THIS ISSUE CONTAINS | Concrete Association Meeting
Good Roads Convention

Canadian Engineer

A WEEKLY JOURNAL
For CIVIL, MECHANICAL, ELECTRICAL and STRUCTURAL ENGINEERS and CONTRACTORS
MONTREAL OFFICE:
B 32 Board of Trade Building
WINNIPEG OFFICE:
315 Nanton Building

Vol. 16. Toronto, Canada, March 5, 1909. No. 10.

BUYERS' REFERENCE—PAGE 54.

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* Every Other Week

† Once a Month

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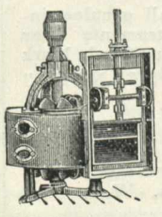

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The Canadian Engineer

WEEKLY

ESTABLISHED 1893

VOL. 16. TORONTO, CANADA, MARCH 5th, 1909. No. 10

The Canadian Engineer

ESTABLISHED 1893.

Issued Weekly in the interests of the

CIVIL, MECHANICAL, STRUCTURAL, ELECTRICAL, MARINE AND MINING ENGINEER, THE SURVEYOR, THE MANUFACTURER, AND THE CONTRACTOR.

Editor—E. A. JAMES, B.A. Sc.
Business Manager—JAMES J. SALMOND

Present Terms of Subscription, payable in advance:

Canada and Great Britain:		United States and other Countries:	
One Year - -	$2.00	One Year - -	$2.50
Six Months - -	1.25	Six Months - -	1.50
Three Months -	0.75	Three Months -	1.00

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NOTICE TO ADVERTISERS

Changes of advertisement copy should reach the Head Office by 10 a. m. Monday preceding the date of publication, except the first issue of the month for which changes of copy should be received at least two weeks prior to publication date.

PRINTED AT THE OFFICE OF THE MONETARY TIMES PRINTING CO., LIMITED, TORONTO, CANADA.

TORONTO, CANADA, MARCH 5, 1909.

CONTENTS OF THIS ISSUE.

A reader is anxious to secure a copy of The Canadian Engineer for January, 1905, and will pay 25 cents for it.

If you do not file your copies of The Canadian Engineer kindly forward us the issue for February 19th, for which we will extend your subscription one month.

IN ORDER TO MEET A DEMAND.

This issue marks to some extent a departure in the method of the arrangement of the literary matter in this journal. Hitherto it has been our practice in dealing with such municipal problems as Sewerage, Sewage Disposal, Water Supply, and Water Filtration, not to devote any particular portion of the journal specially to that branch of civil engineering which includes these subjects. It must be granted, however, that there is a growing tendency amongst civil engineers to specialise on these problems. We have evidence of this, not only in Canada, but even more so in the United States and European countries.

When such problems have to be faced in connection with our larger cities, we find that the tendency is to look for expert advice. Unfortunately, the tendency up to the present has been to obtain such advice outside of Canada. This tendency can only be the result of an impression that Canadian engineers have not had either the time or opportunity to make a special study of municipal engineering hygiene. Just how far this impression may be sound or otherwise we are not prepared to say. The specialising of such subjects in a journal such as this must, however, present great advantages to the engineering profession.

At present in Canada the questions relating to pure water supply, sewerage and disposal of sewage are rapidly coming to the front. In Quebec we have men such as Dr. Starkey, of McGill University; in Ontario, Dr. Amyot, provincial bacteriologist, and Dr. Hodgetts, of the Ontario Board of Health; in Regina, Dr. Seymour, of the Saskatchewan Board of Health, and, in fact, men in all the Provinces who are devoting scientific energy and study to these matters. Dr. Amyot is at present instituting exact and careful experiments as to just what can be done in the way of sand filtration with Ontario Lake water. But what are the Canadian engineers doing? Up to the present it may be said there has been very little demand for this knowledge in a practical form; and that a general knowledge of laying main sewers and water pipes is all that has been called for.

Throughout the United States and Europe experiments, both of a scientific and practical engineering character, have been in progress for many years. Conclusive data has been arrived at, but many questions have still to be solved.

This journal will, therefore, in the future devote a portion of its reading matter entirely to such problems. Matter of moment in foreign work will be carefully sifted and published for the benefit of our readers. Notes of what is being done or contemplated in Canada will, of course, receive precedence.

This special portion of our journal should appeal not only to the municipal engineer, but also to the medical officer of Health, to the alderman or councillor, and, in fact, to all who take an individual interest in promoting the health and esthetic conditions of the people.

We have engaged the services of a well-known and acknowledged authority in these matters to assist in the editorship of this particular portion of our journal, which will be entitled in future "The Sanitary Review."

ANNUAL REPORT OF THE BUREAU OF MINES, ONTARIO.

The report for 1908 of the Ontario Bureau of Mines contains a statistical review of the mineral output and the materials of construction for the past year. Ontario is now the leading mining Province of the Dominion, producing last year over twenty-five million dollars' worth of metals.

The output of iron is becoming important, having in the last three years more than doubled in value.

In the non-metallic classification, the Province is in the lead. In 1907 the output, under the following heads, was as follows:—

Brick	$4,831,931
Cement	2,782,575
Petroleum	1,049,631
Natural gas	746,499
Building stone	675,000
Salt	432,936
Sewer pipe	435,088
Lime	418,700
Corundum	242,608
Drain tile	250,122
Calcium carbide	173,763
Quartz	124,148
Mica	82,929
Pottery	54,585
Iron pyrites	51,842
Arsenic	40,104
Feldspar	30,375
Graphite	20,000
Gypsum	19,652
Talc	5,010
Peat fuel	1,040

These make a total output of some ten millions.

By far the greater part of the report is taken up with a study of the iron and steel industry of Ontario. The history of iron fields and of the industry is dealt with, and several interesting tables are given. The various smelting and reduction plants are described in detail.

EDITORIAL NOTES.

The Engineers' Club, Toronto, are distributing to their membership a neat and complete handbook. Besides containing matter of some historic interest to the members, it will be valuable as a reference, as it gives the names and addresses of all members. The Executive of the Club are to be congratulated on the compact design of the book and the accuracy of the information it contains.

* * * *

A few years ago Western Canada was the home of the land company promoter. To-day, it is the railway charter man. Applications for charters are being made in unheard-of numbers; and the Parliaments are taking upon themselves the sorting out of the good from the bad. The quickest way to cut out the railway promoter would be to cut out the railway bonus and grant charters to all applying.

* * * *

It is Ottawa this time which is so generous with their contractors as to award a tender to others than the lowest bidder. The Waterworks Committee distinguished themselves. The amount involved was small, and there is no doubt but that the contractor will do good work; but why should contractors be put to the expense of figuring closely, spending time and money unless the lowest correct tender is to be accepted?

A new solution of the Quebec Bridge difficulty is being offered by Mr. J. S. Armstrong, C.E., of St. John, N.B. He proposes a tunnel in the form of an immense steel tube, covered, lined and weighted with concrete, and placed in position similar to the one at Detroit. The tube, placed some forty feet below low water, would not interfere with shipping. The probable cost and grades will be a matter of future consideration.

* * * *

The building trade in Toronto shows, for the first two months of 1909, an improvement over 1908. January and February had $1,233,000 as the approximate value of buildings given permits. This compares favorably with the $733,033 of the same period last year. The number of buildings was 329 as compared with 237. The city architect's record gives the number of new buildings actually erected during two months last past as 476, where in the same two months last year it was 288.

JANUARY LAKE LEVELS.

The United States lake survey reports the stages of the Great Lakes for the month of January, as follows:

Lakes.	Feet above tide water New York.
Superior	601.71
Michigan-Huron	579.86
Erie	571.47
Ontario	245.17

STATEMENT OF ACCIDENTS DURING JANUARY 1909.

Trade or Industry.	Killed.	Injured.	Total.
Fishing and hunting	4	..	4
Lumbering	9	11	20
Mining	5	4	9
Building trades	4	11	15
Railway service	18	20	38
Navigation	2	5	7
General transport	..	9	9
Civic employees	..	8	8
Unskilled labor	1	10	11

COMING MEETINGS OF ENGINEERING SOCIETIES.

Western Society of Engineers.—March 12th, 1909, Electrical Section, 1735 Floor, Monadnock Block, Chicago, Ill.

* * * *

Providence Association of Mechanical Engineers.—June 22, 1909, Annual Meeting. Secretary, T. M. Phetteplace.

* * * *

Engineers' Club of Toronto.—March 11th, 1909, "Waterproofing of Concrete Structure," by Mr. P. Gillespie, 96 King Street West, 8 p.m.

* * * *

American Railway Engineering and Maintenance of Way Association.—Tenth annual convention, March 16th-18th, 1909, Auditorium Hotel, Chicago, Ill. President, Wm. McNab, Principal Assistant Engineer, G.T.R., Montreal; Secretary, E. H. Fritch, Chicago.

At the close of 1908, the total mileage of all railway companies operating in Western Canada was estimated at 10,751 miles, distributed as follows:

Canadian Pacific Railway Company	6,160 miles
Canadian Northern Railway Company	3,119 miles
Grand Trunk Pacific Railway Company	854 miles
The Great Northern Railway Company	624 miles

BOULDER STONES IN SOUTHERN ONTARIO—THEIR ROAD-MAKING QUALITIES.

By Andrew F. Macallum, B.A.Sc., C.E., and T. Aird Murray, C.E.

In taking up the question of good roads, it is very difficult to decide on the lines of a paper which will present features for your consideration of an interesting character without going over old ground.

The fundamental principles of good road-making are well established. It is generally taken for granted by everyone, for instance, that:—

(a) Wet ground must be drained.

(b) A good road depends upon having a good foundation.

(c) There must be a thickness of hard material capable of standing the maximum heavy traffic.

(d) Paved surfaces must be composed of tough, good-wearing materials.

(e) Macadam surfaces should be composed of material of good cementing value, as little liable to dust and mud production as possible.

The above may be said to comprise the main essentials in road-making. Much may and has been said on these various heads, but with the exception of the dust problem there is little that is new. It is for this reason that we find that the International Congress of Road Surveyors, recently held at Paris, devoted 90 per cent. of their time to the dust problem.

In Canada, however, the dust is with us, but we are hardly in a position as yet to face the problem, with all its experimental features and attendant expense. What we want, in the first instance, are roads; and in the second instance, good roads. Good roads mean the outlay of large amounts of capital. This is where the whole difficulty lies. Populated centres are far apart; long lengths of roadways are required. Find us the money and we can build them, just as well and as thoroughly as in any other part of the world.

Within practical limits it may be said with truth, however, that good roads, well built, although requiring large initial expenditures, are more economical in the end than roads not built, but thrown together anyhow, as is too often the case.

In this paper we intend to talk about some of the material which we have at hand ready for road use in Southern Ontario.

In the country districts and on country roads the stone in general use for road-making is to a large extent represented by the boulders and rocks found embedded in the ground and removed from the soil by the agriculturist. The rocks present many varieties in character. There are many kinds and sorts, some forming good road metal, others of no practical use whatever. Some are useful as top coatings, others useless. Some form good body material and poor surface finish, and so on.

We don't know of any attempt which has yet been made to classify these various boulders as to their qualities for road material. It is, therefore, for this purpose that we presume to address you.

Last year when in North Manitoba we were talking with a farmer, who stated that there was one thing which often puzzled him, viz., the fact that in working the rich, black prairie soil he often came across huge rounded stones, sometimes granite, sometimes limestone, and more often hard, iron-like stone, very heavy. What he often wondered was, how did they get there.

This question has been satisfactorily answered by geology. There is no doubt that at one time this continent, in the Pleistocene period, immediately preceding the present period of geologic history, was covered by a sheet of glacial ice. Now, glacial ice is never motionless; it is mobile, just as water is, and was ever flowing from the higher altitudes of the continents to the lower, making its way to the sea-coast, where it broke away into icebergs, just as our rivers now flow into the sea. These glacial masses of ice forming in the mountainous districts gathered up all the loose fragments of rocks, sand, and clay. As it took years of time for these glaciers to reach the valleys, the rocks were rounded and smoothed on their surfaces by the action of the flowing ice.

The approaching warmer period affected the coast line and the valleys first, the ice melting, the mud, sand and stone were precipitated over the rock-bed surfaces, and hence our large agricultural areas formed on the coast and in the low-lying areas of land.

As the ice line receded westward and northward, many large icebergs broke away from the line, finding a resting-place on the surface, there to melt and leave deposited near the surface the rocks which so puzzled our Western farmer.

We can, therefore, well understand that these rocky boulders, gathered from distant mountain ranges, present different and variable characteristics. The piece of quartz, with its gold streak or flake speck, may tell of treasures hidden in some rocky crag one thousand miles away, but is no proof of the gold richness of the neighborhood.

The common stones found as boulders in the glacial deposits in Southern Ontario are as follows:—

Greenstones.

Diabase, Gabbro, Hornblende schist	Common.
Granite, Gneiss	Very common.
Crystalline limestone	Not very common.
Palæozoic blue limestone	Fairly common.

We will now attempt to examine these various rocks as to their comparative qualities in "hardness," "toughness," "wearing qualities" and "cementing values," and before doing so it will be well to define exactly what the above terms mean and what is the general method of testing in order to determine these values.

Hardness.—This is generally determined by grinding a sample with sand of a standard size and quality. The measure of hardness is inversely proportional to the loss of weight due to the grinding.

Toughness.—This is understood to mean the power possessed by rock material to resist fracture under impact. The stone is placed in a cylinder, and a hammer allowed to drop on it from a distance of 1 c.m. at the first blow, each blow being increased by 1 c.m. until the rock gives way. The number of blows required to break the sample represents the toughness value. Even rocks possessed of considerable hardness may be very brittle and crumble under the continuous pounding of traffic.

Wearing Qualities.—The material is abraded in a revolving cast-iron cylinder, mounted diagonally on a shaft, and rotated for five hours at a rate of 2,000 revolutions per hour. The percentage of wear is represented by the amount of material under .16 c.m., 1-16-inch in size, worn from five kilograms of a sample made up of fragments ranging in size from 1-5 to 3 inches in their greatest diameters.

Cementing Values.—This is the property possessed by rock dust or other finely-divided material found in nature to act as a cement or binder on the coarser fragments in the road. The testing operations are carried out in a similar manner to those of ordinary Portland cement. We here quote from the United States Department Agriculture Bureau of Chemistry Bulletin 79, page 9: "This property varies enormously, not only with different kinds of rocks, but also with these which are practically identical in classification and chemical composition. The absence of cementing power is so pronounced in some varieties of rocks that they can never be made to compact with the road roller or under traffic. As the binder surface of a macadam or gravel road is most exposed to the action of wind and rain, as well as the wear and tear of traffic, it can be seen that the presence of the property is most essential to good results. Further than this, the hardness and toughness of the binder surface, more than of the rock itself, constitutes the hardness and toughness of the road, for if a load be sufficient to destroy the

* Read before the Provincial Good Roads Association.

bond of cementation of the upper surface of the road, the stones below are soon loosened and forced out of place. The impervious shell obtained by the use of a rock of high cementing value gives the greatest protection to the foundation of a road. Moreover, it is a matter of common observation that a good surface which binds well is less dusty and less muddy, while the advantage from the standpoint of economy is very great, as it is only the loose, unbound material which is ordinarily carried away by wind and water."

We will now take the rocks in the order in which they are given above:—

Diabase.—A form of greenstone. A dark-colored igneous rock of fine grain. Diabases are made up essentially of the minerals, feldspar and pyroxene. Most diabases are characterized by a peculiar interlocking of the mineral grains, due to the fact that the feldspar occurs in elongate tabular crystals, oriented in every conceivable direction. For purposes of road-making they are characterized by hardness, a high degree of toughness. a low percentage of wear, and generally by good cementing values. Their good wearing quality is due in part to the fineness of the grain, the texture and the hardness of the minerals, and also to the fact that the constituent minerals differ only slightly from each other in hardness.

Gabbro.—Another of the above greenstone group. Among the gabbros may be included the peridotities and some of the coarser-grained diorites. They are all of them heavy rocks of dark color and moderately coarse grain. These rocks may be regarded as intermediate in road-making value between the true traps and the granites. Their wearing qualities are not so good as the diabases or finer-grained rocks. Their hardness and cementing value are, however, about equal, but they are inferior in toughness, this being due to their granular texture.

Hornblende Schist.—Also of the greenstone group. Because of their schistose structure these rocks are, on the whole, inferior in road-making value to the granites and the rocks above noted. They are of fairly good hardness, but of low resistance to wear, low toughness, but good cementing value. Their use in road-making is not recommended unless in conjunction with the rocks of better wearing quality.

Granites.—These very common rocks are generally of the coarse-grained character as found in Ontario as glacial boulders. There are, however, many of the finer-grained types. They are igneous rocks, made up principally of quartz, potash, feldspar and mica. Both the light-colored and dark-colored varieties are present. Hornblende is frequently present with or in place of mica. Their texture is granular. The underlocking structure peculiar to the diabase is absent. Their wearing qualities are about the same as for the coarse-grained basic igneous rocks, such as the gabbros, etc. They, therefore, present a low degree of toughness, although a high degree of hardness. They are of poor cementing value. In general, the finer-grained granites possess greater toughness than these, which are coarser. Their low cementing value may be accounted for by the scarcity of these secondary minerals which develop by decomposition from the basic, dark-colored minerals. The use of granites alone, especially the coarser granites, in road construction is to be avoided when rocks of a superior quality can be obtained. With a top dressing of some rock, such as trap, possessing greater toughness and cementing value, they may, however, be used to good advantage.

Gneiss.—A coarsely foliated or laminated rock of the granite type. These rocks as found in glacial deposits, are generally the worse for weathering, and may crumble with small pressure. Their coarse granular formation and low cementing value cause them to form very poor material for road-making, and they should be avoided.

Crystalline Limestone.—A type from which lime is manufactured. It is composed largely of calcite of interlocking grains, with small amounts of quartz and white mica and a little tremolite. Occasionally silicate minerals are developed in it. It is highly crystalline, and varies from white to dark blue gray in color, showing conspicuous banding; there are great varieties in purity. It is very soft, low toughness and low resistance to wear, but of very good cementing value. Its use alone in roads is to be avoided. It grinds up under traffic to a fine, white powder, making the road exceedingly dusty in dry weather, and forms a sticky mud in wet weather. It is better adapted as a binder on roads made up of harder materials, such as granite, etc., possessing higher resistance to wear but much lower cementing value. It is the recrystallizing of this limestone through rigional metamorphism which constitutes the marble.

Palæozoic Blue Limestone.—This is represented in North America by the Trenton limestone in the lower and the Niagara limestone in the upper Silurian system. It is characterized by the presence of marine fossils. These rocks present every gradation of texture and structure from mere soft calcareous mud to compact rock. For road-making purposes it may be said to be fairly on a par with crystalline limestone. Generally speaking, the limestones are more valuable in road-making for their cementing values than as materials for building up roads. They are all dusty in dry weather and muddy in wet.

This, then, concludes a short description of the various rocks most common amongst our field stones. It will be apparent that if discrimination was used in separating these various types of rocks instead of mixing them indiscriminately that much better roads would generally be the result.

CONCRETE BRIDGES.*

Frank Barber, C.E., York County Engineer.

We may, perhaps accept the position that it is seldom that we find a thing good or bad, absolutely, but only as compared with something else. Consequently, in speaking of concrete bridges I shall have something to say from time to time about steel as a criterion for concrete.

It would be well in order to understand the present situation in bridge construction to take a glance at its recent history. In this my remarks will be confined to the county of York. We have only to go back sixteen or seventeen years to a time when all county bridges were built of wood, or of wood with iron verticals. The longer spans were generally of a type known as the Howe truss. Of these wooden bridges an even hundred still remain, which are or may be county bridges, and many more exist throughout the townships. As they are all pretty old, I expect that in ten years not one will remain.

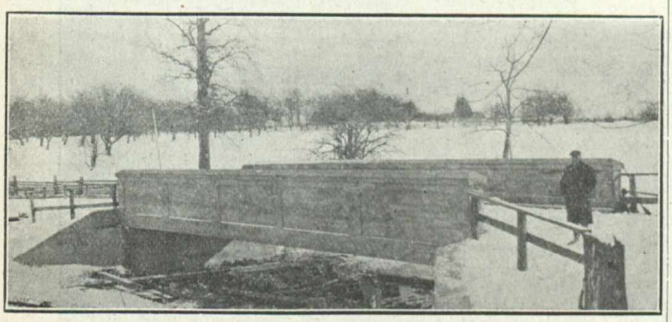
Within a few years from the time I mention twenty steel or iron bridges had been built by the county. These were light, pin-connected bridges, with wooden stringers and floor, and mostly with wooden guard-rails. Such of these as were of the low truss design generally had rivetted trusses, but the bottom laterals were round rods, with turnbuckles. These bridges are not very rigid. The tension members often vibrate when a heavy load passes, and there is the chance that they will get out of adjustment and rattle. Unless these light bridges are kept well painted the thin flanges of the lighter angles soon rust away to a dangerous extent.

Of late years we have discarded this type of bridge, using rigid rivetted connections and stiff tension members, and using a steel fence and a reinforced concrete or a concrete and paving brick floor. No wood is used at all. The first bridge of this class was a small one of 35 ft. span, built at Thornhill in 1903. The first fine modern bridge of a fair size was built at Musson's, near Weston, in 1905. Its clear span is 123 ft. Altogether, the county has built ten bridges with permanent floors, the largest being near Bradford, in two spans of 98 ft. each.

Thus in the course of one short lifetime the fashion in bridges has entirely changed, even without considering the advent of concrete.

*Read before the Good Roads Association, Toronto,

It is only a short time ago that the first reinforced concrete bridge was built in America. This was in the Golden Gate Park at San Francisco, and was built in 1889. Since then the National Bridge Co., of Indianapolis, alone has constructed upwards of one thousand concrete arches. The rise of steel as a building material was comparatively slow, taking over a century, but this marvellous growth of concrete has taken place almost within a decade. Almost every day we hear of concrete being put to new uses. I believe that the first ferro-concrete structure was a boat, which is still in use. Lately, we have seen concrete caskets much advertised. I suppose they are very comfortable, and I should say that a concrete coffin would last a man a lifetime. As another example of the use of this material I might mention concrete water towers. One has just been built in the town of Newmarket according to our specifications, 30 ft. in diameter and 40 ft. high. The York County Council has not as yet built any bridges entirely of reinforced concrete—the townships have so far taken the lead. Last year our office had charge of the construction of a concrete arch of 50 ft. clear span for Markham, a girder bridge of concrete and an arch of 60 ft. span for York Township, and an arch culvert of 50 ft. span (not yet completed) for the Metropolitan Electric Railway. The York Township arch was, however, designed under Peter S. Gibson, who was then township engineer, but who resigned his position before the bridge was built. The first concrete girder bridge to be built near here was designed by my old chief, James McDougall, for the Township of Markham. It was a span of 50 ft., built in 1907. The largest bridge of this material in the county is the electric railway bridge we have under construction at Newmarket. It will contain about 600 yards of concrete. The span is 50 ft., the rise 23 ft., and the length from one side of the culvert to the other at the water is nearly 100 ft. The depth of concrete at the crown is 18 inches. It was found to be cheaper than a steel bridge.



Girder Bridge, Unionville, 1907.

The largest ferro-concrete arch in Canada was constructed last year under Mr. Bell, county engineer for Elgin. It is built over Kettle Creek, near St. Thomas, and has a clear span of 116 ft.

Another important Canadian arch, and, I think, the second largest, is at Massey, Ont. It has a span of 94 ft. and a rise of 24 ft. It was designed by W. H. McLean, of the Public Works Department of Ontario.

Speaking for a moment of masonry arches in general, the largest ever constructed until quite recently was over the River Adda at Trezzo. The span was 251 ft. Next to this was the Cabin John arch at Washington of 220 ft. span. Another fine arch is at Wheeling, West Virginia; span, 159 ft. Its skewbacks are cut in solid rock. Until the last ten years you could count on your fingers all the arches in America of over 150 ft. span—unless you had only four fingers. But concrete has changed all this, and I should only weary you by attempting to enumerate the recently-built arches of long span.

We have not very far to seek for some of the reasons for the popularity of concrete bridges. First, there is its durability. Small steel bridges will scarcely last more than forty years. The flanges of the angles and channels rust through, and again the steel becomes brittle and unreliable through vibration. Even many kinds of stone will decay in time, but not good concrete. It is like a meerschaum pipe or a bottle of champagne—it grows better with age. It means much to be able to place confidence in a bridge. When you see a well-constructed concrete bridge take a certain load once, you may know that it will always take that load again.

Secondly, there is the fact that no repairs are necessary. From a great many cases it has been computed that steel bridges cost for repairs ¼ of 1 per cent. per annum of the first cost. This would be about $7 a year on a bridge worth $3,000.

Again, there is the lack of vibration in concrete. You may trot your horses over a concrete bridge without damaging the structure, and sometimes there is great temptation to trot over a bridge. It is nearly impossible to prevent much of this where the bridge is entered upon from a slope.

Then there is its toughness. Reinforced concrete, even when it is badly constructed and about to fail, will never give way suddenly, causing accident and perhaps death, although there is always the danger of this in old steel and wooden structures.

Another advantage of concrete is that on account of its great weight and monolithic character it is not easily affected by ice or flood. As an instance a concrete arch passed through the flood of 1905 at Indianapolis, though every truss and wooden bridge owned by the city was damaged or destroyed in that flood.

I shall mention another characteristic of concrete arches which is not so well understood: its adaptability to the varying heights of the roadway of its approaches. You must not have the floor of a steel bridge as low as the roadway of the approaches, or when the approaches are regravelled the bridge floor will be too low and water will drain upon it. To keep clear of this disadvantage the bridge floor is often kept too high. Perhaps it is the exception rather than the rule to find both approaches and bridge floor on a proper level or on the same grade. I know that often the floor of a small bridge is kept high so that it will be difficult to trot over it, but this is surely a disadvantage that is not suffered with concrete bridges. Now, a full spandrel arch is filled over with earth, and it is, therefore, a simple matter to alter its surface to suit the varying height of the approaches. In fact, the arch becomes just a part of the road, except that it has an opening for water to pass through.

On the other hand, for long spans the great weight of concrete becomes a disadvantage if we are to build at minimum cost; and secondly, there is the danger of poor workmanship.

Considering for a moment this list of advantages and disadvantages of concrete as a building material for bridges—the list is not intended to be exhaustive—one may ask how we can be sure of the permanent character of concrete, since the first ferro-concrete bridge in America was built only twenty years ago? In the old days many people believed that steel was permanent, and a steel bridge once erected was to serve their grandchildren. We know now that steel is not immortal, and if we expect every bridge which is called concrete to last forever we shall soon find our mistake. Only good concrete will last.

In answer to the proposed question, although reinforced concrete is new, concrete is very old. Arches of this material were built many centuries ago by the Romans and by others. The stone facings of some of these old arches have been disintegrated by the elements and have fallen away, leaving the concrete apparently as good as ever. Many kinds of stone as built into houses, for instance, will fall into ruins in two or three centuries, while well-made concrete becomes only harder and firmer with age. When it is considered that the great dome of the Pantheon, 142 ft. in diameter, was built of concrete nineteen centuries ago and remains to-day without a single crack, I may perhaps be pardoned when I say that there is little reason for doubting that good concrete will last as long as the hills and river banks upon which it is built.

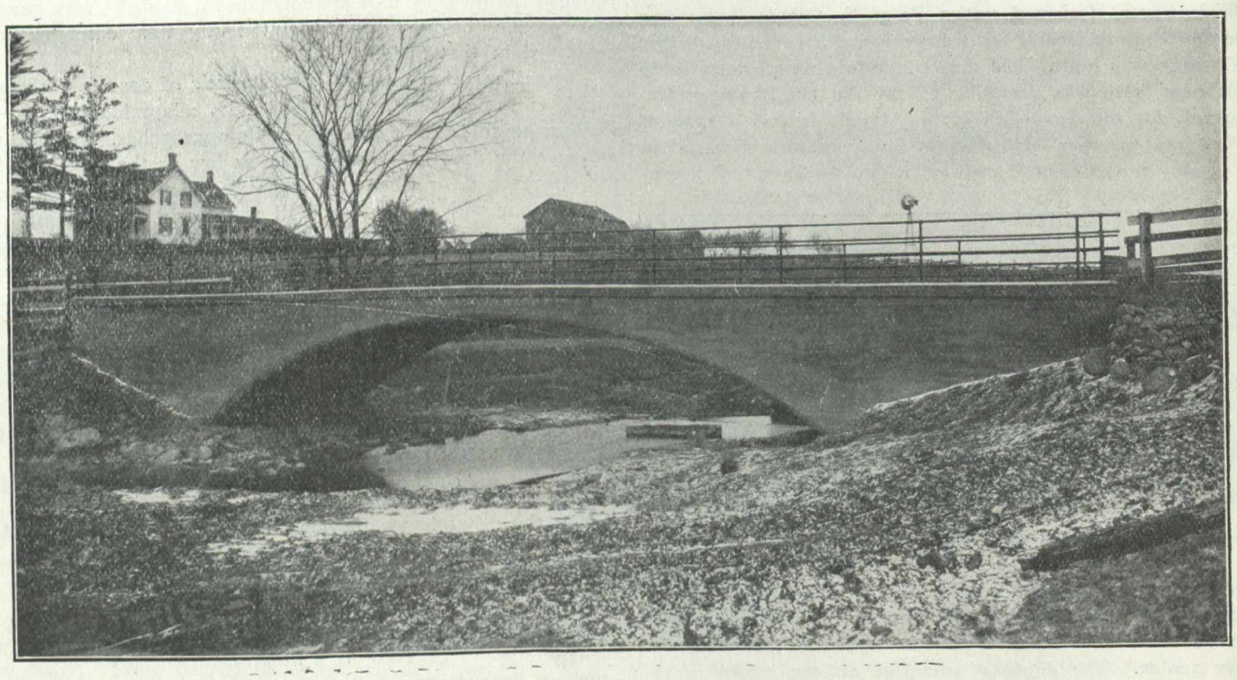
The toughness of concrete is shown by the case of two grain stores at Tunis settling unevenly on poor foundations without any cracks appearing, although the face of one of

them was 25 degrees out of line. The walls of one were thrown 11 ft. out and those of the other 19 ft. out, and yet they were both restored to correct positions without damage. This case is described in the "Engineering Record" of November 3rd, 1906, and, considering the foundations as originally prepared, shows both what can be done with concrete and what ought not to be done.

Over against these advantages of concrete we have to consider the danger of poor workmanship. In buying concrete bridges purchasers are often strangely indifferent. For instance, I have often seen the sand and gravel measured in wide and shallow wheelbarrows, and the amount of cement used was governed accordingly. I think cement and potatoes cost much about the same, bulk for bulk. Now, if you were buying potatoes in this way, that for every six bushels of gravel put into a pier you should get one bushel of potatoes, the amount of money to be paid, however, being according to the number of cubic yards in the pier, not according to the number of barrowfuls, would you allow it to be measured as I say, or would you have it measured in good boxes? It is the practice of our office always to have the sand and gravel measured in open boxes with no bottoms.

We have still to consider the question of cost. Volume for volume, steel costs about fifty times as much as concrete: and for the same sectional areas steel will support in compression only thirty times as much as concrete Therefore, for resisting compressive stresses concrete wi'l take a given load at three-fifths the cost of steel. Steel must be used for tension, however, as concrete will not resist tension economically. But the weight of concrete is a disadvantage from one point of view. A portion of material at the top of a girder, for example, must resist compression, and besides this its own weight adds a certain amount to the weight of the bridge, and thus to the stresses which it must resist. The material which will resist the stresses and at the same time add as little weight as possible to the bridge is the most economical material, other things being equal.

Keeping these facts in mind, we are not surprised to find that concrete is often cheaper than steel. For instance, concrete columns are cheaper than steel columns. For small bridges concrete girders are cheaper than steel bridges with a heavy floor. The following schedule of prices will bear



Fifty-foot Arch, Buttonville, Ont., 1908.

When a box is full and levelled on top it is lifted, leaving the sand or gravel on the platform. This takes no more time than a more careless method. Also, it should be specified what one volume of cement means. We specify that 100 pounds of cement will be assumed as one cubic foot.

In many cases, and especially where elaborate preparations for inspection are not made, the honesty and experience of the contractor has more to do with the strength, good appearance and durability of the work than anything else.

I had begun to prepare a list of concrete bridges which have already failed in order to support what I say as to the necessity of good workmanship, and for employing experienced and reliable contractors, but for several reasons I shall not give it. I shall mention, however, one cause of failure which may easily be guarded against—filling in the earth backing complete on one side of a bridge before it is started on the other side. As you know, a load over one-half of an arch is much worse than twice the same load over the whole arch, and an engineer will never design an arch to stand such an eccentric loading as the whole of the earth fill over one-half of the arch and none of it on the other.

out what I say. Some of the bridges here listed have been built, and the price agrees closely with that given:—

Reinforced Concrete Girder vs. Steel Beam Bridges. Superstructure only.

16-foot roadway.

Style of concrete bridge.	Clear span.	Cost of concrete bridge.	Cost of steel bridge.	Style of steel bridge.
Five beams, spaced 6-ft. centres; 6-in. floor, reinforced with expanded metal; lattice steel guard	8	$106	$177	Steel beams, with lattice steel guard and concrete floor.
	10	134	204	
	12	164	252	
	14	200	283	
	16	242	378	
	18	276	414	
	20	318	505	
Two girders, connected by floor-beams, girders serving as guard; 6½-in. floor	18	276	....	
	20	304	....	
	22	342	545	
	24	392	644	
	26	460	688	
	28	492	854	
	30	572	898	

In the above gravel is assumed to be worth $1.25 at the site of the work.

I shall not attempt to give a schedule of prices for concrete arches, because here the abutments would have to be taken into account, and they are variable in character, depending upon the nature of the foundation, and further, because the quantity of material depends not only upon the height and width of roadway, but also on the height of roadway from the water. I shall only say that as the span increases the price of a concrete bridge increases in general at a faster rate than that of a steel bridge. For a 50-ft. span the prices are often about equal. For this span, where the roadway is from 10 ft. to 12 ft. above the surface of the water and is 16 ft. wide, and where the foundations need to be carried 6 ft. or 7 ft. below it, gravel being fairly cheap and cost of erection for steel not great, the price of a concrete bridge, either girder or arch, and of a good steel bridge, with concrete floor and lattice steel guard, will be about the same, abutments and all complete; that is, about $3,000. When the foundations require piling the concrete girder and the steel bridge would cost about the same, but the arch would be somewhat more expensive. For greater spans than 50 ft. the concrete girder as ordinarily designed requires much reinforcement and becomes very heavy, but there are no such limits to the arch.

I shall say nothing as to the subject of design of concrete or steel bridges, because the discussion would become too technical.

In conclusion I give Mr. Luten's summary of the advantages of concrete bridges:—

"Concrete bridges are permanent improvements.

"Concrete bridges require neither painting nor repairs.

"A concrete bridge is the only one that grows stronger with age.

"Concrete bridges are flood-proof and frost-proof, rust-proof and fireproof.

"As time passes traffic on our highways grows heavier: steel and wooden bridges grow weaker; concrete bridges grow stronger.

"To build a concrete bridge, then, is just plain, common-sense."

ONTARIO PROVINCIAL GOOD ROADS ASSOCIATION.

On March the 3rd and 4th, the seventh annual meeting of the Ontario Provincial Good Roads Association was held in the Municipal Hall, Adelaide Street, Toronto; the President, Mr. W. H. Pugsley, predided.

The delegates were honored with the presence of His Honor the Lieut.-Governor, Hon. J. M. Gibson, who, in formally opening the convention, expressed his appreciation of the good work being done by the Association.

Tracing the history of the first system of road-making in Canada, particularly when the old corduroy roads were being much in use, the Lieut.-Governor said:—"When Senator Geo. W. Ross was Premier of Ontario he, like all stubborn Scotchmen, advanced a theory that something should be done to improve the highways. His theory has been a stimulus for the promoting of the work. Some of his colleagues thought that he should have left it alone, because of the friction that might be created between the larger and smaller municipalities as to which should get the most money. The object of Senator Ross' measure was rather to stimulate local effort."

Later His Honour said:—"Every mile of good roads constructed by a municipality is an object-lesson to the other municipalities to do the same thing, and thus give the people ideal highways."

In the course of a brief address on "What Country Roads Have Accomplished," Mr. A. W. Campbell, Deputy-Minister of Public Works, said that the improvements in roads, bridges, and culverts had been something marvellous. Mr. Campbell declared that there was too much taxation at the present for road improvement purposes. In his opinion there was a heap of carelessness and unnecessary waste, which comes from so many causes, in the expenditure of money for road improvement in some parts of the Province. He did not believe in expending large sums of money and threatening the people with dangerous taxation unless they were given good returns.

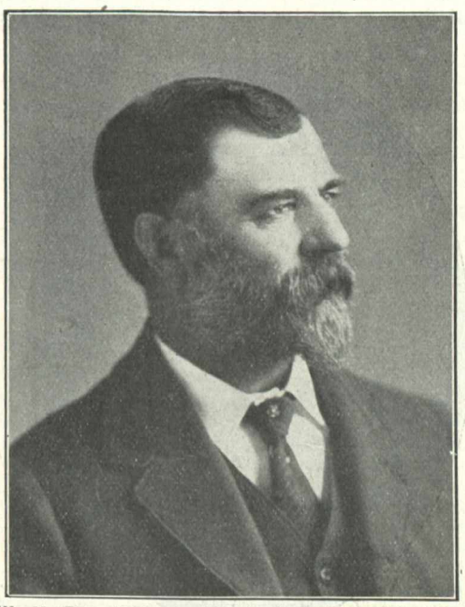
"Whereas, the Province has, with a lavish hand, aided our privately-owned railways which provide the long haul to market for our farm products."

Mr. John Beam, of Welland, Ont., addressed the Association on "The True Solution of the Good Roads Problem."

Mr. Beam claimed that the Government had done more than its share for private roads, i.e., railways, and should now devote some attention to public roads, the county highways.

The failure of the county roads system was the fault of the defective, unworkable act, he said, and not of the people. The Government share of one-third of the cost should be increased to one-half.

"The experience of all the older countries of Europe," said Mr. Beam; "as well as that of the most advanced neighboring states, establishes the fact beyond controversy that by nothing short of a comprehensive scheme, whereby the State



Mr. W. H. Pugsley, President of the Ontario Good Roads Association.

assumes the greater portion of the cost, will our Province ever obtain the priceless boon of a connected system of good roads worthy of the name throughout Ontario.

"To show how far we in Ontario are behind some of the more progressive states, I need only state that New York will construct thirty-five main routes nearly 4,000 miles across the State from end to end, connecting all the larger towns, the entire cost to be paid by the State. That State also pays half the cost for county systems, and one-third the cost for maintaining the remaining township roads, which are now all on the cash or money system, and statute labor is forever abolished."

The failure of counties to adopt the system at present provided was a disappointment to him.

"One of the most potent factors in defeating the by-law," related Mr. Beam, "was that in our eight townships $10,000,000 worth of railway property, extending about 200 miles, is practically exempted from taxation. These railways should pay $85,000 in taxes to be on a par with other property, but only pay $12,000, and then the Province robs the townships of the bulk of this small tax. The towns are permitted to tax railway property full value, and are not robbed of it either. The village of Bridgeburg collects over $7,000 from such property, including the Canadian end of the International Bridge. This is Canadian justice, but it certainly is not British justice. It certainly is not British, as railways pay $1,000 per mile taxes in England."

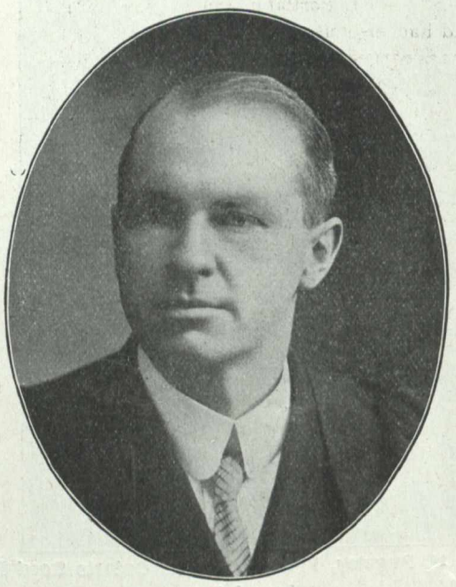
(Continued on Page 341).

CANADIAN CEMENT AND CONCRETE ASSOCIATION.

FIRST ANNUAL CONVENTION.

On the evening of Monday, March 1st, 1909, the Convention was formally opened in the St. Lawrence Arena, Toronto.

President Gillespie in opening said: Gentlemen, I have much pleasure in opening the First Convention of the Canadian Cement & Concrete Association, which was organized about a year ago. Its aims and purposes are to extend a knowledge of cement and concrete and reinforced concrete, and to direct the attention of possible users to the application of these materials in construction. Also to provide opportunities for meetings from time to time at which scientific and practical subjects bearing on the application of these materials in construction will be discussed. Also to provide for the publication from time to time of literature as it may seem advisable. We have two or three precedents for our organization—the great Institute of Great Britain, embracing in its constitution 500 architects and engineers, the most eminent in the British Islands. That organization's president was the Right Honorable the Earl of Plymouth, the late Minister of Work in the Imperial Government service. One



Mr. Peter Gillespie, A.M. Can. Soc. C.E., President of the Canadian Cement and Concrete Association.

of the vice-presidents is Sir Douglas Fox, one of the past presidents of the Society of British Engineers, the most influential organization of its kind in the British Empire. This organization hopes to popularize the uses of cement and concrete, and other products in the line of this material, and it is thought that to hold an exhibition and convention from time to time will accomplish this end. You will find on the floor of this hall this evening a large number of very fine exhibits, over 60 in number, comprising cement products, machinery, and various appliances necessary in their manufacture; and, I think, it is a compliment to the enterprise and ingenuity of the manufacturers in the United States as well as Canada, because many of the exhibitors here are from across the line, and they have shown sufficient interest in this Convention to come and display their exhibits. We have with us this evening Hon. Dr. Reaume, the Minister of Public Works, for the Province of Ontario, representing what, I think, is the most important part of the provincial service, and I am glad to know that he takes a more than superficial interest in that material which is attracting so much attention in the industrial work. I have much pleasure in calling upon him to open the Exhibition.

Hon. Dr. Reaume said: Mr. President, ladies and gentlemen, I assure you that it is a pleasure for me to be here tonight. I thank the Committee of Arrangements for having invited me to take part in the opening ceremonies of your Exhibition. I am glad to see so many throughout the length and breadth of this province taking a deep interest in this industry as exhibited this evening. Within the last few years the Ontario Government had devoted a great deal of time, attention, observation and study to this cement and concrete work. Within the last few years we have recommended the use of cement to the municipal councils and to the farmers, with the result that all the bridges of any importance throughout this province are to-day built with cement abutments with structural steel and even cement floor. We have ourselves lead in the example, as all our bridges of any importance are built with concrete and steel. The Mattawa bridge, costing us some $21,000, is one of those, and only this last year we have built bridges over the Spanish River alone which cost us in the neighborhood of $70,000. We are now preparing estimates for the construction of a large number of bridges, because we observe that throughout this province, particularly in its northern part, where some 10 or 15 years ago the Ontario Government undertook to build bridges spanning important streams, where settlers could not very well undertake the work, those bridges were made of wood. What has been the result? Those that are left are now in a decaying condition, falling down; a large number of them have been swept away by floods and spring freshets; whilst a large number have been burned because of forest fires. We have been taught by experience that although it may cost a little more for the time being, we are determined that we shall give to the people of this province some good, solid and permanent work. I am glad to see that the country at large are adopting the use of cement not only for bridges but for their barns, foundations, concrete floors and pavements. In the town where I live we now have cement blocks. They are durable, practical and very serviceable, and the people are well satisfied. We are now seeing silos built in that way, and even the building of four or five large dams over streams and for private water-powers. At this present time I am figuring on cement as being in the end the cheapest, most permanent and surest of all materials that can possibly be used. You gentlemen who are interested in this industry must unite and work hand in hand for the welfare of your industry. Be careful that you employ good mixers and good upright, honest men. A great deal of the discredit and the fault of the finish of cement work in sidewalks and pavements is generally due to bad mixing and dishonest work, bringing disrepute upon the trade and the industry of this country. However, I must say that sometimes some of the cement men are not altogether blameless. It is our duty, in connection with our department, to visit different towns and examine the cement work, and I have seen where it was not always due to the mixing, but to cement that was not always clean. However, I will say this much, that on the whole in this province, whatever has been supplied to the department for those municipal bridges that have come to our notice, the cement in this province has been of a good quality. But you are here not only for self-admiration, you are here for self-protection. You are here to encourage the trade or the industry that you are engaged in. Let me suggest that you do not allow yourselves to be outdone by our American friends. I am glad to see so many of them. We like them. We like to meet them and discuss things; but after all, Canada for the Canadians, and we want to get our good share of the trade. We are very friendly with the Americans, and we like to do business with them, we like to mix with them. There is one thing that came to my mind, and I would like you to go and stir up the energy and the vim and the best qualities of our Canadian cement men. I noticed within the last two years a tremendous work being carried on between the United States and Canada, through the construction of a big tunnel under the Detroit River. We know that up to the water's edge cement ought to be imported free, but beyond that Canada imported over 100,000 barrels of cement from the United States. What were you doing? That was imported here while your cement mills were idle. Your men were perhaps sometimes walking the street. You wanted to

have that trade. What was said? They said, "We can't get good clean Canadian cement, and we must import it." Then, if you have, some of you, such a reputation, I hope that you will always be ready to produce an article on the market of such quality that when it is tested no such remarks can be made about the Canadian cement. Not only are we building our bridges and our cement works and sidewalks, etc., but we are largely introducing the cement in our public buildings. I could take you to Brockville and show you what has been accomplished with cement—a monument to the credit of our Provincial Secretary—of course through the good advice of the Public Works Department. Now, I have had much pleasure in meeting you. I hope you will have a very successful convention; that you will discuss the question of using cement and machinery to your greatest advantage. It is the coming building material. We are taking it up in building in almost every possible way, and it is for you to unite and foster your industry and you will certainly reap the benefit yourselves. Now, I have not got a button to push. If there was one here I would be very sure to find it, for I never was in a hotel when I was looking for a button but what I could find it. I have much pleasure in declaring this Exhibition open to the gaze and the admiration of the public of Toronto and vicinity.

Tuesday Afternoon.—The Convention opened at 2.30 in the Banquet Room of the King Edward Hotel, a large audience being present.

President Gillespie: Gentlemen, we have with us Dean Galbraith, head of the Faculty of Applied Science of the Toronto University. I shall call upon him to open the First Convention of the Canadian Cement & Concrete Association.

Dean Galbraith: I have not prepared anything that ought to be dignified with the name of an address; in other words, I have not made any special study or investigation for the purpose of this meeting. I came here largely to show that, as representing the University, we are in sympathy with the work in which you are interested, and we are very proud that one of our staff, Mr. Gillespie, this year has the honor of being your president. It only requires a visit to the St. Lawrence Arena to see what progress is being made along the lines of cement and concrete. I don't suppose that 15 years ago, or certainly not in Canada 10 years ago, any Exhibition such as we have now could be seen. Something similar might possibly have been seen in the United States, but not here. Our expansion in the manufacture of cement has been very great for these last few years; in fact, it has been very large over the whole continent within the last twenty years. The last returns show that for the year 1908 the American production of Portland cement is somewhere about forty million barrels, and our own returns show somewhere about two million barrels, as contrasted with forty-nine million barrels, and about 2,400,000 barrels in 1907. In other words, there has been a falling off of production during the year 1908. Whether this will continue, or whether it will maintain its level is, I presume, more or less a mattter of uncertainty for the coming year. I presume the capacity of the cement plants both in the United States and Canada is from one-quarter to one-third greater than the amounts they have been turning out; so that we may not look for a very great increase in the construction of cement factories. We may rather hope for investigation, for invention, for methods of making better use of what we have already, which, when the time comes to spend money, may again bear fruit. It seems to me that the times of depression are times of lying in the ground—seeding, so to speak—and it is from those times that must come the invention and improvements of the future. I remember being interested in concrete very long ago. I was a contractor's engineer once on the Intercolonial Railway in the early seventies, and I remember when we were about to get the dimension stone for one of the bridges on the Metapedia River—the mill stream bridge—it was a question whether the contractor should not make the piers and abutments of artificial stone, as we called it then, instead of getting the natural quarry stone. He set me to work, and I manufactured a concrete block of Portland cement about the size of the ordinary dimension stone in the abutments of the bridge; and, taking all possible care with it, put it in the form, and we put it out into the river in the fall and let it remain there till the spring just to find out how it would stand the action of the ice and water. I suppose that my concrete making was not very good. Even then, of course, we had not Portland cement such as we have now. The theory of Portland cement had not advanced very far even at that stage; the making of it was more a matter of experience than of science. Of course it was an imported cement which had come from England. In the spring that block was seamed with cracks and worn to such an extent that we did not think that artificial stone was the proper material for the building of bridge piers and abutments. Now, that is a little experience from the year 1871. On another occasion I spent a few months in Boston while the off-take sewers were being built—that great system of sewerage by which the sewage is collected and carried out to Moon Island and discharged when the tide is about to fall. Mr. Elliott C. Clark was the chief engineer of that work, and I spent a good deal of time there in trying to learn a little about Portland cement. As you know they used a good deal of cement at that time, in 1883, and I then first heard the theory that Portland cement owes its strength, owes the amount to which it can take up sand, to its fineness. I can remember Mr. Clark telling me that as a new thing at that time. They had been importing English Portland cement then to a very great extent, and had also used some American, but it was the first time I had learned that fact, and I believe it is still considered to be a fundamental fact in the manufacture of cement—that it has to be ground to at least a certain extent of fineness to be of any value whatever. Now, we see the cement industry advancing with leaps and bounds. We have it used for the ordinary masonic mortar, and now it is getting into everything; we have bridges, culverts, and to a certain extent railway ties made with reinforced cement. I have even heard a proposition of making telegraph and telephone poles with cement, reinforced of course. All these advances, and especially that due to reinforcement, will, no doubt, establish for the cement and concrete industry a very great future. I think we are only at the beginning of finding uses for cement. It is certainly a very peculiar substance in itself If you come to think just what its success depends upon, you will see that there is nothing else like it that we know of. In the chemical laboratory we have two general processes of work, one called the "dry" and the other called the "wet" process. This applies to all chemical investigation whatever. The dry process refers to methods of handling your material by means of heat—by melting, drying, calcining, burning. These processes are dry processes. Then the wet processes use solutions, largely acqueous or watery solutions, because investigation is dependent upon the reactions of those solutions with things put in, and among themselves. Now, of course we all understand that the wet method, that is to say, the method which simply required the ordinary atmospheric temperature, is a handier method than the dry method, in which you need high temperatures. While in the manufacture of cement you use the dry method, you necessarily have the high temperatures, yet you make from that cement a bulk of concrete, possibly five or six times as great by what the chemists would call the wet method; and requiring no high temperatures, it is easy to work. You can take your time to a certain extent, within the limits of the action of the cement in hardening. You can make it into what form you please. Well, now, the fact that it is capable of being used by the wet method is a great advantage; it is a great thing in its favor. Another thing is this: that it is capable of hardening in the air, and also under water, within a comparatively short time. When you have a material like cement, which gives you a sufficient time to work it—and not like cast iron, whose action in melting and hardening very quick and consequently very difficult—and which does not change with extreme suddenness, and which has the strength and elasticity and denseness, etc., that are required for nearly all our constructive purposes, no one can wonder that inventors are determined to stick to cement yet, and find out what they can do with it. The investigations that

are now being made on its fireproof properties and on the methods of water-proofing are final investigations which will no doubt bring it more before the public than ever. There is, no doubt, at all that while cement, being a non-combustible substance, is fire-proof in that sense, yet it has not been altogether certain how lasting and how durable cement materials would be under fire. We have had the test of a great many buildings, especially in Baltimore and in other places, to show that cement will hold its own; it is not only non-combustible, but it will hold its own better than stone, and possibly as well or better than brick. There is, no doubt, at all that when the public generally becomes convinced of the fireproof properties of concrete, there will be a greatly increased use of it. The question of building ordinary houses will come up, though in Canada that has not come to the fore to any great extent yet. If inventors are successful in getting the right quality, combined with cheapness, there is a great field for it in the construction of houses; everybody will be able to use cement where only a few now think of doing it. To my mind, the two structural materials that are of the greatest importance to the engineer and the manufacturer and builder of the present day are steel and cement. With these two we can do what we never did before—we can gradually economize wood. You know what has been said lately of forest conservation—that the value of our country will depend very largely on the conservation of our forests; on the holding up and steadying of the water near the head of the streams instead of allowing them to go off suddenly and denude the surface. Now, forest conservation is possibly at the root of a great deal of our future prosperity, and there is no doubt that the cement industries will have a very great effect in helping forest conservation. I am pleased to be with you, and assure you that we in the University are not behind the public in feeling the advance of the cement and concrete industry.

President Gillespie: It will be the policy of the Association to encourage discussion following these talks and papers. Do any of you wish to discuss the Dean's address?

Dean Galbraith: I am afraid, Mr. President, that it does not contain very much for dicussion. I have not advanced any new theories or propositions about it. I have certainly tried not to advance any propositions about which there would be any doubt. For that reason, I think, it would be very difficult to discuss what I have said.

President Gillespie: I am sure the members of the Association as well as myself were very much interested in the reminiscences which Dean Galbraith gave us concerning his connection with the early history of the cement industry. At this first meeting I thought it would be prudent to confine my remarks to what, in my opinion, the Canadian Cement & Concrete Association might accomplish as a semi-technical and scientific organization, and these remarks, which are quite brief, are contained in this paper.

President's Address.

Mr. P. Gillespie said: It is doubtful, indeed, if any industry of magnitude can show a record of growth and expansion comparable at all with that exhibited by the manufacture and use of Portland cement, on this continent. It began in 1875, when D. O. Saylor, the father of the industry in the United States, erected his first plant in the Lehigh Valley. The domestic output totalled a million barrels in 1895; 8,482,000 barrels in 1900; upwards of thirty-five million barrels in 1905, and nearly fifty million barrels in 1907.

With this phenomenal record, a comparison of the growth of the iron industry in the Republic is interesting. As early as 1812, long before Joseph Aspdin in England had conceived the idea of making Portland cement, the output of pig iron in the United States was fifty thousand tons per annum. By 1840, this had grown to 287,000 tons; by 1864, to one million tons, and by 1875, when Saylor erected his first kiln at Coplay, Pa., the production of this material was in the neighborhood of two million tons per annum. Since that time, this industry, which is generally conceded to be a kind of industrial thermometer, has grown with rapid strides, reaching an aggregate output in 1905 of 23,360,000 tons. Between the years 1880 and 1886, the growth in the iron industry was 48 per cent., while between the latter year and 1904, it was 311 per cent. The statistics of the United States Government show during the same periods, increases in the cement industry of 256 per cent. and 23,400 per cent., respectively. In Canada, the growth has been scarcely less marked. The output in this country for 1892, the first year for which statistics are available, was 29,000 barrels. By 1900, this had grown to 283,000 barrels, and for 1907, to 2,368,000 barrels. In short, the home production has doubled itself every second year since 1901. It is interesting to note that whereas the per capita consumption of Portland cement in the United States for 1905 was 161 pounds, that of Canada for the same year was substantially half that quantity.

In consequence of this marvellous growth, a situation inevitable though unfortunate has been created. The advocates of cement construction through misguided enthusiasm, inexperience or commercial knavery, have made declarations concerning the cheapness, strength and excellence of their product, which never have been and doubtless never will be true. The American people have come to recognize the merits of the new material long before they were truly appreciative of its limitations. Its easy manipulation, its relative cheapness, its immunity from decaying influences and its fireproof qualities were recognized before its behavior under stress and its elastic properties were known sufficiently to permit of intelligent and economic construction. The inexperienced designer, without data, without precedent and without standard, has made mistakes, some of which, be it regretted, have proved fatal. Incompetent supervision and careless inspection have been unfortunately too common. There is, no doubtt, that most of the failures in concrete and reinforced concrete structures, during the past decade, are traceable to some or all of these various causes, and, as may be expected, the public at large has attributed the failure to the material rather than to the method of its manipulaion.

Field of the Association.

Fortunately, of late years, much investigation and experiment, both inside and outside of the laboratory, have been carried on. As a result, our knowledge concerning the properties of concrete has become more exact, our methods of manipulation have been improved and our practice in design has approached something like standardization. Such organizations as The American Society for Testing Materials, The American Railway Engineering and Maintenance of Way Association, The American Society of Civil Engineers, The Canadian Society of Civil Engineers, The National Association of Cement Users, and others have had committees working on the various problems in the manufacture and use of Portland cement. Much valuable information has been collected, and much important work has been done. The publications of these bodies are generally regarded as authoritative, and represent the focussed opinion and experience of the best men available. That their work is not yet concluded, is evidenced by the fact that recommendations looking toward changes, sometimes, indeed, quite radical, are frequent. As experience and investigation reveal additional information, the necessity for such changes become imperative. Manifestly then, the control of the methods of employing this material is largely in the hands of such organizations, and if the industry is to be saved from discredit through ignorance, incompetency or dishonesty, it must be through their good offices. How can the Canadian Cement and Concrete Association assist in this work? I think, in several ways, viz.:

First, by becoming an outlet for valuable contributions on the manufacture, testing and use of Portland cement.

Second, by adopting as an organization, either in toto or with modifications, specifications which other reliable organizations have evolved, or by creating others which seem better suited to the conditions under which they will have to operate.

Third, by similarly assisting in the standardization of methods of testing cement and cement products.

Fourth, by becoming a "clearing house" for the ideas and experiences of manufacturers, users, engineers, archi-

tects and chemists. In the last analysis, what is best for an industry as a whole will be best for the individuals who are identified with it in any capacity.

There are many problems before the cement man to-day, which must be honestly met, and the ultimate status of this organization will depend pretty much on its integrity and independence in facing them. To publish authentic information is one of its prime functions, and it will be judged solely on whether it properly discharges that function. The usefulness of concrete in sewer construction has recently been a live topic in Toronto and other places, and there are no doubt many persons who are honestly seeking information on this very important subject. The fire-resisting qualities of concrete and its efficiency in this regard relative to that of clay products, has been much debated of late. The effect of steel on the elastic properties of concrete adjacent to it, the ability of such imbedded metal to resist corrosion, the failure of cement sidewalks, the care of expansion and contraction in large masses of concrete, the effect on concrete of chemical re-agents and products of organic decay and putrefaction, are some of the things concerning which many sincere but inexperienced people, and perhaps too, some experienced users of cement are not absolutely clear. There are in the employ of the cement plants in Canada, chemists whose opportunities for studying these problems of manufacture and use have supplied them with data of undoubted value, and there are contractors, engineers and architects whose constructional experience has been extensive. For all such who, through experiment or experience, successful or otherwise, have learned something which will likely prove of value to their fellow-members, the publication of a method, process or discovery is a duty to their Association. Reciprocity in ideas ought to be the watchword of this organization.

Cement Specifications.

A specification that is too severe defeats its own object; one that is not severe enough is a menace to both parties to the contract. Most of our Canadian cities have incorporated into their building codes, rules for the regulation of concrete construction. These rules are generally conservative, sometimes unduly discriminating as to the use of concrete and reinforced concrete, and err in that they are not sufficiently elastic and fail to recognize that different requirements should be demanded for different kinds of construction. This Association should throw the weight of its influence toward the procuring of specifications that avoid these objectionable features and that will properly safeguard the public by insuring for them reliable and workmanlike products. Such specifications, representing in compact form, what a large number of intelligent, honest, and experienced men have found to produce the best results, will do much to win the confidence of the architect, the builder and the residence owner, and will prove in the long run a protection to both producer and consumer.

To obtain, prior to acceptance, information concerning the fitness of any material or method to perform the work expected of it, is the purpose of a test. Concerning this purpose and the efficacy of a test to serve that purpose, Dr. Charles Dudley has this to say:—

"The knowledge of the properties of materials of construction has increased, methods of testing and testing appliances have grown up in delightful profusion and it is to-day entirely possible, we feel safe in saying, for an engineer to be reasonably sure that defective material does not go into his structures ..... In view of present knowledge and present means and appliances for testing, are engineers or their principals any longer entitled to offer as an excuse for defective materials, that they were bought from the best makers? Can they equitably do so? Can they legally do so? Is not the time near at hand when engineers and their principals will be compelled, if not legally, then by force of public opinion, to acquire, by the establishment of laboratories and means of testing, by the making and enforcement of specifications, such knowledge in regard to the materials they are putting into structures, as will give the public greater security than it now has against disaster?"

Granted then, the wisdom of the practice of testing, what about the method employed? One of the chief difficulties in making comparisons between results obtained in different places at different times and by different operators, is that the methods of conducting tests are often widely different. The drafting of specifications designed to obviate that difficulty has been one of the commendable acts of the technical societies, and I feel that to this worthy object, our Association should contribute something.

In the fourth place, this Association exists for the purpose of interchanging experiences among its members. Here is the opportunity for those whose experiences have been similar, to rub shoulders,—to compare notes. It is in such ways that progress will be made, that the repetition of failures will be prevented, that the successful method will be perpetuated and the organization made an educational factor. The meetings belong to the members—and the public—and it is hoped that they will take advantage of every opportunity afforded to give and receive useful information.

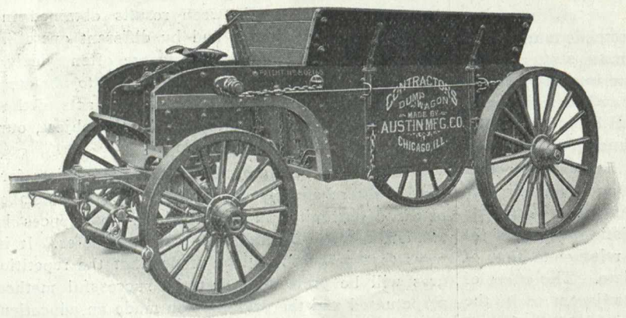
As many of you are aware, the Canadian Society of Civil Engineers at its recent meeting in January, discussed at considerable length the question of Government research laboratories along lines similar to those conducted by the United States Geological Survey at St. Louis, Mo. These laboratories, which are the outgrowth of the model testing laboratory of the Association of American Portland Cement Manufacturers at the St. Louis Exposition, 1904, are now maintained by the Federal Government at an annual cost of $100,000 for "the investigation of structural materials belonging to or for the United States, such as stones, clay, cement, and so forth."

It is to be regretted that in Canada, no provision for such investigations on anything but a small scale, at present exists. How important to the industries of Canada would be the creation of such a laboratory? It would not exist for the purpose of commercial testing, but rather as an institution where, under capable and unbiased direction, the facts concerning the materials of construction could be investigated according to a comprehensive plan not now possible. If a beginning were made, I feel confident that its usefulness would soon justify its creation. It has been estimated that the tests reported to date from the St. Louis Structural Materials Laboratories indicate the possibility of reducing the amount of material used in public buildings and structures made wholly or in part of reinforced concrete, so that the cost will be lowered ten per cent.

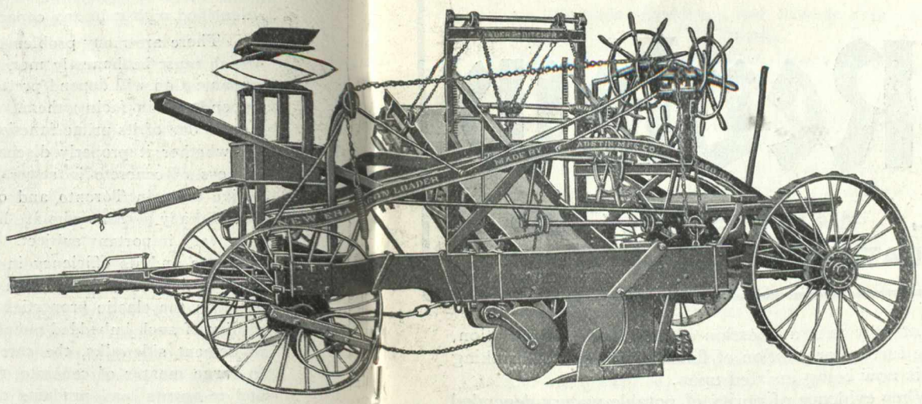
The efficient conduct of a technical society necessitates the appointment of a Permanent Secretary. This is essential in order that there be continuity of method. Since he must act frequently without the advice of the Council, he must be a man of some administrative capacity. Further, the status and influence of the Association, its numerical strength and its resources are pretty much measured by his energy. He must oversee details, take the initiative, and, in brief, perform all the functions of a general manager. In order to do this, he must be a person who is prepared to devote a large portion of his time to the work of the Society, and for this, it is only reasonable that he be paid. It will be very much to the interest of the Association if its financial condition will permit the appointment of such an official.

Finally, let it not be forgotten that the Canadian Cement and Concrete Association is a national organization. Its membership must include representatives from both parties to the transaction—the buyer and the seller; the maker and the user. On its committees, should be found the manufacturer and the builder, the engineer and the architect, the investigator and the scientific writer. That the best interests of this wide constituency may be properly conserved, it is imperative that no one section shall dominate the work of the Organization. Only by resting on this broad democratic basis, and by recognizing that in a multitude of councillors there is safety, can the Association do its part in furthering the interests of all who are concerned in the building up of what is destined to be one of the great national industries of Canada.

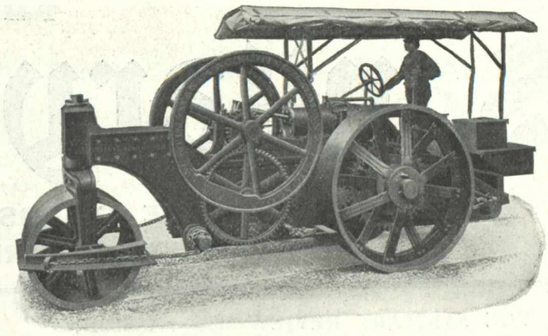
(To be Continued Next Week.)



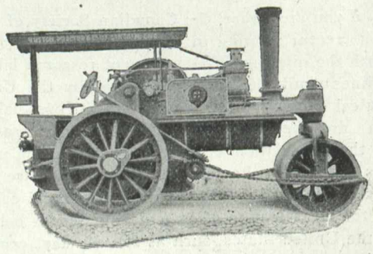
Dump Wagons and Carts



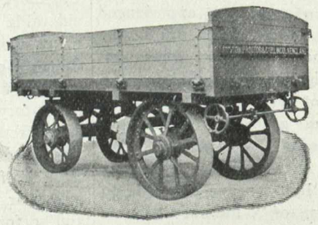
New Era Elevating Graders



Austin Motor Road Rollers

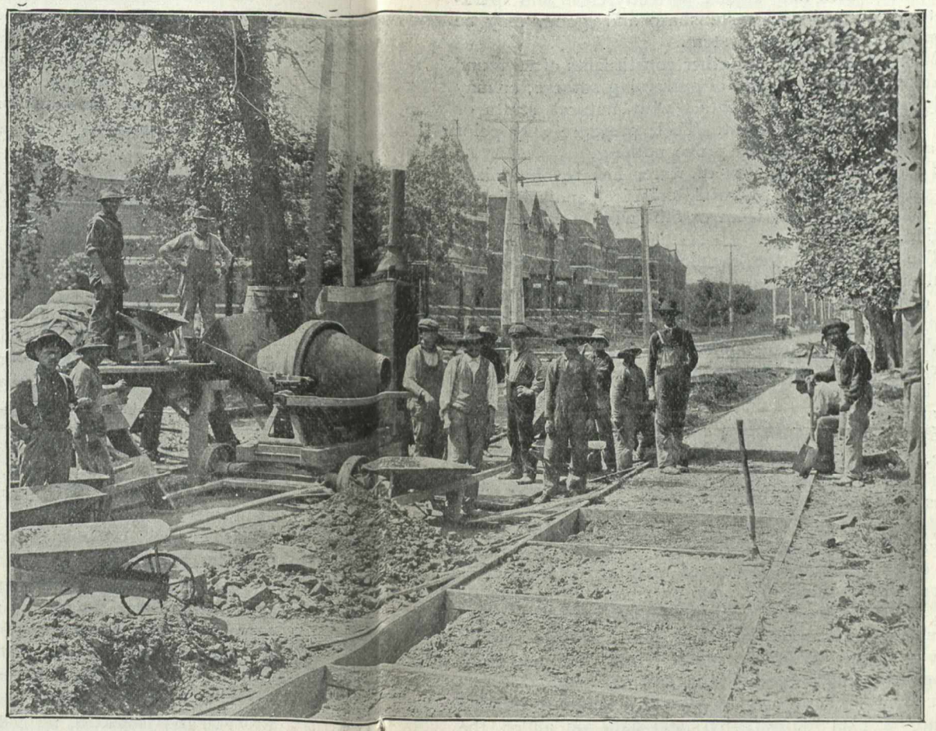


Steam Road Rollers and Scarifiers



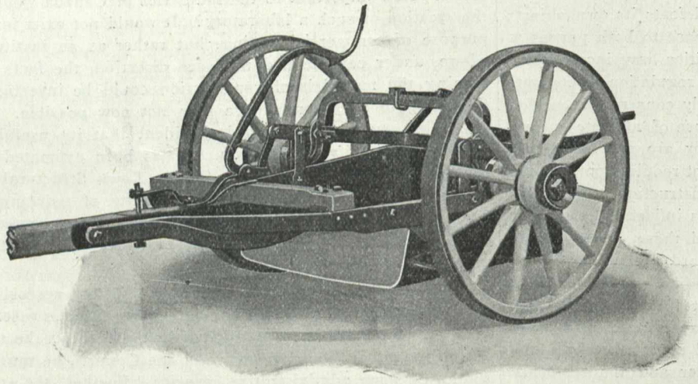
Traction Wagons

MUNICIPAL EQUIPMENT

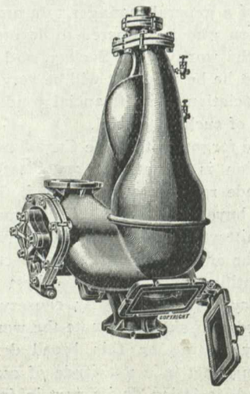


Smith Concrete Mixer on Sidewalk Work

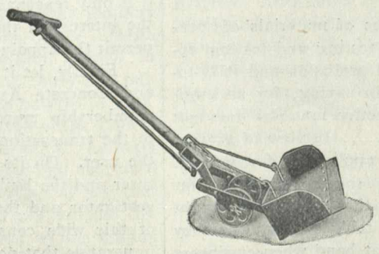
Street Sprinklers and Sweepers



Wheel and Drag Scrapers and Plows



Pulsometer, Centrifugal and Sewage Pumps



Pavement Scrapers

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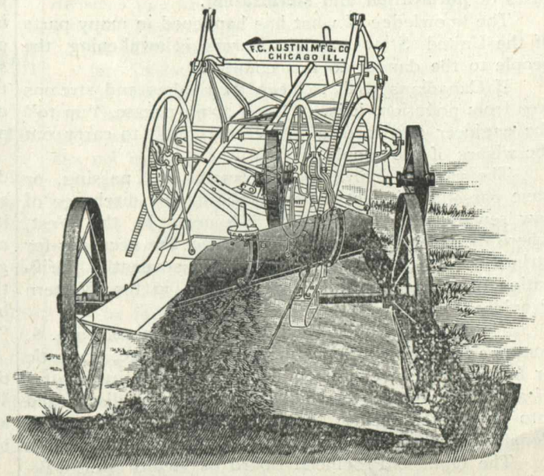

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THE Sanitary Review

SEWERAGE, SEWAGE DISPOSAL, WATER SUPPLY AND WATER PURIFICATION

THE SANITARY REVIEW—ITS MISSION.

From this date it is our purpose to devote a portion of the reading matter specially to the subjects of **Sewage Disposal, Main Sewerage, Water Supply,** and **Water Purification.**

At the present time in Canada there is no publication which especially deals with these subjects.

The consulting civil engineer, the municipal engineer, the medical officer of health, etc., has no ready means of reference for up-to-date data on such subjects.

Results of valuable experiments are only published promiscuously, interspaced with other engineering matter, and are lost sight of in the flotsam and jetsam of general engineering information.

To the community the municipal engineer is an official of great importance. With him lies the spending of large sums of money, the construction of sewerage, sewage disposal and water supply plants. Whether the public money is well spent or merely dissipated depends on the up-to-date knowledge of the engineer.

We regret to think that works are even at the present time promoted on lines which have not stood the test of time and experience, and only ignorance of what has been done elsewhere can excuse their promotion.

Canada is becoming more alive every day to the necessity of guarding and procuring pure water supplies.

Analyses of drinking water are demanded by the people, and when it is shown that impurities exist, it is either demanded that the impurities be removed or a fresh source of supply be tapped.

The question of guarding our sources of water supply is intimately connected with the prevention of pollution.

Raw sewage and trade liquors are discharged into rivers and lakes without the slightest attempt in most cases of **purification** and **sterilization.**

The knowledge of what has happened in many parts of the United States and in Europe is awakening the people to the danger to this country.

If Canadians wish to keep their lakes and streams free from pollution, it is, to use a slang phrase, "up to" the engineer and medical officer of health to carry out the wishes of the people.

The various Provinces in Canada are passing, or have passed, stringent laws prohibiting the discharge of raw sewage into fresh water channels. In the West, where the streams are small in volume, the necessity for stringent laws has first been felt. Consequently, purification of sewage outfalls is demanded in the Western Provinces.

The Ontario Public Health Act, Section 30, para. 6, contains the following enactment: "No sewage, domestic or factory refuse, excremental or other polluting matter of any kind whatsoever shall be placed in or discharged into any waters being the source of water supply." Penalty on summary conviction, $100 for each offence.

The Ontario Provincial Board of Health are awakening up to the necessity of demanding the terms of the enactment.

Not only is it a question of prevention of pollution, but the further precaution of final purification of drinking water is now being insisted upon.

When evidence of purity of potable waters depended solely upon chemical analysis, a lower standard of purity was looked for.

Chemical analysis as a proof of purity is now a thing of the past.

Waters which would easily pass the usual chemical tests and be pronounced good drinking water may be almost alive with typhoid or cholera disease germs.

Water which may appear perfectly clear and sparkling to the naked eye, taste sharp and good, may be poisonous to the human system.

Many of the salts and other constituents often found in waters may be the result of putrefying sewage, or may simply be the result of contact with natural strata or other harmless environment. Their presence may point to suspicion, but generally prove nothing.

The biological analysis of water has revolutionized pure water principles. Careful biological analysis in all cases will prove the presence or otherwise of excremental pollution.

The question of the chemical constitution of water is still one that has to be answered. The question, however, of the presence of disease germs in the water is of the utmost importance.

We find now huge bodies of water, such as Lake Ontario, the purity of which at one time no one would even have dreamed of questioning, being looked upon with suspicion.

Lakes and rivers which are the highways of commerce, apart from the risk of pollution by land-made sewage, or subject to pollution from the sewage and wastes from the floating communities on their surface.

We find in the United States the subject of water purification a live hygienic problem. We find in Canada large cities agitating for defined methods of final water purification. Toronto, $700,000 on water filtration to be spent, while $2,500,000 further sum on sewage concentration and purification. Lindsay, Ont., a large sum of money on ozone sterilization plant. Towns here and there putting down mechanical filters, and so forth.

It is, therefore, our intention to meet a decided demand for exact information and data on all of the above questions. Our "Sanitary Review" will present to its readers in a concise manner, easy of reference, the most up-to-date facts and conclusions affecting engineering hygiene. What is being done in Europe and the United States will from time to time be edited and boiled down to within reasonable focus, so that those "who run may read."

We have the opportunity and means of getting at the results of the "world's" experiments in those matters. We will present to our Canadian readers these results, and attempt to show how far such require modification by reason of our conditions and climate.

We will watch with sympathetic feelings and critical mind all Canadian work in this direction, and, above all and beyond all, will invite Canadian co-operation.

AN OPEN LETTER.

To the Municipal Engineers and Medical Officers of Health of Canada.

Gentlemen,—The editor of this "Sanitary Review" desires a word with you.

We intend publishing in concrete and concise form up-to-date information on subjects affecting engineering hygiene, attempting to meet, what we consider, a demand.

Whether this special publication is a success, or otherwise, depends in part on yourselves.

Without your co-operation we cannot keep this sanitary portion of the "Canadian Engineer" a live one.

You can help us. In the first place, if you are not now subscribers to the journal, commence to be so at once. There is nothing more tiresome than preaching to empty pews.

If you have any criticism to offer, offer it freely, such is, and will always be, welcome. Don't say, "If I were editor I would make this or that improvement." Make your suggestion at once! Criticism, which does not become public in the right quarter, where it can be of use, is as inert as a still-born babe.

You can practically help us, by mailing all information as to the hygienic conditions of the locality in which you are interested. Give us information of what you intend to do, to improve health conditions of the community. Tell us of the work you have done, where success has marked your endeavors, where failure has been apparent. Great lessons result from failures, such should not be hidden.

Remember any discovery of advantage to the health of the people is not your own, it becomes at once the property of the people. Do not patent your medicines, offer them freely. No scientific subject can remain a mystery. Mystery is the basic principle of quackery.

We ask for your ideas, the results of your experience and experiments, such are of interest to the community.

In th's review we intend to run a "Query and Answer" column. Any question relating to fact or known data, we will endeavor to answer. Of course we cannot, nor do we intend to undertake to, answer questions which should properly be addressed to a consulting engineer. Problems, the answer to which, demand the paid services of the expert, will not come under our domain. At times, however, we may have information at hand which to you may not be available, this we will give freely.

The editor of the "Sanitary Review" awaits with confidence your co-operation, correspondence and patient sympathy in the mistakes and errors he is bound from time to time make. "It is human to err."

Yours faithfully,

The Editor.

NOTES IN CONNECTION WITH SEWAGE DISPOSAL WORKS.

In making a report on sewage disposal works the following should be noted:—

Provisional agreement should be entered into for acquiring any land required.

Population provided for by the proposed works, and present population of the district.

Estimated dry weather flow of sewage per head of the population, and data on which the estimate is based.

Particulars of any trade waste discharged into the sewers, and analysis of the same.

Whether sewers are on separate or combined system.

Analysis of sewage when possible.

What proportion, if any, of the dry weather flow is due to infiltration water.

Particulars of storm overflow and degrees of dilution necessary to bring them into operation.

Source of water supply in the district.

Quantity of water used per head.

Will the sewage be discharged at outfall by gravitation or pumping?

Will the sewage be treated by night as well as day; if not, what will be done with the night flow?

Particulars of trial holes, sunk six feet deep on site of disposal works, showing nature of subsoil and ground water level.

Area of land reserved for irrigation or treatment of filtered effluent.

Area of land reserved for extension.

Dimensions and capacity of tanks.

Area and depths of bacteria beds.

What chemicals are to be used, if any?

How the sludge will be disposed of.

Particulars of any waterworks which may be affected by land treatment.

Assessable value of district for sewage purposes.

Average density of population per acre.

Is site of proposed works liable to floods, and, if so, how often, and to what depth submerged.

General description of scheme and proposed system of purification, and degree of purification expected by the works, with probable analysis of the effluent.

Ground levels on site of works.

Invert of outfall sewer.

Top water level of tanks.

Floor of tanks at shallow end.

Floor of tanks at deep end.

Surface of media in bacteria beds.

Floor level of bacteria beds.

Invert of main effluent drain.

If percolating filters, amount of dose per surface area.

Amount of gallons of sewage per day per cubic yard of filtering area.

THE ROYAL COMMISSION ON SEWAGE DISPOSAL.

General conclusion: "We are satisfied that it is **practicable** to **purify** the sewage of towns to any degree **required,** either by land treatment or by artificial filters, and that there is no essential difference between the two processes, for in each case the purification, so far as it is not mechanical, is chiefly effected by means of micro-organisms."

The chief point in the above statement is that after nine years' experiment, observation and taking of evidence, the Commission are able to be so definite. "Purify sewage to any degree required." Hitherto, and even at the present time, many can be found who will doubt this practicability

A digested study of the Royal Commission's findings and the deductions of the most exacting experiments lately made by the Hamburg State Hygienic Institute point to three divisions into which the sewage purification problem can be divided. These are as follows:—

(1) Clarification processes.

(2) Oxidation processes.

(3) Sterilization or disinfecting process.

The first process refers entirely to the removal of as much suspended matter from the sewage as possible, the aim not being to change the chemical formation of the constituents of the sewage or produce a liquid effluent any purer than the liquid effluent.

The second process is mainly to bring about a chemical change in the constitutents of the sewage and produce a mineralized effluent, via an effluent of a non-putrescible character, incapable of producing any nuisance to the senses.

The third process, that of sterilization, to kill and exterminate the various disease germs which may be found in sewage, and which cannot be entirely removed by the above two processes.

Just how far a community is required to go in proceeding with the above processes depends entirely upon local conditions. Do not let any community, however, run away with the idea that in only attempting the first they are going in for sewage purification, or in attempting the first and second they are going to produce an effluent equal to the

required standard of drinking waters. Nothing of the kind! Only by the adoption of the whole three processes can sewage be purified to the highest degree possible and made fit to turn into a stream or source from which drinking water is obtained.

The adoption of a part of, or the whole of, the scheme, we have said, however, depends on local conditions. It will seldom be found that the third process, viz., that of sterilization, is required by local conditions. It is not so, in most parts of Europe, England and the States the first and second processes being generally considered to fulfill all the necessary purification required. However, occasionally circumstances do arise when the third process is an absolute necessity. Take the circumstances of a community discharging its sewage effluent into a stream, the water from which may be used for domestic purposes by people immediately below the outfall point. Those people who depend on this stream for domestic water supply may be in the legal position of demanding it absolutely pure as far as it may be affected by sewage pollution.

With reference to the removal of suspended solids only, it is difficult to say under what conditions this alone may be insisted on. As a rule, this process by itself is only applied in the case of discharges into tidal basins. In the case of tidal basins, it has been found that the action of the inflow and receding tides tends to strew the foreshore with filth when raw sewage is discharged. By removal of the greater and grosser parts of the suspended solids this nuisance is avoided, while the liquid sewage is carried away by the tidal currents. In the neighborhood of seaside holiday resorts municipalities are finding it necessary, however, to adopt the secondary process along with the first and produce non-putrescible effluents. In the case where shellfish or oyster beds are located sterilization of sewage effluents should be always insisted upon.

It has been held lately that in the case of Toronto the first process, viz., removal of part of the matter in suspension is all that is required for the sewage of that large city. Toronto has a population of over 300,000, and is rapidly growing. The argument advanced by the medical officer of health is that Lake Ontario, presenting such a large basin of water, it is capable within itself of purifying by oxidation the total sewage discharge. There is no doubt that the lake as a body of water is capable of doing this, and also of treating and purifying the whole of the raw sewage also. But we hold that, in the light of modern hygienic bacteriology, an inland quiesent lake, used for drinking supply, bathing, and other purposes, should have no such duties thrust upon it as the work of sewage purification. In spending a large sum of money and in dealing with the sewage of so large a population we look for something of a more final and less objectionable character than a proposal such as this.

With thousands of acres of sand land surrounding the city we look to the medical officer of health to support some system of complete sewage disposal which will be a precedent to others in Canada, and point to the advisability of protecting our inland waters from disease and organic pollution.

A USEFUL TABLE.

Repayment of loans and interest in equal installments. In order to find out the annual installment necessary to pay off a loan plus interest at from 3 to 4 per cent. at periods of years from 10 to 50, it is only necessary to multiply the amount of the loan by the decimal figure in the table opposite the time allowed for repayment.

Period of years.	3 per cent.	3¼ per cent.	3½ per cent.	3¾ per cent.	4 per cent.
10	.117231	.118731	.120241	.121762	.123291
15	.083767	.085289	.086825	.088376	.089941
20	.067216	.068779	.070361	.071962	.073582
25	.057428	.059040	.060674	.062332	.064012
30	.051019	.052682	.054371	.056087	.057830
35	.046539	.048253	.049998	.051773	.053577
40	.043262	.045028	.046827	.048659	.050524
45	.040785	.042602	.044453	.046341	.048263
50	.038865	.040730	.042634	.044574	.046550

WATER FILTRATION AT HARRISBURG, PA.

Annual Report 1908.

This report contains matters of interest in the removal of turbidity and bacteria from domestic water supply. The city of Harrisburg obtains its water supply by pumping water direct from the Susquehanna River. This water is first treated in settlement basins where alumina to the amount of 1.09 grains per gallon is added as a coagulant. The water is then further purified by means of slow sand filtration. The water pumped during last year amounted to 3,358,029,150 gallons or just over 9,000,000 gallons per day. The original water shows a fairly high degree of turbidity and a high bacteria pollution. The maximum turbidity, in parts per 1,000,000, being 950 and minimum 1. The maximum number of bacteria were 107,500 per c.c. and minimum 110. B. Coli tests (samples 1 c.c. each) showed out of 426 examined 280 positive; or 65.72 per cent. samples prove the presence of B. Coli.

This, of course, is a fairly foul and dangerous water, and cannot be compared in any sense with such water as, for instance, that of Lake Ontario, when out of 100 c.c. samples recently examined of the new tunnel water only 15 of the samples showed B. Coli. The cost of treating the Harrisburg water amounts to, operating expenses, $5.91, and interest and sinking fund charges, $6.85 per million gallons, making a total cost of filtration to the city of $12.76 per million gallons.

The effect of the plant has been to remove turbidity and color. An average of nineteen bacteria per c.c. have remained in the water, making an elimination of 99.62 p.c. The maximum number of bacteria per c.c. was 460, the minimum 0. Out of 1,785 samples examined 20 showed B. Coli or 1.09 per cent. of samples taken.

The above figures show high efficiency as compared with other processes of a like nature, and point to capital and careful management.

In comparing the bacteria figures (number remaining in the water) for the different months of the year we find the highest numbers during the winter months. This applies not only to last year's working but also to the two preceding years. While 19 is the average number throughout the year per cubic centimetre, we find that in December there were 68 per c.c. and in February 99. This, of course, does not necessarily point to a decrease in the efficiency of the working capabilities of the filter, but depends to some extent upon the number of bacteria in the raw water. In December, however, the elimination efficiency was only 97.50 per cent., with 68 organisms per cubic centimetre, while in February the elimination efficiency was 99.57 per cent., with 99 organisms per c.c. remaining in the water.

This brings us to a very important point in connection with water filtration figures, viz., that the percentage elimination efficiency may be a guarantee that the filter is doing a lot of work thoroughly, but is no guarantee as to the degree of purity of the water.

It is obvious that the number of bacteria remaining in a water with a given percentage of reduction depends entirely upon the numbers present in the raw water. For instance, suppose a raw water to contain 100 bacteria per c.c. and by filtration 99 organisms were removed, leaving 1 specimen in the water. The efficiency reduction would be 99 per cent. Also suppose a raw water to contain 100,000 organisms per c.c. and by filtration 99,000 were removed, leaving 1,000 organisms in the filtrate, then the efficiency reduction would still be 99 per cent. In the first case we have an almost pure water, in the second case a water ten times more impure (bacteriologically) than is allowed for filter effluents in Germany.

It will thus be seen that there is an absolute limit to what can be done by sand filtration, and the degree of purity at the finish depends, of course, upon the degree of purity at the start.

We note a remark in the report as follows: "A certain amount of turbidity in the river water is most necessary at

some time in the year to get good bacterial results. Occasionally when the river water is clear, clay is added to it to make turbidity enough for the coagulant to take hold and do its work properly."

This simply means that when there is not sufficient matter in suspension in the water such matter has to be added. It being held that bacteria are retained by sedimentation or filtration because they are connected with such suspended matter, and it is just those organisms which may have become free from such matter that pass with comparative ease through any filter.

It is just here where one may hesitate as to the advisability of filtering such a water as, say that of Lake Ontario, which is practically free from suspended matter. The medical officer of health of Toronto on once being approached on this point was reported to have said by way of sarcasm, "Then if there is not sufficient dirt in the water we can add dirt to it." There is more in this statement of Dr. Sheard's than he probably thought, for in Harrisburg we find that this is just what they have to do. During the month of December, when the filter efficiency fell off so alarmingly to 97.50, the report says: "Much trouble was experienced with air, that collected in spots in the sand, being released from the water in the course of filtration. This air, after sufficient quantity had collected, would break through the bed destroying the coating on the sand and allow water to pass through that was imperfectly filtered. As no feasible method is known to remove the air the filters had to be washed at as low a loss of head as would not allow the air to collect in quantities that would be dangerous." This is a very common trouble in connection with sand filters, causing what is called short circuits. It has given a great amount of trouble in Europe. We have ommitted to note that the number of bacteria per c.c. in the filtrate amounted to over 100 during 14 days in the year, this probably being during this bad month.

SOCIETY NOTES.

Toronto Builders' Exchange.

The annual banquet was held last week. Addresses were delivered by Mayor Oliver, W. D. McPherson, M.P.P., and President Arthur Dinnis, who pointed out that $12,000,000 had been spent in building operations in Toronto during 1908, and that more than three-fourths of this had been handled by members of the Exchange. Other speakers were: W. J. Hill, G. W. Gouinlock, Dr. Galbraith. The guests included Joseph Russell, M.P., S. Harrison, of the Employers' Association, Rev. A. Logan Geggie, Rev. W. H. Hincks, Joseph Wright and Fred. Armstrong.

ONTARIO LAND SURVEYORS.

Annual Meeting.

Following the president's address which we gave in full last week, (page 311), Mr. T. Fawcett submitted the report of the Topographical Committee on Survey, which urged that nothing would be of more value to the commercial and travelling public than a complete topographical map of the Province. It was pointed out that roads and streams are practically unknown except to the people living in their locality. It was suggested that a survey under the control of the Surveys Department within the area of the older part of the Province should be provided for in the estimates for the current year. Reference was made to the fact that the Minister of Public Works contemplates introducing legislation for the purpose of gathering information respecting storage reservoirs, water sheds and streams.

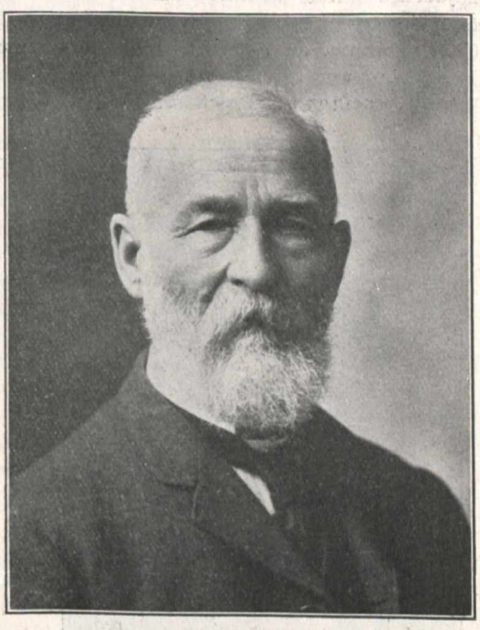
The report of the Secretary-Treasurer presented by Mr. Killaly Gamble showed receipts of $4,768, which included a balance of $3,276 from last year. There are 235 members in the Association.

Mr. J. W. Tyrrell read a paper entitled "Hudson Bay a National Asset."

After giving a historical summary of the Hudson's Bay territory, Mr. Tyrrell declared that Fort Churchill is destined to be the great distributing point of the North-West, showing that the distance from a central point such as Prince Albert to Churchill is twelve hundred miles less than to Montreal. From Regina to Churchill, he said, the saving in rail travel would amount to over 1,000 miles, and from Edmonton it would be more than eleven hundred miles. He thought these facts alone formed the strongest possible argument in favor of railway connection between Fort Churchill and the railway system of the Western Provinces—providing the navigating of Hudson's Bay and the Straits is feasible. He mentioned Fort Churchill only as the terminal point, since it is beyond all question the most advantageous port on the west coast of the bay.

"The Sewerage System in Hamilton" was the title of a practical paper read by Mr. E. G. Barrow. He gave statistics relative to the wear upon the brick, tile and egg-shaped sewers, and showed that the latter had been designed to accommodate itself to varying flows. "The relative value of concrete and brick in the construction of sewers," declared Mr. Barrow, "will require time to decide."

The paper on "Gravity" read by Dr. Klotz, of Ottawa, was followed with great attention. It was confined to sc entific calculations. He showed in a very clear manner how the position of the level depends upon the distribution of matter surrounding a place where an instrument is set up.



Lewis Bolton, O.L.S., President of the Ontario Land Surveyors.

The annual banquet was held at McConkey's, President A. J. Van Nostrand presiding. There were about sixty members of the Association present. The speakers included Dr. Otto Klotz, Dominion Astronomer; Lieut.-Col. Merritt, Mr. Elihu Stewart, Mr. R. J. Marshall, Mr. E. A. James, Mr. A. B. Barry, Mr. Angus MacMurchy, K.C., Dr. Galbraith, of the S.P.S., Mr. Aubrey White, Dr. Kennedy, Mr. C. C. James, and Prof. Miller, Provincial Geologist.

In the report of the Committee on Legislation, it was decided to apply for legislation this session for amendments to the Surveying Act, which will facilitate mining men and others in the laying out of mining claims and the running of lines between farm lots, with the object of making the lines more definite and less expensive.

Mr. J. F. Whitson read a paper on "The Future of Surveyors in Northern Ontario," in which he suggested that the examination for Ontario land surveyors be extended so as to include papers on forestry and the survey of waterpowers.

Officers for the ensuing year were elected as follows:—President, Mr. Lewis Bolton, Listowel; Vice-President, Mr. H. W. Selby, Toronto; Secretary-Treasurer, Mr. Killaly

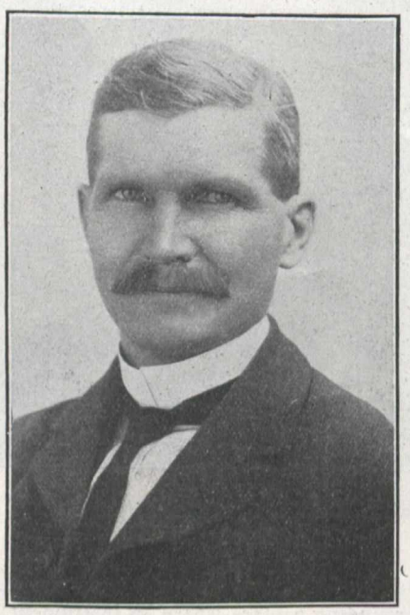
Gamble, Toronto; Chairman of Council, Mr. G. B. Kirkpatrick.

Mr. Lewis Bolton, the newly-elected president of the Ontario Land Surveyors, is senior member of the firm of Lewis Bolton & Sons, Ontario and Dominion Land Surveyors, and Civil Engineers, Listowel, Ont. Mr. Bolton was admitted to practice as a surveyor in 1864, and has, with the exception of a few years, devoted his life to surveying and engineering.

Born in the Township of Albion, in Peel County, Ontario, in 1840, he received his early training in the public schools of the Province. In 1860, he attended the Rockwood Academy, and after three terms there articled as an apprentice land surveyor with R. W. Hermon, P.L.S. In 1868 Mr. Bolton moved to Listowel, and from there has carried on his professional work. In 1872, and for several succeeding years, he was engaged on Dominion land survey work in the North-West, and in 1898 and 1899, went to the Yukon surveying mining claims.

CANADIAN SOCIETY OF CIVIL ENGINEERS, TORONTO BRANCH.

The adjourned annual meeting of the Toronto Branch of the Canadian Society of Civil Engineers was held at the Engineers' Club, Toronto, on February 25th. The chief business of the evening was the election of officers. The result of the ballot was as follows: Chairman, J. G. G. Kerry; Secretary-Treasurer, E. A. James; Executive Committee: President, Secretary and Messrs. M. J. Haney, P. Gillespie and A. F. Macallum, and auditors, A. C. D. Blanchard and S. Gagne.



J. G. G. Kerry, Chairman Toronto Branch Canadian Society Civil Engineers.

Mr. Kerry, the chairman of the Toronto Branch, although but recently a resident of Toronto is well known to the profession and well informed as to the workings of the Canadian Society of Civil Engineers, having served for some time on the executive of the parent society. Mr. Kerry graduated from McGill University in 1886 and after spending several years in practising his profession returned to McGill as Associate Professor of Surveying and Lecturer in Railroad Engineering. While engaged in academic work Mr. Kerry acted, in a consulting capacity, for several large corporations. In 1907 he became a partner in the firm of Smith, Kerry & Chace, consulting engineers, Toronto, and in August, 1907, was appointed by the Dominion Government a member of the Quebec Bridge Commission.

ORDER OF THE RAILWAY COMMISSIONERS OF CANADA.

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

6281—Feb. 19—Approving and sanctioning application of the C.N.O.Ry. for approval of the location of its line of railway from Queen Street, Toronto, Ont., to Rosedale Station, with extension to the Cherry Street yards.

6282—Feb. 11—Authorizing the T.H. and B. Ry. to construct a covered concrete culvert across the line of its roadway at Station 1355 + 60, Township of Saltfleet, Ont.

6283 to 6291—Feb. 19—Authorizing the Canadian Machine Telephone Co., Limited, to erect, place and maintain its wires across or under the tracks of the G.T.Ry. at various points in the Province of Ontario.

6292—February 17—Directing the G.T.R. Company to protect the Foxmead crossing, near Atherley, Ont., by an electric bell.

6293—February 18—Directing the W. E. & L. S. R. Railway Company to equip all its cars with air brakes, within 3 months from the date of this Order.

6294—February 26—Authorizing the Bell Telephone Company to carry its wires across the M.C.R.R. tracks at corner 7th Concession and Crowland Road, Township of Crowland, Ontario.

6295—February 19—Authorizing the Water Commissioners of Guelph, Ont., to lay a water main under the C.P.R. tracks on Metcalfe Street, Guelph; and a 24-inch water conduit across the Guelph Junction Branch of the G.T.R., in the Township of Puslinch, Wellington County, Ontario.

6296—February 19—Authorizing the City of Vernon, B.C., to lay sewer pipes under the track of the Shuswap & Okanagan Branch of the C.P.R., where the same crosses South Vernon, Seventh and Schubert Streets, Vernon, B.C.

6297—February 19—Authorizing C. H. Winslow, Millbrook, Ont., to lay a water pipe under the G.T.R. track on King Street, Millbrook, Ont.

6298—February 19—Authorizing the C.P.R. Company to construct a spur in the town of North Bay, Ont., to and into the premises of the Pintsch Compressing Company.

6299—February 10—Ordering that the maximum charge to be made by any railway company under the Board's jurisdiction on every shipment of new empty cars over one or more lines of railway be not more than $5 per car.

6300—February 19—Authorizing the Robitaille Eureka Distillery, Limited, to place an electric wire under the tracks of the Quebec Railway, Light & Power Company, near Beauport Station.

6301—February 15—Authorizing the C.N.Q. Railway Company to ballast the Montford Branch of its railway; make suitable ditches along its right of way; remove all brush; replace the rail now in use with a heavier rail; provide a platform and shelter for passengers at Chapleau; supply the regular passenger trains with baggage cars; appoint a permanent agent at Montford; and certain other requirements. Also authorizing a penalty of $50 for every violation of any of the provisions of the Order.

6302—February 20—Authorizing the Scarboro Independent Telephone Company to place its wires across the C.P.R. tracks on Lot 32, Concession 2, Township Scarboro, York County, Ont.

6303—February 20—Authorizing the Bell Telephone Company to place its wires across the tracks of the G.T.R. at Boucher Street, Meaford, Ont.

6304—February 20—Authorizing the Government of Alberta to place its wires across the C.P.R. tracks at the Standard Soap Works, 1¼ miles east of Calgary Station, Alberta.

6305—February 20—Authorizing the Government of Alberta to place its wires across the C.P.R. tracks, 2½ miles south of Strathcona, Alberta.

6306—February 13—Dismissing application of the Guernsey Board of Trade for an Order directing the C.P.R.

Company to give to Guernsey a lower rate on grain to the terminal elevators at Fort William than at present furnished.

6307—February 13—Dismissing application of the Saskatchewan Grain Growers' Association of Indian Head, Saskatchewan, alleging excessive rates on lumber and coal shipments.

6308—February 13—Dismissing complaint of the Elstow Board of Trade, Elstow, Sask., alleging delay on the part of the railway companies in the transportation and delivery of coal shipments.

6309—February 13—Dismissing complaint of W. O. Miller, Tessier, Sask., that he is unable to secure a settlement from the C.N.O. Railway Company for property taken for railway purposes.

6310—February 13—Authorizing the G.T.P. Railway Company to construct, within 15 days, a suitable and proper temporary crossing over their tracks at Zelma, Sask., at or near the west side of Main Street; and dismissing the petition for a station and freight room accommodation.

6311—February 13—Dismissing petition of residents of Rush Lake, Sask., requesting the C.P.R. Company to construct a highway over its tracks at Rush Lake.

6312—February 13—Dismissing complaint of Chester L. Mintminnick, of Churchbridge, Sask., that the G.T.P. Railway Company has failed to compensate him for right of way through his property.

6313—February 13—Dismissing petition of the Farmers' and Grain Growers in Saskatoon County, Sask., for loading platform at a siding on Sec. 8-36-6, W. 3, of Goose Lake Branch.

6314.—February 13.—Dismissing complaint of Strassburg, Sask., Board of Trade, respecting freight rates of C.P.R. Company on lumber shipments.

6315—February 13—Dismissing complaint of J. R. Standen and others of Osage, Sask., alleging that the C.P.R. Company propose closing its station at that point, and asking that the same be continued.

6316—February 13—Dismissing complaint of the Rosaleigh School District No. 820 of Frobisher, Sask., of failure of C.P.R. to provide station agent or operator at Hirsch, Sask.

6317—February 13—Dismissing application of C.P.R. Company for authority to construct branch line in the city of Regina, Sask., from a point on the northerly boundary of its station grounds between Broad and Rose Streets, in a northerly direction across Dewdney Street and 8th Avenue.

6318—February 13—Dismissing complaint of J. L. Sundabe, Hitchcock, Sask., that the C.P.R. Company has refused to put in a crossing over road allowance in Sec. 22, Tp. 3, R. 9, W. 2 M.

6319—February 13—Directing the C.P.R. and C.N.R. companies to file with the Board a joint tariff on coal shipped from Taber, Alta., destined to Dalmeny, Sask., making provision for the same rate that exists from Taber to Rosthern, Sask.

6320—Feb. 13—Directing the C.P.R. Co. to move the existing westerly connection of the spur across Blocks 7 and 11 in the townsite of Estevan, Sask., and re-establish the easterly connection, thereby reinstating the location and length of the spur as the same existed prior to the said change made by the Railway Company; and rescinding Order of the Board of May 6th, 1908.

6321—February 13—Directing the C.N. Railway Company to erect and maintain a suitable and proper station of the third-class at Condie, Sask., and place an agent in charge, on or before the 1st day of June, 1909.

6322—February 13—Directing the C.N. Railway Company to erect proper and suitable fences on both sides of its right-of-way where the same crosses the lands of Hugh K. Miller, of Lumsden, Sask., Sec. 26, Tp. 19, R. 22, W. 2 M., on or before the 15th May, 1909.

6323—February 13—Directing the C.N. Railway Company to fence along both sides of its right of way where the same passes through Sec. 32, 19, 21, W. 2 M., on or before the 15th May, 1909.

6324—February 13—Directing the C.N. Railway Company to construct a suitable crossing across its right-of-way in the town of Aberdeen, Sask., in the line of Fifth Avenue, extended to what is shown as Main Street, upon plan registered E. C., and to properly grade to approaches and furnish all necessary planking.

6325—February 13—Directing the C.N. Railway Company to establish gates on either sides of its right-of-way and station grounds on 23rd Street, Saskatoon, Sask., on or before the 15th day of May, 1909, and to continue the filling between its main line and Goose Lake Branch.

6326—February 8—Directing the C.N.R. Company to properly fence both sides of its right-of-way between Dauphin and Gilbert Plains, Man., on or before the 1st day of September, 1909.

6327—September 1—Granting permission to the Pere Marquette and Lake Erie & Detroit River Railway companies to load and unload on and from car ferries plying between Conneaut, Ohio, and Port Stanley, Ont., and forward to their destination, trains in transit in the United States, or Canada, on such ferries or on the lines of the said railway companies when the Lord's Day begins, and do any work necessarily incidental thereto, including the returning of empty cars which have been placed in the slip tracks at Port Stanley before 6 o'clock a.m., or after 8 o'clock p.m., upon the Lord's Day.

6328—February 13—Directing the Council of Dundurn, Sask., to elect by resolution whether it accepts a permanent crossing at a point over the C.N. Company's tracks and station grounds 700 feet south of the south limit of Clark Street, and a temporary crossing over and at or near the north end of the existing elevator track, such last crossing, if elected to be taken, to remain in existence and to be used only till the company may lay an additional track between the existing main line and the elevator track; and upon the laying of such new track, the temporary crossing at the end of the elevator track shall be closed, or the said Council may elect to take a permanent crossing as provided in Order dated November 29th, 1907; and immediately upon the Council electing as aforesaid, the railway company shall construct such crossing and perform the grading and lay the necessary planking.

6329—February 13—Same as No. 6328.

6330—February 13—Same as No. 6328.

6331—February 13—Directing the C.P.R. and C.N.R. companies to agree upon terms for the erection of a union station and the establishment of joint facilities at the town of Maryfield, Sask., on or before the 1st May, 1909, and to file such agreement with the Board; and if the companies are unable to agree upon terms, within the time mentioned, then the same shall be settled by the Board, upon application of any interested party.

ONTARIO PROVINCIAL GOOD ROADS ASSOCIATION.

(Continued from Page 329).

At the close of his address Mr. Beam moved the following resolution:—"Resolved, that the Province now provide more liberal aid for the equally important short haul of the same products from the farm to the railway station over our publicly owned highways by increasing the present grant from one-third to one-half the cost for good roads under county systems." The resolution carried.

Papers were also read by Reeve G. L. Telfer, Paris; Messrs. G. W. Bennett, Peterboro; W. D. Annis, Scarboro; J. D. Evans, Islington; Jas. A. Bell, county engineer of Elgin; Charles Talbot, county engineer of Middlesex; Frank Barrie, county engineer of York; C. L. Hicks. Humber; R. H. Jupp, Simcoe; J. W. Gage, Warden of Wentworth County; R. E. Taylor, Picton; A. McG. Rankin, Collin's Bay.

Two of the papers read will be found in this issue, others will be given later.

RAILWAY EARNINGS AND STOCK QUOTATIONS

NAME OF COMPANY	Mileage Operated	Capital in Thousands	Par Value	EARNINGS Week ending Feb. 28		STOCK QUOTATIONS TORONTO				MONTREAL			
				1909	1908	Price Feb. 27 '08	Price Feb. 18 '09	Price Feb. 25 '09	Sales Week End'd Feb25	Price Feb. 27 '08	Price Feb. 18 '09	Price Feb. 25 '09	Sales Week End'd Feb25
Canadian Pacific Railway	8,920.6	$150,000	$100	1,371,000	1,220,000	144 143	172½	168¾	430	144	142¾	174¾ 173	169¾ 169¼	1269
Canadian Northern Railway	2,986.9	.....	.....	132,600	130,700	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Grand Trunk Railway	3,568.7	226,000	100	681,947	761,069	.....	....*1st. pref. 104, 3rd pref. 44⅝, ordinary 18½			.....	.....	.....	.....	.....
T. & N. O.	305	(Gov. Road)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Montreal Street Railway	138.3	18,000	100	69,202	65,430	.....	.....	.....	.....	180 177⅞	180 207¾	207 .06		266
Toronto Street Railway	114	8,000	100	69,879	64,879	.....	119½	119¾	122	99¼ 99	120¼ 119⅜	119 118¾		755
Winnipeg Electric	70	6,000	100	.....	.....	137½ 136¾	170 168	170 167	322	.....	170 167½			12

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

HALIFAX ELECTRIC TRAMWAY COMPANY.

Annual Report.

The Halifax Electric Tramway Company, of which Hon. D. MacKeen is president, and J. W. Crosley, manager, was incorporated in 1895, with a capital stock of $1,350,000. They have a perpetual franchise and an exclusive franchise of the entire street railway system of Halifax until 1918, and serve a population of 45,500.

In 1902 they acquired the People's Heat and Light Company.

For 1908 the net increase in earnings is $13,397, and the percentage of operating expenses to revenue is 55.29 per cent. as compared with 56.54 per cent. last year. The earning power per capita is of interest being less than a half of that of Winnipeg, Man.,* and a little less than that of London, Ont.**

Statistical Statement.

Comparative Statement.	1908.	1907.	1905.	1902.	1899.
Railway Earnings..	$184,927.51	$174,646.62	$152,034.42	$144,324.36	$120,697.24
El. Light & Power	182,437.06	173,943.31	153,592.64	121,681.60	83,238.62
Gas and Products..	57,254.18	56,862.47	64,741.80	48,154.76	.....
Total Earnings ...	424,618.75	405,452.40	370,368.86	314,160.72	203,935.86
Operating Expenses	234,713.67	228,944.17	231,594.34	187,942.80	112,137.19
Net Earnings	159,905.08	146,508.23	108,774.52	96,217.92	61,798.67
Per Cent. Operating Expenses to Income	55.29	56.64	62.55	59.97	55.15
Passengers Carried.	4,162,986	3,928,892	3,404,747	3,204,504	2,616,231
Car Mileage	814,375	806,411	700,004	687,819	613,942
Railway Earnings per capital	4.06	3.88	3.41	3.53	3.01

*Vol. 16, page 298. **Vol. 16, page 263.

RAILROAD ENTERPRISES.

Central of Canada Asks for Time Extension—Manitoba and Great Northern Seeks Charter.

(The Monetary Times).

From time to time announcements have been made regarding the financing in London of the Central Railway of Canada. A private and confidential prospectus regarding this road was printed in 1906. Nothing further was then done. Senator Campbell, of West Toronto, is identified with the enterprise. It is now understood that application will be made to the Dominion Parliament this session for an Act extending the time for the construction of the road, to authorize the company to increase its bonding powers, to confirm agreements between the company and the Ottawa Valley Railway Company, the Ottawa River Railway Company, and the Montreal Bridge and Terminal Company, to authorize the company to connect its line with railways on the south side of the River St. Lawrence, by means of a tunnel or tunnels, and to provide terminal facilities in and near the city of Montreal.

From Winnipeg to Brandon and Elkhorn.

A bill to incorporate the Manitoba & Great Northern Railway has come before the Manitoba Legislature. Louis W. Hill, Robert I. Farrington, James Hisher, Charles P. Wilson and John Francis Fisher are the incorporators. The bill gives permission to the company to build lines of railway from Winnipeg to Brandon, Manitoba, and from Brandon to Elkhorn, Manitoba, and thence westerly to the boundary of Saskatchewan. From Morden the line will go to Rathwell in Manitoba and thence north to meet the Winnipeg-Brandon line. The capital stock will be $2,500,000 in shares of $100 each. The general offices are to be in Winnipeg. The company is to have power to buy inland lines from Greetna to Portage la Prairie and from Morden to the boundary. Two years ago when James J. Hill, chairman of the board of the Great Northern Railway, was in Winnipeg he announced that the Great Northern would build another line across western Canada, starting from Winnipeg. Since then the project had been in abeyance, but the present bill would seem to mean a revival of the scheme.

The Quebec and New Brunswick Railway Company has applied to Parliament for authority (1) to increase its bonding powers to $35,000 per mile; (2) to fix and extend the times for the commencement and completion of its lines of railway; (3) to empower the company to construct and operate a railway of the gauge of four feet eight and one-half inches from a point on its railway at or near Connor station in New Brunswick, to Centreville, thence to Woodstock and from Woodstock by the St. John River Valley to St. John.

Many Western Roads.

The Burrard Westminster Boundary Railway & Navigation Company will apply to Parliament for an act extending the time within which the company may commence and complete railway construction of which was authorized by the company's act of incorporation, and to authorize the company to enter into any agreement with the Vancouver, Westminster & Yukon Railway Company.

The Southern Alberta Railway Company's application for a charter has been granted by the Provincial Government.

The Railway Committee of the British Columbia Legislature have passed bills incorporating the Prince Rupert and Port Simpson Railway Company, the Portland Canal Short Line Railway Company, and the Graham Island Railway Company.

The Dominion House has granted a charter to the new Canadian Western Railway. The line is to be constructed from Calgary to the International Boundary, continued thence to Butte, Mont., with a branch line to the Elk River valley near Pincher.

CANADIAN FLOTATIONS IN LONDON.

Several flotations of interest to Canada were made last week in the London market. One of the most important is the £1,000,000 Grand Trunk Pacific 4 per cent. debentures at 90, redeemable 1936 at 105.

Subscriptions were also invited last week for £300,000 Winnipeg Electric Railway Company 4½ per cent. debentures at 97. Soon after the close of the subscription list the stock was quoted at ½ premium.

LATE CONSTRUCTION NEWS—TENDERS.

Ontario.

OTTAWA.—Tenders, addressed to the undersigned, for electric fixtures, Guelph Armoury, will be received until 4.30 p.m. on Wednesday, March 17th, 1909. Napoleon Tessier, Secretary, Department of Public Works.

WINDSOR.—Tenders will be received by the undersigned up till noon on Friday, the 12th March inst., for:—One steel boiler, 72-inch diameter by 18 feet long; 140 pounds working pressure; half-inch plate; 74 four-inch tubes; manhole plate in front below tubes; eclipse type, with mud drum 16-inch diameter by 9 feet long; horizontal steam dome, 30-inch diameter by 5 feet long; best quality of shaking grates; angle valve in steam pipe; safety valve connected to present steam pipe. One 250 horse-power Cross Compound Engine, 200 to 225 revolutions per minute, with extended base and shaft for direct connected generator, with drive-wheels 24-inch diameter, 14-inch face, to drive the present line shaft 350 revolutions per minute. Engine must be centre crank type. Stephen Lusted, Clerk.

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.

New Brunswick.

MONCTON.—The City Council will receive, until March 20th, tenders for an electric turbo pump. This is an extension of time. Address, Major Willett.

Quebec.

MONTREAL.—Tenders, addressed to the undersigned, will be received up to noon on Monday, 8th March, 1909, for Portland cement and sand. David Seath, secretary-treasurer, 57 Common Street.

Ontario.

HAILEYBURY.—Tenders will be received up to 20th March, 1909, for the several trades required in the erection and completion of an eight-roomed brick public school in the town of Haileybury. Address: Paul A. Cobbold, secretary, Haileybury Public School Board.

OTTAWA.—Tenders for heating apparatus, Public Building, Kincardine, will be received until Friday, March 19th, 1909. Address, Dept. of Public Works, Ottawa.

OTTAWA.—Tenders, addressed to the undersigned, will be received up to noon of the eleventh day of March, 1909, for one or two small sea-going steamers for immediate delivery, with a speed of at least ten knots an hour and of the following dimensions, namely: Length between perpendiculars, 55 to 65 feet; breath, 10 to 12 feet; draft, 5½ to 6½ feet. G. J. Desbarats, Acting Deputy Minister of Marine and Fisheries, Ottawa.

PORT ARTHUR.—Tenders will be received by the undersigned until Wednesday, March 10th, for the supply and delivery of the following material f.o.b. Port Arthur: 2,000 pounds 5½ x 9-16 spikes; 700 pounds 3½ x ¾ track bolts (square nuts); 60 tons 60-pound standard T rails. J. McTeigue, secretary E.R.L. & T. Commissioners.

TORONTO.—Tenders will be received up to noon on March 16th, for the supply of cast iron water pipe for the year ending April 1st, 1910. Also for the laying and jointing of pipes, valves, hydrants, special castings, etc., up to 31st of December, 1909. Address: Joseph Oliver, Mayor, Chairman Board of Control, City Hall, Toronto.

TORONTO.—Tenders will be received until March 10th, 1909, for the construction of a quarry stone or concrete pier for a steel bridge over the Humber River, Lambton Mills, Ont. Frank Barber, C.E., County Engineer. (Advertised in The Canadian Engineer.)

TORONTO.—Tenders will be received, until the 8th March next, at Shea's Theatre, Yonge Street, for the erection of the whole or any part of Shea's New Theatre, on the southeast corner of Victoria and Richmond Streets, Toronto. Address: Shea's Yonge Street Theatre Companv.

Manitoba.

WINNIPEG.—Tenders will be received by the undersigned for telephone poles, wire, cable, and other construction supplies until Tuesday, March 9th, 1909. Telephone Commission, Winnipeg.

WINNIPEG.—Tenders will be received up to Thursday, April 15th, 1909, for the manufacture and delivery at Winnipeg of two testing transformers, viz.: One 30 k.w. at 80,000 volts, and one 200 k.w. at 200,900 volts, also for control equipment therefor. Copies of the instructions to bidders, specifications and forms of tender may be obtained at the power engineer's office, Carnegie Library building, Winnipeg, Manitoba. These specifications may also be seen at the office of Smith, Kerry & Chace, Confederation Life Building, Toronto, Ontario. M. Peterson, secretary, office of the Board of Control, Winnipeg, Man.

Saskatchewan.

PRINCE ALBERT.—Tenders for road machinery will be received until Thursday, March 18th, for one stone crusher, one elevator and screens, one electric motor, one steam road roller. Information will be forwarded on application to F. A. Creighton, Esq., city engineer, Prince Albert, Sask. (Advertised in The Canadian Engineer.)

WEYBURN.—Tenders will be received until April 7th, 1909, for pipe-laying, water tower, cast iron pipe, and fire hydrants and valves for the town of Weyburn. Geo. Ross, secretary-treasurer; Willis Chipman, chief engineer. (Advertised in The Canadian Engineer.

British Columbia.

LADYSMITH.—Tenders will be received until March 15th for the construction of sewerage works for the city of Ladysmith, B.C. Address: N. A. Morrison, C.M.C.

VANCOUVER.—The British Columbia Electric Railway Company will shortly call for competitive plans for the new office building and terminal station which it proposes erecting at the corner of Hastings and Carrall Streets. The block will cost in the neighborhood of $200,000 and will probably be arranged with the idea of the ground floor being used entirely for terminal purposes.

VICTORIA.—Tenders will be received until Monday, 1st March, for supplying: 15 12-inch double gate valves; 20 8-inch double gate valves; 20 6-inch double gate valves. Address: W. W. Northcott, purchasing agent, City Hall.

Foreign.

ADELAIDE, AUSTRALIA.—Tenders addressed to the undersigned will be received until April 28th, for the supply of one bucket dredger, one tug, and two hopper barges. Address, Engineer-in-Chief's Department, Adelaide, South Australia.

BRISBANE, AUSTRALIA.—Tenders will be received until May 31st for installing in the general post office a switchboard, consisting of one trunk line section, three subscribers sections, cable turning and string sections, frames, racks, power plant, etc. Address: Captain R. M. Collins, Australian Commonwealth Offices, 72 Victoria Street, Westminster, S.W., London, England.

GUAYAQUIL, ECUADOR.—Tenders will be received until May 1st for the execution of drainage, water supply, paving, asphalting and sanitary works at Guayaquil. Address: Junta de Canalizacion y Proveedora de Agua, Quayaquil, Ecuador.

LA PALOMA, URUGUAY.—Tenders addressed to the undersigned will be received until April 2nd, for the construction of a port. Ministerio de Obras Publicas, Monte Video.

CONTRACTS AWARDED.

New Brunswick.

MONCTON.—The Canadian General Electric Company of Toronto were awarded the contract for electrical supplies for the city. The contract for cross-arms was given to the Paul Lea Company, Limited, and the tender of The Sumner Company for cedar poles was accepted.

Quebec.

MONTREAL.—The Grand Trunk Pacific Railway has awarded a contract for 25,000 tons of steel rails to the Soo Company for delivery at Fort William. They also require

15,000 tons at Prince Rupert, the order for which will probably go to the Dominion Iron & Steel Company, Sydney.

Ontario.

BROCKVILLE.—The contract for the submarine rock excavation and dredging for improving the middle channel in the River St. Lawrence between Brockville and Kingston, has been awarded to the Gilbert Bros. Engineering Company, Montreal.

NORTH TORONTO.—Tenders were received for the construction of a 4-foot concrete sidewalk on Davisville Avenue and Brownlow Avenue. The tender of the Royal Artificial Stone Paving Co., at 49½c. per lineal foot, was accepted.

OTTAWA.—The contract for supplying forty-six thousand barrels of Vulcan cement to Department of Railways and Canals for work on the Quebec and Lachine Canals has been awarded to the Wm. G. Hartranft Cement Company, Montreal.

TORONTO.—The Board of Control recently awarded the contract for the erection of the proposed transportation building at the Exhibition grounds to Frank Armstrong, 296 Berkeley Street, his tender price being $87,919, of which $2,640 is for maple flooring. The estimate of the architect, Geo. W. Gouinlock, was $86,000. Eight tenders were received, the others being as follows: $100,382; $101,894; $92,341; $92,910; $111,000; $92,100 and $104,275. The building will be 337 feet long and 153 feet wide and constructed of red pressed brick and cut stone. It is to be completed, under the contract, by the 21st of August.

Manitoba.

WINNIPEG.—The city recently awarded contracts as follows: Supplies for Street Commissioner's Department, 20 dozen hoes at $10.50 per dozen, W. E. Skinner, Limited, Winnipeg; 30 dozen bass brooms, 6½-inch bristles, at $8 per dozen, delivered, G. O. Stephens & Company, Winnipeg.

The contract for rubber elevator belting for city quarry was recommended to be awarded to J. L. Neilson & Company, of Winnipeg, for supply of Granite Bell at $439.50, f.o.b. Stony Mountain, Manitoba.

Alberta.

CALGARY.—The City Commissioners have awarded a contract for four modern street railway cars on the pay-as-you-enter plan at $4,875 each to the Car & Coach Company, Preston, Ont. The Ottawa Car Company gets a contract for eight of a similar type at the same price.

CALGARY.—The City Commissioners recently awarded contracts for the street railway system amounting to more than $100,000, as follows: The Allis-Chalmers-Bullock Co., motor generator set and switchboard, $15,950, installed in the power plant. Their nearest competitor was the Fairbanks Co., who bid $6,150, for the generator set alone but did not tender on the switchboard. The Allis-Chalmers-Bullock tender on the generator set was $6,085. Seven hundred and fifty horse-power engine, Robb Engineering Co., Amherst, N.S., $14,300. The Belliss-Morcom Company were next with a triple expansion engine, with the same power at about the same price. The 1,110 tons of steel rails, 400 tons of which will be 80 pounds to the yard, and 710 tons 60 pounds, Gorman, Clancey and Grindley, Calgary, who represent a steel manufacturing firm with headquarters in Lorain, Ohio. The amount involved reaches the total of $70,000, the price being $61.54 per ton. The 80-pound rail will be used on paved streets and the lighter steel on the unpaved streets. The East Kootenay Lumber Company will supply the necessary ties at the rate of 56 cents each. Pugh and Livingston, of Okotoks, were also after this contract, but their tender did not state the ties would be of uniform size or sawn on four sides, so they lost the job.

EDMONTON.—The Street Railway recently awarded contracts as follows: The Federal Electric Company, Montreal, Que., aluminium, contract price, $4,550. The nearest competitor was the Northwest Electric Company, of Edmonton, whose price was $50 lower. The Northwest Electric Company will furnish the overhead specials for $1,947.90. Wm Stuart & Company will supply the wooden poles needed for $3,400, while copper bonds will be furnished by the Canadian General Electric Company, Peterborough, Ont., for $5,070.

Foreign.

CHICAGO.—G. M. Davis Regulator Company report a recent shipment to the General Fire Extinguisher Company, Providence, R.I., of a 30-inch pressure reducing valve to reduce pressure of 75 pounds down to 30 pounds. It is designed to pass twenty million gallons of water per day through the valve. They also report the receipt of an order for 30-inch combination atmospheric relief and back pressure valve to be used on five thousand K. W. Curtis turbine being installed in the 59th Street station of the Interborough Rapid Transit Company's plant, New York City. Their plant is considered the largest power plant in the world.

DULUTH.—Bids received by Lieut.-Col. Graham D. Fitch, corps of engineers, United States Army, opened February 15th, 1909, for furnishing and delivering 134,620 linear feet of piling floating in water at Superior entry, Duluth-Superior Harbor, were as follows: Duluth Log Co., Duluth, Minn., $22,077.68; *A. J. MacDonald, Superior, Wis., $23,757.90; Zenith Cedar Co., Duluth, Minn., $22,212.30; Martin Bros., Duluth, Minn., $22,548.85; Lake Superior Piling Co., Duluth, Minn., $24,231.60; H. Younker, Ashland, Wis., $18,173.70; Virginia & Rainy Lake Co., Duluth, Minn., $25,577.80. *Bid irregular.

RAILWAYS—STEAM AND ELECTRIC.

Quebec.

MONTREAL.—The Railway Commission have ordered the C.N.R. to reorganize their Monfort branch, between St. Jerome and Arundel. Amongst other improvements the line has to be ballasted and the light rails replaced by heavier ones.

MONTREAL.—The Grand Trunk Railway Company have filed plans for their preposed freight yards at St. Lambert, which will comprise 100 acres. It has not yet been announced when work will be commenced.

MONTREAL.—The Quebec, Montreal and Southern Railway is now practically completed to Ste. Philomene. The cost is said to be considerably over $40,000 per mile. It is officially announced that in two months the road will be open for traffic from St. Lambert to Ste. Philomene, but no announcement is forthcoming as to the further extension of the system to Levis. The Nicolet, Becancourt and Gentilly bridges are all completed except the superstructure on the Nicolet.

Ontario.

BRANTFORD.—The Brantford Street Railway Co. have deposited certain bonds with the city as evidence of good faith that it will fulfil its obligations. These consist of rebuilding the existing eight miles of street railway within one year from May 1st, and making eight miles additional extensions in the city within two years.

PORT ARTHUR.—The warehouse of the C.P.R. at Port Arthur will be made 300 feet larger. Construction will probably commence shortly.

Manitoba.

WINNIPEG.—Announcement is made that the Canadian Northern Railway is preparing to electrify its shops here, using power from the street railway's plant.

WINNIPEG.—The greater portion of the surveys of the Hudson's Bay Railway has been completed. On February 1st 365 out of a total of 465 miles had been finished, and it is felt that another two weeks will practically finish the work. Parties three and four many remain in the field all next summer, gathering data. The surveys have been satisfactory. The route mapped out does not present the difficulties which were anticipated, and for the greater part of the distance it will be possible to carry on construction cheaply and rapidly. Optional routes have been suggested.

Alberta.

CALGARY.—A survey party of the Canadian Pacific have taken up quarters at Cheadle, and will immediately lay

out lines for the new extension to be run north through the irrigation block.

EDMONTON.—The Legislature of Alberta has approved of the railway policy of the Government as set out in resolutions introduced by Premier Rutherford and accompanied by bills to guarantee the bonds of the Grand Trunk Pacific and Canadian Northern Railways for branch lines totalling 1,681 miles. The total guarantee is $27,433,000. Six or seven hundred miles will be built this season.

British Columbia.

VANCOUVER.—The V.W. and Y. Railway Co. announce that they will have survey parties in the field next summer between Vancouver and Fort George.

VANCOUVER.—The final location of the G.T.P. from Edmonton to Prince Rupert is completed, and engineers will shortly survey the Vancouver branch from a thirty-mile radius of Fort George and Vancouver.

VANCOUVER.—The Great Northern Railway is calling for tenders for the construction of a branch line across the east end of the city from its present tracks to the deep water front of the inlet.

VANCOUVER.—Messrs. Macdonald & Gzowski, engineers and contractors, will build five miles of railway from salt water to Gordon Pash Lakes, the contract for construction having been awarded a few days ago. The railway will start at Stillwater Bay on the mainland, a few miles north of Jervis Inlet.

LIGHT, HEAT, AND POWER

New Brunswick.

ST. JOHN.—The contract for the construction work involved in the Hydro-Electric development of the Grand Falls Power Co. on the St. John River at Grand Falls, New Brunswick, has been placed in the hands of the Frank B. Gilbreth organization, of New York. This plant will generate 100,000 horse-power in electric current, which will be furnished to the various cities throughout New Brunswick and Maine. The work involves, among other features, the construction of a number of shafts in rock excavation 130 ft. deep, a power chamber 30 by 260 ft. and 130 ft. deep, and a tail race tunnel 28 ft. in diameter and 2,400 ft. long, a power house 350 ft. long and 260 ft. wide. The intake shafts will be nine in number, 12 ft. in diameter and 130 ft. deep. Actual construction will be begun immediately and will be pushed through to completion at an early date. The St. John River at Grand Falls, which is the largest river in New Brunswick, describes a horseshoe curve at this point, and has a fall of 135 ft. through a gorge of the most magnificent scenic beauty. This spectacle is second only to that of Niagara, and its utilization, like that of Niagara, will result in a great increase in industrial activity in the Province. Grand Falls is situated on the Canadian Pacific Railway, about two hundred miles north of St. John, N.B., and about two miles east of the State of Maine. The expenditure involved will amount to over $5,000,000. Mr. John B. McRae, of Ottawa, Canada, is the chief engineer, and Mr. Ralph Mershon, of New Pork, is the electrical engineer.

Ontario.

BRANTFORD.—Announcement is made that the city council has just about completed an agreement with the Cataract Power Co. for the supply of lighting for a short term to this city. The price for street lighting is close to $47.50 per arc light per annum, and 7½ cents per kilowatt for commercial and industrial lighting.

Alberta.

CALGARY.—The Calgary Power and Transmission Co. have secured the services of Cecil B. Smith, of Toronto, to report on their power proposition at Horseshoe Falls on the Bow. Mr. Smith states that this fall alone will produce at least 8,000 horse-power.

SEWERAGE AND WATERWORKS.

Ontario.

NORTH TORONTO.—Messrs. T. Aird Murray and A. F. Macallum, consulting engineers, Toronto, have been retained by the corporation to report as follows: A sewerage scheme for the district; the advisability or otherwise of connecting with Toronto main system or disposing of the sewage within the district. The report to include an estimate of the cost of their suggestions.

British Columbia.

VANCOUVER.—The Esquimalt Waterworks Co. has made an offer to the city to supply them with water at four cents per 1,000 gallons if the city guarantees to take at least 3,000,000 gallons per day.

CURRENT NEWS

Quebec.

MONTREAL.—To succeed Professor Owens as occupant of the chair of electrical engineering in the Faculty of Applied Science of McGill University, a special meeting of the board has been called to appoint Mr. Louis A. Herdt, at present associate professor of electric engineering.

Ontario.

SAULT STE. MARIE.—Manager Franz, of the Lake Superior Corporation, says the company will commence at once extensive additions to the open hearth furnaces at the Algoma steel plant in the Canadian Soo.

WINDSOR.—Much damage has been done to roadways, bridges and buildings throughout Essex County by recent floods.

MISCELLANEOUS.

Quebec.

MONTREAL.—Members of the Church of St. Matthias, Westmount, have approved of the plans for the erection of a new church, and authorized the Building Committee to proceed with the erection at a cost of $45,000. The dimensions will be 50 feet by 120 feet. It will be built of Indiana limestone. The architects are Messrs. Ross & Macfarlane.

Ontario.

TORONTO.—The Polson Iron Works Co. have under construction a steel tug sixty feet in length. It will be equipped with high-power engines, and used by Mr. Frank Simpson in his dredging operations during the coming season.

Alberta.

CALGARY.—The C.P.R. proposes to expend five million dollars during the current season in improving the roadbed, new lines and extensions of the irrigation project.

MACLEOD.—The Raymond Concrete Pile Co. are about starting the driving of their system of concrete piling for the new C.P.R. viaduct over the Old Man River, near Macleod. This company have just completed the piling for the legislative buildings at Regina, for which Messrs. Edward and W. S. Maxwell are the architects, and Messrs. Peter Lyall & Sons the general contractors.

British Columbia.

VANCOUVER.—J. Burnett, of Nanton, Alta., has secured a site with 150 feet frontage on the C.P.R. tracks, upon which he proposes to commence building a terminal elevator early in spring.

VICTORIA.—The repairs to the collapsed section of the outer wharf which broke away when the sea wall for 250 feet fell away subsequent to the recent dredging will be begun at once. A survey will be made without delay and plans made for the necessary repairs.

VICTORIA.—The contract will be let shortly for the construction of a twin-screw wooden passenger steamer of the approximate size of the "Charmer" to replace the steamer "City of Nanaimo" on the Victoria-Nanaimo Comox route of the C.P.R. coasting service.

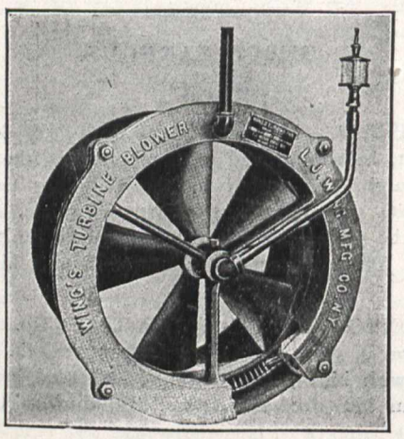
AMONG THE MANUFACTURERS

A department for the benefit of all readers to contain news from the manufacturer and inventor to the profession.

WING'S TURBINE BLOWER.

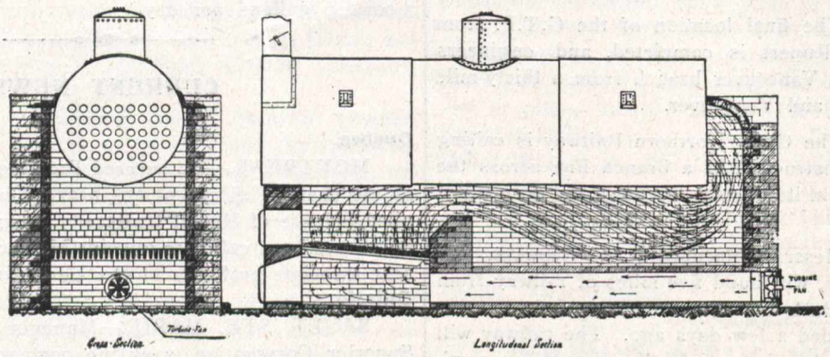
This blower consists of the well-known Wing Disc Fan, to which is added an impulse turbine engine of simple construction.

The fan blades are fastened to the inside of a ring carrying the turbine buckets or vanes on the outside, so that the fan and vanes are literally one piece, and as the steam acts direct on these vanes, the centre shaft or spindle is a fixture around which these blades revolve. No power is transmitted



by this shaft, and the only friction loss is that due to the weight of the blades, which, as they are built of a special alloy, are quite light. Ample provision is made for lubricating, and after being installed this is the only thing that requires the occasional attention of the engineer.

The fan is easily installed, each boiler having its own individual installation, and the small amount of steam required to drive it passes in under the grates with the air thoroughly mixed, and gives the best combustion at lowest cost. Besides this, the steam so used helps to preserve the grates, by



reducing the clinkers and keeps open the entire grate surface.

These fans are built in four sizes: 12, 16, 20 and 24-inch, and can be applied to boilers ranging in size from the smallest up to 400 horse-power. The larger sizes can also be installed in pairs, thereby doubling their range.

In addition to their use for mechanical draft, they can also be applied to such purposes as that of ventilation, drying, removing heat, steam, vapours, dust, etc., and are also particularly available for cooling towers, humidifying the air in cotton, silk, or other mills, etc. For ventilating of mines, tunnels, factories, theatres, etc., the fans can be run with compressed air acting on the buckets instead of steam, and is an ideal system of supplying cool, fresh, pure air.

These fans are being manufactured in Canada by the Laurie Engine and Machine Company, Limited, Montreal.

Real economy is as important in small things as in great, but it is more likely to be neglected. People who are obliged to use a large amount of rope are compelled to study the rope market and soon learn that it pays to buy the best and to let the cheap stuff alone. This is likely to be overlooked by the small user because the amount involved is comparatively little, but it is a mistake to ignore the question.

Foreign.

SAN FRANCISCO.—The chief engineer of the Board of Harbor Commissioners was ordered Feb. 19 to prepare plans for the construction of a new seawall and four modern docks. They will be built of concrete cylinder piles, and will be equipped with all modern facilities for the loading and discharging of vessels, and will replace the present old-fashioned wharves. The cost of the work is estimated at three-quarters of a million dollars.

FINANCING PUBLIC WORKS.

Ontario.

GRAVENHURST.—The by-law to raise $15,000 for the purpose of completing the expenditure undertaken in the construction of the Hydro-Electric power plant at South Falls was carried by a majority of 73 votes.

Alberta.

CALGARY.—The City Commissioners are considering assisting the Calgary Natural Gas Co. to the extent of $10,000, provided the money be used for development purposes.

PERSONAL.

MR. LEWIS BOLTON, of Lewis Bolton & Son, Listowel, Ont., has been elected president of the Ontario Land Surveyors.

MR. J. G. G. Kerry, of Smith, Kerry & Chace, Toronto, has been elected chairman of the Toronto Branch of the Canadian Society of Civil Engineers.

MR. D. McNICOLL, vice-president of the C.P.R., has been appointed to serve on the transportation committee of McGill University, in the railway engineering department to succeed Mr. R. B. Angus.

MR. G. A. McCARTHY, chief engineer of the T. & N. O. Railway, has resigned his position to take effect April 1st. Mr. McCarthy will join the firm of Smith, Kerry & Chace, consulting engineers, Toronto.

MR. J. J. CAGNEY, general agent of the Montreal Light, Heat & Power Company, has resigned from the company's service to take up the position of manager of a large hydro-electric plant now under construction in Georgia. Mr. Cagney has been connected with the development of the Power Company for the past nine years.

OBITUARY.

MR. HENRY BAUSCH, vice-president of the Bausch & Lomb Optical Company, of Rochester, N.Y., died March 2nd, 1909, at Augusta, Ga.

OSCAR PETERSON, aged 37, died at Elfros, Sask., on Sunday, February 21st. He was a prominent contractor on the Sheho extension of the C.P.R.

W. J. McCORDOCK, superintendent of dredging in the Maritime Provinces for the Canadian Government, died at his home last Tuesday, in his 78th year. He had been in the Government service for 38 years.

MARKET CONDITIONS.

Montreal, March 3rd, 1909.

A feature of the decline in the iron markets of the United States is its retroactive character. While contracts do not necessarily contain a stipulation by which buyers get the advantages of reductions subsequently made, many buyers look for such reduction being allowed them and very frequently get them. This applies more especially if not altogether to the deliveries made after prices have fallen. It would seem that sellers are granting claims of this nature on recently made contracts, but are refusing them on those of long standing which are almost completed. It would seem that large purchasers may now buy steel rails in the United States at $25 instead of $28, though some dispute this lower figure being yet available. Pipe mills have reduced prices to $6, from $10, per ton; billets have been reduced to $22 at Pittsburg; steel bars are $1.20; struc-

TENDERS CALLED FOR

VILLAGE OF BURLINGTON

PROVINCE OF ONTARIO.

WATERWORKS — TENDERS WANTED

Sealed Tenders will be received by the Village Clerk until 8 p.m. on Tuesday, March 23rd, 1909 for the following sections of the proposed Waterworks System:—

"A"—Pipelaying.
"B"—Pump House.
"C" Water Tower.
"D"—Cast Iron Pipes.
"E"—Hydrant Valves.
"G"—Electrically Operated Pumping Machinery.
"I"—Pump Well.

Plans and specifications for "A," "C," "D," and "E" may be seen at the office of the Clerk, Burlington, or at the office of the Chief Engineer, Toronto, on or after March 1st.

M. C. SMITH, Esq., Reeve, Burlington, Ont.
O. T. SPRINGER, Esq., Clerk. Burlington, Ont.
WILLIS CHIPMAN, C.E., Chief Engineer, 103 Bay Street, Toronto, Ont.

TENDERS FOR BRIDGE ABUTMENTS AND PIERS

Tenders will be received at the office of the undersigned up to twelve o'clock noon of Wednesday, March 10th, 1909, for the construction of a quarry stone or concrete abutment and centre pier and a concrete floor for a steel bridge over the Humber River on the Searlett Road, north of Lambton Mills, County of York.

Plans and Specifications may be seen and all necessary information may be obtained at the office of the undersigned, 57 Adelaide Street East, Toronto.

The lowest or any tender not necessarily accepted.

FRANK BARBER, C.E., County Engineer.

Toronto, March 1st, 1909.

CITY OF PRINCE ALBERT

TENDERS

"Tenders for Road Machinery" will be received until 8 p.m. on Thursday, March 18th, for the following:—

1. One Storm Crusher.
2. One Elevator and Screens.
3. One Electric Motor.
4. One Steam Road Roller.

Specifications and other information will be forwarded on application to F. A. Creighton, Esq., City Engineer, Prince Albert, Sask.

C. O. DAVIDSON, Sec.-Treas.

TOWN OF WEYBURN

Province of Saskatchewan.

TENDERS WANTED

Sealed Tenders will be received by the Secretary-Treasurer of the Town of Weyburn until 8 p.m. on Wednesday, April 7th, 1909, for the following sections of proposed System of Waterworks:—

"A"—Pipelaying.
"C"—Water Tower.
"D"—Cast Iron Pipes.
"E"—Fire Hydrants and Valves.

Plans and Specifications may be seen at the office of the Secretary-Treasurer, Weyburn, or at the office of the Chief Engineer, Toronto, on or after March 8th.

SAMUEL MURRAY, Esq., Chairman W.W. Committee, Weyburn, Sask.
GEORGE ROSS, Esq., Secretary-Treasurer, Weyburn, Sask.
J. R. FOX, Esq., Mayor, Weyburn, Sask.
WILLIS CHIPMAN, C.E., Chief Engineer, 103 Bay Street, Toronto, Ont.

tural steel and steel plates, $1.30, Pittsburg, and possibly less. All along the line reductions have been made. A very important point is now being insisted upon, and that is that the recent declines have put prices at such a level that they will no longer be subject to further reductions because of any decreases which may be made in the tariff at the coming revision. Nevertheless, many think that further declines must take place even if it be at the expense of the wages of employees.

In England and Scotland, the markets have been very unsettled as the result of the occurrences in the United States, and there has been a general decline in prices. Latest cables, however, quote a rather firmer tone in pig-iron, again, and a rather better tone is reported. However, there is little as yet to cause any very great expectations for the immediate future.

The local market, strange enough to say, continues unchanged in all lines. It may be that purchases are being made at lower figures than those quoted, in many instances, but dealers continue to repeat former figures. For instance, one merchant claims that he can purchase steel bars at less than $1.90, but dealers repeat that quotation. Some claim they are able to purchase other lines at less than the prices quoted, also. Dealers and importers state that they have been buying at less than the general price quoted in the United States for a long time past, and that their customers in Canada have been getting the advantage of these prices. The present decline in the United States, they claim, just about brings prices to the level of what the United States has been accepting for export, and at which occasional sales were being made to home customers. Consequently, prices here are unaffected, so far. There seems to be a very fair enquiry, locally, but buyers are disappointed at not being able to get reductions, and as a result, are frequently refusing to close. The situation, therefore, remains unsettled, and it is difficult to say what may be the outcome.

Antimony.—The market is steady at 9 to 9¼.

Bar Iron and Steel.—Prices are steady all round, and trade is dull. Bar iron, $1.90 per 100 pounds; best refined horseshoe, $2.15; forged iron, $2.05; mild steel, $2.00; sleigh shoe steel, $1.90 for 1 x ¾-base; tire steel, $1.95 for 1 x ¾-base; toe calk steel, $2.40; machine steel, iron finish, $2.10; smooth finish, $2.75.

Boiler Tubes.—The market is steady, quotations being as follows:—2-inch tubes, 8½c.; 2½-inch, 10c.; 3-inch, 11½c.; 3½-inch, 14¾c.; 4-inch, 19c.

Building Paper.—Tar paper, 7, 10, or 16 ounces, $1.60 per 100 pounds; felt paper, $2.40 per 100 pounds; tar sheathing, No. 1, 55c. per roll of 400 square feet; No. 2, 35c.; dry sheathing, No. 1, 45c. per roll of 400 square feet, No. 2, 28c. (See Roofing; also Tar and Pitch).

APPLICATIONS WANTED

Applications will be received at the office of the Undersigned and marked "Application for City Engineer" up to and including **Tuesday the 23rd of March, 1909** until 5 o'clock P. M.

J. H. TRUSDALE, City Clerk

Saskatoon, Sask., Feb. 15th, 1909

CONTRACTOR'S SUPPLIES

To know where to look for what you want, to know where to dispose of what you don't want is a great convenience. You require special equipment. This department will enable you to get in touch quickly with reliable men who wish to dispose of that which you require. Whether a buyer or a seller, you will find this department an aid to business.

RATES FOR THIS DEPARTMENT ARE VERY SPECIAL. BETTER SEND FOR THEM.

FOR SALE

CONTRACTORS' MACHINERY.

1, 48" x 20' semiportable fire box boiler.
2, 44" x 18' semiportable fire box boilers.
1, 39" x 14' 8" semiportable fire box boiler.
1, 36" x 12' 11" semiportable fire box boiler.
1, 48" x 10' 9" semiportable return tube boiler.
1, 30" x 12' semiportable return tube boiler.
1, 30" x 10' semiportable return tube boiler.
1, 9" x 10" Abell semiportable engine and boiler.
1, 8" x 12" semiportable engine and boiler.
2, 7" x 10" Champion portable engines and boilers.
1, 7" x 10" Victor portable engine and boiler.
1, 7½" x 12" Russell traction engine.
1, 7" x 10" Cornell traction engine.
1, 10" x 12" double cylinder, single drum hoisting engine without boiler.
1 8" x 10" single cylinder, single drum hoisting engine without boiler.
1, 5" x 7" single cylinder, single drum steam hoist with boiler.
4, 7" x 10" double cylinder, double drum steam hoists with boilers.
1, 7" x 8" single cylinder, single drum hoisting engine without boiler.
1, 6½" x 8" double cylinder, single drum hoisting engine without boiler.
1, 5¼" x 7" double cylinder, double drum steam hoist with boiler.
1, 5" x 7" double cylinder, single drum hoisting engine without boiler.
1, 7" x 12" double cylinder, double drum steam hoist with boiler.
1, 10" x 10" x 10" steam driven air compressor.
1, 6" x 6" vertical, double cylinder air compressor.
1, 6" x 6" vertical, single cylinder air compressor.
1, No. 2 McCully rotary stone crusher.
1, No. 4 Waterloo concrete mixer.
1, portable concrete mixer with gasoline engine.
2, cement block machines complete with plates.
1, 8" horizontal centrifugal sand pump with pipe.
1, 900 gallon, Northey vertical centrifugal pump.
1, 470 gallon, Morris vertical centrifugal pump.
1, 260 gallon, Morris vertical centrifugal pump.

A copy of our supply catalogue or machinery stock list for the asking.

H. W. PETRIE, Ltd.

Toronto Montreal Vancouver

JARDINE UNIVERSAL CLAMP RATCHET DRILL

Indispensable for Machine Repairs, Factories, Machine Shops, Bridge Builders, Track Layers, Structural Metal Workers, have use for it. Send for description.

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Rails—Newand second-hand

Locomotives—Standard and narrow gauge.

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JOHN J. GARTSHORE

58 Front Street, West, TORONTO

FOR SALE. Great Bargains if you act promptly in D.C. MOTORS

1—500 volt, 15 Kilowatt 900 R. 1—250 volt, 11 Kilowatt, 1150 R. 2—250 volt, 8 H.P. 1—250 volt, 10 H.P. 600 R. Built Specially for Hoisting Purposes.

All in First Class Order and no Reasonable Cash Offer refused.

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Supplied at Shortest Notice.

Railroad Contractors and Engineers

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Electric & Hand Cranes

NORTHERN CRANES

NORTHERN ENGINEERING WORKS DETROIT MICHIGAN — U.S.A.

The Newten Cupola

NEW INCORPORATIONS.

Ontario.—Hanging Stone Silver Mines, Limited, $1,000,000; D. R. Leask, C. G. Locke, Roy Eustace, Toronto. The Langham Cobalt Mines, Limited, $1,200,000; Douglas McNair, J. A. Seybold, F. W. Carling, N. J. Ker, Ottawa. The Cobalt Laguna Mining Corporation, Limited, $300,000; R. L. Jewett, P. W. Blue, G. J. Frei, Cobalt. MacDuff Mining Co., Limited, $40,000; Archibald McGibbon, W. I. Dick, Alex. Duff, Milton, Ont. Gow Ganda Prospecting Co., Limited, $10,000; D. E. Johnson, E. M. Adams, C. E. McCuaig, Ottawa. Diamonds & Gold, Limited, $2,000,000; Wm. David Earngey, John B. Hall, W. Freeman, Toronto. Gow Ganda Exploration Co., Limited, $100,000; John I. Grover, F. J. Ap'John, G. A. Grover, Toronto. St. Anthony Prospecting, Developing & Mining Co., Limited, $500,000; S. D. Madden, Cobalt; J. F. Leamox, Toronto. Empire Fence Export Co., Limited, $10,000; M. Church, Detroit; J. W. Coatsworth, R. P. Hall, Walkerville. The Don Valley Brick Co., Limited, $500,000; John M. Bowman, H. St. J. Jarvis, George T. Davies.

Cement.—Quotations are for car lots, f.o.b., Montreal. Canadian cement is $1.55 to $1.65 per 350-lb. bbl., in 4 cotton bags, adding 10c. for each bag. Good bags re-purchased at 10c. each. Paper bags cost 2½c. extra, or 10c. per bbl. weight. English cement is $1.65 to $1.85 per 350-lb. bbl. in 4 jute sacks (for which add 8c. each) and $2.20 to $2.40 in wood. Belgian cement is $1.60 to $1.65 in bags—bags extra—and $2.10 in wood.

Chain.—The market is steady as follows:—¼-inch, $5.30; 5-16-inch, $4.05; ⅜-inch, $3.65; 7-16-inch, $3.45; ½-inch, $3.20; 9-16-inch, $3.15; ⅝-inch, $3.05; ¾-inch, $3; ⅞-inch, $2.95; 1 inch, $2.95.

Copper.—The market is about steady at 14⅜ to 15c. per lb. Demand continues limited.

Explosives and Accessories.—Dynamite, 50-lb. cases, 40 per cent. proof, 18c. 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, $3.50; 6-ft. wires, $4; 8-ft. wires, $4.50; 10-ft. wires, $5. Double strength fuses, 1$ extra, per 100 fuses. Fuses, time, double-tape, $6 per 1,000 feet.

Galvanized Iron.—The market is steady. Prices, basis, 28-gauge, are:—Queen's Head, $4.40; Comet, $4.25; Gorbal's Best, $4.25; Apollo, 10¼ oz., $4.35. 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 10¼ oz., and English 28-gauge.

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

Iron.—Prices are rather higher, and the outlook is steady. The following prices are ex-store: Canadian pig, $18.50 to $19.50 per ton; No. 1 Summerlee, $21 to $22; No. 2 selected Summerlee, $20.50 to $21.50; Carron soft, $20.25 to $20.75; No. 3 Clarence, $19 to $20 per ton.

Laths.—See Lumber, etc.

Lead.—Trail lead is firmer, at $3.75 to $3.85 per 100 pounds, ex-store.

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 rate of $1.50. At the moment, the market is exceptionally irregular and prices are uncertain. Red pine, mill culls out, $18 to $22 per 1,000 feet; white pine, mill culls, $22 to $25. Spruce, 1-in. by 4-in. and up, $16 to $18 per 1,000 ft.; mill culls, $14 to $16. Hemlock, log run, culls out, $14 to $16. 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 carrying $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 moderate, but prices are steady at $2.30 per keg for cut, and $2.25 for wire, base prices.

Pipe—Cast Iron The market continues steady at $33 for 8-inch pipe and larger; $34 for 6-inch pipe; $34 for 5-inch, and $34 for 4-inch at the foundry. Pipe, specials, $3.10 per 100 pounds. Gas pipe is quoted at about $1 more than the above.

Pipe.—Wrought and Galvanized.—The market is steady, moderate-sized lots being: 1-4-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. The discount on the following is 69 per cent. off for black and 59 per cent. off for galvanized; ½-inch, $8.50; 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

Rails.—Quotations on steel rails are necessarily only approximate and depend upon specification, quantity and delivery required. A range of $31.50 to $32.50 is given for 60-lb., 70-lb., 80-lb., 85-lb., 90-lb., and 100-lb. 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, 64c. per roll; three-ply, 86c. per roll of 100 square feet. (See Building Paper; also Tar and Pitch).

Rope.—Prices are steady, at 9 1-2c. per lb. for sisal, and 12c. for Manila. Wire rope, crucible steel, six-strands, nineteen wires; 1-4-in., $2.75; 5-16, $3.75; 3-8, $4.75; 1-2, $6; 5-8, $7.25; 3-4, $8.50; 7-8, $10; 1-in., $12 per 100 feet.

Spikes.—Railway spikes are in dull demand and prices are steady at $2.40 per 100 pounds, base of 5½ x 9-16. Ship spikes are also dull and steady at $3 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.

Steel Plates.—The market is steady. Quotations are: $2.15 for 3-16; $2.25 for ⅛, and $2.15 for ¼ and thicker; 12-gauge being $2.30; 14-gauge, $2.15; and 16-gauge, $2.10.

Telegraph Poles.—See lumber, etc.

Tar and Pitch.—Coal tar, $4 per barrel of 40 gallons, weighing about 500 pounds, roofing tar, $3.15 per barrel; roofing pitch, No. 1, $1 per 100 pounds; and No. 2, 50c. per 100 pounds; pine tar, $8.50 per barrel of 40 gallons, and $4.75 per half-barrel; pine pitch, $4 per barrel of 180 to 200 pound. (See building paper; also roofing.)

Tin.—Prices are 32c. to 32½c.

Zinc.—The market is steady at 5½ to 5¾c.

* * * *

Toronto, March 4th, 1909.

The throwing open of the steel market in the United States last week demoralized the share market, which had been showing activity. This week, the inauguration day proceedings and feelings cause further irregularity. So that one must wait still longer for steady commercial activity. As to manufactures, the reductions of price by the United States Steel Company have brought out but meagre orders, and the reduction of wages posted by the Lackawanna Steel Works at Buffalo on Monday does not look like brisk trade. As to reports of an advance in copper, there are large sales reported abroad, but at prices still low, while domestic demand is very slow in reviving.

Mr. Plummer's reply to enquiry as to the effect of United States Steel Company's reductions of price upon quotations by the Dominion Steel Company is that the latter had made its reductions beforehand, and does not think it needful to make any further change. Neither merchants nor manufacturers in Canada report spring activity yet. But the building trade, in spite of much bad weather, has shown an output of buildings in the first two months of the year greatly in advance of 1908.

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

Antimony.—Unchanged at 9 3-4c. Not much doing.

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

Boiler Plates.—1-4-inch and heavier, $2.40. Boiler heads 25c. per 100 pounds advance on plate.

Boiler Tubes.—Orders continue active. Lap-welded, steel, 1 1-4-inch, 10c.; 1 1-2-inch, 9c. per foot; 2-inch, $8.75; 2 1-4-inch, $10; 2 1-2-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. A moderate demand can be now reported, for shipment about 1st April.

Bricks.—Common structural, $9 per thousand, wholesale, and the demand moderately active. Red and buff pressed are worth, delivered, $18; at works, $17.

Cement.—Price in 1,000-barrel lots $1.70 per barrel, including bags, or $1.30 without bags. Smaller quantities, $1.55 to $1.60 per barrel, in load lots delivered in town, and bags extra. No marked activity.

Coal Tar.—Nothing doing, price maintained at $3.50 per barrel.

Copper Ingot.—The market is irregular, but the result is lower prices. We quote 14 1-2c. to 15c.

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.—Still quiet on account of coarse climatic conditions. Price maintained at $1.80 per 100 lbs.

Fire Bricks.—English and Scotch, $30 to $35; American, $27.50 to $35 per 1,000. The demand has become quite active.

Fuses.—Electric Blasting.—Double strength, per 200, 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. Bennett's double tape fuse, $6 per 1,000 feet.

Galvanized Sheets—Apollo Brand.—Sheets 6 or 8 feet long, 30 or 36 inches wide; 10-gauge, $3.05; 12-14-gauge, $3.15; 16, 18, 20, $3.35; 22-24, $3.50; 26, $3.75; 28, $4.20; 29, $4.50; 10¾, $4.50 per 100 pounds. Fleur de Lis—28-gauge, $4.30; 26-gauge,$4.05; 22-24-gauge,$3.50. Queen's Head—28-gauge, $4.50; 26-gauge, $4.25. Sheets are in very active request.

Iron Chain.—¼-inch, $5.75; 5-16-inch, $5.15; ⅜-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.

Bar Iron.— $1.95 to $2, base, from stock to wholesale dealer.

Iron Pipe.—Black, ¼-inch, $2.03; ⅜-inch, $2.26; ½-inch, $2.63; ¾-inch, $3.16; 1-inch, $4.54; 1¼-inch, $6.19; 1½-inch, $7.43; 2-inch, $9.90; 2½-inch, $15.81; 3-inch, $20.76; 3½-inch, $26.13; 4-inch, $29.70; 4½-inch, $38; 5-inch, $43.50; 6-inch, $56. Galvanized, ¼-inch, $2.86; ⅜-inch, $3.08; ½-inch, $3.48; ¾-inch, $4.31; 1-inch, $6.19; 1¼-inch, $8.44; 1½-inch, $10.13; 2-inch, $13.50. Makers are holding prices stiff.

Lead.—Prices firm outside. Price here steady at $3.90 to $4.

Lime.—In adequate supply and slow movement. Price for large lots at kilns outside city 22c. per 100 lbs. f.o.b., cars; Toronto retail price 35c. per 100 lbs. f.o.b. car

Lumber.—We quote dressing pine $32 to $35 per thousand; common stock boards higher at $26 to $30.00; cull stocks, $20; sidings, $17.50. Norway pine is neglected in favor of Southern, which is much stronger in fibre and the price well maintained. Hemlock continues to sell pretty freely, and in car lots brings $16.50 to $17.00. Spruce flooring is quoted at $22.00 in car lots. The season being practically over for shingles, there is but little movement in them, but prices are suddenly strong at $3.20 for British Columbia. White pine lath are scarcer, No. 1 especially, and stiff in price. No. 1 are $4, and No. 2 $3.50. Spruce laths are scarcer in this market and prices keep up. More spruce and hemlock have moved than pine. Prices are maintained all over the list.

Nails.—Wire, $2.25 base; cut, $2.70; spikes, $3. There is a fair supply and no especial activity.

Pitch.—Demand is flat; price, 70c. per 100 lbs.

Pig Iron.—Business continues quiet; prices are fairly well maintained. Clarence quotes at $20.50 for No. 3; Cleveland, $20.50 to $21.00; in Canadian pig, Hamilton quotes $19.50 to $20.

Plaster of Paris.—Calcined, wholesale, $2; retail, $2.15. Trade quiet.

Putty.—In bladders, strictly pure, per 100 lbs., $2.25; in barrel lots, $2.05.

Rope.—Sisal, 9¾c. per lb.; pure Manila, 12½c., Base

Sewer Pipe.—

	4-in.	6-in.	9-in.	10-in.	12-in.	24-in.
Straight pipe per foot	$0.20	$0.30	$0.60	$0.75	$1.00	$3.25
Single junction, 1 or 2 feet long.	.90	1.35	2.70	3.40	4.50	14.63
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	.....

In steady demand; price 73 per cent. off list at factory for car-load lots; 65 per cent. off list retail.

Steel Beams and Channels.—Quiet. We quote:—$2.50 to $2.75, according to size and quantity; if cut, $2.75 to $3; angles, 1 1-4 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.—Market steady, with fairly good demand; 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.

Tool Steel.—Jowett's special pink label, 10½c. Cyclops, 16c.

Tin.—From outside accounts firm prices are warranted. A fair amount of business is passing.

Wheelbarrows.—Navvy, steel wheel, Jewel pattern, knocked down, $21.35 per dozen; set up, $22.35. Pan Canadian, navvy, steel tray, steel wheel, per dozen, $3.30 each; Pan American, steel tray, steel wheel, $4.25 each.

Zinc Spelter.—Business fairly active, market strong at $5.25 to $5.50, outside market here quiet but firm at $5.25 to $5.50.

* * * *

Winnipeg, March 3rd, 1909.

The local quotations are as follows:—

Anvils.—Per pound, 10 to 12 1-2c.; Buckworth anvils, 80 lbs., and up, 10¼c.; anvil and vise combined, each, $5.50.

Bar Iron.—$2.50 to $2.60.

Beams and Channels.—$3 to $3.25 per 100 up to 15-inch.

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

Bricks.—$11, $12, $13 per 1,000, three grades.

Cement.—$2.65 to $2.75 per barrel.

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.—Plaster's, 80 to 90 cents 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., 4¾c.

Iron.—Swedish iron, 100 lbs., $4.75 base; sheet, black, 14 to 22 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.

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, ¼-inch, $4.25; ⅜-inch, $5.75; 1-inch, $8.35; 1¼-inch, $11.35; 1½-inch, $13.60; 2-inch, $18.10. Lead, 6¾c. per lb.

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

Lumber.—No. 1 pine, spruce, tamarac, British Columbia fir and cedar—2 x 4, 2 x 6, 2 x 8, 8 to 16 feet, $27.25, 2 x 20 up to 32 feet, $38.

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

Tool Steel.—8¼ to 15c. per pound.

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.

Boards.—Common pine, 8-inch to 12-inch wide, $38 to $45; siding, No. 2 white pine, 6-inch, $55; cull red or white pine or spruce, 6-inch, $24; No. 1 clear cedar, 6-inch, 8 to 16 ft., $60; Nos. 1 and 2 British Columbia spruce, 6-inch, $55; No. 3, $45.

ONTARIO MINES OUTPUT.

The Ontario Department of Mines have issued the following statement of the mineral production of Ontario last year:—

Product	Value
Metallic—	
Gold, ounces	$ 60,337
Silver, ounces	9,125,903
Cobalt, tons	110,166
Nickel, tons	1,866,059
Copper, tons	1,071,140
Iron ore, tons	537,379
Pig iron, tons	4,390,839
	$17,161,823
Less value of Ontario iron (170,215 tons) ore smelted into pig iron	456,176
Net metallic production	$16,705,647
Non-metallic	8,513,962
Total production	$25,219,609

The figures given are subject to revision. Values are computed at the selling price at the mines or works, and in the form of which the substances are produced. As compared with 1907 there has been a considerable increase in the output of metalliferous mines and works, and a shrinkage in the non-metallic production, the aggregate for 1908 being about $200,000 in excess of that for the preceding year.

The Prince of Wales, president of the Society of Arts, presented Sir James Dewar, F.P.S., with the society's Albert Medal for his scientific investigations.

BUYERS' REFERENCE

Numbers indicate pages on which may be found advertisements of desired materials.