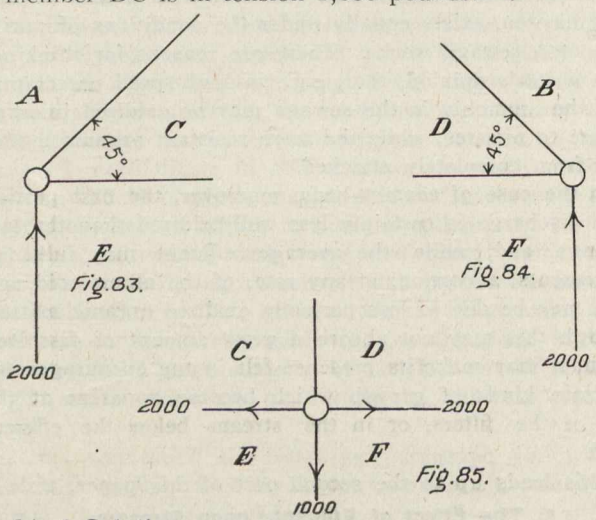
T. R. Loudon, B.A.Sc.

This series of problems began in the issue for the week, October 22nd, 1909. It is assumed that the reader either has an elementary knowledge of the subject of Statics, or is in a position to read some text on such theory.

Consider the forces acting at the point EFDC. The condition of affairs is represented in the Statical Diagram (Fig. 85).

$$\Sigma Y = Y_{EF} + Y_{FD} + Y_{DC} + Y_{CE} = 0.$$
$$-1{,}000 + 0 + DC + 0 = 0.$$
$$DC = 1{,}000.$$

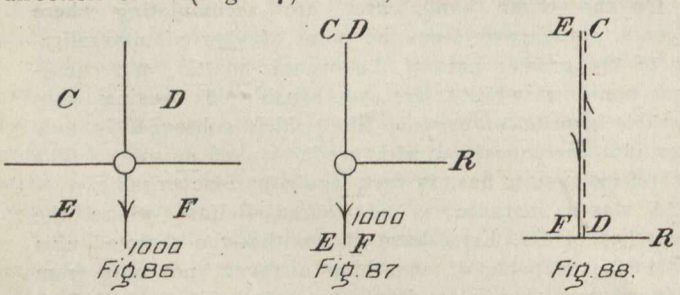
From the positive result it is seen that the Y_{DC} is positive. DC, therefore, acts away from the point; i.e., the member DC is in tension 1,000 pounds.



Graphical Solution.

Consider the forces acting at the point EFDC, represented in the Statical Diagram (Fig. 86). Since there are three unknown forces in this case, it is seemingly impossible to construct the Vector Polygon for the set of forces. However, **because FD and CE have the same lines of action, their resultant must act in that line.** Replace FD and CE by their resultant as indicated by R, Statical Diagram (Fig. 87). How this resultant acts is as yet unknown, but, as will be seen, this is of no importance.

Construct the Vector Polygon for the forces shown in the Statical Diagram (Fig. 87). Draw EF (Fig. 88) to represent the known force EF (Fig. 87). Then, from F (Fig. 88) a line is drawn to represent the known direction of R (Fig. 87). Now, since the set of forces

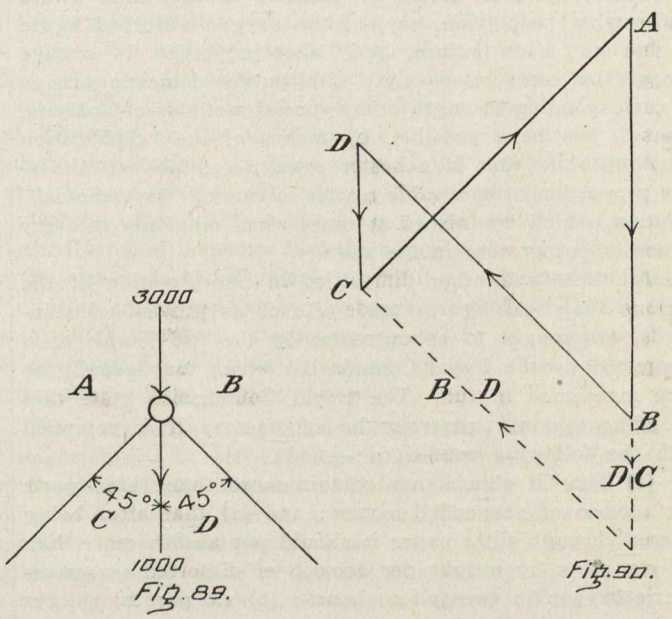


being considered is in equilibrium, we know that from some point in the line drawn to represent the direction of R, another line must be drawn to represent the direction of CD (Fig. 87), and also pass through E (Fig. 88), thereby closing the Vector Polygon. It is evident that such a line will coincide with EF (Fig. 88). To avoid confusion, the line representing DC, which would coincide with EF, is shown dotted to one side of EF. The force DC is seen to be an equal and opposite force to EF; i.e., it acts away from the point. The member DC is, therefore, in tension 1,000 pounds.

Consider the forces acting at the point ABDC, Fig. 89 being the Statical Diagram representing the condition of affairs at this point.

AB (Fig. 90) represents the known force AB (Fig. 89), due to the load of 3,000 pounds. Referring to Fig. 89, it is seen that an unknown force intervenes between the force AB and the next known force DC. It will, therefore, be impossible to use Bow's Notation throughout in constructing the Vector Polygon. **Whenever this notation cannot be applied to a line representing any particular force, the line will be shown dotted and the letters designating the force placed beside the line.**

From B (Fig. 90) a dotted line is drawn to represent the known force DC. Now, since the forces under con-



sideration are in equilibrium, their Vector Polygon must close, and it must be closed by lines drawn to represent the directions of the unknown forces BD and CA. Therefore, from the termination of the dotted line drawn to represent DC, a dotted line is drawn to represent the direction of the force BD, and from A is drawn another line to represent the direction of the force CA. These last two lines intersect at C, and it is seen that Bow's Notation applies to the line representing the force CA. This line is, therefore, drawn in full. The Polygon should then read: AB, DC (dotted line), BD (dotted line), and CA.

Having fully determined the unknown forces, it is now possible to go back and construct a Vector Polygon lettered throughout with Bow's Notation.

From B (Fig. 90) draw the full line BD equal in length and parallel to the dotted line representing the force BD. If D be joined to C, the line DC should then be equal and parallel to the dotted line representing the force DC. This new polygon, which will represent fully the forces acting at the point being considered, reads: AB, BD, DC, and CA.

(Continued on Page 645.)

PRODUCER GAS PLANT PRACTICE.*

Michael Chapman, A.M.I.E.E.†

I shall not attempt to more than very briefly touch on the history of producer gas. You have probably heard it so often that, although a fascinating story, it will not bear repetition.

Sir William Siemens first utilized producer gas in connection with steel furnaces and industrial application of gas firing, and actually previous to 1878 attempted to utilize it in gas engines. He failed for two reasons:—

1. The gas made in his producer was too poor in quality to be fired by engines using the compressions at that time available.

2. He had not solved the problem of cleaning the gas.

Mr. T. Emerson Dowson, in 1878, secured a patent covering a producer, which overcame the first mistake made by Siemens by the addition of steam to the air which passed through the incandescent coal, and so raised the quality of the gas from 80 B.t.u. to 130 B.t.u. per cubic foot.

The second mistake was overcome by a compromise. He confined his plant to the use of fuels free from tar, such as hand-picked anthracite and gas-house coke. This plant was the first really serviceable equipment for supplying producer gas to gas engines.

I will now give you the chemical constitution of producer gas and a short description of its manufacture, which is commonly applicable to all the different styles of plants put on the market by the different well-known makers.

The chemical reaction is as follows:—

(1) $C+O_2=CO_2$. (2) $C+CO_2=2CO$. (3) $C+H_2O=H_2+CO$.

These reactions take place in the order given, the first at the bottom of the fire, the second in the hottest part, about seven inches higher up.

In order to obtain the above results a temperature of about 500° C. at the bottom of the fire and 1,000° C. a little higher is necessary In short, producer gas is the result of passing a mixture of steam and air through incandescent fuel, and the quality of the gas obtained depends on variations in the process.

I shall not touch on the two other gases chiefly met with, namely, Town's gas and water gas, except to say that the first is made by the destructive distillation of coal in a closed retort, and the second by blowing steam through incandescent fuel, with decomposition of the same, the incandescence being produced by combustion of the fuel with an air blast, and the blowing and steaming periods being intermittent.

Producer Gas.

The gas of which we are talking can be roughly described as being made by one of three processes:—

1. By the piston of a gas engine aspirating the gas from a producer direct without any intermediate storage or gas-holder. The resultant gas is known as suction gas.

2. By the action of a roots or other type of blower placed between the producer and the point at which the gas is to be used. The blower draws the gas under less than atmospheric pressure and delivers it under pressure. This is called a suction pressure plant.

3. By the action of a positive blower forcing air and steam through the producer and delivering the resultant gas under pressure to the point required. This is called a pressure plant.

It becomes the first duty of the engineer laying out a power plant with gas engines as prime movers to ask himself the following questions:—

1. Shall the plant be of the suction, suction pressure, or pressure type?

2. How is it possible to obtain the maximum benefit from the use of producer gas in Canada where, during six months of the year, heating in a factory is required?

Now, one of the great advantages that producer gas offers over steam or any other source of power is its applicability to singeing, grazing, melting, etc., and it is this side of the problem which has been neglected in this country, and has held back its rapid development. Also, every factory owner is obsessed with the idea that with a gas engine it is impossible to utilize the exhaust for heating purposes as in a steam engine, and many are the orders for gas plants that have been lost in this way, owing to the gas engineer being nonplussed when asked if he could undertake to heat the factory in the winter from the exhaust.

The day when this remark regarding factory heating held good is over, and I am in a position to say that anyone utilizing 50 horse-power and over on a reasonably steady load can by the use of a properly designed heater obtain during the day nearly as much heating effect from a gas plant as from a steam system, the difference being purely in the efficiency of the gas engine and the steam engine and the amount of heat wasted in the two systems, which, of course, is less in the gas engine than the steam engine.

Some rough rules to guide the engineer in settling on the type of plant to be employed are as follows:—

1. For a straight power proposition, such as the driving of a factory, I would recommend a plain suction plant.

2. Where there is the chance of applying gas to brazing, etc., a suction pressure plant.

3. Where several engines are running at different points on a violently fluctuating level, a pressure plant.

I propose now to mention some of the troubles that are met with in actual practice, troubles which have their origin in causes ridiculously simple, and yet cause the engineer many moments of worry until he knows the vagaries of producer gas as thoroughly as the steam engineer knows those of steam. I shall take the instance of a plain suction plant running an engine on a steady load. That is the simplest problem you can have, the engine being a single cylinder hit-and-miss Otto cycle engine.

Starting from the time the man blows up his fire, he is supposed to have good gas and his engine under way in two minutes. Suppose he cannot get any gas, and the time for starting the factory arrives, he asks himself what is the matter, and generally loses his head, blaming the producer, the state of irritation being increased by the monotonous job of grinding the fan. What he should do is this:—

1. See that water is in his boiler. If there is not any, he is making air gas only, and the addition of steam will cure the trouble.

2. Feel at his test-cock if there is plenty of pressure, and look at his gauge, an instrument which is hardly ever installed, and yet tells such a lot to an intelligent operator. If there is no pressure at the cock and his fan runs easily, and yet the gauge registers two or three inches, he will know that the gauge which covers the test-cock is blocked, and that by renewing it he will probably find good gas, and plenty of it. This simple mistake has nonplussed many good men at times.

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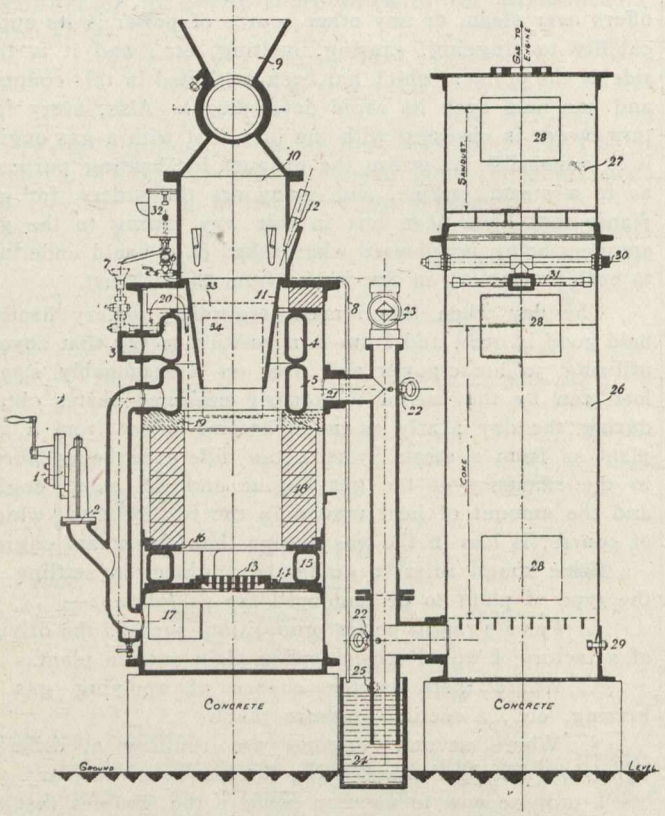
* Paper presented at the Engineers' Club of Toronto, November 18th, 1909.

† Of Chapman & Walker, Limited, 69 Victoria Street, Toronto, Ont.

3. If his gauge registers a pressure a great deal lower than usual and the pressure at the test-cock is small, he will know there is an obstruction either in the producer from clinkers or in the piping from accumulation of dust, or if the plant is just being started for the first time, from someone having left waste in one of the pipes. This trouble will be accompanied by a hard feeling of back pressure to the grinding of the fan. He should first poke down his fire, and be sure that the producer is not solid with clinker, and then, after being sure that there are no doors left open or leaking joints, he must search for the obstruction in the pipes.



Key to Sectional Drawing of Suction Gas Plant.

1, Hand Fan; 2, Damper Valve; 3, Air Inlet; 4, Vaporizer; 5, Vaporizer; 6, Suction Pipe Auto. Feed Tank; 7, Water Inlet to Vaporizer; 8, Overflow from Auto. Feed; 9, Feeder; 10, Hopper; 11, Hopper Bell; 12, Poker Hole Plugs; 13, Firegrate; 14, Firegrate Support; 15, Superheaters; 16, Firebrick Support; 17, Firedoors; 18, Firebrick; 19, Fireclay; 20, Gas Passage; 21, Gas Outlet; 22, Cleaning Holes; 23, Blow-off Cock; 24, Seal Pot; 25, Overflow from Seal Pot; 26, Coke Scrubber; 27, Sawdust Scrubber; 28, Doors; 29, Cleaning Door; 30, Water Spray Feed; 31, Sprays; 32, Automatic Feed to Vaporizer; 33, Vaporizer Cleaning Door Frame; 34, Vaporizer Cleaning Door Cover.

4. He may get gas at the producer test-cock and none at the engine. In this case he should compare the gauge which is placed before the scrubber and that placed after it. If the difference is excessive, he knows that there is an obstruction in the scrubber, or that some joint is leaking badly. The only way to remedy the first trouble is to repack the scrubber, but it is an unlikely trouble, unless the quality of coal requires big sawdust scrubbers.

5. Leaking joints are the greatest cause of trouble in suction producers, and every joint should be most carefully made, and the complete plant given a smoke test before starting.

6. If the gas is obtained quickly and the engine goes off splendidly and then dies away, you know that one of the following things has happened:—

I. The doors may be leaking and too much air being admitted before the point of chemical reaction.

II. The hopper or portion of the plant after the point of reaction may be leaking, so diluting the resultant gas.

III. The water supply to the boiler may be affected.

IV. Air may be leaking up the brickwork lining without going through the fire. This is the worst and most insidious form of trouble, but with good erection should never occur.

The troubles I have so far given are mostly those due to lack of intelligence, want of attention, or faulty erection

Now I shall come to troubles due **to fuel,** and first of all shall confine myself to anthracite and coke.

An analysis generally applicable to anthracite is:—

	Carbon.	Hydrogen.	Nitrogen.	Sulphur.
Welsh anthracite	89.17	3.50	0.91	0.96

	Oxygen by Difference.	Moisture.	Ash.	B.t.u. per lb.
Welsh anthracite ...	1.56	1.78	2.12	15,224

You will see from this that the percentage of hydrocarbon is small, so we have to take very little precaution against tar, and, therefore, the plant is simple.

The analysis of gas-house coke is:—

	Carbon.	Hydrogen.	Nitrogen.	Sulphur.
Welsh anthracite coke	88.64	1.37	0.99	0.63

	Oxygen by Difference.	Moisture.	Ash.
Welsh anthracite coke	0.60	5.60	2.17

Again, volatile matter is small, and, therefore, the same plant is applicable, but just in proportion to the difference of the B.t.u. of the fuel, so the plant for coke has to be larger than that for anthracite; and here I would like to warn you against blast furnace coke, the product of coke ovens. It is not a clean fuel, and resquires special cleaning apparatus, although certain parts of the coke which comes from the bottom of the Beehive oven form the purest fuel you can get, but commercially, for producer work, it is dangerous to attempt to use it in a plain suction plant.

Now, there are anthracites and anthracites, all differing little in their analysis. They have deceived many engineers, who have not been to the trouble and expense of treating them in large bulk samples, and I propose to mention the chief causes of their trouble:—

1. First comes the fact that a large demand for a product of any kind creates a special quality of that product treated in a special way to make it suitable for its special market.

In England and on the Continent, for instance, producer plants have been in use for many years. The number of horse-power at work is enormous, and there the demand for anthracite for this purpose became so great that the coal owners, seeing a good field for their product, took the trouble to very carefully supply what the producer maker demanded, namely, an anthracite, washed, freed from slate by hand-picking, and graded very carefully in sizes. The result is that, weight for weight, English anthracite, as sold for producer use, has more B.t.u.'s than Pennsylvania anthracite, which is bought in Canada, and the ash resulting from combustion is far less, which means:—

1. That to develop the same horse-power in this country you must have a larger plant.

2. That in order to get rid of the ash accumulating on the grate you must, for ease of handling and as a labor-saving device, supply a Shatsing or Rotatine grate. The

latter appeals to me most from my own experience, and makes the fire settle down mose solidly after its use, also keeping the bricks freer from clinkers.

II. The first fact I referred to was **purely a commercial** coincident, due to local circumstances, and **easily remediable** if taken in time. The second is the fact that the incombustible constitutent of Pennsylvanian coals fuse to clinker at a lower temperature than do those from Wales, and, therefore, we **must** in this country keep the temperature down to a proportionately low level, depending on these critical temperatures. You will see that a larger producer will, as it happens, effect this result without further attention. A further fact for which I have not found a really satisfying reason is that an increase in the height of the producer improves the working of producers with Canadian fuel immensely.

I would like to hear a few suggestions on this subject. It is not as if the proportion between height and diameter had been kept constant. The height for Canadian anthracite is considerably more in proportion to the diameter than with English anthracite. To sum up all my experience and the remarks previously made, I would specify for a successful producer on Canadian anthracite:—

1. That the diameter and height of the plant should be ample.
2. That gauges should be installed, and intelligently used.
3. That the hand-fan should be motor-driven.
4. That all bends should be cleaning bends.
5. That the water supply for the boiler should be under automatic regulation, so that the steam generated should be in strict proportion to the load.
6. That all test-cocks be fitted with gauze, applying Davy's well-known principle to prevent explosions.
7. That all joints be designed so that possibilities of leaks are reduced to a minimum.

Given all these points and handled by an intelligent man, a suction anthracite or coke plant is the simplest and most efficient equipment in conjunction with a gas engine that can be obtained.

Now, anthracite and coke are all right as fuels, and, in fact, ideal, but, like all things ideal, they are expensive, and the more people realize their possibilities in producers the more expensive will they become, so that it has been the object of every up-to-date firm in the business to put on the market a plant which will use bituminous coal as well. The company with whom I am associated has been grappling with this problem for years, and now they have plants of 50 horse-power up to any size for this class of fuel, arranged again on the three principles of suction, suction pressure, and pressure.

The use of bituminous fuel in large plants has been solved for quite a number of years by such firms as Crossley Bros., the Power Gas Corporation, etc., and the horse-power of these plants already in use runs into hundreds of thousands, and is constantly increasing, but there has, till the last few years, been a disposition not to build them much below three or four hundred horse-power.

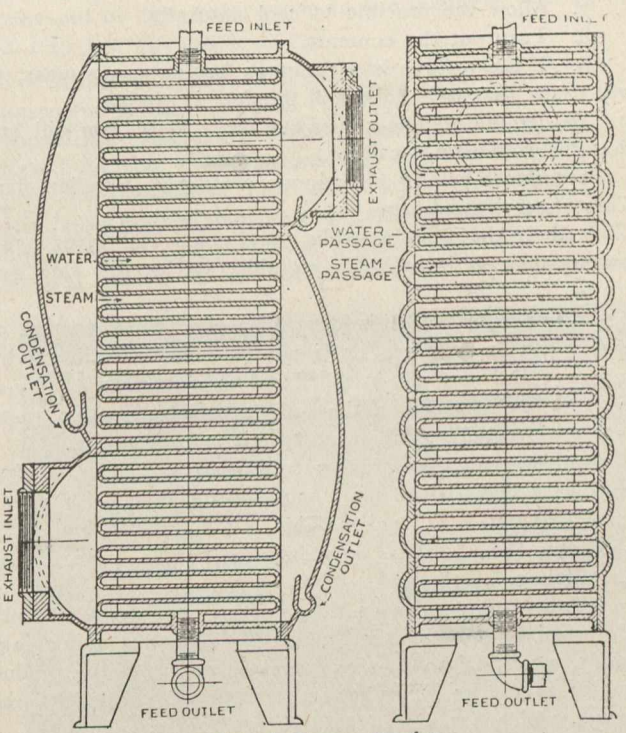
In the solution of this problem of using bituminous fuel there have been two schools of thought, and nearly everyone has started by being a strong adherent of the one, and, after thinking they had solved the problem, have gone over to the other, which, so far, has proved the only truly satistory system.

The first idea was to make gas, either in one producer and pass those gases through a second producer, which was maintained at a high temperature, and there convert the volatile and tarry constitutents into a permanent gas, or to carry out practically the same process in one producer by having two zones: the one a gas-making zone, the other a zone at a high temperature, for what we call cracking the tarry matter into permanent gas, so adding the heat value of these constituents to the sum total of B.t.u. of the gas, and at the same time removing all chances of trouble from tar on the engine piston or in the pipe system.

The idea is fascinating and apparently simple, but in practice it does not work, and you will find, as I have said, that when you inspect such plants they have always in addition a number of special washers to take out the tar, which was supposed to be removed by the second producer, or double zone system.

The second process is to combine with your bituminous producer a slow-speed centrifugal water-fed fan, which intimately mixes the gas with a water spray and removes all particles of tar.

This tar extractor is a simple machine, and by its use in combination with their bituminous producers the makers can supply plants as small as 50 B.h.p. to use bituminous



Exhaust Steam Heater

coal, anthracite, coke, and, with modification, wood, sawdust, and peat, thus placing customers in the position of not being bound to one source of fuel supply.

When I say bituminous plants, I want to make it clear that I do not mean that one can use such coal indiscriminately.

To a producer gas engineer, bituminous fuels are sharply divided into those that are called "caking" and those that are called "non-caking," or free-burning, and, although in actual fact these fuels are generally distinctly different in their behaviour under certain tests, cases occur where it is difficult to say to which class they belong, and then a test with a bulk sample under actual working conditions is the only reliable data on which to depend.

Roughly speaking, the practical engineer can, by a test, find whether a fuel is caking or non-caking, but before I give you the test, I will give a rough definition of the two terms:—

I. A caking fuel is a fuel that, when heated, does not retain its original shape, but runs together into a homo-

geneous mass, becomes pasty, and, as the volatile matter is expelled, yields a solid mass, preventing the passage of the gas.

II. A non-caking fuel is a fuel that, when heated, approximately retains its original shape and then crumbles into ash.

Test for Caking Coal.

1. Powder the fuel very finely in a mortar.

2. Place in a small crucible a teaspoonful of the powder.

3. Place a loose-fitting lid on the crucible and heat over a spirit lamp.

4. Heat until all the gas has ceased to come off.

5. In order to test this apply a match above the crucible and around the edge of the lid, when probably a flame will spring from the crucible and burn for a few seconds.

6. In case no gas is available, heat the crucible for five minutes.

7. Allow the crucible to cool naturally.

8. Turn out the contents.

9. If the residue is a compact, homogeneous mass, you will know that it is coke and the fuel is caking.

10. If the residue comes out fairly loose, you will know that the coal is non-caking.

11. Most caking bituminous coals give a yellow flame. This generally indicates tar.

12. If the sample swells very much and gives a soft, porous coke, it is probably suitable, and at any rate worth trying.

When a test of this description has been carried out, and if the fuel proves itself non-caking, an ordinary bituminous plant can be installed; if the test is not very distinct in its result, then the only satisfactory action to take is to ship a bulk sample and test it in the factory.

If, however, the fuel according to the test is clearly caking, a very special plant must be installed, with a water-cooled, motor-driven poker This is a complicated plant, and the high first cost is only justified in the case of large installations.

The Wellman-Seaver-Morgan Engineering Co.'s plant, designed by Mr. Fraser Talbot especially for using caking coals, a vertical rod passes down the centre of the producer, which is of the water-bottom type, and carries two radial arms, which are placed at different angles.

The rod and arms are water-cooled, and rotate slowly, about once in ten minutes, at the same time having a vertical motion.

In this paper I have briefly tried to touch on the practical side of producer work as applied to gas engines, and have purposely left out gas engines, as both subjects are so large that it is impossible to do justice even to the one in the short time at my disposal.

There are, however, one or two practical points which make the difference between success and failure, satisfaction and disappointment in the combination of a producer with a gas engine, which truly come under the heading of the latter, and which I propose to mention before closing.

The gas engine as generally supplied to-day is either multi-cylinder vertical, or single flywheel single cylinder horizontal, and in the last design, as the sizes of the units grow, the weight of the flywheel increases to a point at which it is foolish, if not criminal, not to supply special gear for placing the engine into its starting position, and afterwards of causing the engine to carry out its complete cycle, and so obtain its own impulses by firing its own gas.

Barring Gear.

Some makers supply no means of placing the engine in position on the firing stroke up to as high as 75 horse-power. The result is that you will sometimes see the engineer and probably two or three helpers dragging on the flywheel, to their complete disgust and exhaustion. Other makers have small holes in the side of the rim of the flywheel, and supply a fulcrum and bar. This is better practice, but a poor job, and in this respect there is only one satisfactory equipment, and that is a pinion keyed on to a shaft resting in bearings and supplied with a large hand-wheel, the pinion meshing in teeth cast in the rim of the flywheel.

Starting Apparatus.

When an engine is put to work on producer gas, it is given an impulse either by what is known as an explosion starter or by compressed air. The first method consists of pumping a certain number of strokes of a pump, generally fixed to the engine, which delivers a certain quantity of gas into the engine cylinder, a valve is then operated and a certain quantity of air is pumped into the cylinder, so as to make an explosive mixture. The charge is then fired by electric ignition or tube.

Now, this system is a poor one for producer gas, because the quality of your gas at the commencement of operations is not constant, and, therefore, I would not recommend its use except as a standby. The engineer may obtain the right mixture the first attempt; he may try ten times, and, therefore, no one can call it a truly reliable system.

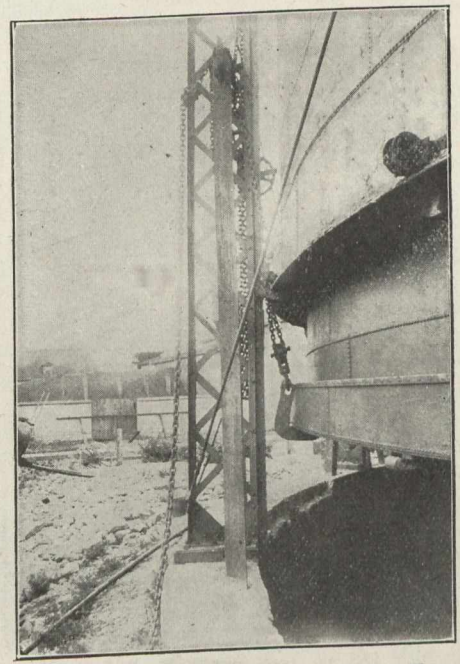
Compressed air from a separate small air compressor set is the ideal practice; failing that, compressed air stored in a receiver by running the engine as a compressor when shutting down, but economy should not be allowed to influence the engineer in these two details. An extra $200 on a plant of 50 horse-power will save the engineer's temper and avoid all delays in starting.

THE RECONSTRUCTION OF A CONCRETE GAS TANK HOLDER AT KINGSTON, ONT.*

Once more the necessity of care in concrete building has been demonstrated in the case of the concrete tank in connection with the gas plant of the corporation of Kingston, Ont. It has brought up the oft-repeated warning that concrete must be well built. It has demonstrated once more the fact that where care and precaution have been taken concrete is superior to all other materials for most classes of construction work. The general public of to-day are too well acquainted with the properties of concrete to condemn it whenever faulty construction has produced failure. In the case in question those in charge of the city's welfare, after first endeavoring to meet the difficulties by temporary changes and alterations, called for tenders, allowing those who tendered to use almost entirely their own methods of procedure. As a matter of fact, the work was well advanced by the successful tenderers, Messrs. Merrill & Allen, before they finally decided upon the method of waterproofing to be employed. The method of procedure throughout was entirely their own, and in portions experimental, as many difficulties presented themselves throughout the work. That the con-

* Mr. E. B. Merrill, consulting engineer, Toronto, delivered an illustrated address before the Engineers' Club of Toronto in connection with this work.

tractors have been successful may be judged from the notices in local Kingston papers, which speak in the highest terms of the nature of the work and the satisfactory tests which have been made since the work was finally completed. A brief mention of the events leading up to the final reconstruction of the work may be of interest. There was completed during the fall of 1907 a concrete tank and a two-lift steel holder for the Heat, Light and Power Department. The steel holder was constructed by Messrs. Davis & Farnum Co., Waltham,

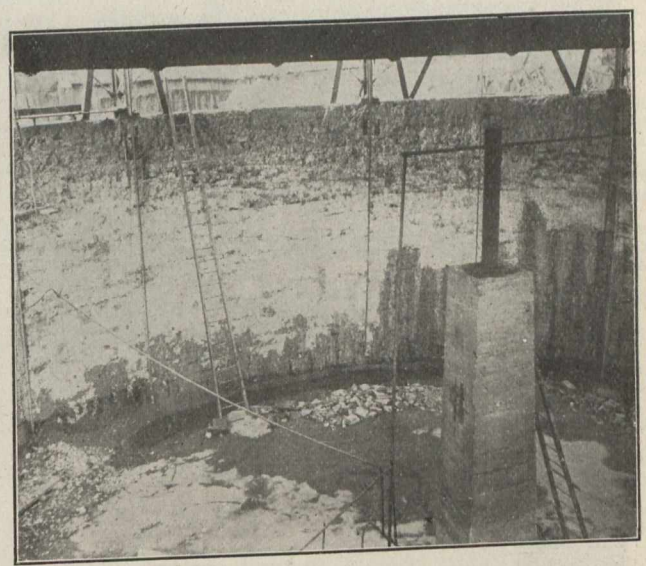


Suspension of Tanks, showing One of the Ten Columns.

Mass. It had a capacity of 150,000 cubic feet. The tank was constructed of concrete by a local contractor under the supervision of Mr. J. M. Campbell, then manager for the Heat, Light and Power Department. In the fall of 1907, before filling tank with water, it received a good coating of coal tar and resin, which adhered well to the walls and bottom. When water was put in it settled as much as two feet in twenty-four hours, or 69,000 gallons per day, and as much as 23,000 gallons per day after being tarred, still a large leakage. In the spring of 1908 the tank was put out of commission and the water pumped out. A general inspection was made, and several bad leaks were located. Mr. Campbell then arranged with the Warren Bitumen Co., of Rochester, to waterproof the interior of walls. This coat consisted of three layers of tarred felt, with a cap sheet, making four ply, all told, with a coating of No. 4 pitch between each layer. Both sides and bottom were thus treated. Then four inches of concrete of a 1:2:4 mixture was placed in the bottom of the tank. The paper sagged out for several inches in places along bottom of walls. It was originally intended to put a layer of three inches of concrete against the paper to hold it to the main concrete wall. This idea was abandoned, and instead a four-inch brick lining against the tarred felt was suggested. The question resolved itself into whether to make the tank watertight or condemn it entirely and build a new one. Several suggestions were made as follows: (1) Take off felt and rack the walls to a rough surface so that a new coating of cement and sand (2 to 1) of ½ or ¾ of an inch in thickness be trowelled on. (2) To take off felt and roughen surface and erect wooden forms, so that three inches of concrete might be placed against the present main concrete wall. (3) Leave paper on and line with brick, (four inches) embedded in cement. (4) Put in steel lining, with a 3-inch flange at bottom, this flange to be covered with a good, strong mixture of concrete. (5) Raise both lifts and blow up present concrete wall and build a new one.

In regard to No. 4, it was considered too expensive, as was also No. 5. Nos. 2 and 3 were thrown out as the space between the holder and concrete was small. It would be necessary to cut off about two inches of the flange or cut away the masonry to allow the laying of brick on the concrete. In the meantime several methods were used to stop the leaks. The driving of a small wrought iron pipe, about ⅛-inch, into wall where leaks were the worst and fill up the other leaking places. Also, the leaks were plugged with clay and mortar. Over this was trowelled on a strong mortar of cement, alum and sand, but this was forced or eaten away. Several loads of manure were scattered upon the surface of the water, and a mixture of three parts of bran and one of cement was put on the water close to the concrete wall to draw it into the openings.

A report made to the Light, Heat and Power Department of the Kingston council by Mr. W. E. McKay, consulting engineer, Boston, during November, 1908, based on the specifications for the tank construction, personal inspection, and information furnished by the Kingston council contains a criticism of the conditions under which the concrete work was built, as well as several details of the specifications. The following is a



A View of the Interior showing the Crumbled Condition of the Original Wall.

portion of this report in so far as it deals with the manner in which the concrete work was originally carried out:—

(a) The concrete to be composed of one part cement, three parts of coarse sand, and six parts of broken stone, and that the largest piece of broken stone shall pass through a two-inch ring, and that large stones may be placed in the concrete work.

(b) That the concrete wall is to be approximately two feet thick.

2. The specifications may be adversely criticized in the following details:—

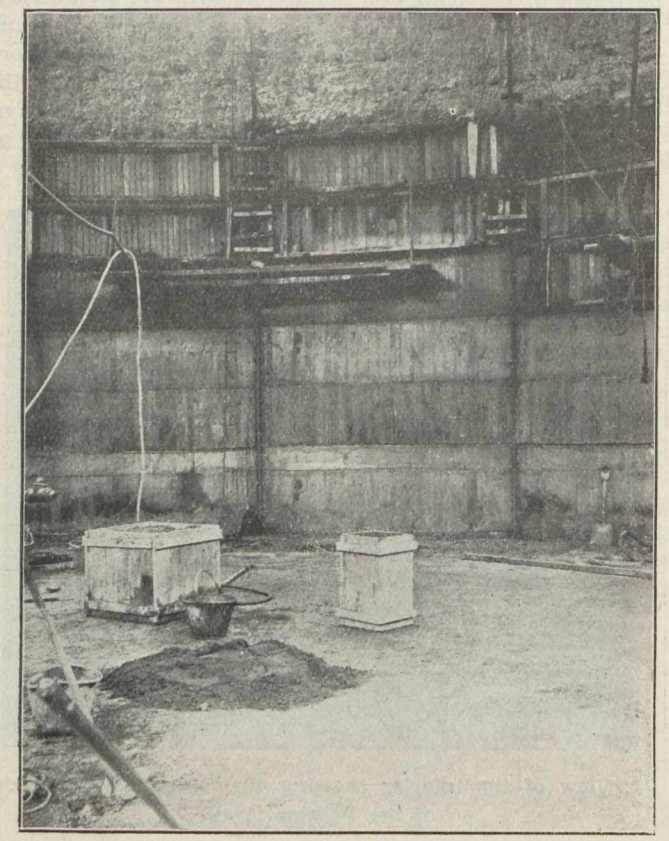
(a) The concrete mixture is not sufficiently rich to insure watertight work; the proportions should be one, two and four, or one, two and a half, and five. The stone should be carefully graded, and all pieces should pass in any direction through a two-inch ring. No large stones should be used.

(b) In the rock the wall was laid without outside forms, and the minimum thickness is stated as eight inches. The rock is stratified, with the joints of varying magnitude between the layers of the rock. Into and through these openings the cement and sand of the concrete mixture could flow as the concrete was placed, reducing in the stone of the wall the cement binder that was already too small in volume from the proportions of the concrete.

Without the solid rock backing the two-foot wall is not thick enough for the head of water of twenty-four feet. Even with the solid rock backing, eight inches of this concrete is not enough to make watertight work.

There are no provisions in the specifications for ramming the concrete, for limiting the depth of the layers, nor for jointing old and new concrete.

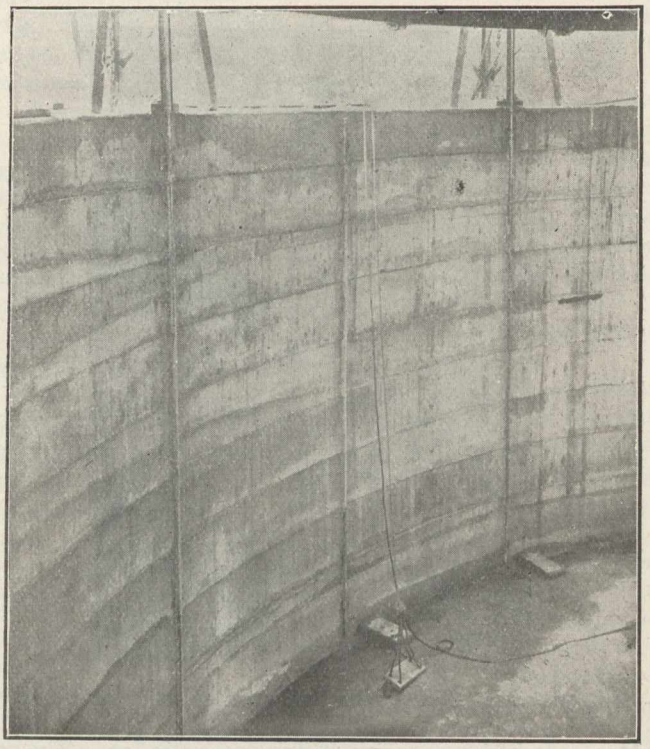
The following portion of this report is of general interest. It points out the need of careful construction



The new Concrete Lining partly completed, showing the Method of Working Forms.

and skilled supervision. After stating that concrete, to be watertight, must not be laid in freezing weather, nor with the thermometer near 32° F., it says:—

"It is to be further noted that no matter how good the material of the concrete, nor how rich the proposed mixture, the excellence of the finished concrete directly depends on the care with which it is mixed and placed, and on continuous, careful, skilled supervision. This fact cannot be too forcibly stated, and should never be omitted from any consideration of concrete construction. There is no form of building where constant personal attention is so absolutely necessary as in concrete work. One barrow of poor concrete or one barrow of good concrete poorly placed in a wall may leave a poor section that cannot thereafter be made dense and tight. When concrete is once cast, no external inspection of the moulded wall can disclose the location or extent of the imperfect work. The builder should be reliable, responsible, and skilled, and the purchaser's inspection should be zealous and unremitting. These pre-requisites are



The completed Concrete Wall as it appears at the present time.

quite independent of, and auxiliary to, physical and chemical examinations of the components of the concrete. The general idea is that nearly anybody can make good concrete. The general fact is that the best concrete requires good judgment, good faith, incessant care and attention, and superior skill, as well as first-class materials."

During May of this year tenders were called for the reconstruction of the gas tank holder. The work consisted in rebuilding the interior of the gas tank holder to make it conform to the dimensions called for in the plans prepared by the Davis-Farnum Co., of Waltham, Mass.; of rendering the concrete walls and bottom of the tank impervious, or comparatively impervious, to the action of water; of replacing the gas tank and its framework, fittings, and all other connections in commission. Messrs. Merrill & Allen, engineers, of Toronto and Belleville, respectively, proceeded with the work by first lifting and supporting the two cylinders of the tank. This was a very important step, and by the method employed a perfectly clear space to work in was obtained. The attempts made previously to waterproof by giving the wall a tar paper lining had been accomplished by lifting the outer cylinder only. The accompanying views illustrate the various stages of the work as they progressed and the system employed of lifting and holding tanks in place during the progress of the work.

The original bottom lining was first completely removed and the rock floor prepared to receive the waterproofing lining. The first steps consisted of the removal of the surface of the original concrete walls in order to have a suitable surface for the adhesion of the new lining. The floor was lined with a special four-inch thoroughly waterproofed concrete layer, placed so as to insure thorough adhesion to the rock floor. Sufficient forms were employed to complete two circles at a time, the bottom one being carried above the other at each stage of the work. The walls were then lined with a special three-inch thoroughly waterproofed concrete layer, placed so as to insure thorough adhesion to the original wall. It consisted of a 1:2:4 mixture, with a large percentage of hydrate of lime. Special precautions were taken to insure tightness at the footing of these walls. A thorough drainage system was arranged in order to prevent the possibility of inward water pressure during and subsequent to the operations. The work was completed in less than three months, the guaranteed time. As it stands to-day, it is equal in all essential respects to an entire reconstruction. Tests have been conducted since its completion, and will be continued during the next nine months. The contractors were under a guarantee of a maximum leakage of not over fifteen gallons per hour. They were successful in keeping it under ten gallons, which is much under the guarantee. The contractors, Messrs. Merrill & Allen, have evidently taken every precaution, and have once more demonstrated the fact that concrete well built, with every attention to workmanship and used with discretion, offers no ground for the criticisms of those opposed to the use of this material.

APPLIED STATICS

(Continued from Page 638.)

From either of the last two Vector Polygons it is seen that both the forces BD and CA act against the pin. This places the members BD and CA, respectively, in compression, the magnitudes of the stresses being found from the magnitudes of the lines BD and CA (Fig. 90).

The stresses in the members DF and CE may be found by constructing the Vector Polygons for the points ACE and BDF, respectively, as shown in Figs. 92 and 94.

(These polygons will be shown next week.)

COMING MEETINGS.

Montana Society of Engineers.—January 6-8. Annual meeting at Butte, Mont. Secretary, Clinton, H. Moore, Butte.

American Association for the Advancement of Science.—December 27. Annual meeting at Boston, Mass. Secretary, L. O. Howard, Smithsonian Institution, Washington, D.C.

American Society of Agricultural Engineers.—December 28-29. Annual meeting at Ames, Iowa. Secretary, L. W. Chase, University of Nebraska, Lincoln, Neb.

Association of American Portland Cement Manufacturers.—December 14-15. Annual meeting at New York City. Secretary, Percy H. Wilson, Land Title Building, Philadelphia,

ENGINEERING SOCIETIES.

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

QUEBEC BRANCH—
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, J. G. G. Kerry; Secretary, E. A. James, 62 Church Street, Toronto. Meet last Thursday of the month.

MANITOBA BRANCH—
Chairman, H. N. Ruttan; 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 College.

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

MUNICIPAL ASSOCIATIONS.

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

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

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

UNION OF SASKATCHEWAN MUNICIPALITIES.—President, Mayor Hopkins, Saskatoon; Secretary, Mr. J. Kelso Hunter, City Clerk, Regina, Sask.

CANADIAN TECHNICAL SOCIETIES.

ALBERTA ASSOCIATION OF ARCHITECTS.—President, R. Percy Barnes, Edmonton; Secretary, H. M. Widdington, Strathcona, Alberta.

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

CANADIAN CEMENT AND CONCRETE ASSOCIATION.—President, Peter Gillespie, Toronto, Ont.; Vice-President, Gustave Kahn, Toronto; Secretary-Treasurer, Alfred E. Uren, 62 Church Street, Toronto.

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

CANADIAN FORESTRY ASSOCIATION.—President, Thomas Southworth; Secretary-Treasurer, King Radiator Company, Toronto; Secretary, James Lawler, 11 Queen's Park, Toronto.

CANADIAN INDEPENDENT TELEPHONE ASSOCIATION.—President, Dr. W. Doan, Harrietsville, Ont.; Secretary, Francis Dagger, Toronto.

CANADIAN MINING INSTITUTE.—Windsor Hotel, Montreal. President, W. G. Miller, Toronto; Secretary, H. Mortimer-Lamb, Montreal.

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

CANADIAN STREET RAILWAY ASSOCIATION.—President, D. McDonald, Manager, Montreal Street Railway; Secretary, Acton Burrows, 157 Bay Street, Toronto.

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

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

DOMINION LAND SURVEYORS.—Ottawa, Ont. Secretary, T. Nash.

EDMONTON ENGINEERING SOCIETY.—President, Dr. Martin Murphy; Secretary, B. F. Mitchel', City Engineer's Office, Edmonton, Alberta.

ENGINEER'S CLUB OF TORONTO.—96 King Street West. President, A. B. Barry; Secretary, R. B Wolsey. Meeting every Thursday evening during the fall and winter months.

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

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

NOVA SCOTIA 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, Louis Bolton; Secretary, Killaly Gamble, 703 Temple Building, Toronto.

ROYAL ARCHITECTURAL INSTITUTE OF CANADA.—President, A. F. Dunlop, R.C.A., Montreal, Que.; Hon. Secretary, Alcide Chausse, 5 Beaver Hall Square, Montreal, Que.

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 MINING CONGRESS.—President, J. H. Richards; Secretary, James F. Callbreath, Jr., Denver, Colorado.

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

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION.—President, Wm. McNab, Principal Assistant Engineer, G.T.R., Montreal, Que.; 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. Andrew Allen, President; J. H. Warder, Secretary.

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

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

(Continued from Page 617)

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

8693—November 17—Authorizing the C.P.R. to construct, maintain, and operate a system of industrial spurs for International Elevator Company, and St. Boniface, Man.

8694—November 18—Granting leave to the C.P.R. to open for the carriage of traffic the extension of its Snowflake Branch to Windygates, Manitoba, mileage 0 to 6.5.

8695—November 18—Recommending to the Governor-in-Council for sanction agreement of the C. N. R. with the Northern Extension Railway Company.

8696—November 15—Granting leave to the Winnipeg Electric Railway to operate their cars and trains over crossing at Logan Avenue, Winnipeg, Man., (C.P.R. crossing) for a further period of two months without being brought to a stop.

8697—November 18—Authorizing the C.P.R. to construct, maintain, and operate industrial spurs across Ross Avenue, Xante Street, and over Blocks 89, 90, 91, and 92, Lot 9, Winnipeg, Man.

8698—November 18—Authorizing the corporation of the city of Toronto, Ont., to lay ducts under the tracks of the G.T.R. and C.P.R. near Strachan Avenue, Toronto, Ont.

8699—November 18—Authorizing the city of Toronto to lay ducts under the tracks of the G.T.R. and C.P.R. on Strachan Avenue, (northern crossing), Toronto, Ont.

8700 and 8701—November 18—Granting leave to the village of Brussels, to erect, place, and maintain its wires across the track of the G.T.R. at intersection of its Wellington-Grey-Bruce division, Brussels, Ont., also across the G.T.R. at intersection of its London, Huron & Bruce division with concession line between 4th and 5th concessions, Township of Morris, Ont.

8702 and 8703—November 18—Granting leave to the Horton and McNab Telephone Company to erect, place, and maintain its wires across the track of the C.P.R. at a point on Lot 8, Concession 4, Township Horton, Ont., and one mile west of Castleford Station, Ont.

8704 to 8709 Inc.—November 19—Authorizing the C.P.R. to use and operate bridge at mileage 47, on its central division, Prince Albert branch, over the Battle River, western division, Wetaskiwin section; over the Government Drainage Ditch, central division, Lariviere section, and bridges, Nos. 147, 151, 196, 71, 84.3, 99.5, and 132.5 on its Cranbrook section, western division, and bridge 104.17 on its McLeod section over Old Man River, also bridges Nos. 1.5 and 102.9 on the western division, Edmonton section of its railway.

8710—November 19—Granting leave to the C.N.R. to operate temporarily and until further Order of the Board spur constructed by the G.T.P. Railway into the property of the Clover Bar Coal Company at Edmonton, Alta.

8711—October 29—Directing that the C.P.R. provide and construct a suitable highway crossing over its track at a point about one mile west of Carlin Station, B.C.

8712—November 20—Approving and sanctioning location of G.T.P. Railway Company's Calgary branch, mileage 0 to 24.753, Province Alberta.

8713—November 20—Approving and sanctioning location of G.T.P. Railway Company's Tofield-Calgary branch, mileage 24.75 to mileage 50, Alta.

(Continued on page 656.)

PAVEMENTS.

Mr. W. A. Clement, M. Can. Soc. C.E., the city engineer of Vancouver, B.C., and a committee of the Vancouver Council, Aldermen Macmillan and Crowne visited a number of United States cities to study the pavement problem. Several sections of their report are of general interest and the conclusions reached apply to more than one Canadian city.

1. A perfect pavement has not yet been found, no one paving material combining in itself all the desirable qualities.

2. Nearly every paving material possesses at least one advantageous characteristic not possessed by others.

3. Pavements which give good satisfaction in dry climates are often unsuitable for wet climates.

4. Pavements such as stone block, which would be intolerable on residential streets, often become a necessity on heavily travelled business streets.

5. Pavements which have many qualities to recommend them for streets with moderate grades, may be quite unsuitable for steep grades.

6. The increasing use of pneumatic rubber tired passenger vehicles and heavy drays propelled by gasoline and other motive powers makes it necessary that pavements to meet these conditions of travel, should besides having a durable wearing surface, which will provide a sure grip for horses feet, have great strength, and a surface which will, as far as possible, counteract the tendency of auto tires to slip or slide. It is also desirable that the pavements be inexpensive, or at least of moderate cost.

7. Steep grades in the business section.—From observation and information obtained we are of opinion that for streets with a steep grade in the business portion of the city, that sandstone blocks on concrete foundation occupy the first place, but that granitoid, on most of the streets in Vancouver, will serve the purpose equally well at less cost.

8. Moderate grades in the business section.—For streets in the business section with grades not exceeding three per cent. we consider that a pavement constructed of wood blocks of the large size, on concrete foundation, has more desirable qualities for uses in Vancouver, than any other pavement. It has a good surface for traction, is easy on horses and vehicles, is less noisy than other pavements, does not require a costly plant for making repairs, and when worn out, can be resurfaced with other materials. Granitoid would probably cost 10 or 15 per cent. less, and have a durable wearing surface, but would be more noisy, and harder on horses, as all unyielding pavements must be. If the large sized paving bricks of good quality can be obtained at a reasonable cost, they will also make a good durable pavement, but will be somewhat more noisy than granitoid.

9. Residential streets with moderate grades.—For residential streets with grades not exceeding [illegible] per cent. would blocks, bitulithic, granitoid and asphalt have more desirable qualities than other paving materials, but we would point out that expensive plants are required for constructing and repairing bitulithic and asphalt pavements, consequently we would not advise their use until the growth of the city warrants the maintenance of a civic plant, nor would we advise their use on streets where there are street railway tracks. In the case of wood blocks and granitoid, the plants required are inexpensive.

10. Residential streets with steep grades.—For residential streets with grades exceeding 5 per cent. we would advise the use of granitoid pavement, as it gives a good foothold for horses, and is not slippery for automobiles.

11. For the paving of lanes with steep grades, we would recommend, as in the case of steep streets, the laying of sandstone blocks, and for moderate grades, granitoid.

ENGINEER'S LIBRARY

THE CANADIAN ENGINEER'S MONTHLY INDEX OF CIVIL ENGINEERING LITERATURE.

The purpose of this monthly index is: To inform engineers and contractors of the literature published on those subjects in which they are especially interested, the character of the article and the journal in which it appeared. **We do not index in this section articles that appear in The Canadian Engineer.**

Periodicals containing articles indexed, should be ordered direct from the publishers.

LIST OF PERIODICALS INDEXED.

Canadian Society of Civil Engineers Proceedings.—(Can. Soc. C. E. Proc.), Montreal, Can., m., 4 x 7 in., 50 cents.

Canadian Cement and Concrete Review.—(Can. Cem. and Con. Rev.), Toronto, Ont., m., 9 x 14, 15 cents.

Contractor.—(Contr.), Chicago, Ill., bi.-w.; 7 x 10 in., 20 cents.

Engineering—Contracting.—(Eng.-Cont.) Chicago, Ill., w.; 9 x 12 in., 10 cents.

Engineering News.—(Eng. News), New York, N.Y., w.; 10 x 14 in., 15 cents.

Engineering Magazine.—(Eng. Mag.), New York, N.Y., 7 x 10 in., 25 cents.

Good Roads Magazine.—(Good Rd. Mag.), New York, U.S.A. 9 x 12 in., M., 10 cents.

Machinery.—(Mach.), New York, N.Y., m., 7 x 11 in., 20 cents.

Municipal Journal and Engineer.—(Mun. Jl. and Eng.), w., New York, N.Y., 9 x 12, 10 cents.

Municipal Engineering Magazine.—(Mun. Eng. Mag.), Indianapolis, Ill., m., 7 x 10 in., 25 cents.

Power and Engineer.—(Pow. and Eng.), New York, N.Y., w.; 9 x 12 in , 5 cents.

Railway Age Gazette.—(R. R. Age Gaz.), New York, w.; 8 x 11 in., 15 cents.

Surveyor, The.—(Sur.), London, Eng., w.; 6 x 11, 10 cents.

Engineering.—(Engr.), London, Eng., w.; 12 x 15 in., 15 cents.

*Illustrated.

CONCRETE AND REINFORCED CONCRETE.

Stresses in Concrete Beams.*—2½ pp. Eng.-Cont., Nov. 10. An article by Professor Gaetano Lanza and Lawrence S. Smith, comparing experimental results obtained from the use of three theories of distributed stresses.

Concrete Viaduct.*—2½ pp. R. R. Age, Nov. 26; photos and dimension drawings with descriptive article on reinforced concrete viaduct at Rotterdam.

White Portland Cement.*—Can. Cem. & Con. Review, 4 pp. Facts regarding its manufacture at Clayton, Mass., and its adaptation as a finishing surface to various materials.

RAILWAYS.

Valuation of Railway Properties.*—4 pp., R. R. Age, Nov. 19; the author, Robt. Yates, takes up item by item the various departments of the railroad and analyses a system for their valuation.

SEWAGE AND WATERWORKS.

Hydraulic Work.*—2 pp., Power and Eng., Nov. 9. W. Burns on plungers, valves, and frames for hydraulic jacks; manner of testing; making and treatment of cup leathers; gutta percha forms.

Centrifugal Pumps.*—4½ pp., Power and Eng., Nov. 23, a study of three methods used to find efficiency of centrifugal pumps.

Water Purification.*—2½ pp., Mun. Jl. & Eng., Nov. 10; a description of the purification works at Wilmington, Del.

Storm Water Sewers.*—2½ pp., Mun. Jl. & Eng., Nov. 10. Methods, formulaes and data used in calculation capacity of storm water sewers in New York.

Pumping Plant and Filters.*—5 pp., Pow. & Eng., Nov. 16. Describes Torresdale centrifugal pumping station and large filter plant.

ROADWAYS AND PAVEMENTS

Roadway Crowns.*—1½ pp., Mun. Jl. & Eng., Nov. 17; a plea for simple statements in place of formulae.

Mountain Road-building.*—5 pp., Good Road Mag. Describes construction of road to and up Mount Rainier.

LIGHT, HEAT, AND POWER

Steam Boilers.*—3 pp., Pow. & Eng., Nov. 16. Telling what should be done to render safe and keep in good condition small boilers.

MISCELLANEOUS.

Cost of Erecting Steel Smoke-stack.*—½ p. Eng.-Cont., Nov. 10. Method and cost of erecting a sixty-six inch by a hundred and sixty foot steel stack in one piece.

Stadia Rod.*—½ p., Eng.-Cont., Nov. 17; design and method of constructing a stadia rod, divided to tenths.

Manhattan Bridge.*—9 pp., Eng.-News, Oct. 14; a copy of Ralph Modjeska's report on the design and construction of the Manhattan Bridge over East River, New York.

Bridge Construction.*—2½ p.p., Cont., Nov. 15; dealing with method of bridge construction and erection.

Broadway Street Bridge.*—7 pp., Eng. News, Nov. 25; describing the desgin and giving particulars of erection and test of this bridge.

BOOK REVIEWS.

Books reviewed in these columns may be secured from the Book Department, Canadian Engineer, 62 Church Street, Toronto.

Pocket Companion, containing useful information regarding the use of iron and steel, for engineers, architects, and builders; leather bound, gilt edges, 300 pages pocket size. Carnegie Steel Company, Pittsburgh, Pa; Mr. T. Guilford Smith, manager of sales, 208 Ellicott Square, Buffalo, N.Y., U.S.A., together with a seventy-page supplement, Part I., of which contains corrections and additions to the data published in the above company's well-known shape book of 1903. Part II. of the supplement includes many new sections and several tables of weights not given in the larger publication, which contains a host of information on angles, beams, channels and steel work generally, as well as tables of properties and new tables of safe loads for channel columns.

Standard Steel Construction, 1908, revised by Mr. F. L. Garlinghouse. C.E., member A.S.C.E., and published by the

Jones and Laughlin Steel Company, of Pittsburg and Chicago. U.S.A. Pocket size, 300 pages, leather bound.

This revised edition of the above company's standard handbook contains data relating to beams, channels, and structural shapes. The permissible working shear and bearing for rivets has been brought up-to-date to make it consistent with the balance of unit loads used in proportioning steel structures. The standard specifications for structural steel are given in full and correspond with those adopted in 1903 by the Association of American Steel Manufacturers. Much old matter has been revised, while new material of value has also been added.

"Electric Lamps."—By Maurice Solomon, A.C.G.L., A.M.I.E.E. Published by Archibald Constable & Company, London. 321 pp., 112 illustrations, and 34 tables. Price, net, $1.80. The book, as its name implies, is a treatise describing the manufacture, operation, testing and characteristic of electric lamps which have been proved a commercial success. The opening chapters briefly discuss artificial illumination, studying the characteristics that distinguish it from daylight, defining the various technical terms in common use and their importance in the science of illumination. The various photometers in use are described and the principles of their operation clearly given, with a discussion on the common methods of testing electric lamps. The practical manufacture of the carbon filament, Nernst and metallic filament lamps, is described in detail, taking up life tests, distribution of light and efficiency, accompanied by numerous general curves of distribution and efficiency. Arc lamps are discussed generally, touching on their characteristics, operation, efficiency, and the manufacture of carbons. The newer types of flame arc lamps being given considerable attention. The author concludes by comparing the various types of lamps as light producers and their use, giving tables showing the relative efficiency, including cost of power, maintenance and renewals. The book is well written by one familiar with the practical manufacture of lamps and contains much useful information.—F. A. G.

Railroad Curves and Earthwork.—By C. Frank Allen, S.B. Published by Spon & Chamberlin, 123 Liberty Street, New York. Leather binding, 4½ x 6½; pages, 225; price, $2.00.

This is the fourth edition, and in revising this work the chapter on Turnouts has been rewritten so as to apply to split switches.

The book contains chapters on: 1. Reconnoissance. 2. Preliminary survey. 3. Location survey. 4. Simple curves. 5. Compound curves. 6. Reversed curves. 7. Parabolic curves. 8. Turnouts. 9. "Y" tracks and crossings. 10. Cubic spiral easement curve. 11. Setting stakes for earthwork. 12. Methods of computing earthwork. 13. Special problems in earthwork. 14. Earthwork tables. 15. Earthwork diagrams. 16. Haul. 17. Mass diagram. Tables and diagrams. Diagram for three level sections Base 14, slope 1½ to 1. Diagram for three level sections Base 20, slope 1½ to 1. Diagram for prismoidal correction, diagram for triangular prisms. It is a compact convenient work, handy to carry, complete and very useful on railroad location, construction or maintenance.

Field and Office Tables.—By C. Frank Allen, S.B. Published by Spon and Chamberlin, 123 Liberty Street, New York. Limp leather binding, 4½ x 6½; pages, 293; price, $2.00.

This is a companion book for Railroad Curves and Earthwork by the same author. The two books may be secured in one binding for $3.00.

It is hoped that these tables will be found more complete than those that have preceded. Great care has been taken by the author in the selection, arrangement and computation of these tables. The tables having been checked by several expert mathematicians to correct them from any errors. The tables given are:—Radii and their Logarithms, Tangent Offsets and Middle Ordinates, Tangent Distances for 1° Curve, Corrections for Tangent Distances, External Distances for a 1° Curve, Offsets from Tangent for a 10° Curve, Angles Proportional to Squares of Distances, Long Chords and Actual Arcs, Acres for Strip 100 Feet Wide, Curves for Metric System, Barometric Heights, Logarithms of Numbers, Logarithmic Sines, Cosines, Tangents and Cotangents, Auxiliary Tables for Logarithmic Sines and Tagents of Small Angles, Logarithmic Versed Sines and External Secants, Auxiliary Versed Sines and External Secants of Small Angles, Natural Sines and Cosines, Natural Tangents and Cotangents, Natural Versed Sines and External Secants, Lengths of Circular Arcs; Radius = 1, Squares, Cubes, Square Roots, Cube Roots and Reciprocals, Turnouts and Switches, Velocity Heights, Rise per Mile of Various Grades, Elevation of Outer Rail on Curves, Inches in Decimals of a Foot, Middle Ordinates for Curving Rails, Stadia Reductions, Horizontal and Vertical, Mean Refractions in Declination, Triangular Prisms; Cubic Yards per 50 Feet, Prismoidal Correction; Cubic Yards per 100 Feet, Three Level Sections; Cubic Yards for 50 Feet, Cubic Spiral Easement Curves, Numbers and Formulas, Explanation of Tables.

Specifications.—Compiled by the Canadian Inspection Company, Stair Building, Toronto, Ont., and Canadian Express Building, Montreal. Size, 4½ x 6; pages, 130.

This publication contains specifications for bridges, steel and malleable castings, steel rails, splice bars, track spikes, track bolts, galvanized iron wire, woven wire fence, cast iron pipe, and cement.

It also contains several pages of useful tables dealing with weight, specific gravity of materials, etc.

Co-Ordinate Geometry as Applied to Land-Surveying.—By Woodford Pilkington, M. Inst. C.E. Published by Spon and Chamberlain, 123 Liberty Street, New York. Size, 4 x 6; pages, 46; price, 40 cents.

The author describes a method of making surveys and preparing diagrams to be used in the description and transfer of land where property is located by triangulation surveys. It would be a system admirably suited for Nova Scotia and New Brunswick where the records and systems of survey are so ill-defined and complicated.

Essentials of Sanitary Science.—By Gilbert E. Brooke. Published by Henry Kimpton, Holborn, London, E.C.

The edition is prepared specially for the student in sanitary science, and should prove of great value to medical men who desire to take up public health.

The sanitary engineer is at times faced with chemical questions arising out of his work, he will find the above concise edition extremely handy as a work of reference in throwing light upon questions affecting purity of water or sewage effluents. It is more a text-book than a treatise and deals extensively with definitions relating to questions in hydrostatics, pneumatics, heat, meterology, air, water, disinfectants, bacteriology, vital statistics, sanitary administration, etc., etc. We are sometimes asked by the sanitary engineer to recommend a book which will explain many of the terms used by chemists and bacteriologists in dealing with water and sewage questions. We can recommend the above small volume as just giving the necessary information required.—T. A. M.

"Sanitary Engineering."—By Colonel E. C. S. Moore, R.E. Third edition, two volumes, revised, and in part re-written, by E. I. Silcock, M. Inst., C.E. Published by B. T. Batsford, High Holborn, London, in two volumes. Pages, 950; tables, 160; illustrations, 920; price, $12.00.

This edition recently published forms a complete up-to-date book of reference on sanitary engineering, and will at once take its place as a leading treatise on the subject. In fact since the now out of date publications by Baldwin, Latham & Baily Denton, no such complete and extensive work has been placed on the market. Vol. 1 deals with Sewerage, Hydraulics, Sewer and Drain Ventilation, Sanitary Fittings and Apparatus; while Vol. 2 includes Land Drainage, Sanitary Notes, Sewage Disposal, Refuse Destructors, Trade Effluents, and Sewage Fungus.

In preparing the present edition Mr. Silcock has kept as far as possible to the general arrangement adopted by the late Col. Moore, but the work is brought entirely up-to-date, and much new and valuable information added dealing with the recognized methods of **Sewage Purification and Sewage Ventilation.** The large number of complete plates including plans and details of modern works will be found most useful, both to the student and practising engineer. A résumé of the reports of the Royal Commission on Sewage Disposal form part of the work. New and valuable information is introduced upon questions of:—"Rainfall in Sewers," "Sewage Lifting," "Trade Effluents," "Sewage Fungus," etc.

The standard value of Moore's hydraulic tables have universal recognition, and the practical and useful manner in which they are presented for easy reference will appeal to every sanitary engineer.

On going through the two volumes, it appears impossible to point to any one subject in connection with sanitary engineering which is not fully dealt with. Even questions in detail on plumbing are just as carefully gone into in detail as more important engineering subjects.

We must certainly advise every engineer on public health questions to see to it that he has these two valuable volumes within reach for immediate reference.—T. A. M.

Modern Methods of Street Cleaning.—By Geo. A. Soper, Ph.D., M.A.S.C.E. Published by the Engineering News Publishing Company, New York. Price, $3.

This edition is largely the result of a three months' visit to Europe in 1907 by the author, in order to collect notes for an advisory commission on street cleaning for New York, appointed by Mayor McClellan. Much valuable statistical information is given in connection with several large European cities, including London, Paris and Berlin. A comparison is made between foreign methods of street cleaning and those in vogue in New York City.

Valuable information is supplied generally upon such questions as "Reason for extravagance and inefficiency in street cleaning." "Preventable and Unavoidable Littering," "Public Receptacles for Refuse," "General Methods of Street Sweeping," and the "Use of Water in Cleansing Pavements," etc. The volume is of great practical interest and should prove of considerable value to those in authority over street cleaning departments.—T. A. M.

Investigation of the Peat Bogs and Peat Industry of Canada, by Erik Nystrom, M.E., and S. A. Aurep, M.E. Bulletin No. 1 Department of Mines, Ottawa. Pages 25. Size, 6 × 9.

The importance of the peat fuel industry to the central portion of Canada, where coal fuel is non-existent and its importation so comparatively costly, requires no demonstration.

The mines branch of the Department of Mines, Ottawa, issued a year ago a report on "Peat and Lignite, their Manufacture and Uses in Europe," with the object of giving to Canadians as complete a review as possible of this industry in those countries in which it has been most successfully carried on.

This report is now followed by a bulletin entitled "The Investigation of the Peat Bogs and Peat Industry of Canada during the season of 1908-09," by Erik Nystrom, M.E., peat expert. This bulletin comprises 25 pages of text, and includes six large scale maps of the following peat bogs:—

1. Mer Bleue, near Ottawa.
2. The Alfred Peat Bog, about 40 miles from Ottawa.
3. The Welland Peat Bog, about six miles north of Welland.
4. The Newington Bog, on the New York and Ottawa Railway, and about 40 miles from Ottawa.
5. The Perth Bog, a mile and a half from Perth.
6. The Victoria Road Bog, about a mile from Victoria Road Station on the Midland division of the Grand Trunk Railway.

The bulletin contains a descriptive report of each bog, showing the location, area, and structure, and giving an estimate of the available supply of peat fuel with records of analyses, calorific value, etc., and should be of particular interest to those engaged in or connected with, the development of Canadian peat resources.

A fuel testing plant is now being erected at Ottawa, in which the value of peat for the production of power gas will be demonstrated, and the Department proposes to carry on a very thorough investigation of this subject.

Copies of the above Bulletin and Report on Peat may be had on application to Dr. Haanel, Director of Mines, Ottawa.

A Brief History of Cements.—An interesting booklet written by I. C. Johnson, of Mayfield, Gravesend, England, and published by the Cement Record Company, Kansas City, Mo. The original invention and early history of Portland cement is not in general thoroughly understood. As the preface states, text books on cement and concrete mention those men who have gained fame through inventions that have aided the industry to develop to its present stage, but the early history and those who were first to understand this material and the difficulties, etc., under which they labored has been but little touched upon. This book contains a biography of Mr. Johnson, a brief history of cements, as well as other information as to the early days of its manufacture that will be read with interest. It is well illustrated. The price is fifty cents.

Railroad Promotion and Capitalization in the United States, by Frederick A. Cleveland, Ph. D., and Fred Wilbur Powell, A. M. Longmans, Green, & Company, publishers, 91 and 93 Fifth Avenue, New York, U. S. A.

Over three hundred pages of valuable information, gathered from many sources, carefully classified and indexed, constitute a volume whose scope is practically unlimited. Each of the eighteen chapters teems with data affecting the administration and affairs of railroads that is available in no other single publication.

Notes regarding the conditions existing in the 18th century—the first era of transportation development—are given in the opening chapters. Early accounts of the railway, views expressed in 1802 as to the practicability and the advantages of a general system of railroads, and much early history of the locomotive, including references to the men responsible for the first steam engines built, together with a few pages devoted to the situation in America at that time, comprise Chapter III. Observations apropos of the effect of

early experiments on popular and investment opinion, backed up by an abundance of conclusive testimony, brief mention of the question of signals and double-tracking, and reference to the elements of opposition and the results of practical demonstration, with some notes relative to the lines constructed during the forties, form the fourth chapter.

Chapter V., entitled "The Economic Basis of Transportation Development," is devoted to a discussion of transportation enterprise from the point of view of investors and capitalists. Railway transportation and canal transportation are compared—to show the advantages possessed by railway. State finding of transportation enterprise, rivalry between trade centres in its relation to promotion and capitalization and the promotion of private companies are the subjects dealt with in the sixth, seventh and eighth chapters, while chapter IX. is devoted to Reconnaissance and Surveys.

Promoters will be particularly interested in chapter X., which takes up legislative provisions as an element in promotion and capitalization. This embraces, among others, the questions of charter and general laws, right to operate. maximum rates for operation, limit of profits, monopoly privileges, tax exemptions and subsidy laws. Chapters XI. and XII. deal with the methods of appeal for financial support and individual and local subsidies to private companies, while thirty pages immediately following are devoted to State aid to private companies, the reaction against State and local subsidies and National aid to private companies. Chapter XII. on Transcontinental Railroads is especially interesting. It is followed by a section which relates to financial institutions and syndicates as agencies of capitalization, and the volume concludes with a good bibliography and an alphabetically-arranged list of sources and materials which is of inestimable value.

Much has been written upon the subject of railway promotion and kindred subjects, but for many reasons which it is unnecessary to enumerate, "Railroad Promotion and Capitalization" must take first place.—Wm. M.

Report on Chromite Deposits.—The Mines Branch of the Department of Mines of Canada has just issued a "Report on the Chrome Iron Ore Deposits of the Eastern Townships," by Fritz Cirkel, M.E.

In the last few years, owing to the rapid development of the iron and steel industry in Canada, more than ordinary interest has been manifested by the mining and metallurgical public in respect to the Canadian deposits of raw materials and ores, which enter into the manufacture of iron and steel products. To meet the demand for information on these subjects, the Mines Branch has undertaken to issue a series of reports on the Canadian deposits of the substances which form the basis of the iron and steel industry. Several reports on iron ores and one on tungsten ores have already been issued and the present report is another of this series.

The scope of the "Report on the Chrome Iron Ore Deposits in the Eastern Townships of the Province of Quebec" is best judged by quoting the Table of Contents, which is as follows:—

"Introduction.—Chapter I., Historical; Chapter II., The Chrome Iron Ore Deposits of Canada; Chapter III., Mining of Chrome Iron Ore; Chapter IV., Dressing for the Market; Chapter V., Market Prices, and Status of the Canadian Industry; Chapter VI., Chrome Iron Ore Mines: Prospects in Canada; Chapter VII., Chrome Iron Ores in Foreign Countries; Chapter VIII., Origin; Chapter IX., Composition of Chrome Iron Ores; Chapter X., Statistics and Chronology; Chapter XI., Determination of the Value of Chromium; Chapter XII., Uses of Chromium; Chapter XIII., Technology of Chromium and its Compounds; Appendix II., Experiments with Chromite at McGill University; Bibliography."

The report is well illustrated by eleven plates in halftone, from photographs of mines, mills and machinery; and fifteen diagrams, maps and drawings all illustrative of the chromite industry. The author of the report is Mr. Fritz Cirkel, Mining Engineer. This work was entrusted to Mr. Cirkel on account of his long connection, as consulting engineer, with the chromite and the asbestos industries; the deposits of these two substances in the Province of Quebec occur in the same region, and the origin of both is closely connected with the serpentine rocks of the Eastern Townships.

The typography of the report is very good and the book will form a welcome addition to the library of the mining engineer, the metallurgist, and the capitalist interested in the iron and steel industry. Moreover, it may be pointed out that the chapters on the uses, the technology, the metallurgy of chromium, and those on the origin, the composition of chrome iron ores, as well as the Bibliography, will be appreciated by all students and investigators on the subject of Chromium and Chromite.

The book is obtainable on application to Dr. Eugene Haanel, Director of Mines, Department of Mines of Canada, Ottawa.

The several occurrences of tungsten ore in Canada are described in detail, and a general statement is given on the geological occurrence of the ores, chemical tests, concentration, the uses of the metal, producing mines in other countries, statistics of the world's production, etc., while a very useful bibliography of the literature on Canadian and United States occurrences is added.

In view of the present condition of the iron ore industry of Canada and particularly Nova Scotia, where so much imported iron ore is being used, this report should be of special value to mining engineers, investors and others interested in the development of the iron resources of this province.

PUBLICATIONS RECEIVED.

Methods and Devices for Bacterial Treatment of Sewage.—By William Mayo Venable, M.S., M. Am. Soc. C.E. First edition, 240 pages, 6 x 9, $3. Published by John Wiley & Sons, New York, U.S.A.; Renouf Publishing Company, Montreal.

Publications:—New Catalogue of the Publications of the Geological Survey, Department of Mines, Ottawa, (No. 1073) —revised to July 1, 1909. Issued September, 1909.

White Horse Copper Belt—Report on the Whitehorse Copper Belt, Yukon, by R. G. McConnell, (No. 1050). Published October, 1909, by the Geological Survey, Department of Mines, Ottawa. Pp. 63, 4 illustrations, 8 maps.

Rossland Camp.—Geological Map of Rossland Mining Camp B.C., scale of 1,200 feet to 1 inch. Published by the Geological Survey, Department of Mines, Ottawa, 1909.

Coal Fields.—Report on the Coal Fields of Manitoba, Saskatchewan, Alberta and Eastern British Columbia, by D. B. Dowling, (No. 1035) Published, October, 1909, by the Geological Survey, Department of Mines, Ottawa. Pp. 111, 14 illustrations, and colored map.

RAILWAY EARNINGS AND STOCK QUOTATIONS

NAME OF COMPANY	Mileage Operated	Capital in Thousands	Par Value	EARNINGS Week of Nov. 28 1909	EARNINGS Week of Nov. 28 1908	STOCK QUOTATIONS TORONTO Price Dec. 3 '08	Price Nov. 25 '09	Price Dec. 2 '09	Sales Week End'd Dec. 2	MONTREAL Price Dec. 3 08	Price Nov. 25 '09	Price Dec. 2 '09	Salk Weed End' Dec. 2
Canadian Pacific Railway	8,920.6	$150,000	$100	1,682,000	2,141,000	175	177¾	176¾	178¼	501	176¾	175½	177	176¾	178¼	178⅝	610
Canadian Northern Railway	3,180	.....	.....	44,500	377,900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Grand Trunk Railway	3,536	226,000	100	2,127,837	1,007,266	.....	.....	*1st. pref. 103½, 3rd pref. 50½, ordinary 20½	.....	.....	.....	.....	.....	.....	.....	.....	.....
T. & N. O.	334	(Gov. Road)	.....	48,420	25,739	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Montreal Street Railway	138.3	18,000	100	74,838	68,575	.....	.....	.....	.....	203½	203	213⅝	213½	212½	211	682
Toronto Street Railway	114	8,000	100	75,625	67,836	108	107	124½	124⅝	125	123⅜	10	107½	107	124⅜	124½	124	716
Winnipeg Electric	70	6,000	100	.....	.....	167⅜	167	185	185	.....	.....	.....	170	166	.....	.....	.....	.....

* G.T.R. Stock is not listed on Canadian Exchanges These prices are quoted on the London Stock Exchange.

RAILWAY ACCIDENTS IN CANADA.

A statement showing the character of accidents on various railways operating in Canada under Dominion charter for year ending March 31st, 1909, as compiled by the Board of Railway Commissioners for Canada.

Character of Accident.	Passengers. K.	Passengers. I.	Employees. K.	Employees. I.	Other Persons. K.	Other Persons. I.	Totals. K.	Totals. I.
Derailment	1	87	10	40	..	4	11	131
Head-on collision	3	23	25	39	..	2	28	64
Stealing ride	.	..	..	..	2	12	2	12
While shunting	.	..	1	6	..	..	1	6
Level crossing	.	..	..	..	41	54	41	54
Falling off freight cars	.	..	12	36	3	2	15	38
Trespassing	.	..	..	..	83	57	83	57
Body found on track or bridge	1	..	1	..	47	..	49	..
While switching	1	..	15	39	2	1	18	40
Pitch-in with hand car	.	..	6	6	2	..	8	6
Died on train, natural cause	1	..	..	..	..	..	1	..
Working under cars	.	..	..	4	..	..	..	4
Struck looking out of cab window.	.	..	..	5	..	..	..	5
Suicide	1	..	1	..	5	..	7	..
Struck by switch stand	.	..	1	8	..	..	1	8
Adjusting couplers coupling	.	..	11	60	..	..	11	60
Passengers falling off trains	7	10	..	..	..	..	7	10
Working on track	.	..	22	23	..	..	22	23
Working on bridge	.	..	2	2	..	..	2	2
Collision rear end	7	50	8	14	..	..	15	64
Collision street car and steam car	.	..	1	1	..	..	1	1
Boarding train in motion	1	9	3	17	8	12	12	38
Side ladders	.	..	..	7	..	..	..	7
Falling off cars	.	..	1	3	1	..	2	3
Fell off work train	.	..	..	2	..	..	..	2
Falling off hand car	.	..	1	8	..	..	1	8
Farm crossing	.	..	..	..	1	..	1	..
Bridge burnt	.	..	..	3	..	..	..	3
Collision with cars standing foul.	.	2	..	6	..	..	..	8
Under construction	.	..	..	..	9	18	9	18
Working under engine	.	..	1	2	..	..	1	2
Locomotive explosion	.	..	2	..	..	..	2	..
Jumping off train in motion	3	15	4	17	2	4	9	36
Wash out	.	4	4	2	..	..	4	6
Riding on pilot of engine	.	..	..	6	..	..	..	6
Working on the cars and engines	.	..	..	2	..	..	..	2
Overhead bridge	.	..	..	2	..	..	..	2
Fell off tender when moving water spout	.	..	..	7	..	..	..	7
Working in shop	.	..	2	97	..	..	2	97
Falling off bridge or trestle	.	..	6	6	4	4	10	10
Struck by water spout	.	..	..	2	..	..	..	2
Ran into open switch	.	10	5	14	..	..	5	24
Unclassified	.	17	46	283	21	35	67	335
Totals	26	227	191	769	231	205	448	1,201

Comparing the number of killed and injured this year with last we find:—

	Passengers. K.	Passengers. I.	Employees. K.	Employees. I.	Other Persons. K.	Other Persons. I.	Totals. K.	Totals. I.
Year ending March 31st, 1908	64	326	246	806	219	177	529	1,309
Year ending March 31st, 1909	26	227	191	769	231	205	448	1,201
Increase over 1908	..	...	...	...	12	28	...	.....
Decrease over 1909	38	99	55	37	...	...	81	108

Toronto Street Railway earnings for week ended December 4th, were:—1909, $75,710; 1908, $68,362; increase over 1908, $7,347. The gross earnings of the Halifax Electric Tramway for the final week in November amounted to $4,668.89, an increase of $978.21.

C. P. R. traffic returns for October, 1909: Gross earnings, $9,744,597; working expenses, $5,358,300; net profits, $4,386,297. In October, 1908, the net profits were $2,655,267 and for four months ended October 31st, 1909, the figures are as follows:—Gross earnings, $32,634,789; working expenses, $19,372,674; net profits, $13,262,115. For four months ended October 31st, 1908, there was a net profit of $9,623,346. The increase in net profits over the same period last year is therefore for October $1,731,030 and for four months ended October 31st, there was an increase of $3,638,769.

Industrial accidents occurring to 439 individual workpeople in Canada during the month of October were reported to the Department of Labor. Of these 146 were fatal, and 293 resulted in serious injuries. Twenty-six railway employees were killed and 44 injured. During the month there were eleven trade disputes in existence, affecting 68 firms and 4,361 employees. The loss of time to employees was approximately 100,190 working days, compared with 37,880 days in October of last year.

NOVEMBER RAILWAY EARNINGS.

Steam and Electric Roads in Canada.

Although a decrease is shown when the figures for the past two months are compared, the railway earnings for November, 1909, indicate an increase of two million dollars over the same month in 1908, so far as the companies included in the accompanying table are concerned, while the returns for the eleven months of this year show an increase of over sixteen millions as compared with the same period last year.

Here is a statement showing how the figures for the past three months compare:—

	November, '09.	October, '09.	Sept., '09.
C. P. R.	$8,868,000	$9,684,000	$8,148,000
C. N. R.	449,500	1,384,200	1,076,000
G. T. R.	1,127,837	4,043,361	3,959,004
T. & N. O.	155,347	161,366	153,217
Montreal St.	330,693	305,652	307,489
Toronto St.	325,016	332,453	379,581
London St.	18,693	19,047	24,645
	$11,275,086	$15,930,079	$14,047,936

Road	Nov., '09.	Nov., '08.	Increase.	Jan'y 1st to Nov. 30, '09.	Jan'y 1st to Nov. 30, '08.	Increase
Canadian Pacific	$8,868,000	$7,106,000	$1,762,000	$75,824,860	$63,236,000	$12,588,860
Canadian Northern	449,500	377,900	71,600	8,604,160	7,650,700	953,460
Grand Trunk	1,127,837	1,007,266	120,571	34,651,278	32,957,220	1,694,058
T. & N. O.	155,347	77,813	77,534	1,399,569	767,055	632,514
Montreal Street	330,693	294,764	35,929	3,278,272	3,071,377	206,895
Toronto Street	325,016	286,557	38,459	3,241,233	2,938,636	302,597
London Street	18,693	17,290	1,403	216,849	210,667	6,182
Totals	$11,275,086	$9,167,590	$2,107,496	$127,216,221	$110,831,655	$16,385,566

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.

Nova Scotia.

FREDERICTON.—Tenders for lighting will be received up to noon on December 13th, for installing acetylene lighting plant in the Provincial Education Office. John Morrissy, Chief Commissioner of Public Works.

Quebec.

MONTREAL.—Tenders will be received until Saturday, the 11th December, for tile floor, city hall building. L. O. David, City Clerk.

QUEBEC.—Contractors for bridge superstructure are invited to visit the office of the Board of Engineers in the Canadian Express Building, Montreal, after January 3rd, 1910, where information may be had to enable them to prepare bids for the superstructure of a 1,758 feet span bridge 88 feet in width. The contractor is invited to submit alternative designs, which must conform to the conditions laid down in the general specification. L. K. Jones, secretary, Department of Railways and Canals, Ottawa. (Advertised in the Canadian Engineer.)

Ontario.

BERLIN.—Tenders will be received up to 14th December by Edmond Pequegnat, secretary of the Berlin School Board, Berlin, Ont., for the erection of an eight-rooom public school. Munro & Mead, architects, Hamilton, Ont.

KINGSTON.—Tenders will shortly be invited by the city engineer for next year's supply of cement and tile. Mr. H. B. R. Craig is the city engineer.

KINGSTON.—Tenders for ordnance store fittings will be received until Monday, December 13. Mr. Napoleon Tessier, Department of Public Works, Ottawa.

OTTAWA.—Tenders will be received upto three o'clock Tuesday, December 14th, for the construction of a tile pipe sewer on St. Patrick Street, between King Edward Avenue, and Notre Dame Street. Newton J. Ker, City Engineer.

ST. THOMAS.—Tenders will be advertised for by the city in a few days for motors and transformers for the power house, to be installed in connection with the Hydro-Electric power.

TORONTO.—Tenders will be received until Monday, December 20th, for alterations and fittings, Drill Hall, Toronto. Further particulars obtainable on application to Mr. Thos. Hastings, Clerk of Works, Toronto; Napoleon Tessier, secretary, Department of Public Works, Ottawa. (Advertisement in the Canadian Engineer.)

TORONTO.—Tenders will be received until December 13th, for labor, tools, machinery and plant for grading between Cobalt and North Cobalt. Mr. A. T. McGee, secretary-treasurer, T. & N. O. Railway, 25 Toronto Street, Toronto.

TORONTO.—Tenders will be received until December 21st for a supply of 48-inch special castings for the connection between the waterworks tunnel and the new 15 million gallon engine. Mr. Joseph Oliver, (Mayor) Chairman Board of Control; Mr. C. H. Rust, City Engineer. (Advertisement in the Canadian Engineer.)

Manitoba.

WINNIPEG.—Tenders for poles will be received until December 10th, for the supply of Telegraph Poles, required for 1910. F. C. Paterson, Chairman Telephone Commission.

WINNIPEG.—Tenders will be received up to Friday, December 31st, for the supply of about eighteen thousand posts, for the manufacture and delivery of about forty-two miles of woven wire fence, and for the erection of the fence along the right-of-way of the City's Transmission Line, between the Brokenhead River and the city. M. Peterson, Secretary, Board of Control.

Alberta

WETASKIWIN.—Tenders are invited for a steam pump. Write Alderman Gross, Fire, Light and Water Committee.

British Columbia.

NELSON. — By the Nelson Street Railway Company, Limited, tenders are requested for two semi-convertible cars and for station metering and switching equipment, full particulars of which with copies of specifications can be secured at the office of E. B. McDermid, Secretary-treasurer.

U. S. A.

ALBANY, N. Y.—Tenders will be received until Tuesday, December 28th, for improvements to the Erie and Champlain canals. Further particulars on application to F. C. Stevens, superintendent of Public Works, Albany, N. Y., and at Canal office, Spaulding's Exchange, Buffalo, N. Y.

DETROIT, MICH.—Proposals will be received up to Tuesday, December 28th, for furnishing and erecting the structural steel and iron work for Engine Room building of the New Pumping Station. Benj. F. Guiney, Secretary.

CONTRACTS AWARDED.

Nova Scotia.

FREDERICTON.—The contract for rebuilding the Gaudet bridge at Shediac has been given to Julien Cormier, of Shediac, at about $3,000.

New Brunswick.

ST. JOHN.—At a recent council meeting tenders for a new boiler were opened. The St. John Iron Works tender was $569; the Phoenix Foundry wanted $685, and the International Power Company, Boston, $975. The tender of the iron works was accepted. Frank E. Jones's tender of $170.80 for wiring City Hall was accepted.

Quebec.

HULL.—On Monday the council opened tenders in connection with the bridge over Brewery Creek. The bids were as follows: Mr. Brisson, $4,658; Carriere & Wilson, $6,032; Mr. Laverdure, $5,263. The contract was awarded to Mr. Brisson and the ironwark to the Trussed Concrete Steel Company, of Toronto, at a figure of $1,115. The pump tenders left over until next Monday.

QUEBEC.—It is undertsood that the contract for the sub-structure of the new Quebec bridge has been awarded to Mr. M. P. Davis, the Ottawa contractor who built the original pier work. The price of the new work is stated as in the neighborhood of $2,500,000.

Ontario.

COLLINGWOOD.—J. Stephens was given a contract at $775, for seating in exhibition building which will be used as a rink.

HAMILTON.—The Canadian Westinghouse Company will probably install the motors for the waterworks pumps at the beach for Hydro-Electric power.

HAMILTON.—Contracts were awarded as follows at a recent meeting of the council:—1,400 foot sewer on Barton Street, Andrew Mercer, $112 per foot; other tenders, S. Cheeseman, $124; city engineer $110. New septic tank at Ferguson Avenue disposal works, Sawyer-Massey Company, $438; only tender received; pile driving, E. A. Fearnside, 35 cents a foot; only tender received.

NORTH TORONTO.—A contract for the installation of a fire alarm system at North Toronto, has been awarded to the Holmes Electric Company of Toronto, at $1,400.

TORONTO.—At Wednesday council meeting the Gaul Lumber Company and the J. B. Reid Company, got all the lumber contracts for an exceptionally large quantity and the Canada Foundry Company the contract for supplying 2,000 lengths of 12-inch cast-iron pipe at $16.75 a length.

PORT COLBORNE.—Messrs. H. W. Petrie, Limited, of Toronto and Montreal, have been awarded the contract by this municipality for a single-acting, triple power pump with a capacity of 400 gallons per minute against a pressure

of 80 lbs., erected on foundation, ready for operation, at $1,950.

Saskatchewan.

SASKATOON.—A contract for the construction of an attachment to the C. N. R. bridge was awarded to Strickland Brothers at $2,200.

Alberta.

WETASKIWIN.—Contracts have been awarded by this municipality for a 40 h.p. gas engine to the Canadian Westinghouse Company, at $3,200, and for a Dean gas driver pump, at $1,950.

British Columbia.

SOUTH VANCOUVER.—This municipality has let a contract for grading south boundary of 667, at $26 per chain to S. Bliss. The road is to be cleared 33 feet wide and 24 feet graded between outside and ditches. Mr. Bliss also received a contract for clearing and grading Somerville Street, at $22 a chain, while Joseph Rogers was given an order for grading and clearing at $22.50 per chain.

VICTORIA.—Contracts for twelve steel tubular poles for trolley and arc lamp supports have been awarded by this city to Messrs. Hutchinson Bros., Company, Limited, of Victoria, at $1,500.

VICTORIA.—Tenders for thirty-five tons of lead pipe were received from the John Colbert Company, and A. Sherret at $4.30 per cwt. each,and for waterworks brass goods from the J. Colbert Company, at $2,520, E. G. Prior, at $2,757.90, and A. Sherret at $2,520. The contracts have not yet been given out.

RAILWAYS—STEAM AND ELECTRIC.

Nova Scotia

HALIFAX.—Much damage has been done on the Sydney & Louisburg Railway by washouts.

New Brunswick.

ST. JOHN. — Representatives of the New Brunswick, Quebec and Federal Governments, the National Transcontinental Railway Commissioners, the Railway Commission, the Miramichi Lumber Company, the Alexander Gibson Manufacturing Company, the New Brunswick Lands and Power Company, and the Grand Falls Power Company, will meet in Ottawa on December 16, to discuss the proposal that the Grand Trunk Pacific Railway should operate its trains through the New Brunswick forest region by electricity, generated at Grand Falls on the St. John River. This matter was discussed in the New Brunswick Legislature last year, and the plan suggested as a means of protecting the valuable timber areas from fire.

Quebec.

MONTREAL.—Montreal Street Railway Company are about to commence the construction of the new $1,000,000 shops in the northern part of the city. The buildings will consist of car-building shops, machine shops, electrical and winding shops, blacksmith and paint shops, and a large building for the stores and material of the company.

MONTREAL. — On Saturday, December 4th, the first train over the new line of the Canadian Northern Railway between Quebec and Ottawa, left Quebec, reaching Ottawa early on Sunday morning.

SHERBROOKE. — It is thought here that the Grand Trunk Railway intends making Sherbrooke a divisional point.

Ontario.

OTTAWA.—The latest issue of the Canada Gazette contains notice of an application to incorporate the Ottawa, Montreal and Eastern Railway Company, which seeks authority to construct a line from Lake Megantic to Montreal, with power to construct a bridge or tunnel for railway purposes, vessels, and pedestrians, and to collect tolls, and thence through Hochelaga, Jacques Cartier, Laval, Terrebonne, Two Mountains, and Argenteuil counties, crossing the Ottawa river, and passing through Prescott, Russell and Carleton counties, to Ottawa city. Branch lines to Arthabasca, Victoriaville and Yamaska are proposed. The Quebec Colonization Railway Company seeks authority to build a line from Tadousac, north-westerly to a point between Lakes Chibougamou and Mistassini and thence to Hannah Bay, Ontario, with a branch from Mistassini to the National Transcontinental.

ST. THOMAS.—The special committee appointed to report on the requirements of the street railway in order to put the road in shape recommended that a by-law be submitted to care for the following: Purchasing two new single truck cars, $8,000; lowering the large two truck cars and adding equipment and windows to same, $2,000; repairs to six closed cars, $3,000; extending line on Elgin Street to Centre Street, $2,200; placing Ross Street line, Wellington to Forest Avenue on cement foundation and steel ties, $790; extending Ross Street line, Forest Avenue to Hemlock and placing it on concrete foundation, with steel ties, $5,200; placing Wellington Street, William to Ross, on concrete foundation, with steel ties, $4,500, a total of $25,690.

TORONTO.—The Grand Trunk have completed the 36-stalls for an engine-house at New Toronto, at a cost of $1,400 each, or a total of $50,400. In the spring another engine-house will be erected, at a similar cost.

TORONTO.—After twenty-eight days in court the case of Mr. M. A. Pigott against the Guelph & Goderich Railway Company for $500,000 was settled on Saturday and dismissed by Mr. Justice Britton, both sides paying their own costs, which approximately amount to $50,000. It is understood that the case was settled for $175,000.

Manitoba.

BRANDON.—Messrs. E. J. Gifford and H. J. Skynner again made application to the city council for a franchise for the establishment of a heating plant, also for a street railway, and power and light plant.

WINNIPEG.—On Monday next the C. P. R. will open the Pheasant Hills branch.

Saskatchewan.

CARLYLE.—Grading on the C. N. R. has been completed by Cowan's construction outfit to mileage 150, which is 113 miles south and west of Carlyle.

Alberta

LETHBRIDGE.—The question of a street railway for Lethbridge and neighborhood, has been the subject of much discussion here recently.

British Columbia.

VANCOUVER.—The British Columbia Electric Railway Company have just placed an order for 50 car tenders of the Watson type.

VANCOUVER.—General Manager Sperling of the British Columbia Electric Railway, on returning from England on Tuesday the 7th December, announced that the directors had passed six million dollars for expenditures. One large work to be immediately undertaken will be the erecting of a 20,000 horse-power steam auxiliary plant in Vancouver.

VANCOUVER.—Nearly all the details of a project for building a subway between the Inlet front and the False Creek railway yards have been worked out by the local engineering staff of the C.P.R., and the work may be started next year.

SEWERS, SEWAGE AND WATERWORKS.

Ontario

KINGSTON.—A cedar culvert will be constructed on North Street here at a cost of $1,600.

ST. CATHARINES.—The Water Commissioners have recommended the installation of a new 24-inch supply pipe from the reservoir. This would give a supply 2¼ times greater than that of the present main.

Saskatchewan.

SASKATOON.—Sewer and waterworks extensions to cost $160,000 will be made next year by this municipality.

British Columbia.

VANCOUVER.—Work is progressing favorably on a dam which the Quesnele River Hydraulic Gold Mining Company is building across the Swift River, 600 feet long and 45 feet high, for the purpose of bringing water to its properties on Quesnele River. The company will construct its 26-mile ditch system in the spring, necessitating two miles of five-foot diameter pipe. The balance will be ditch flume and tunnel. The company has about 300 men at work now, and Mr. H. B. Fergusson, of Burr & Fergusson, is the chief engineer.

LIGHT, HEAT, AND POWER.

Ontario.

LONDON.—The agreement between the city council and the London Electric Company, for street lighting, mentioned in these columns last week has been ratified and the streets will be lighted on the sliding scale for a year.

TORONTO.—The municipalities of Milton, Port Credit, Mimico, Toronto Township and Brampton, all in Ontario, are seeking the service of the Hydro-Electric Power Commission. This means the establishment of another transformer station.

Saskatchewan.

SASKATOON.—The following schedule of rates has been recommended by the Light Committee:—From 1 to 100 k.w., 11 cents per k.w.; from 101 to 150 k.w., 9 cents; from 151 k.w. up, 8 cents, with a 10 per cent. discount if accounts are paid within 10 days. This was adopted.

SASKATOON.—The Saskatchewan Power Company have offered to supply the city with power at less than $30 per h.p. per annum for a twenty-four hour day.

British Columbia.

VICTORIA.—Work is being rushed on the clearing of the site for the new British Columbia Electric Railway power plant at Jordan River. Plans and specifications for the electrical and mechancial apparatus have been prepared, and a number of the leading manufacturers in the United States, Canada and Great Britain contemplate tendering. The machinery will cost several hundred thousand dollars.

FINANCING PUBLIC WORKS.

The following municipalities have sold debentures:—Sarnia, Ont., $31,361; Maidstone, Ont., $11,921, drainage works; Lindsay, Ont., $25,000, schools and waterworks; West Zorra Township, Ont., $7,000; Sarawack Township, Ont., $25,000, schools; Adjala Township, Ont., $2,400, schools.

Ontario.

GUELPH.—The library board have asked that debentures be issued for $3,000.

HAMILTON.—The ratepayers will vote on the following by-laws; $200,000 good roads by-law; $50,000 police station by-law; $25,000 public library by-law; $26,000 registry office by-law.

ST. CATHARINES.—The ratepayers will vote on a $15,000 by-law for hospital funds.

LONDON.—The ratepayers of London will shortly vote on a garbage by-law.

WELLAND.—The ratepayers will vote on a pavement by-law in January.

Alberta.

LETHBRIDGE.—The ratepayers will vote on a $46,000 general purposes by-law.

FORT SASKATCHEWAN.—Tenders will be received up to Monday, December 27th, for $6,000 electric light debentures. Thomas J. Stacey, secretary-treasurer.

British Columbia.

NEW WESTMINSTER.—The ratepayers here will vote on a local improvement by-law.

VICTORIA.—Ratepayers here will be asked to vote on a $52,000 by-law to enlarge Ross Bay.

VANCOUVER.—The civic finance committee have endorsed by-laws calling for $1,374,000 for public works, which include school extensions $274,000; exhibition by-law, $80,000; park improvements, $50,000; park purchase, $334,000; fire halls, $35,000; juvenile house of detention, $20,000; clearing and rough-grading streets, $350,000; macadamizing streets, $150,000; supplementary by-laws for causeway across Coal harbour, $80,000.

MISCELLANEOUS.

Nova Scotia.

HALIFAX.—Messrs. Swan & Hunter, the English shipbuilders, are sending an expert to Halifax to look into the cost of shipbuilding here. Bonuses aggregating $300,000 have been offered to any shipbuilding company erecting a plant on Halifax harbour.

New Brunswick.

ST. JOHN.—A party of surveyors sent out by the Government of Ottawa to survey the international boundary has concluded its labors for the season, and the members have returned to their homes in Ottawa, Toronto and Winnipeg.

Quebec.

MONTREAL.—The Canadian Rubber Company are planning extensive alterations to their plant here.

Ontario.

HARWOOD.—The Trent Canal engineering staff have moved up to Rice Lake, where some of them will put in the winter months surveying the lake.

LONDON.—Mr. E. I. Sifton, electrical engineer, will ask the council to engage a consulting engineer to check the tenders tabulated in connection with the awarding of power plant contracts.

LINDSAY.—The plans for the Wellington Street bridge will be ready in a few days.

TORONTO.—The city council are considering the installation of several garbage destructors.

Alberta.

CALGARY.—City Engineer Child has outlined plans for a bridge across the Elbow River.

TABER.—The last spike of a bridge spanning the Belly River, 1½ miles north of here was driven by the Hon. Archie McLean, M.P., on Saturday morning, November 27th. On May 1, 1908, Mr. P. W. Simons commenced work on the bridge, which consists of five concrete piers, each descending 25 feet from the water level, and resting upon a hard shale foundation. The four spans of steel in its construction are 712 feet in length, which added to the 459 feet of piled trestle gives it a total of 1,171 feet. The structure is capable of carrying a 25-ton traction engine, and contains a driveway of 18 feet, and has a clearance overhead of 14 feet. Twenty-eight feet six inches marks its height from top of floor to water level, and is 9 feet higher than any water mark known.

PERSONAL NOTES.

HON. W. A. BUCHANAN, of Lethbridge, formerly of Toronto, will be appointed commissioner of municipalities at Ottawa.

MR. JOHN M. MOORE, who has been engineer in charge of the waterworks at London, Ont., for 16 years, resigned this week.

THE CANADIAN INSPECTION COMPANY, LTD., have removed their Toronto offices from 37 Melinda Street to Stair Building, corner of Adelaide and Bay Streets.

THE CANADIAN FAIRBANKS COMPANY, LTD., have been appointed exclusive sales agents in Canada for Dicks' Balata Belting, and have purchased the business of J. S. Young.

MR. C. H. NICHOLSON, traffic manager of the Northern Navigation Company, Collingwood, Ont., has resigned to accept a position with the Grand Trunk Pacific Railway as general manager of their Pacific Coast fleet. At present he will be located at Vancouver.

MR. THOMAS W. PATTERSON, a prominent railway contractor, has been appointed Lieutenant-Governor of British Columbia. Lieutenant-Governor Patterson is a native of Ayrshire, Scotland, and celebrated his 57th birthday on Monday. He was educated in Oxford County, Ont., and spent his early manhood in Bruce County, going to Victoria in 1885. In 1902 he was elected at a bye-election to represent Victoria City in the Legislature and was re-elected at the general election of 1903.

MR. G. E. GRAHAM, at present acting divisional superintendent of the C.P.R., at Fort William, is to be transferred to a similar position at Vancouver, according to a Winnipeg report. Mr. R. Armstrong, at present general freight agent at Fort William, is to be the new superintendent, and the present freight agent at Brandon is to be transferred to Fort William. Mr. J. S. Youngson, dining and sleeping car agent at Fort William, is to be moved farther west, and Mr. C. Mead, inspector at Port Arthur, will fill the vacant position. The changes are to take effect on 1st January.

MR. R. S. KELSCH, consulting engineer of the Montreal Light, Heat & Power Company, will likely be appointed to fill the position of chief engineer of the company, made vacant by the sudden death of Mr. W. McLea Walbank, vice-president and chief engineer. This choice is regarded as a very natural one, and the announcement of Mr. Kelsch's elevation will be favourably received by the engineering profession of Montreal. Mr. Kelsch, who is a Chicagoan, came to Montreal twelve years ago to collaborate with Mr. Walbank on the construction of the Lachine hydraulic plant, which was successful in spite of many difficulties. Afterwards he took office as independent consulting engineer, and was retained in that capacity by the Montreal Light, Heat

& Power Company. He has since worked up an extensive clientele, and is consulting engineer for the Winnipeg Street Railway, Quebec Railway, Light & Power Company, Ottawa Electric Company, Ottawa and Hull Power and Manufacturing Company, and the McCall, Ferry Power Company, Pennsylvania. Mr. Kelsch, who is 47 years of age is a member of the Canadian Society of Civil Engineers, past president of the Canadian Electrical Association, member of the American Institute of Electrical Engineers, and member of the Executive Committee of the Engineers' Club, of Montreal.

SOCIETY NOTES.

Canadian Society of Civil Engineers, Montreal.—A meeting of the general section of the Canadian Society of Civil Engineers was held on Thursday, December 2, at 8 p.m. A paper on "Construction of Lethbridge Viaduct, Crow's Nest Branch, Canadian Pacific Railway," by Mr. C. N. Monsarrat, M. Can. Soc. C.E., was read by the author and illustrated by lantern slides.

Canadian Society of Civil Engineers, Winnipeg Branch.—The second annual dinner of the Manitoba branch of the Canadian Society of Civil Engineers was held in the Royal Alexandra on Wednesday evening, December 1st. There were about fifty engineers present, Mr. J. E. Schwitzer, a member of the executive committee, presiding in the absence of Colonel Ruttan. The toast list was a very brief one, and the speeches were also brief. A considerable portion of the evening was spent in social conversation both prior to and at the conclusion of the dinner. The list of toasts with the names of the various speakers was as follows: The King, proposed by J. E. Schwitzer; The Profession, with which there was coupled the name of Professor Brydone-Jack; Our Guests, proposed by C. H. Dancer; The Ladies, responded to by Paul Schioler. Special guests of the society were President George McPhillips, of the Manitoba Land Surveyors Association, and President Joseph Greenfield, of the Architects Association. Among the engineers in attendance were: W. L. Mackenzie, J. G. Legrand, M. Brodie Atkinson, A. E. Innes, C. W. Chivers, R. B. Pratt, J. C. Holden, W. Walton, J. A. Hesketh, D. A. Evans, H. C. Lett, I. Woodman, A. R. Dufresne, A. K. Gemmer, E. H. Harrison, H. Lumsden, Paul Schioler, H. F. McDonald, S. F. Peters, J. La Cour, T. R. Deacon, A. H. Aldinger, J. Greenfield, W. Percy Over, J. E. Schwitzer, E. Brydone-Jack, G. McPhillips, Stone Edelen, Thomas Turnbull, J. Smith, A. W. Garty, J. G. Glassco, D. F. Coyle, B. Ripeye, W. A. Duff, C. C. Chataway, J. M. Leamy, George H. Archibald, John D. Matheson, T. W. White, Donald A. Ross, J. N. Dillabough, W. G. Chace, Francis Sedziak, W. M. McPhail, A. Erickson, J. A. Douglas. Prior to the banquet the annual meeting of the society was held and the following officers were elected: Chairman for 1910, J. E. Schwitzer; executive, Messrs. Hesketh, Turnbull, and Dancer; secretary-treasurer, Professor Brydone-Jack; auditors, Messrs. Lee and Bowman; committee on papers, Messrs. Hesketh, Fetherstonhaugh, Harrison and Bayne; committee on research and investigation, Messrs. Brydone-Jack, Fetherstonhaugh and Wilson; committee on library, Messrs. Fetherstonhaugh, Woodman, Duff and McKenzie.

Architects' Association, Winnipeg.—The fourth annual banquet of the Manitoba Association of Architects was held last Thursday evening at the Grange Hotel, Winnipeg. Professor Brydone-Jack, of Manitoba University, in his reply to one of the toasts, touched upon a subject concerning which there had been much informal discussion previously—namely, the organization of a lecture class in architecture. Past President Greenfield presided at the banquet, and toasts were drunk to the King, our profession, the city, our sister societies, etc. The following officers were elected for the coming year: President, J. H. G. Russell; 1st vice-president, Wm. Fingland; 2nd vice-president, J. D. Atcheson; treasurer, G. W. Northwood; secretary, W. Percy Over. The following is the list of Winnipeg architects and guests who attended the banquet: W. B. Lait, W. H. Carter, J. Woodman, F. O. Fowler, E. Brydone-Jack, J. Greenfield, John Atcheson, G. W. Northwood, G. M. Black, E. H. Rodgers, H. B. Rugh, H. L. Chalmers, L. S. Hooper, William T. Davis, W. A. Elliott, Charles S. Bridgman, R. B. Pratt, S. F. Peters, G. F. Carruthers, J. H. G. Russell, W. J. Ireland, H. R. Linnell, W. P. Over, and William Fingland.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

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

8714—November 20—Authorizing the C.P.R. to construct, maintain, and operate industrial spur across 9th Street, town of North Bay, Ont.

8715—November 15—Dismissing complaint of J. F. Hunter, Boissevain, Man., against the C.P.R. as to the manner in which they handle local freight at that point.

8716—November 15—Dismissing application of Tees & Persse, Limited, of Winnipeg, Man., for Order directing the C.P.R. to for all time maintain a siding on what was formerly Point Douglas Avenue, Winnipeg, Man.

8717—October 15—Directing the C.N.R. to forthwith make passenger station facilities at Howell, Sask., adequate and suitable to accommodate twelve persons.

8718—November 15—Dismissing complaint of the McCollom Lumber Company, of Winnipeg, Man., that the C.P.R. and C.N.R. overcharged the complainants on a mixed carload of lumber from Warroad, Minn., to Indian Head, Sask.

8719—November 22—Granting leave to the G.T.P. Railway for leave to connect its tracks with the tracks of the C.N.R. near 1st St. E., of 21st St., Edmonton, Alta.

8720—November 23—Recommending to the Governor-in-Council for sanction by-law passed by the Temiscouata Railway Company re spitting in cars and railway premises.

8721—November 22—Granting leave to the G.T.P. Railway to cross at grade, the track of the C.P.R. at Yorkton, District of Assiniboia, Sask.

8722—November 24—Authorizing the corporation of the city of Toronto, Ont., to construct a suitable sewer on Bathurst Street, under the tracks of the C.P.R., said city.

8723 to 8725 Inc.—November 23—Granting leave to the Bell Telephone Company to erect, place, and maintain, its wires across the track of the G.T.R. at public crossing, Mary Street, Chesley, Ont.; the P.M.R.R. at public crossing 300 feet west Glenwood Station, Ont., and the P.M.R.R. at public crossing Foundry St., Leamington, Ont.

8726—November 24—Granting leave to the C.N.Q. Railway to place its tracks and telegraph wires under the telephone and power wires of the Quebec, Jacques-Cartier Electric Company, and wires of the Bell Telephone Company in parish of St. Sauveur, County Quebec, P.Q.

8727—November 23—Granting leave to the Horton & McNab Telephone Company to erect, place, and maintain its wires across the tracks of the C.P.R. on Lot No. 9, 3rd Con. Tp. of Horton, Ont.

8728—November 24—Granting leave to the Government of the Province of Alberta to erect, place, and maintain its wires across the track of the C.N.R. 200 feet west of Bruderheim Station, Alta.

8729—November 24—Dismissing application of Adam Gordon, of Cowichan, B.C., for Order directing the Esquimalt & Nanaimo Railway to provide and construct a suitable farm crossing where the company's railway intersects his farm in Lot 18, R. 3, Shawinigan District, County Nanaimo, B.C.

8730—November 23—Directing that the C.P.R. construct, maintain, and operate a spur at mileage 84.8 (from Muskoka) on the Toronto-Sudbury branch of its railway, Township Bigwood, Sudbury District, Ont.

8731—November 23—Authorizing the C.P.R. to construct, maintain, and operate industrial spur in the village of Beausejour, Man., for J. L. Turner, and the Manitoba Glass Manufacturing Company, Limited.

8732—November 23—Authorizing the G.T.P. Railway to construct, maintain, and operate branch line of railway or spur on Blocks 13 and 14, River Lots 12 and 14, Edmonton, Alta.

8733—November 24—Granting leave to the Kaministiquia Power Company, Limited, to erect, place, and maintain its power lines across the track of the C.P.R. north of Victoria Street, Westfort, Fort William, Ont.

8734—November 24—Authorizing the C.P.R. to construct bridge No. 19.6 on its Farnham Section, over Richelieu River, P.Q.

8735—November 23—Amending Order of the Board No. 8735, authorizing the G.T.R. to construct overhead farm crossing bridge at mile post 125.12 of its line between London & Windsor, Ont., on the lands of A. M. Dickie, by changing the figures and letters "5 per cent." in the second line of the second paragraph of the said Order to "6½ per cent."

8736—November 25—Amending Order No. 6858, dated April 19th, 1909, authorizing the A. Q. & W. R. to operate its trains over its line of railway from mileage 19.75 to mileage 20.5 at the new station at Port Daniel, P.Q., by striking out clauses 1 and 2 in the operative part of the said Order.

8737—November 15—Extending for a period of thirty days from date of Order period within which the M.C.R.R. may have to widen the bed of the stream across the company's right of way under the trestle bridge at Bear Creek, one mile east of town of Petrolea, Ont.

8738—September 22—Amending Order of the Railway Committee of the Privy Council, dated December 3rd, 1892, in re crossing of the G.T.R. by the Davenport Street Railway at Davenport Road, by directing the Toronto Suburban Railway to install derails at crossing interlocked with semaphores; dismissing application of the Toronto Street Railway for Order reducing amount to be paid by them for the construction, operation, and maintenance of the crossing.

8739—November 17—Forbidding and restraining the Nipissing Power Company, Ltd., from erecting, placing, and maintaining its lines of wires for the conveyance of heat, light and power across the line of the Bell Telephone Company, between Powassan & North Bay, Ont.

8740—November 24—Directing the C.P.R. to lower its tracks where the same crosses Sutherland Avenue, Winnipeg, Man.

8741—November 20—Dismissing application of the settlers and residents of Ribstone, Alta., for Order directing the G.T.P. Railway to provide a spur connection and loading platform between Dunne and Chauvin, Alta.

8742—November 25—Extending until 1st February, 1910, the time for installation of interlocking plant at the crossing of the G.T.R. by C.P.R. at Drumbo, Ont.

8743—November 22—Limiting the speed of the trains of the C.P.R. passing over Durham Road, town of Walkerton, Ont., to a speed of ten miles an hour.

8744—November 22—Directing the C.P.R. to provide and construct a suitable shelter with platform in Village of Clark, Ont.

8745—November 25—Directing the C.N.R. to provide and construct a suitable crossing over its railway where the same intersects Lincoln Avenue, Municipality of Rosser, Man.

8746—November 19—Granting leave to the C.N.Q. Railway to construct its railway across the highways in parish of Beauport, County Quebec, P.Q.

8747—November 26—Granting leave to the G.T.P. Railway to appeal to the Supreme Court of Canada upon all questions of law arising re location of its line of railway throughout the town of Fort William, Ont.

8748—November 26—Rescinding Order of the Board No. 7320, dated June 18th, 1909, approving of plans of subway for C.N.R. proposed to be constructed at 22nd Street, Saskatoon, Sask., by directing that the city file new plans for approval of the Board.

8749 to 8751 Inc.—November 25—Granting leave to the Government of the Province of Alberta, to erect, place, and maintain its wires across the track of the C.P.R. at three points in said province.

8752—November 26—Granting leave to the Dresden Rural Telephone System, to erect, place, and maintain its telephone wires across the track of the P.M.R.R. at Emmett, Township of Chatham, County Kent, Ont.

8753 and 8754—November 26—Authorizing the town of North Battleford, Sask., to lay and thereafter maintain a water main under the track of the C.N.R. at Victoria Street, also sewer mains at Victoria Street.

8755—November 25—Authorizing the C.N.O. Railway to place its lines and tracks across and to connect with the lines and tracks of the G.T.R. near Brooklyn, Ont.

8756—November 27—Granting leave to the Bell Telephone Company to erect, place, and maintain its underground wires across the tracks of the Montreal Terminal Railway at St. Antoine Street, Tetrauville, P.Q.

8757—November 25—Authorizing Chas. Lawrence, of Bentinck, Ont., to lay water pipe under the tracks of the Walkerton and Lucknow branch of the C.P.R. where the same crosses Durham Road, Township of Bentinck, Ont.

8758—November 27—Authorizing the C.P.R. to construct, maintain, and operate industrial spur for the city of Winnipeg, Man., in parish of St. Paul.

8759—November 27—Authorizing the C.P.R. to construct, maintain, and operate industrial spurs for the North Pacific Lumber Company, New Westminster, District, B.C.

8760—November 29—Approving and sanctioning location of the C.N.R. Company's line from mileage 0 to mileage 5 up the Fraser River from Yale, B.C.

8761—November 29—Authorizing the C.P.R. to divert road allowance between Sections 22 and 15, Township 8, R. 5, west of the Principal Meridian, Manitoba.

8762—November 29—Approving and sanctioning location of the V. V. & E. Railway Company's line of railway from Hope at station No. 1988-79, to station 3020-7.5 to the boundary line between districts Yale and Westminster, B.C.

8763—November 29—Approving and sanctioning location of the C.N.O. Railway Company's line from the Rideau River, at mileage 5.3 to the boundary line between Townships of Goulbourne and Nepean, Ont.

8764—November 29—Granting leave to the Vancouver Power Company to cross "Y" of the Seattle Branch of the Canadian Pacific Railway north of Huntingdon Station, in the municipality of Sumas, B.C.

8765—November 29—Granting leave to the Vancouver Power Company to cross the main line and a spur track of the Seattle Branch of the C.P.R. at Clayburn Station, Westminster District, B.C.

8766—November 29—Authorizing the C.P.R. to construct, maintain, and operate siding to the premises of R. West & Company, at mileage 14.75, London Section.

8767—November 29—Extending for thirty days from date of Order the time within which the M.C.R.R. and the P.M.R.R. Companies each install upon its own railway at highway crossing over the railways on the town line between Townships of Southwold and Dunwich, Ont.

8768—November 26—Directing the C.P.R. to provide and construct a highway over its line of railway at Mackey Station, Township of Head, Nipissing District, Ont.

8769—December 2—Authorizing the Canada Atlantic Railway Company (G.T.R.) to construct, maintain, and operate branch line of railway, or siding, from the tracks on the south side of Sappers Branch to and into the site of Hotel Chateau Laurier, now being erected in Majors Hill Park, Ottawa, Ont.

8770—November 29—Amending Order 8540, dated October 15th, 1909, approving plans and specifications of the municipality of Township of Colchester, North Ontario, re Pinkerton Drain, under the tracks of the M.C.R.R. by approving plans substituted for above mentioned plans.

8771—November 29—Authorizing the corporation of the town of St. Louis, P.Q., to lay and thereafter maintain a water pipe under the track of the C.P.R. where the same intersects Sanguinet Street.

8772—December 2—Authorizing the Chatham Gas Company to lay and thereafter maintain a gas main under the track of the G.T.R. at Degge Street crossing, Chatham, Ont.

8773—November 30—Granting leave to the municipal corporation of the village of Burlington, Ont., to erect, place, and maintain its electric wires and a telephone wire under the track of the G.T.R., at Burlington Beach, Ont.

8774 to 8777—November 22—Granting leave to the Consolidated Telephone Company to erect, place, and maintain its wires across the track of the C.P.R. near Upper Kent Station, N.B.; one mile south of Bath, N.B.; across the C.P.R. at Bath, N.B.; and at Bristol, N.B.

8778 and 8779—November 22—Granting leave to the village of Brussels, Ont., to erect, place, and maintain its wires across the track of the C.P.R. at intersection of boundary line between the Townships of Morris and Grey, with its Guelph and Goderich line, at village of Walton, adjoining Walton Station, and across the track of the G.T.R. on its Wellington, Grey & Bruce division at intersection of concession line between Concession 4 and 5, Township Morris, Ont.

8780—November 22—Granting leave to the North Huron Telephone Company of Wingham, Ont., to erect, place, and maintain its wires across the track of the G.T.R. at public crossing near Whitechurch Station, Ont.

8781—December 1—Granting leave to the Claremont & Ashburn Telephone Company to erect, place, and maintain its wires across the track of the G.T.R. at the 7th Concession, Whitby Township, Ont.

8782—November 18—Granting leave to the Bell Telephone Company to erect, place, and maintain its wires across the track of the C.N.Q. Railway.

MARKET CONDITIONS.

Montreal, December 9th, 1909.

From the United States come reports of renewed interest in pig-iron for delivery covering the second half of next year. A very large tonnage is now under negotiation and will likely result in business, as the furnace interests are in a position to calculate fairly accurately the cost of their next year's output. Foundries throughout the whole country are well supplied with orders and are looking forward to even greater activity from the beginning of the new year. Manufacturers of cast iron pipe are in receipt of heavy orders and are in the market for a large tonnage of pig to take care of their requirements. Steel-making grades are strongly held and an upward tendency is beginning to manifest itself in prices of basic iron which, during the past few weeks, has been on the weak side. The steel markets are still very strong and railways are placing contracts for rails, cars, locomotives, and other supplies which, coupled with heavy orders for structural work and expansions to steel plants, are giving manufacturers all they can do to take care of business in sight.

In England, prices have just held about steady during the past three or four weeks. A moderate business is passing in pig-iron and steel, but there is nothing doing in the situation to warrant any decided upward movement. Conditions in Germany and Belgium are more satisfactory, prices on all classes of iron and steel material, including pig-iron, showing moderate improvement. The German situation is strengthened by the fact that a considerable portion of the output of billets crop-ends are being exported in quantity to the United States. The elections will have the tendency to keep business in suspense.

Conditions in the local market are very satisfactory. Dealers report good orders being received, for this time of year, and nothing to complain of. This is the period of the year when dulness generally prevails, but this year orders are coming to hand every day. The feeling among the trade seems to be that Canada was never in so hopeful a condition as at the present moment. The financial basis is all that could be asked, money is plentiful and there is little doubt that next year will see great industrial activity and a general expansion.

The local market for finished and semi-finished material continues in its previous groove. For some strange reason, price changes are almost entirely absent, yet everywhere else, advances seem to be taking place. In the case of cold rolled shafting, plates, sheets and bars, no alteration has taken place for a long time past. Manufacturers in the east, however, are advancing their prices to meet the west, and the mills across the border are so overcrowded with orders that they cannot make deliveries inside of six or eight weeks. Dealers claim that it is the English market that holds back local advances.

Following are this week's quotations:—

Antimony.—The market is steady at 8 to 8¼c.

Bar Iron and Steel.—The market promises to advance shortly. Bar iron, $1.85 per 100 pounds; best refined horseshoe, $2.10; forged iron, $2; mild steel, $1.85; sleigh shoe steel, $1.85 for 1 x ⅜-base; tire steel, $1.00 for 1 x ⅜-base; toe calk steel, $2.35; machine steel, iron finish, $1.90; imported, $2.20.

Boiler Tubes.—The market is steady, quotations being as follows:—1½ and 2-inch tubes, 8¼c.; 2½-inch, 10c.; 3-inch, 11¼c.; 3½-inch, 14 1-2c.; 4-inch, 18 1-2c.

Building Paper.—Tar paper, 7, 10, or 16 ounces, $1.80 per 100 pounds; felt paper, $2.75 per 100 pounds; tar sheathing, 40c. per roll of 400 square feet; dry sheathing, No. 1, 30 to 40c. per roll of 400 square feet; tarred fibre, 55c. per roll; dry fibre, 45c. (See Roofing; also Tar and Pitch).

Cement.—Canadian cement is quotable, as follows, in car lots, f.o.b., Montreal:—$1.30 to $1.40 per 350-lb. bbl., in 4 cotton bags, adding 10c. for each bag. Good bags re-purchased at 10c. each. Paper bags cost 2½ cents extra, or 10c. per bbl. weight.

Chain.—Prices are as follows per 100 lbs.:—¼-inch, $4.90; 5-16-inch, $4.40; ⅜-inch, $3.70; 7-16-inch, $3.50; ½-inch, $3.25; 9-16-inch, $3.20; ⅝-inch, $3.15; ¾-inch, $3.10; ⅞-inch, $3.05; 1-inch, $3.05.

Coal and Coke.—Anthracite, egg, stove or chestnut coal, $6.75 per ton, net; furnace coal, $6.50, net. Bituminous or soft coal: Run of mine, Nova Scotia coal, carload lots, basis, Montreal, $3.85 to $4 per ton; cannel coal, $9 per ton; coke, single ton, $5; large lots, special rates, approximately $4 f.o.b., cars, Montreal

Copper.—Prices are strong at 14 to 14¼c.

Explosives and Accessories.—Dynamite, 50-lb. cases, 40 per cent. proof, 15c. in single case lots, Montreal. Blasting powder, 25-lb. kegs, $2.25 per keg. Special quotations on large lots of dynamite and powder. Detonator caps, case lots, containing 10,000, 75c. per 100; broken lots, $1; electric blasting apparatus:—Batteries, 1 to 10 holes, $15; 1 to 20 holes, $25; 1 to 30 holes, $35; 1 to 40 holes, $50. Wire, leading, 1c. per foot; connecting, 50c. per lb. Fuses, platinum, single strength, per 100 fuses:—4-ft. wires, $3; 6-ft. wires, $3.54; 8-ft. wires, $4.08; 10-ft. wires, $5. Double strength fuses, 4-ft., $3.75; 6-ft., $4.29; 8-ft., $4.83; 10-ft., $5.37. Fuses, time, double-tape, $6 per 1,000 feet; explohmeters, fuse and circuit, $7.50 each.

Galvanized Iron.—The market is steady. Prices, basis, 28-gauge, are:—Queen's Head, $4.10; Colborne Crown, $3.85; Apollo, 10¾ oz., $4.05. Add 25c. to above figures for less than case lots; 26-gauge is 25c. less than 28-gauge, American 28-gauge and English 26 are equivalents, as are American 10¾ oz., and English 28-gauge.

Galvanized Pipe.—(See Pipe, Wrought and Galvanized).

Iron.—The outlook is strong. The following prices are for carload quantities and over, ex-store, Montreal, prompt delivery; No. 1 Summerlee, $21.50 to $22 per ton; selected Summerlee, $21 to $21.50; soft Summerlee, $20.50 to $21; Clarence, $19.50 to $20; Carron, No. 1, $21.50 to $22, and Carron special, $21 to $21.50.

Laths.—See Lumber etc.

Lead.—Prices are about steady at $3.55 to $3.65.

Lead Wool.—$10.50 per hundred, $200 per ton, f.o.b., factory.

Lumber, Etc.—Prices on lumber are for car lots, to contractors, at mill points, carrying a freight of $1.50. Red pine, mill culls out, $18 to $22 per 1,000 feet; white pine, mill culls, $16 to $17. Spruce, 1-in. by 4-in. and up, $15 to $17 per 1,000 ft.; mill culls, $12 to $14. Hemlock, log run, culls out, $13 to $15. Railway Ties; Standard Railway Ties, hemlock or cedar, 35 to 45c. each, on a 5c. rate to Montreal. Telegraph Poles: Seven-inch top, cedar poles, 25-ft. poles, $1.35 to $1.50 each; 30-ft., $1.75 to $2; 35-ft., $2.75 to $3.25 each, at manufacturers' points, with 5c.

freight rate to Montreal. Laths: Quotations per 1,000 laths, at points carring $1.50 freight rate to Montreal, $2 to $3. Shingles: Cedar shingles, same conditions as laths, X, $1.50; XX, $2.50; XXX, $3.

Nails.—Demand for nails is better and prices are firmer, $2.40 per keg for cut, and $2.35 for wire, base prices. Wire roofing nails, 5c. lb.

Paints.—Roof, barn and fence paint, 90c. per gallon; girder, bridge, and structural paint for steel or iron—shop or field—$1.20 per gallon, in barrels; liquid red lead in gallon cans, $1.75 per gallon.

Pipe.—Cast Iron.—The market is unsettled and uncertain, as dealers are compelled to meet competition from all sources. Prices are easy and approximately as follows:—$31 for 6 and 8-inch pipe and larger; $32 for 5-inch and 4-inch at the foundry. Pipe, specials, $3 per 100 pounds. Gas pipe is quoted at about $1 more than the above.

Pipe.—Wrought and Galvanized.—Demand is much better and the tone is firm, though prices are steady, moderate-sized lots being: ¼-inch, $5.50 with 63 per cent. off for black, and 48 per cent. off for galvanized; ⅜-inch, $5.50, with 59 per cent. off for black and 44 per cent. off for galvanized; ½-inch, $8.50, with 69 per cent. off for black, and 59 per cent. off for galvanized. The discount on the following is 72½ per cent. off for black, and 62½ per cent. off for galvanized; ¾-inch, $11.50; 1-inch, $16.50; 1¼-inch, $22.50; 1½-inch, $27; 2-inch, $36; 2½-inch, $57.50; 3-inch, $75.50; 3½-inch, $95; 4-inch, $108.

Plates and Sheets.—Steel.—The market is steady. Quotations are: $2.20 for 3-16; $2.30 for ⅛, and $2.10 for ¼ and thicker; 12-gauge being $2.30; 14-gauge, $2.15; and 16-gauge, $2.10.

Rails.—Quotations on steel rails are necessarily only approximate and depend upon specification, quantity and delivery required. A range of $30.50 to $31 is given for 60-lb. and 70-lb.; 80-lb. and heavier, being $30; rails, per gross ton of 2,240 lbs., f.o.b. mill. Re-laying rails are quoted at $27 to $29 per ton, according to condition of rail and location.

Railway Ties.—See lumber, etc.

Roofing.—Ready roofing, two-ply, 70c. per roll; three-ply, 95c. per roll of 100 square feet. Roofing tin caps, 6c. lb.; wire roofing nails, 5c. lb. (See Building Paper; Tar and Pitch; Nails, Roofing).

Rope.—Prices are steady, at 9c. per lb. for sisal, and 10½c. for Manila. Wire rope, crucible steel, six-strands, nineteen wires; ¼-in., $2.75; 5-16, $3.75; ⅜, $4.75; ½, $5.25; ⅝, $6.25; ¾, $8; ⅞, $10; 1-in., $12 per 100 feet.

Spikes.—Railway spikes are firmer at $2.45 per 100 pounds, base of 5⅝ x 9-16. Ship spikes are steady at $2.85 per 100 pounds, base of ⅝ x 10-inch, and ⅝ x 12-inch.

Steel Shafting.—Prices are steady at the list, less 25 per cent. Demand is on the dull side.

Telegraph Poles.—See lumber, etc.

Tar and Pitch.—Coal tar, $3.50 per barrel of 40 gallons, weighing about 500 pounds; roofing pitch, No. 1, 70c. per 100 pounds; and No. 2, 55c. per 100 pounds; pine tar, $8.50 per barrel of 40 gallons, and $4.75 per half-barrel; refined coal tar, $4.50 per barrel; pine pitch, $4 per barrel of 180 to 200 pounds. (See building paper; also roofing).

Tin.—Prices are unchanged, at 32½ to 33c.

Zinc.—The tone is steady, at 6 to 6¼c.

CAMP SUPPLIES.

Beans.—Prime pea beans, $1.85 per bushel.

Butter.—September and October creamery, 26c.; dairy, 22 to 23c.

Canned Goods.—Per Dozen.—Corn, 80 to 85; peas, $1.05 to $1.15; beans, 75 to 80c.; tomatoes, 82½ to 90c.; peaches, 2s, $1.65, and 3s, $2.65; pears, 2s, $1.60, and 3s, $2.30; salmon, best brands, 1-lb. talls, $1.87½, and flats, $2.02½; cheaper grades, 95c. to $1.65.

Cheese.—Late makes, 11¼ to 11¾c.; finest makes, ½c. more.

Coffee.—Mocha, 20 to 25c.; Santos, 15 to 18c.; Rio, 10 to 12c.

Dried Fruits.—Currants, Filiatras, 5¾ to 6½c.; choice, 8 to 9c.; dates, 4 to 5c.; raisins, Valentias, 5 to 6c.; California, seeded, 7½ to 9c.; Sultana, 8 to 10c. Evaporated apples, prime, 9¾ to 9¾c.

Eggs.—No. 1 candled, 26c.; selects, 29 to 30c.; new laid, 35c.

Flour.—Manitoba, 1st patents, $5.70 per barrel; 2nd patents, $5.20; strong bakers, $5.

Molasses and Syrup.—Molasses, New Orleans, 27 to 28c.; Barbadoes, 40 to 50c.; Porto Rico, 40 to 45c.; syrup, barrels, 3½c.; 2-lb. tins, 2 dozen to case, $2.50 per case.

Potatoes.—Per 90 lbs., good quality, 50 to 60c.

Rice and Tapioca.—Rice, grade B., in 100-lb. bags, $2.95 to $3; C.C., $2.90. Tapioca, medium pearl, 4½ to 4¾c.

Rolled Oats.—Oatmeal, $2.45 per bag; rolled oats, $2.20, bags.

Tea.—Japans, 20 to 38c.; Ceylons, 20 to 40c.; Ceylon, greens, 19 to 25c.; China, greens, 25 to 50c.; low-grades, down to 15c.

Provisions.—Salt Pork.—$30 to $32 per bbl.; beef, $15 per bbl.; smoked hams and bacon, 15 to 18c. per lb.; lard, 17c. for pure and 12c. for compound.

Fish.—Salted.—Medium cod, $7 per bbl.; herring, $5.25 per bbl.; salmon, $15.50 per bbl., for red, and $14 for pink. Smoked fish.—Bloaters, $1.10 per large box; haddies, 7½c. per lb.; kippered herring, per box, $1.20 to $1.25.

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Toronto, December 9th, 1909.

With the colder weather, the demand for building materials is weaker. Changes in prices have been practically confined to camp supplies, for which some increases will be noted.

The following are wholesale prices for Toronto, where not otherwise explained, although for broken quantities higher prices are quoted:—

Antimony.—Demand active and price higher at $9.25 per 100 lbs.

Axes.—Standard makes, double bitted, $8 to $10; single bitted, per dozen, $7 to $9

Bar Iron.—$1.95 to $2, base, per 100 lbs., from stock to wholesale dealer. Market well supplied.

Boiler Plates.—¼-inch and heavier, $2.20. Boiler heads 25c. per 100 pounds advance on plate. Tank plate, 3-16-inch, $2.40 per 100 lbs.

Boiler Tubes.—Orders continue active. Lap-welded, steel, 1¼-inch, 10c.; 1½-inch, 9c. per foot; 2-inch, $8.50; 2¼-inch, $10; 2½-inch, $10.60; 3-inch, $12.10; 3½-inch, $15; 4-inch, $18.50 to $19 per 100 feet.

Building Paper.—Plain, 30c. per roll; tarred, 40c. per roll. Demand is only moderate.

Bricks.—Business is very active, price at some yards $9 to $9.50, at others, $9.50 to $10 for common. Don Valley pressed brick move also freely. Red and buff pressed are worth $18 delivered and $17 at works per 1,000.

Broken Stone.—Lime stone, good hard, for roadways or concrete, f.o.b., Schaw station, C.P.R., 60c. per ton of 2,000 lbs., 1-inch, 2-inch, or larger, price all the same. The demand has been active for some weeks, and supply not equal to it; feeling is upward. Broken granite is selling at $3 per ton for good Oshawa.

Cement.—Manufacturers' prices for Portland cement are $1.40 without bags, or $1.70 including cotton bags for car lots on board car, Fort William or Port Arthur; the price at Toronto is $1.30 without bags, or $1.70 with bags. Smaller dealers get $1.35 to $1.40 per barrel without bags, in load lots, delivered in town. Demand dropping off.

Coal.—Retail price for Pennsylvania hard, $7.25 net, steady. This price applies to grate, egg, stove, and chestnut; only pea coal is cheaper, namely, $6.00. These are all cash, and the quantity purchased does not affect the price. Soft coal is in good supply, American brokers have been covering the ground very fully. In the United States there is an open market for bituminous coal and a great number of qualities exist. We quote. Youghiogheny lump coal on cars here, $3.70 to $3.80; mine run, $3.60 to $3.75; slack, $2.65 to $2.85; lump coal from other districts, $3.40 to $3.70; mine run 10c. less; slack, $2.50 to $2.70; cannel coal plentiful at $7.50 per ton; coke, Solvey foundry, which is largely used here, quotes at from $5.75 to $6.00; Reynoldsville, $4.90 to $5.00; Connellsville, 72-hour coke, $5.50.

Copper Ingot.—Demand quite heavy, and price advanced to 14¼c. Supply adequate.

Detonator Caps.—75c. to $1 per 100; case lots, 75c. per 100; broken quantities, $1.

Dynamite, per pound, 21 to 25c., as to quantity.

Roofing Felt.—An improvement in demand of late, no change in price, which is $1.80 per 100 lbs.

Fire Bricks.—English and Scotch, $30 to $35; American, $25 to $35 per 1,000. The demand is steadv.

Fuses.—Electric Blasting.—Double strength 4 feet, $4.50; 6 feet, $5; 8 feet, $5.50; 10 feet, $6. Single strength, 4 feet, $3.50; 6 feet, $4; 8 feet, $4.50; 10 feet, $5, per 100 count. Bennett's double tape fuse, $6 per 1,000 feet.

Iron Chain.—¼-inch, $5.75; 5-16-inch, $5.15; ¾-inch, $4.15; 7-16-inch, $3.95; ½-inch, $3.75; 9-16-inch, $3.70; ⅝-inch, $3.55; ¾-inch, $3.45; ⅞-inch, $3.40; 1-inch, $3.40, per 100 lbs.

Iron Pipe.—Repeat quotations of last week, as follows:—Black, ¼-inch, $2.03; ⅜-inch, $2.25; ½-inch, $2.63; ¾-inch, $3.28; 1-inch, $4.70; 1¼-inch, $6.41; 1½-inch, $7.70; 2-inch, $10.26; 2½-inch, $16.39; 3-inch, $21.52; 3½-inch, $27.08; 4-inch, $30.76; 4½-inch, $38; 5-inch, $39.85; 6-inch, $51.70. Galvanized, ¼-inch, $2.86; ⅜-inch, $3.08; ½-inch, $3.48; ¾-inch, $4.43; 1-inch, $6.35; 1¼-inch, $8.66; 1½-inch, $10.40; 2-inch, $13.86, per 100 feet.

Lead.—Prices steady outside. This market is steadier, and demand quiet, at $3.75 to $3.85 per 100 lbs.

Lime.—Retail price in city 35c. per 100 lbs. f.o.b., car; in large lots at kilns outside city 22c. per 100 lbs. f.o.b. car without freight. Demand is good.

Lumber.—Prices continue steady, and city demand quieter. We quote dressing pine $32.00 to $35.00 per M; common stock boards, $26 to $30; cull stocks, $20; cull sidings, $17.50; Southern pine dimension timber from $30 to 45, according to size and grade; finished Southern pine according to thickness and width, $30 to $40. Hemlock in car lots, $16.50 to $17; spruce flooring in car lots, $22 to $24; shingles, British Columbia, weak, and rather over-stocked, $3 to $3.10; lath, No. 1, $4.40, white pine, 42-inch; No. 2, $3.75; for 32-inch, $1.60.

Nails.—Wire, $2.35 base; cut, $2.60; spikes, $2.85 per keg of 100 lbs.

Pitch and Tar.—Pitch, demand moderate, price so far unchanged at 70c. per 100 lbs. Coal tar fairly active at $3.50 per barrel.

Pig Iron.—There is fair activity and prices are maintained. Clarence quotes at $20.50 for No. 3; Cleveland, $20.50 to $21; in Canadian pig, Hamilton quotes $19.50 to $20 per ton. Producing plants are everywhere busy, and there is considerable business in prospect for 1910.

Plaster of Paris.—Calcined, New Brunswick, hammer brand, car lots, $2; retail, $2.15 per barrel of 300 lbs.

Putty.—In bladders, strictly pure, per 100 lbs., $2.15; in barrel lots, $2.00. Plasterer's, $2.15 per barrel of three bushels.

Ready Roofing.—Dealers report a large demand, the prices being as before, per catalogue

Roofing Slate.—Most of the slate used in Canada comes now from Pennsylvania or Maine, the Canadian supply being slender and mostly from the Rockland quarries of the Eastern Townships in Quebec. There is a great variety of sizes and qualities, so that it is difficult to indicate prices. But No. 1 Bangor slate 10 x 16 may be quoted at $7 per square of 100 square feet, f.o.b., cars, Toronto; seconds, 50c. less. Mottled, $7.25; green, $7. There is still a scarcity of good slaters and much demand for them.

Rope.—Sisal, 9½c. per lb.; pure Manila, 10½c. per lb., Base.

Sewer Pipe.—

	4-in.	6-in.	9-in.	10-in.	12-in.	24-in.
Straight pipe per foot	$0.20	$0.30	$0.65	$0.75	$1.00	$3.25
Single junction, 1 or 2 ft. long	.90	1.35	2.70	3.40	4.50	14.65
Double junctions	1.50	2.50	5.00	....	8.50	.....
Increasers and reducers	....	1.50	2.50	....	4.00	.....
P. traps	2.00	3.50	7.50	....	15.00	.....
H. H. traps	2.50	4.00	8.00	....	15.00	.....

Business quieter; price, 73 per cent. off list at factory for car-load lots; 65 per cent. off list retail. Small lots subject to advance.

Steel Beams and Channels.—Quiet.—We quote:—$2.50 to $2.75 per 100 lbs., according to size and quantity; if cut, $2.75 to $3 per 100 lbs.; angles, 1¼ by 3-16 and larger, $2.50; tees, $2.80 to $3 per 100 pounds. Extra for smaller sizes of angles and tees.

Steel Rails.—80-lb., $35 to $38 per ton. The following are prices per gross ton, for 500 tons or over; Montreal, 12-lb. $45, 16-lb. $44, 25 and 30-lb. $43.

Sheet Steel.—We do not alter prices as yet; 10-gauge, $2.50; 12-gauge, $2.55; American Bessemer, 14-gauge, $2.35; 17, 18, and 20-gauge, $2.45; 22 and 24-gauge, $2.50; 26-gauge, $2.65; 28-gauge, $2.85. Quite a good demand exists, and there is prospect of higher prices.

Sheets Galvanized.—Apollo Brand.—Sheets 6 or 8 feet long, 30 or 36 inches wide; 10-gauge, $2.90; 12-14-gauge, $3.00; 16, 18, 20, $3.10; 22-24,

$3.25; 26, $3.40; 28, 3.85; 29, $4.15; 10¾, $4.15 per 100 lbs. Fleur de Lis—28-gauge, $4; 26, $3.80 per 100 lbs. Demand very active.

Tank Plate.—3-16-inch, $2.40 per 100 lbs.

Tool Steel.—Jowett's special pink label, 10½c. Cammel-Laird, 16c. "H.R.D." high speed tool steel, 65c.

Tin.—The feeling in tin is firm, and the price 32 to 33c. per lb.

Wheelbarrows.—Navvy, steel wheel, Jewel pattern, knocked down, $21.60 per dozen; set up, $22.60. Pan Canadian, navvy, steel tray, steel wheel, $3.30 each; Pan American, steel tray, steel wheel, $4.25 each.

Zinc Spelter.—A very active movement continues, and a large business is being done. Price very firm at $5.75 to $6 per 100 lbs.

CAMP SUPPLIES.

Beans.—Hand picked, $2; prime, $1.90.

Beets.—85c. a bag.

Butter.—Dairy prints, 21 to 22c.; creamery rolls, 27 to 28c.

Canned Goods.—Peas, $1.00 to $1.50; tomatoes, 3s, 85c. to 95c.; pumpkins, 3s, 80 to 85c.; corn, 75 to 85c.; peaches, 2s, white, $1.50 to $1.60; yellow, $1.90 to $1.95; strawberries, 2s, heavy syrup, $1.90 to $1.95; raspberries, 2s, $1.90 to $1.95.

Carrots.—60c. and 65c. a bag.

Cheese.—Large, 12¾c.; twins, 13c.

Coffee.—Rio, green, 10 to 12½c.; Mocha, 21 to 23c.; Java, 20 to 31c.; Santos, 11 to 15c.

Dried Fruits.—Raisins, Valencia, 5½ to 6c.; seeded, 1-lb. packets, fancy, 7½ to 8c.; 16-oz. packets, choice, 7 to 7½c.; 12-oz. packets, choice, 7c.; Sultanas, good, 5 to 6c.; fine, 6 to 7c.; choice, 7 to 8c.; fancy, 8 to 9c.; Filiatras currants, 6½ to 7c.; Vostizzas, 8½ to 9c.; uncleaned currants, ¼c. lower than cleaned. California Dried Fruits,—Evaporated apricots, 14 to 15c. per lb.; prunes, 60s to 70s, 7 to 7½c.; 90s to 100s, 6½c.; evaporated apples, 9½c.

Eggs.—Cold storage, 26 to 28c.; new laid, 33 to 35c. per dozen, in case lots.

Flour.—Manitoba Flour.—Quotations at Toronto are:—First patents, $5.60; second patents, $5.10; strong bakers', $4.90; 90 per cents., Glasgow freights, 28s. 6d. Ontario Flour.—Winter wheat patents, for export, $4.20 to $4.25, in buyers' sacks outside.

Lard.—Tierces, 16c.; tub, 16 to 16¼c.; pails, 16¼ to 16½c. per lb., market firm.

Molasses.—Barbadoes, barrels, 37 to 45c.; Porto Rico, 45 to 60c.; New Orleans, 30 to 33c. for medium.

Onions.—$1.25 a bag.

Potatoes.—Best, 60 and 65c. a bag.

Pork.—Market uncertain. Short cut, $28 per barrel; mess, $26.50.

Rice.—B grade, 3¾c. per lb.; Patna, 5¾ to 5¾c.; Japan, 5¾ to 6c.

Salmon.—Fraser River, talls, $2; flats, $2; River Inlet, $1.55 to $1.75.

Smoked and Dry Salt Meats.—Long clear bacon, 13½ to 14c., tons and cases; hams, large, 14 to 14½c.; small, 15½ to 16c.; rolls, 14½ to 14¾c.; breakfast bacon, 17c.; backs (plain), 17½ to 18c.; backs (peameal), 17½ to 18c.; shoulder hams, 12c.; green meats out of pickle, 1c. less than smoked. Market steady.

Spices.—Allspice, 16 to 19c.; nutmegs, 30 to 75c.; cream tartar, 22 to 25c.; compound, 15 to 20c.; pepper, black, pure Singapore, 14 to 17c.; pepper, white, 20 to 30c

Sugar.—Granulated, $4.85 per 100 lbs. in barrels; Acadia, $4.75; yellow, $4.45; bags, 5c. lower; bright coffee, $4.65; bags, 5c. less.

Syrup.—Corn syrup, special bright, 3½c. per lb.

Teas.—Japans, 20 to 35c. per lb.; Young Hysons, 16 to 35c.; Ceylons, medium, 16 to 45c.

Turnips.—45c. a bag.

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Winnipeg, December 7th, 1909.

Winter weather has set in in earnest in Winnipeg, and outside activity is practically at an end for a few months. Consequently business with the supply dealers is quiet. The chief concern of the contractors now is the rushing of interior work. Plumbers and steamfitters are very busy, as apart from work on large buildings this is the season of the year when they have their harvest.

Lumber for finishing work is active and there is a great deal of finishing in Winnipeg to be done this winter. It is learned that some of the leading architects are already working on plans of large buildings to be erected next season, and the outlook generally for the coming year would seem to be very bright. The season just closed has been a splendid one for builders and contractors, and the feeling is that 1910 will be even better. There will be plenty of money available for new buildings, and dealers are placing large orders for early delivery.

Quotations on the local markets are as follows:—

Anvils.—Per pound, 10 to 12½c.; Buckworth anvils, 80 lbs., and up, 10¼c.; anvil and vice combined, each, $5.50.

Axes.—Chopping axes, per dozen, $6 to $9; double bits, $12.10 per dozen.

Barbed Wire.—4 point and 2 point, common, $3.15 per cwt.; Baker, $3.20; Waukegan, $3.30.

Bar Iron.—$2.50 to $2.60.

Bars.—Crow, $4 per 100 pounds.

Beams and Channels.—$3 to $3.10 per 100 up to 15-inch.

Boards.—No. 1 Common Pine, 8 in. to 12 in., $38 to $45; siding, No. 2 White Pine, 6 in., $55; cull red or white pine or spruce, $24; No. 1 Clear Cedar, 6 in., 8 to 16 ft., $60; Nos. 1 and 2 British Columbia spruce, 4 to 6 in., $55; No. 3, $45.

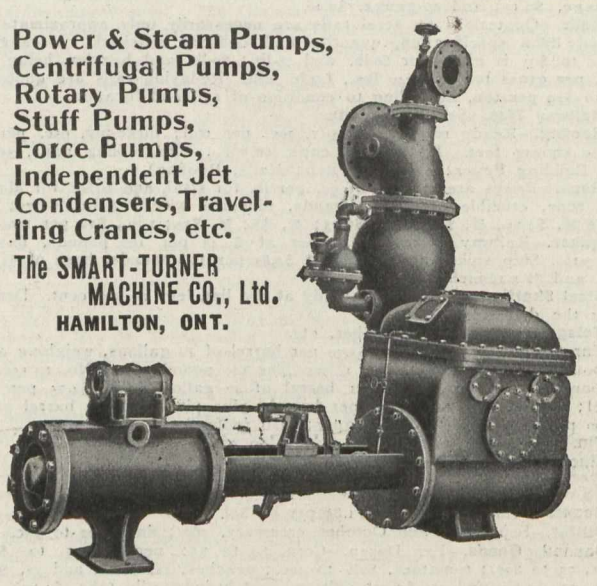
Bricks.—$10, $11, $12 per M, three grades.

Building Paper.—4½ to 7c. per pound. No. 1 tarred, 84c. per roll; plain, 60c.; No 2 tarred, 62½c.; plain, 56c.

Coal and Coke.—Anthracite, egg, stove or chestnut coal, $9.75 large lots to $10.50 ton lots, net; Alleghany soft coal; carload lots, basis, Winnipeg, f.o.b., cars, $6 per ton; cannel coal, $10.50 per ton; Galt coal, $2 f.o.b., carload lots, $9 single ton; coke, single ton, $7 at yard; large lots special rates. American coke, $11 to $11.50 a ton; Crow's Nest, $1[illegible] a ton.

Copper Wire.—Coopered market wire, No. 7, $4 per 100 lbs.; No. 6, $4; No. 10, $4.06; No. 12, $4.20; No. 14, $4.40; No. 16, $4.70.

Copper.—Tinned, boiler, 26½c.; planished, 29¾c.; boiler and T. K. pits, plain, tinned, 45 per cent. discount.



Cement.—$2.25 to $2.50 per barrel, in cotton bags.

Chain.—Coil, proof, ¼-inch, $7; 5-16-inch, $5.50; ⅜-inch, $4.90; 7-16-inch, $4.75; ½-inch, $4.40; ⅝-inch, $4.20; ¾-inch, $4.05; logging chain, 5-16-inch, $6.50; ⅜-inch, $6; ¼-inch, $8.50; jack iron, single, per dozen yards, 15c. to 75c.; double, 25c. to $1; trace-chains, per dozen, $5.25 to $6.

Dynamite.—$11 to $13 per case.

Hair.—Plasterers', 80 to 90c. per bale.

Hinges.—Heavy T and strap, per 100 lbs., $6 to $7.50; light, do., 65 per cent.; screw hook and hinge, 6 to 10 inches, 5¼c. per lb.; 12 inches up, per lb., 4¼c.

Galvanized Iron.—Apollo, 10¾, $4.90; 28, $4.70; 26, $4.30; 22, $4.10; 24, $4.10; 20, $4; 18, $3.95; 16, $3.90; Queen's Head, 28, $4.90; 26, $4.70; 24, $4.30; 22, $4.30; 20, $4.10 per cwt.

Iron.—Swedish iron, 100 lbs., $4.75 base; sheet, black, 14 to 24 gauge, $3.75; 24-gauge, $3.90; 26-gauge, $4; 28-gauge, $4.10. Galvanized—American, 18 to 20-gauge, $4.40; 22 to 24-gauge, $4.65; 26-gauge, $4.65; 28-gauge, $4.90; 30-gauge, $5.15 per 100 lbs. Queen's Head, 22 to 24-gauge, $4.65; 26-gauge English, or 30-gauge American, $4.90; 30-gauge American, $5.15; Fleur de Lis, 22 to 24-gauge, $4.50; 28-gauge American, $4.75; 30-gauge American, $5.

Lead Wool.—$10.50 per hundred, $200 per ton, f.o.b., Toronto.

Lumber.—No. 1 pine, spruce, tamarac, British Columbia fir and cedar—2x 4, 2 x 6, 2 x 8, 8 to 16 feet, $26.00; 2 x 20 up to 32 feet, $36.50.

Nails.—$4 to $4.25 per 100. Wire base, $2.85; cut base, $2.90.

Picks.—Clay, $5 per dozen; pick mattocks, $6 per dozen; clevishes, 7c. per lb.

Pipe.—Iron, black, per 100 feet, ¼-inch, $2.50; ⅜-inch, $2.80; ½-inch, $3.40; ¾-inch, $4.60; 1-inch, $6.60; 1¼-inch, $9; 1½-inch, $10.75; 2-inch, $14.40; galvanized, ½-inch, $4.25; ¾-inch, $5.75; 1-inch, $8.35; 1¼-inch, $11.35; 1½-inch, $13.60; 2-inch, $18.10. Lead, 6½c. per lb.

Pitch.—Pine, $6.50 per barrel; in less than barrel lots, 4c. per lb.; roofing pitch, $1 per cwt.

Plaster.—Per barrel, $3.

Roofing Paper.—60 to 67½c. per roll.

Rope.—Cotton, ¼ to ½-in. and larger, 23c. lb.; deep sea, 16½c.; lath yarn, 9½ to 9¾c.; pure Manila, per lb., 13¼c.; British Manila, 11¼c; sisal, 10½c.

Spikes.—Basis as follows:—1¼ 5 and 6, $4.75; 5-16 x 5 and 6, $4.40; ⅜ x 6, 7 and 8, $4.25; ½ x 8, 9, 10, and 12, $4.05; 25c. extra on other sizes.

Steel Plates, Rolled.—3-16-in., $3.35 base; machinery, $3 base; share, $4.50 base; share crucible, $5.50; cast share steel, $7.50; toe calk, $4.50 base; tire steel, $3 abse; cast tool steel, lb., 9 to 12½c.

Staples.—Fence, $3.40 per 190 lbs.

Timber.—Rough, 8 x 2 to 14 x 16 up to 32 feet, $34; 6 x 20, 8 x 20, up to 32 feet, $38; dressed, $37.50 to $48.25.

Steel.—8½ to 15c. per pound.