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MISSING

The Canadian Engineer

WEEKLY

ESTABLISHED 1893

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No. 29

The Canadian Engineer

ESTABLISHED 1893

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TO OUR READERS.

If you are coming to Toronto, Montreal or Winnipeg and wish to have your mail forwarded the offices of the Canadian Engineer are at your disposal. Have it addressed to our offices and we will take care of it until you call or ask to have it re-directed.

DESPATCHING BY TELEPHONE.

For these many years the effort to install the telephone on railway lines has been unsuccessful. In the earlier days of telephony long distance transmission of sound was unsatisfactory. With the perfecting of the mechanism of the telephone and the introduction of copper conductors long distance messages can be heard distinctly. On the ground of reliability recent experiments prove the telephone the equal of the ordinary telegraph wire with the Morse code. It now remains for the railway operating officials to consider the advantages and disadvantages of the telephone as suitable for their purposes.

Several electric railway lines have used the telephone for train despatching, and with very satisfactory results. On large stretches of construction work the telephone has been used for the handling of construction trains, and as yet the first accident, due to inaccurate telephone despatching, has to be reported. The number of trains passing a given point and the rate of travel on much of this work is as high as the ordinary single track on the main line. The necessity of retaining men at each crossing point and the ease with which men not trained for years in the handling of the key directed successfully the movements of trains was apparent to all who made any study of the question. A month ago the Canadian Pacific installed a telephone system on the line between Montreal and Farnham, Que., and as a piece of mechanism it has worked perfectly.

Not only will the telephone work well, but it will allow of fuller directions and more thorough understanding of the situation by the conductor, operator and despatcher. It will be a comparatively easy matter to secure temporary assistance should the operator, at any point, for any reason fail to report for duty. The superintendent of telegraphs for the C., B. and Q. Railways says:—

“In handling orders the same general methods were observed as with the telegraph, any figures or names of stations occurring in the order being spelled out letter by letter, both in the giving of the order and of all the repetitions, and the name of the conductor on a 31 order is spelt out as well.”

The telephone has the disadvantage that the installation will be much more expensive. This is a serious drawback, but there is another drawback that will be just as difficult to educate railroad men around—that is its want of secrecy. Imagine, if you can, a country station with a sound-proof telephone box. The secrecy that now covers the movements of railway trains, and which is to a large measure desirable, cannot be maintained with a telephone system such as is now in common use. Safety and efficiency is what is required, and whichever system possesses this in the highest degree should be used.

EDITORIAL NOTES.

When the great railways increase their staffs of shop hands it is an encouraging sign, for the roads are barometers of business conditions. The Grand Trunk has resumed “all hands and full time” at its shops in Montreal and St. Thomas, while the C.P.R. at Winnipeg have put their shops on 9½ hours’ time. The

United States Steel Corporation makes the public statement that the last two weeks of June were the best in its experience since the depression of October. This, in the face of the number of mechanics out of employment in the States, is an indication of improvement which means much.

* * * *

Less than two years ago the Canadian Engineer opened an office in Winnipeg, and since the opening of this office we have been able to keep in closer touch with Western news, Western business and engineering works of interest in Western Canada. Our efforts to keep in touch with this half of the Dominion have been appreciated by the engineers, contractors, manufacturers and municipalities and corporations. During this time the business and editorial interests of the Engineer have steadily grown, until now new offices are required. These have been secured in the Nanton Building, and Mr. G. W. Goodall, who is in charge, will be glad to see our readers at any time. Sample copies are always on hand, and a file of the paper is kept in the office. The Engineer has always recognized the importance of Western Canada; for years it was largely an agricultural country only. Now, with its large cities, railways and irrigation ditches, the engineering problems and the construction works, are as large and important as in any other district in Canada, and we hope with our new facilities to cover fully the work in the middle West.

* * * *

This week the Engineers' Club, Toronto, are away on their summer outing trip.

The trip includes a visit to Peterboro', an inspection of the Lift Lock, and a sail through the canal and Kawartha Lakes, taking the train for Toronto at Bobcaygeon.

The Club has had many delightful outings, but we anticipate that reports will show this outing surpassed all previous trips. It cannot fail to be enjoyable, this travelling together of good and mutually helpful friends.

* * * *

In this week's issue we commence a series of articles on "Sewerage and Sewage Disposal" by Mr. T. Aird Murray, civil engineer, now of Toronto, and late of Leeds and Sheffield, England. Mr. Murray has received a long experience in the class of work in Great Britain over a term of twenty years, having served his articles in a well-known office in Newcastle-on-Tyne at the time when land intermittent filtration was in vogue, and where much of this work was done. Mr. Murray has since been connected with sewerage and sewage disposal both as engineer to the North-Eastern Sanitary Association, England, and as a private counselling engineer for over ten years, and has carried out a large amount of such works, notably for the Sheffield Board in Thurlston District, Yorkshire, and the Shepley and Shelley Joint Sewerage Board of the Warfe Valley, etc. He is the author of several publications on the questions of drainage and sewage disposal, and has since May given several lectures in Canada on the subject.

A KIND WORD FROM DOWN BY THE SEA.

Dear Sir,—I am a subscriber to the Canadian Engineer, and write to say that you are issuing a good paper, and improving every issue, and wish you every success.

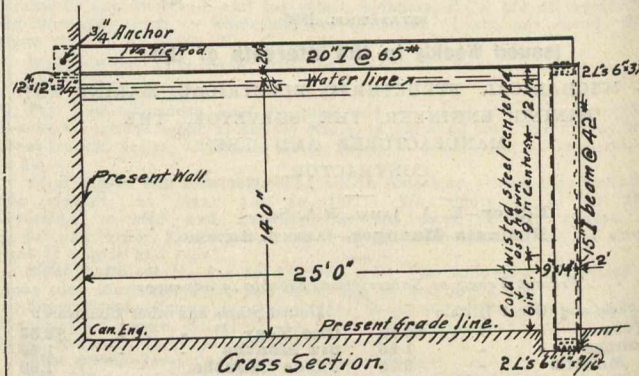
Yours truly,

Truro, July 8th, 1908.

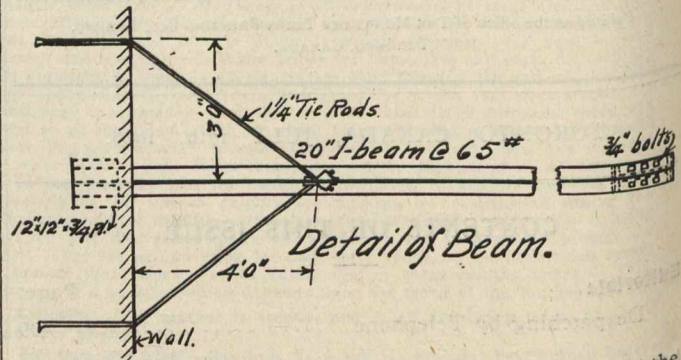
The Peterborough Lubricator Manufacturing Company, with one hundred thousand dollars capital, and head office in Peterboro', has been organized to acquire the Canadian Patent of Automatic Grease Cups, invented by John Francis Lewis, and to manufacture the same, and all kinds of grease cups, lubricating material and to deal in same.

REPLACING A WOODEN FLUME WITH CONCRETE.

For years the Pepperell Manufacturing Company, of Biddeford, Maine, conveyed the water to its turbines through a wooden flume. One side was formed against the mill foundation wall, the other was built up of planks held in place by overhead wooden tie beams and under water iron tie rods extending from the foundation wall across the flume. The entire construction occupied so much space that the possible area of the cross-section was materially reduced, while the resistance of the iron bars to the flow of water was manifest and decidedly objectionable.



To overcome these objections reinforced concrete was recently substituted for the entire construction, the design being made and the work executed by the Aberthaw Construction Company, of Boston, Mass. The new flume wall is about 9 inches thick and 16 feet in height, the flume being 25 feet wide inside. Vertical 15-inch I-beams spaced 8 feet high on centres, imbedded about one foot in the rock bottom and aided by cross ties of 20-inch I-beams riveted to the top of these verticals by means of angle clips on both sides, form a very effective support for the wall. Reinforcement consists of cold twisted bars running both horizontally and vertically, both, of course, being near the outside to resist ten-



sion strains. Additional reinforcement is provided at the wall supports to prevent shearing. The vertical I-beams are covered for protection against rust by a layer of concrete 3 inches thick. The inside ends of the cross tie beams are set into the well about 15 inches, their bearing area being increased by a 12 by 12-inch plate riveted at the bottom. One and one quarter-inch tie rods on both sides set 2 feet into the building wall prevent the water pressure on the flume wall from withdrawing the beam.

It is the intention to plank over the I-beams and use the space as a runway, the beams being of sufficient strength to support a distributed load of 150 pounds per square foot. The bearing area of the verticals is increased by 6 x 6-inch angles securely riveted in anticipation of the load.

The Canadian Weber Gas Engine Company, with offices in the Janes Building, Toronto, is the name of the new company which will soon be incorporated for the purpose of building large high-class engines in Canada. A factory will be built in close proximity of the city and will be thoroughly equipped for the manufacture of their special product. The latest and most up-to-date machine tools will be used by them.

MAIN SEWERAGE AND SEWAGE DISPOSAL.**T. Aird Murray, C.E.**

The term "sewerage" as used applies to the process of the removal of sewage by water carriage by means of pipes or other conduits.

The term "sewage disposal" applies only to some process by means of which the sewage delivered by the "sewerage system is dealt with in order to render it innocuous to human beings."

Although a sewerage system in every town is recognized as an early necessity, the application of some system of sewage disposal is only very tardily recognized. The practical application of sewage disposal is in fact a new subject in Canada.

The author's chief aim will be to lay stress on the necessity of some method of sewage disposal. To describe as simply as possible the leading features appertaining to an up-to-date disposal plant, the evolved result of the experience of both Europe and America. In order to obtain satisfactory results from sewage disposal it is necessary to broadly consider the subject of main sewerage.

Haphazard Sewerage Systems.

Much money is at present being thrown away in Canada by laying out sewerage systems without any consideration of how such systems will meet certain requirements, if at any time sewage disposal is found necessary. The City of Toronto is very much to the point. Here the sewers have been laid in any haphazard manner, each discharging locally at the nearest point to the lake from which the city's water supply is obtained. No care has been taken to separate storm and subsoil water from the sewage proper, hence it is now found that a large sum of money must be expended to first collect and arrange the general outfall of the system and provide storm overflows before any scheme of sewage purification can be adopted. While there may be some excuse for lack of forethought in the case of older towns such as Toronto. There can be no excuse for towns, which are at present springing, as it were, into municipal existence, adopting haphazard sewerage systems. It is now quite apparent to those who have watched the progress of city hygiene that sooner or later every community will be called upon to deal with the question of sewage disposal.

Canada as at Present.

Throughout Canada generally there has been up to the present no attempt of a serious nature to deal with the question of sewage purification. Throughout the Province of Ontario it is the common practice to discharge the raw sewage from towns into rivers and lakes, otherwise of a pure water character, which form the only source from which drinking water can be obtained.

Town after town on the banks of the St. Lawrence pours its raw sewage into the river, while these towns pump back the river water and use it for drinking purposes without any attempt even at filtration.

At the head of Rainy River the town of Fort Frances contaminates the water, and the various towns below drink the diluted sewage.

Niagara-by-the-Lake drinks the unfiltered water from the river, receiving the whole of the sewage of Buffalo and other towns on both sides of the river.

The Grand River, The Thames, and in fact all the rivers on which towns are situated, are sewage contaminated and totally unfit as water supplies for domestic purposes. The serious aspect of such a state of things is being brought more and more before the people every day. As populations along the river banks increase, and as people become more educated to the fact that the health of a community depends to a great extent upon a pure and unadulterated water supply, so we are beginning to understand that the problem of sewage purification is very much with us, and is a problem which must be faced by every community in the near future.

[This series of articles when completed will be bound in book form and may be ordered from The Canadian Engineer. Price, 25 cents per copy.—Ed.]

Legislative Power.

The Ontario Provincial Board of Health, with Dr. Hodgett's as the secretary, is doing a good work in bringing before communities this serious and disgusting state of matters. In several of the most glaring cases they have been able to bring sufficient pressure to bear to cause the authorities to act. But it is generally admitted that the laws on the subject require strengthening and more rigidly put in force. The Provincial Board of Health is ridiculously understaffed. Sewerage works and other works of a like character over which the Provincial Board have certain powers of administration are carried out practically without their knowledge and in many cases entirely against the principles of good hygiene recognized by that authority.

Some administrative system such as that adopted in Great Britain, where the Local Government Board are empowered to hold public enquiries into questions relating to sewerage, sewage disposal, and water supply, and insist on communities adopting certain standards is much required in Canada. Again, in Great Britain the powers granted to River Boards are extremely useful in preventing river pollution. They have the power to obtain in the law courts an injunction against any municipality or private person, who contaminates a water course, and inflict a fine sometimes amounting to \$1,000 a month until such time as the pollution complained of ceases.

The addition to the staff of the Board of Health of an engineer expert in public works problems with a staff of competent inspectors would tend to make the Board of Health more of a power for useful work in advising authorities, and keeping some check upon the work done. A systematic report upon the rivers of Ontario and the amount and degree of pollution from the various towns would be useful to the Board as a basis upon which much good work of a propagandist character could be effected.

The Excuse for Neglect.

Some will here say, "You cannot expect Canada to be on a line with Great Britain, Canada is a new country." We may ask the question, When is Canada going to cease to be a new country? Or because it is a new country, is that any reason why it should not be a clean country? Canada at some time or another will have to toe the line of civilization. Canada is no longer represented by isolated wood cabins. It has huge cities, prosperous and modern built towns, fed with electricity and every scientific improvement of a utilitarian character. Canada must also recognize that it has duties to perform in fathering its population, in providing every care for its good health, physical development and consequent happiness. This is where the principles of hygiene come in.

Sewage Disposal an Essential Duty.

It has been held in Great Britain, in Germany, in France and in other civilized communities that it is the duty of every community who borrows water for domestic purposes to return it in as pure a condition as it is possible to do so. In fact that no town has the right, simply because it exists on a river bank, to pollute that river with sewage to the detriment of its own inhabitants, and especially to the inhabitants below who in turn receive the water at their doorsteps.

The Results of Neglect.

The acknowledgment of this duty sixty years ago in Great Britain, brought the community face to face with a great expenditure of money. The rivers once clear and full of fish, even at such towns as Leeds, Huddersfield and Sheffield had become stygian ferments. fruitful beds of disease, most objectionable and nauseous. The evil had been done slowly and gradually. Rivers once beautiful turned into hideous sewers, their banks impossible to walk along, places to be shunned. Now the experience of other countries is writ large before us. The Rhine, the Danube, the Rhone, the Thames at London, the Clyde at Glasgow, the Forth above Edinburgh, the Tyne at Newcastle, the Mersey at Liverpool all turned into objectionable sewers costing millions of gold to re-purify.

Where Canada May Profit.

Is Canada going to profit by this knowledge? And, at the commencement, even granting the new country excuse,

is it going to put its foot down at once, adopt principles and rules of government which will make such a state of things impossible? Is it going to preserve its rivers and lakes, things of joy and beauty for ever? Is it going to adopt a policy for which its children will praise it and be thankful? A new country! Why the benefit of being a new country is that there is all the experience of the sad mistakes of the old to figure from. The extent of Canada, its scattered populations are no excuses for delay. Everyone with faith in Canada, faith in its future, and with the knowledge of its wonderful development in the near past and present, expects it to go on increasing, expects populations to arise and rivers and lakes become, even more so, highways of commerce and prosperity.

Now is the Opportunity.

Surely now is the fit and proper time when the country must recognize it as a duty to cease to pollute the beautiful lakes and water courses, to retain them as fit and proper sources of water supply.

If legislation is necessary, then legislation must be put in force. Boards of health must insist upon a standard of purification. Communities and peoples must be educated to the subject, and our children taught in school that it is a crime to pollute God's water supply, sent for the benefit of His people for not only this but other ages.

Typhoid and Water Supply.

Epidemics of typhoid fever are generally the result of drinking sewage contaminated water. Wherever such water is provided, typhoid is generally found to be endemic. The typhoid infection is carried by a specific germ or bacillus which is given off from the patient. The disease may be of a mild character in the first instance, the person having it being unaware of its presence. Such a patient may even undertake and continue his daily avocations and yet sow the germs of disease broadcast with every direction.

The bacilli of typhoid, which are given off with the excreta find ready access by means of sewers to water supply sources. They continue to multiply in the water or in the organic matter of the sewage, from which they ultimately find their way into pure water. Although such water may appear pure enough, as soon as it is taken into a slightly disordered stomach or intestinal canal, the bacillus gains a foothold, and another patient is attacked or a general epidemic may occur. This may happen simply through the rinsing out of a milk pail by water from a stream which has received sewage contamination.

Milk and Typhoid.

The germs propagate at a great rate in milk, and many causes of epidemic may be traced to a milk supply, but in the first instance the infection is almost always obtained by the milk utensils coming in contact with sewage polluted water.

Other Diseases Common.

Typhoid fever is perhaps the most important of water-borne diseases, but diarrhoea, dysentery and cholera are often carried by water, and all frequently result from sewage, contaminated sources.

Details of enquiries into epidemics of the above diseases are numerous, and many of an interesting character might be given, conclusively proving how hundreds of lives have been sacrificed, and are still being so, by providing water for drinking purposes known to be polluted by sewage.

In a comprehensive volume entitled "Sewage Disposal in the United States,"* a large amount of evidence is collected of a most instructive nature, showing conclusively that zymotic diseases and epidemics are peculiar only to those towns in America which are supplied with sewage contaminated drinking water. And, that on the institution of water filtration and by cutting off the sources of contamination the proportion of such diseases at once fell to a low rate, and that epidemics practically ceased to occur. An interesting quotation from the above is as follows: "In 1880 a number of large hotels were constructed on the lake beach not far from the mouth of the Genesee River. Numerous cottages

were erected, and these soon gathered about and near the river's mouth a considerable summer population, consisting almost entirely of citizens of Rochester. On Sundays and holidays it is no uncommon thing for from 25,000 to 30,000 people to visit the lake beach. Drinking water is supplied through pipes which lead a short distance into the lake, and through which at times the sewage polluted water of the Genesee River, mixed with lake water, is drawn.

The growth of the summer resorts at Lake Ontario and the consequent drinking by a large number of citizens of a seriously polluted water, has directly contributed to nearly double the typhoid rate in the City of Rochester. As the matter stands a warm May is followed by an increase in the typhoid death rate, either in the latter part of the month or in the following month of June." The authors conclude: "From the consideration of a large number of cases similar to the foregoing we derive the conclusion that crude sewage should never be discharged into any body of water used as a water supply at any point within the influence of the sewage. This statement may be considered the fundamental proposition of modern sewage disposal."

"Scepticism to be Overcome."

An adequate treatment of the systematic work and discussion on the subject of stream pollution is however impossible in the limits of a single chapter. Enough, however, may have been said to convince those who have not given the matter much consideration that the subject is one worthy of deep consideration. There are no doubt many who maintain a sceptical attitude with regard to the importance of the matter. But such scepticism is generally the result of ignorance or lassitude of interest. But whatever the result of, it is the one prick which the sewage engineer finds it hard to kick against. The spirit of ignorance is to domineer. Many an honest engineer who in his heart knows exactly what the advice is he should give, finds it diplomacy to play the role of the silent guest, and quietly takes his orders and pocket his fees, rather than suffer the strain of attempting to persuade a corporation that they should be paying for advice and not paying in order to give it.

An engineer of repute in Canada only lately informed the author in accents sad and pathetic: "Once I had hope in bringing the subject of sewage disposal to the fore, but now I have almost given up. I visited the Old Country to see what they were doing there, and came back with tons of information. But, if you want to make dollars you must give the advice the people want, not the advice they should have."

A fitting close to this chapter is the well-known quotation from Sir Spencer Wells: "Typhoid fever, scarlatina, diphtheria, smallpox, whooping cough, can no longer be looked upon as natural, providential, or unavoidable. The existence of such 'preventable diseases' is a proof of ignorance or negligence, and a disgrace to the country, to the town, to the family."

(To be Continued.)

RAILROAD EARNINGS.

The following are the latest figures:

	1908.	1907.	1906.
Canadian Pacific.			
Mileage	9,230	9,154	8,776
4th week June . . . \$	1,177,000	\$ 2,025,000	\$ 1,696,000
Month of June . . .	5,458,000	6,740,000	5,420,000
July 1st-June 30th	71,231,768	72,091,677	61,578,404
Grand Trunk System.			
Mileage	4,528	4,528	4,528
4th week June . . . \$	1,199,453	\$ 1,182,720	\$ 1,157,865
Month	3,462,514	3,828,780	3,559,500
July 1st-June 30th	41,801,612	43,688,488	39,659,838
Canadian Northern.			
Mileage	2,874	2,554	2,100
4th week June . . . \$	218,700	\$ 328,400	\$ 104,200
Month	674,400	963,100	612,100
July 1st-June 30th	9,012,400	7,493,100	5,563,100
Toronto, Hamilton & Buffalo.			
Gross, May	62,560	81,834
July 1st-May 31st	792,454	778,663

* Authors: Messrs. Rafter & Baker. Published 1894.

A Page of Costs

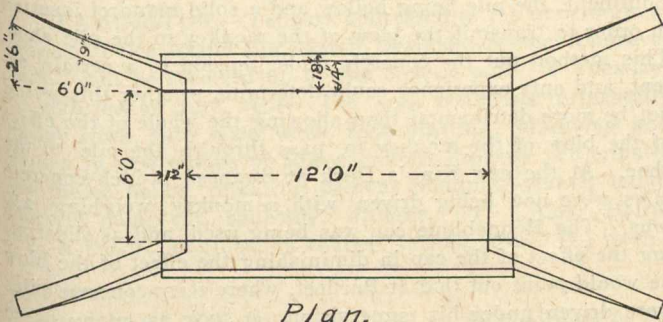
ACTUAL, ESTIMATED, AND CONTRACTED.

A HIGHWAY CULVERT.

Concrete for culverts is now used almost universally. We give here the cost of a 6 foot culvert built on a rural road.

A timber bridge with an eight-foot opening formally spanned the stream at this point so that very little excavation was required.

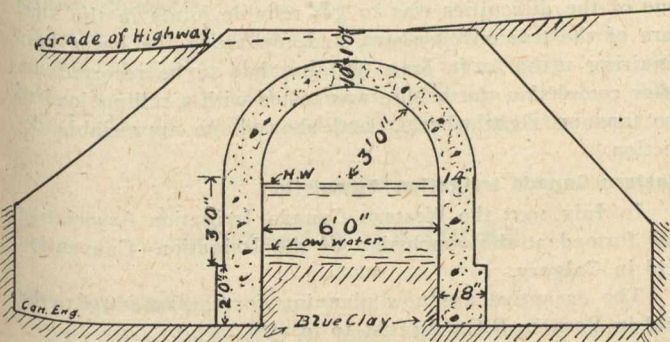
The lumber and forms used on this job were used before and were used afterwards on a number of similar culverts,



Plan.

so that only the lumber actually wasted is charged against this work:

Digging out foundations—	
One man one day at \$1.75 per day.....	\$ 1 75
Making forms—	
One man four days at \$2.50.....	10 00
Cement, 17 barrels at \$2.50 per barrel	42 50
Mixing and filling in concrete—	
Two men 3½ days at \$1.75 per day.....	12 25
Moving mixer to work	2 50
Rent of mixer four days at \$3 per day.....	12 00
Hauling lumber to work	3 00
Two hundred F.B.M. at \$20 per thousand....	4 00
Seventeen yards gravel at \$1 per yard	17 00
Total	\$105 00



End Elevation.

Altogether there were 15 cubic yards of concrete placed. This makes the cost per yard \$7.

Because of the narrow embankment the mixer could not be brought nearer than within 50 feet of the culvert.

COST OF HIGHWAY BRIDGES.

To estimate quickly and with a fair degree of accuracy the probable cost of highway bridges, a matter of some importance with district and county engineers.

During 1907 the Ontario Government erected a number of such bridges and we give the cost of the superstructure, the cost per lineal foot covering supplying and erection of all material.

In Algoma District, Ontario.

Goulais River Bridge.—The steel superstructure of this bridge, consisting of two spans of 102 feet each, 16 feet in

width, and heavy enough to carry, in the future, a concrete floor, cost \$22.67 per lineal foot.

Spanish River Bridge, Webbwood.—The bridge is a substantial structure, having a central span 170 feet in length, and two spans of 50 feet each. The central span has a clear headway of 30 feet above the ordinary high water of the river. These steel spans are supported on steel pedestals 21 feet 6 inches in height, which rest upon piers 17 feet in height above summer level. A timber trestle approach 140 feet in length, is constructed on the west side, and 50 feet in length on the east side. The total length of the bridge floor is 465 feet. The steel superstructure cost \$29.63 per lineal foot.

Thessalon Bridge.—A steel superstructure 100 feet in length and 14 feet in width, erected at the town of Thessalon to replace an old timber structure. The foundations of this bridge are pile abutments. The superstructure cost \$27.30 per lineal foot.

Larchwood Bridge.—A steel bridge was erected across the Vermillion River close to Larchwood Station, having a span of 123 feet. The steel superstructure cost erected \$24.35 per lineal foot.

Temiskaming District.

La Blanche River Bridge, Tomstown.—A timber bridge having three spans of 60 feet each, and two spans of 37 feet each, with a total length of flooring of 314 feet, was erected early in the year across La Blanche River, at Tomstown. The floor of the bridge is 36 feet above low water level, being made high enough to permit the steamers plying on this river to pass under. The piers are constructed of framed bents supported on piles and sheeted with three-inch planking. Cost complete \$20 per lineal foot.

New Liskeard Bridge.—The new bridge has a roadway 22 feet in clear width, with a footwalk six feet in width; it consists of one centre span 75 feet and two approach spans of 45 feet each, making the total length 165 feet. The substructure is of concrete upon pile foundation. Total cost \$50.45 per lineal foot.

LOADING BY STEAM SHOVEL.

The cost of loading cars by means of steam shovels is difficult to estimate. For no fault of the shovel crew the shovel is idle much of the time.

The following gives the figures for four consecutive days. A ninety-ton shovel with a 2½ yard dipper was used. Material, light gravel. The wage bill was made up as follows:

Engineer at \$4.80 per day.....	\$ 4 80
Craneman at \$3.45 per day	3 45
Fireman at \$2.00 per day	2 00
Six trackmen at \$1.75 per day	10 50
	<hr/>
	\$20 75
For the four days at \$20.75 per day.....	\$83 00

The number of yards moved was:

First day	3,080 cubic yards
Second day	3,276 " "
Third day	2,912 " "
Fourth day	3,220 " "

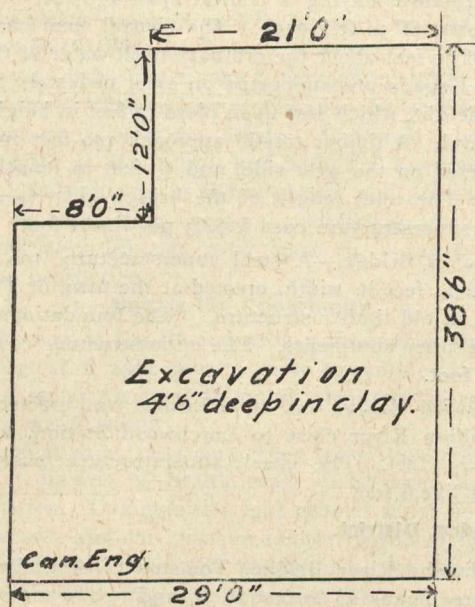
Total 12,488 cubic yards

This gives the cost for loading at .065 cents per cubic yard. No allowance has been made for fuel, water, oil or repairs.

EARTH EXCAVATION.

Earth excavation prices when the quantity to be excavated is large runs about 22 to 25 cents per cubic yard.

The diagram herewith gives the dimensions of a cellar that was excavated in still clay soil. A plow was used to loosen the material and it was hauled out with a dray scraper.



Longest haul two hundred feet; average haul one hundred feet.

The cost was distributed as follows:

One team and driver 5 days at \$4 per day\$20 00
One man 5 days at \$1.75 per day 8 75
One man trimming sides 3 days at \$1.75 per day 5 25
Total\$34 00

The amount of earth excavated was 170 cubic yards. This made the cost about 20 cents per cubic yard.

SOCIETY NOTES.

Association of Municipal and County Engineers.

The annual meeting of the Incorporated Association of Municipal and County Engineers was held at Nottingham, Eng., on June 25th, 26th and 27th.

Mr. E. P. Hooley, in his presidential address, dealt mainly with the road question. He said that little had been done in this country towards the permanent improvement of roads, but in Nottinghamshire, after repeated failures, they had been successful in making roads which appeared to withstand heavy and light motor traffic satisfactorily. Such roads treated with tarmac had hitherto cost 65 cents per superficial yard to convert from ordinary macadam, and up to the present time, although some portions of these roads had been reconstructed for six winters, they had only cost 30 per cent. of the former charges for manual labor, and had entailed no expenditure in materials.

Mr. C. S. Meik read a paper on "Reinforced Concrete in Engineering Structures." The author pointed out that, although the laws governing the combination of steel and concrete were not absolutely fixed, they were known with sufficient approximation to enable all classes of engineering structures to be designed with safety under normal conditions. He referred to experience gained in connection with works carried out under his own supervision at Swansea and at Purfleet. He was of opinion that 1 to 8 was as weak a mixture as should be used with reinforced concrete for beams or flooring, while piles should not be weaker than 1 to 5. The extra compressive strength gained by using 1 to 4 as against 1 to 8 would be at least 30 per cent., while the cost of the additional cement, with cement at 30s. per ton, would not be more than 2½d. per cubic foot of concrete. The piles used in the construction of a pier at Purfleet were made of concrete composed of 1 of cement to 1½ of sand and 3½ screened ballast, and they sometimes fractured at the heads when the

driving became hard. At Swansea the concrete used for piles tested was composed of 1 of cement to 1½ of sand and 2¾ of graded granite broken to pass through ¾-inch square mesh. These piles behaved satisfactorily, the monkey used, weighing 2½ tons, being frequently allowed to fall through 10 ft. without causing the least damage. It was most important to have as few joints as possible in the reinforcing bars, and any which were necessary in a beam should be made with screwed couplings. In columns or extensions of piles the joints should be at the junction of the columns with a brace or strut, experience having shown that fracture took place, when a ship collided with a pier, at the joints in the steel bars. It was not possible to drive reinforced piles without a cushion being employed, and in the Hennebique system a heavy cast-iron cap filled with sawdust was used to deaden the blow. A new system of driving piles had lately been introduced on the Continent, the pile being hollow and a solid mandrel inserted in order to transmit the blow of the monkey to the pile shoe. This method put the concrete under tension to a certain extent, and only experience could determine whether this would not be more detrimental than allowing the whole of the effect of the blow of the monkey to pass through the pile to the shoe. At the new King's Dock at Swansea 14-inch concrete piles were now being driven with a monkey weighing 2½ tons. The Hennebique cap was being used, and as illustrating the effect of the cap in diminishing the effect of the blow he would point out that at Purfleet, where ferro-concrete piles were driven under his supervision, it took as many as 30 blows for an inch set towards the finish, with a monkey weighing two tons falling through 4 ft. 6 in., the material being driven into consisting of compact ballast. Figures relating to the cost of ferro-concrete at Purfleet and Swansea showed that the cost of material in the reinforced concrete was from 42 to 45 per cent. of the total cost, while as regarded the cost of the work as a whole, the cost of the reinforced concrete in the pier at Purfleet worked out at 17s. 8d. per superficial foot of docking, the pier to 15s. 4d. and the approach viaduct at 10s. 2d. At Swansea the cost was about 12s. 6d. per superficial foot. The bridge at Purfleet was, perhaps, the most interesting part of the work carried out there. The girders were of the bow-string type, and both top and bottom booms were equally reinforced with steel bars. In this girder the steel in the lower boom took all the tensile stress, and in the upper boom the steel took about 75 per cent. of the compressive stress and the greater part of the shearing stresses. One of the difficulties was to get reliable joints in the steel bars of the tension members, and, owing to the lower bars requiring to be 63 ft. long, welding had to be resorted to. After completion the bridge was tested with a rolling load of 100 tons on sight wheels, and showed no appreciable deflection.

Western Canada Irrigation Association.

In July 1907 the Western Canada Irrigation Association was formed at the conclusion of the Irrigation Convention held in Calgary.

The executive are now planning for the meeting to be held in Vernon, B.C., August 10 to 15th.

It is expected that a most interesting programme will be carried out, which, it is hoped, will include papers from Prof. L. G. Carpenter, Director and Professor of Irrigation, Colorado Agricultural College, Fort Collins, Col.; Senator W. C. Edwards; A. E. Ashcroft, Esq., C.E., of Coldstream; J. S. Dennis, of Calgary, and others. Another important feature will be the comprehensive discussions anticipated on the vital subject of water legislation.

The following is the skeleton programme for the week:

Monday, August 10th—Arrive Vernon, 11 a.m. Three business sessions at 11 a.m., 2 and 8 p.m.

Tuesday, August 11th—Three business sessions, 9.30 a.m., 2 and 8 p.m.

Wednesday, August 12th—Drive over Grey Canal Irrigation System. Evening session at 8 p.m.

Thursday, August 13th—Leave Vernon for Kelowna, 7.30 a.m. Drive over the irrigation system of the Kelowna Land and Orchard Company.

(Continued on Page 507.)

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.

Ontario.

SHELBURNE.—Sealed tenders will be received by the undersigned up to Monday, July 20th, 1908, for laying cement concrete sidewalks in the village of Shelburne, Ont. W. H. Hillhouse, town clerk.

LEAMINGTON.—Tenders addressed to the undersigned, marked "Pelee Island Big Marsh Drainage System Improvement," will be received up to one o'clock p.m., of Tuesday, the 28th day of July, 1908. The work comprises principally dredge work, with team work, rock blasting, supplying and placing in new pumps of 40,000 gallons capacity per minute, new steam boiler, repairing present pumping plants, building concrete pump pit, spill-way, bridges, etc. Alex. Baird, C.E. & O.L.S., engineer in charge, Leamington P.O., C.t.

Manitoba.

WINNIPEG.—Tenders, addressed to the chairman of the Board of Control, for construction of the undermentioned works, will be received on Thursday, July 23rd, 1908, viz.: Cedar block pavements,—24 feet wide on Sargent Avenue from Arlington to Erin Street; 16 feet wide on Logan Avenue from McPhillips Street to city limits; 24 feet wide on Stadacona Street from Nairn Avenue to end of Stadacona Street. Granolithic walk,—6 feet wide, east side of Charlotte Street, from Notre Dame to William Avenue. Sewer,—In Derby Street from south line of lot 8, block 3, plan 63, to a point 84 feet southerly. M. Peterson, secretary.

Saskatchewan.

REGINA.—Tenders for bare copper wire, will be received until 12 o'clock noon on Saturday, July the 25th, 1908. S. P. Porter, Deputy Commissioner, Department of Railways and Telephones.

British Columbia.

NORTH VANCOUVER.—Tenders will be received until August 7th for the erection of a steel truss bridge over Seymour River. Donald Cameron, district engineer; Alex. Philip, C.M.C. (Advertised in The Canadian Engineer.)

CONTRACTS AWARDED.

New Brunswick.

WOODSTOCK.—A. E. Jones' tender for 25 barrels of asphalt at \$5.98 and 15 barrels of tar at \$4.98 has been accepted by the town council.

Quebec.

MONTREAL.—The Otis Fensom Company of Toronto received the contract for the placing of two new elevators in the City Hall. Their price was \$450 higher than that of Cote Bros., of Montreal.

Alberta.

WETASKIWIN.—Creek diversion tenders were opened by the council for the cutting of the new creek channel as follows: R. E. Patterson, 9 cents per cubic yard—no deposit; David Ambler, 18 cents—cheque not marked; Geo. H. H. Robinson, 17 cents—marked cheque; W. H. Eggleston, 14¾ cents—marked cheque; J. R. Willowe, 27 cents—marked cheque; Geo. Irish & E. James, 14 cents—marked cheque. The tenders were referred to the public works committee with instructions to get a cheque from Mr. Patterson.

SEWERAGE AND WATERWORKS.

Ontario.

GUELPH.—Foreman McGean and his men employed by the Conn Company have started work on the laying of the tile conduit along the river valley which will bring the spring water to the pumping station in connection with the new water system.

NORTH BAY.—The special committee appointed in conjunction with the town engineer re reservoir, reported as follows: That we have submitted the plans and specifications to J. Kennedy, C.E., of Montreal, and herewith attach his report on same. We recommend the calling of tenders for construction can be commenced at as early a date as possible.

TORONTO.—Mr. Allan Hazen, consulting engineer of New York, submits the following terms on which he will take charge of the installing of the filtration plant for the city. Mr. Hazen asks for 2½ per cent. of the entire cost of the construction work, except the engineering, and the City Engineer must furnish plans of all the present waterworks plant, with full information; or he would take entire charge, furnish a resident engineer and assistants and inspectors, and charge 3½ per cent., making a total of 6 per cent. If the plant cost \$600,000, his fee would thus be \$36,000; or he would ask \$150 a month as a fee for correspondence, and \$100 a day and travelling expenses for his visits.

Saskatchewan.

REGINA.—On July 30th, Regina ratepayers will vote on two money by-laws. One for \$250,000 to provide money for a sewerage system and a second for \$50,000 for the extension of the waterworks.

KINCARDINE.—Widely-scattered typhoid cases and other indications of impure water have alarmed Kincardine people. Dr. Amyot was asked to make an analysis, and his report does not set the uneasiness at rest. He says that the filtration plant is evidently getting its water from the town side as well as the lake. The analyst thinks that sewage as well as water is being pumped. Now the town is talking about a sewerage system.

LIGHT, HEAT, AND POWER.

Ontario.

FORT FRANCIS.—Mayor Williams has advised the council that he has secured for the town free and without restriction 200 horse-power for ten years. The old agreement for 2,000 horse-power still holds good as well. Work on the dam is looked for to be resumed as soon as the promoters raise the necessary sum of \$3,000,000 to complete the dam and mills.

NIAGARA FALLS.—General Francis V. Greene held a conference with Mayor R. F. Carter and Aldermen Hanan, Dore, Clendenning and Battle on power matters. On behalf of the Ontario Power Company General Greene agreed to supply current at 2,200 volts for \$14, the horse-power at the municipal lighting plant. The Canadian Niagara Power Company has made a similar offer at \$15 the horse-power. The offers of the companies will be considered at the next meeting of the city council.

RAILWAYS—STEAM AND ELECTRIC.

Quebec.

HULL.—The city of Hull and the C.P.R. recently signed the agreement for the double-tracking of the lines of the Hull Electric Railway, a subsidiary line of the C.P.R. The

contract means a great deal for the city, which will now have a thoroughly up-to-date service, and, in return for the double-tracking permission will have its principal streets paved by the company.

Ontario.

S. THOMAS.—City Engineer Bell submitted an estimate of the cost of extending the city railway line to Port Stanley. His figure did not include equipment, and the power to be used would be utilized from the Niagara Power line. The roadbed would cost \$6,638 per mile for seven miles, which would total \$46,466; \$3,000 added for bridges and \$1,500 for turnouts would bring the total cost to \$51,200. The overhead construction would amount to \$11,690 for seven miles at the rate of \$1,670 per mile, and adding \$5,000 for incidentals, the total outlay would be \$67,950.

WELLAND.—The surveyors are at work for the extension of the Niagara, St. Catharines & Toronto Electric Railway, to connect with the T. H. & B. and M.C.R. at Welland. Electric cars are now running to the Welland River, but a bridge has to be built across the river.

PORT ARTHUR.—The result of the street railway arbitration is that Port Arthur will receive from Fort William \$52,000 in full settlement for the end of the railway in that city. Such is the decision of the arbitrators, Messrs. Leitch, Ingram and Kitson, as set out in their award.

BROCKVILLE.—Brockville and Ottawa may soon be connected by an electric railway. Mr. C. P. Stuart Morgan, of Bristol, England, a gentleman of influence and wealth, and heavily interested financially in the proposed new road, was here inspecting waterfront properties for the purpose of locating a terminal. The new route will cut off eighteen miles between here and the capital, and travel through a country not now accommodated by railways.

KENORA.—Messrs. Wall & Creelman, who have the contract for the building of the C.P.R. bridge across the Winnipeg River in connection with the double-tracking operations, have just succeeded after nearly two years' work and endless difficulty, in finishing the third and last pier across the east branch of the river.

OTTAWA.—The Government has given notice of very heavy railway subsidies, guarantees, etc. The amount in each case is \$3,200 a mile, when the cost does not exceed \$15,000 a mile. When the costs exceeds that figure the subsidy is increased on a sliding scale, running up to \$6,400 a mile.

The list includes re-votes of subsidies granted last session to 26 railways, aggregating 1,678 miles, and new subsidies to 44 roads, aggregating a total length of about 2,150 miles. In addition there is a bond guarantee of \$13,000 per mile for 609 miles of Canadian Northern Railway in Manitoba and Saskatchewan.

In addition subsidies amounting to \$800,000 for bridges are provided for.

The following Ontario lines figure in the new subsidies:

Erie, London, and Tillsonburg, Port Burwell to London, 35 miles.

Nipissing Central, from New Liskeard to Guigues, Que., 13 miles.

St. Mary's and Western Ontario line, Woodstock to Exeter, 45 miles.

Algoma Central to Hudson Bay, Michipicoten Harbor to National Transcontinental, 50 miles.

Grand Trunk Pacific branch lines from Port Arthur and Fort William to N.T.R., 220 miles.

Lac Seul, Rat Portage, and Keewatin Company, Kenora to N.T.R., 18 miles.

Burk's Falls and French River Co., Burk's Falls to French River, 35 miles.

Thessalon and Northern, from Thessalon northerly, 4 miles.

Canadian Northern Ontario, Sudbury Junction to Hutton Mines, 30 miles.

Canadian Northern Ontario, Hawkesbury to Ottawa, 60 miles.

Total possible mileage in Ontario, 580 miles.

Manitoba.

WINNIPEG.—G.T.P. steel was laid into Winnipeg July 13th, and this city is now connected up with Butze, 629 miles west. The line will not be completed to the site of the Union Depot until ballasting has been finished.

Alberta.

EDMONTON.—Grading on the Grand Trunk Pacific, east of this city, has been completed, and the shifting of the outfit westward to the section between the Saskatchewan and Macleod Rivers has taken place. Work is to be concentrated now upon a section of 115 miles, toward the Rocky Mountains. Messrs. Foley, Welch and Stewart, who have the contract for that part of the route, have sub-let portions of it, but will put on 1,500 men of their own, and grading operations during the summer and autumn will be carried on to a finish.

RECENT FIRES.

Ontario.

COBALT.—Fire destroyed the power house at the Silver Queen mine. The building was a complete loss, but the plant can be repaired. Three eighty horse-power boilers, the new twelve drill compressor, engine and dynamo may be repaired. Mining operations will be greatly hampered for the next few weeks.

LINDSAY.—The saw mill of G. J. Brumwell was destroyed by fire here. The mill has been shut down for some time, and the cause of the fire is unknown. It is valued at \$5,000 and the insurance is \$2,000.

SAULT STE. MARIE.—Two fires coming almost simultaneously destroyed property to the value of \$40,000. As a result of the first fire the Soo Falls Brewing Company was almost completely gutted. The company has already started preparations for re-building.

Saskatchewan.

MEDICINE HAT.—The company is composed of United States capitalists with Dr. R. R. Stoner, as president. They had made nearly 200,000 brick of a medium quality and had accepted contracts for nearly 2,000,000. The plant had an output of 40,000 brick each 10-hour day. The factory was valued at about \$35,000 and would have been one of the finest in Western Canada. It was insured for about two-thirds and it is likely re-building will commence at once.

MISCELLANEOUS

Ontario.

LONDON.—Natural gas by next fall for use in every home is the promise made by the London and Western Counties Company. The supply will be procured from Port Dover where there are now seven wells bottled up with a capacity of 4,000,000 cubic feet daily. Gas will be sold for 30 or 35 cents instead of 95 cents, as at present.

MIDLAND.—The dredges at work at Tiffin, the new G.T.R. transshipment point near Midland, have struck hardpan. To get over the difficulty arranged with the C. S. Boone Company for the loan of the drill scow which has been working here since the opening up of navigation. It is expected that it will take fully three weeks to complete the work which has been undertaken at Tiffin. It is the intention of the Government to fully deepen the channel to and from the inner and the outer harbor to at least 22 feet towards the outside and something about 20 feet in the inside. This week the dredge cleaned out the south-east corner of the harbor, providing a further berth for large steamers.

TORONTO.—The Cleveland Bridge and Iron Company, of Darlington, England, contractors for the iron and steel work on the Landsdowne Subway, have shipped a large quantity of the material, and their foreman, who has been employed to superintend the work, is on his way to Toronto, and will engage his men out here.

OTTAWA.—The supplementary estimates were brought down in the House of Commons this week. The appropriations of interest to engineers and contractors are as follows:

To provide a survey and location of a line of railway from Saskatchewan River to Hudson Bay, \$100,000.

For harbors and rivers improvement in Manitoba the following is given: Gimli, protection wall on the west shore of Lake Winnipeg south of the Government wharf, \$4,500; Lake Dauphin, lowering the lake level by removing obstructions from the bed of Mossy River, \$3,000; River Assiniboine, improvements near Portage la Prairie, \$5,000; Winnipeg River, removal of obstructions in Manitou rapids, \$2,500; Winnipeg Beach, harbor protection pier, \$7,500; Last Mountain Lake improvements of navigable route, additional amount, \$20,000; Lesser Slave River to complete urgent provisional improvements, \$5,000; North Saskatchewan River, removal of boulders opposite Prince Albert, \$2,000; the British Columbia harbor and river votes included \$100,000 for improvements of the ship channel of Fraser River.

For harbors and rivers in Ontario the following was submitted: Burlington piers, \$30,000; Collingwood harbor, \$25,000; Goderich harbor breakwater, \$29,000, with other small items; Port Stanley, \$20,000; Little Current, \$50,000; Meaford, \$13,700; Port Stanley, \$6,300; Southampton, \$15,000; Tiffin, \$50,000; Victoria harbor, \$75,000; Wiarton, \$6,000, and Whitby, \$5,000.

Evidently also the Government intends to do more dredging on its own account, \$680,000 being asked for dredging plant. Two other dredging items amount to \$600,000. The break in the Cornwall Canal will cost \$150,000.

For public buildings Ontario gets \$776,330.

For work in the Province of Quebec \$603,030 goes for sundry wharves and breakwaters; there is \$5,200 for a breakwater at the outer end of the railway wharf at Lachine; \$32,280 is taken to pay to J. Poupore in final settlement of all claims in connection with the contract of the firm of Thompson & Poupore for construction of River du Lievre lock and dam at Little Rapids, being the amount of the award of the Board of Departmental Arbitrators in their favor. Other items include \$5,000 for a deep water wharf at Longe Pointe, island of Montreal; \$5,000 for improving Rimouski wharf; \$3,200 for improvement of the wharf at Caughnawaga; Chateaugay gets \$2,000 to complete its wharf on the south shore between Woodland and Bellevue.

OTTAWA.—The policy of the Dominion Government in regard to the re-building of the Quebec Bridge will be embodied in an Act of Parliament of the present session by which this work is to be brought under the supervision of the Transcontinental Railway Commission. The names have been mentioned of three eminent engineers, one a Canadian, one a Britisher, and the third an American, to whom will be entrusted the duty of preparing plans for the new bridge, and the recommendation of the Quebec Bridge Commission will also be acted upon, which advised that more thorough and expert engineering oversight should be given to the structure on behalf of the Dominion Government during the course of its erection than was given to the old bridge.

Manitoba.

PORTAGE LA PRAIRIE.—The Smart-Turner Machine Company, Limited, have received an order for a 2-ton jib crane from the Grand Trunk Railway System for the Grand Trunk Pacific Railway at Portage la Prairie, Man.

PERSONAL.

MR. R. R. KEELY, C.E., has for his present address Penticton, B.C.

MR. F. W. THOROLD, B.A. Sc., late of Calgary, Alta., has been appointed assistant engineer in charge of the outside work on Toronto's new trunk sewer.

MR. HENRY HOLGATE, C.E., Montreal, has been selected to represent the Intercolonial Railway on the Conciliation Board appointed to settle the freight clerks' trouble at Halifax and St. John, N.B.

MR. MUIR EDWARDS, M. Sc., son of Dr. Edwards, of MacLeod, Alta., has been appointed Assistant Professor of Mathematics and Lecturer in Engineering. Mr. Edwards

has been assistant professor in McGill University for five years, and has made a specialty of municipal engineering.

RACETER EVERITT, Iron and Metal Merchants of 40 Chapel Street, Liverpool, Eng., has admitted into partnership Mr. F. W. Dingwall and Mr. Geo. E. Lewis, who have for the last twenty and twelve years, respectively, been associated with the business. The style of the firm will remain unaltered.

GENERAL SUPERINTENDENT JAMIESON, of the Canadian Pacific, Winnipeg, is now away on the first long vacation which he has ever enjoyed. Writing from Calgary, Alta., to friends in Winnipeg, he expresses very great satisfaction with the conditions prevailing in Alberta, which is looking at its best at the present time. Mr. Jamieson will go East to Ontario to his old home before returning to work.

NEW ADVERTISERS IN THIS ISSUE.

Polson Iron Works,
New and Second-Hand Machinery,
Toronto, Ont.

Gorman, Clancey & Grindley,
Wanted, an Engineer,
Calgary, Alta.

Vancouver City,
Steel Bridge,
Vancouver, B.C.

COLLECTION OF MINERALS FROM ONTARIO.

A prize of \$100 in cash is offered by Mr. J. B. Tyrrell, mining engineer, Toronto, for the best collection of minerals collected in the Province of Ontario during the year 1908 by any one not employed as a collector by a public institution dealer in minerals.

The collection must contain at least thirty mineral species, and it is suggested that where convenient the size of the specimens should be 2 x 3 inches.

Each specimen must be labelled with the exact locality from which it was obtained, and the date on which it was collected. No specimen will be considered unless it is so labelled.

A typewritten list of the specimens, with names of minerals and localities, in triplicate, together with a declaration stating that they were personally collected by the signer of such declaration in the Province of Ontario in 1908 at the localities stated, with the post office address of the collector, must accompany each collection.

The collections must be addressed:

"Examiners, Tyrrell Prize, Government Assay Office, Belleville, Ont.," and must be sent, prepaid, to the Government Assay Office, Belleville, Ontario, on or before December 1st, 1908, where they will be opened and examined jointly by Professor Nicol of the School of Mining, Kingston, and Dr. Walker of Toronto University.

If requested the collections will be returned, charges collect, as soon as possible after the prize is awarded.

(Continued from Page 504.)

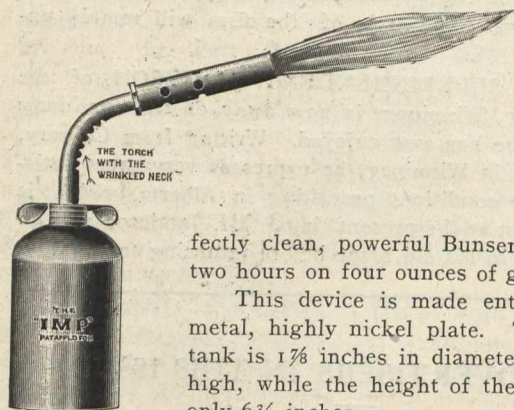
Friday, August 14th—Leave Kelowna for Penticton, stopping at Peachland and Summerland.

Saturday, August 15th—Leave Penticton on return trip, calling at Okanagan Center to visit the irrigation system there.

Mr. W. R. Megaw, of Vernon, B.C., is secretary of the Association.

A POWERFUL GASOLINE BLOW TORCH.

The IMP Torch, shown in the accompanying illustration, is a patented device, which will do as much work as most of the larger torches, with the advantage of compactness, simplicity and cheapness.



It is entirely automatic in operation, has no pump or valve, needs no tools, starts with a match and gives a perfectly clean, powerful Bunsen flame for over two hours on four ounces of gasoline.

This device is made entirely of brass metal, highly nickel plate. The size of the tank is 1 7/8 inches in diameter by 3 3/8 inches high, while the height of the whole torch is only 6 3/4 inches.

The corrugated neck increases the heating surface to such an extent that the flame of a match easily generates gas enough for starting, after which the perfectly designed mixing-tube renders further attention unnecessary.

The IMP is sure to receive a hearty welcome from electricians, automobilists, the handy man, and, in fact, from anyone who wants clean, intense heat cheaply and quickly.

FERRO-CONCRETE IN LOCOMOTIVE DEPOT CONSTRUCTION.*

In respect of general design and arrangement it may fairly be said that British locomotive depots are worthy of acceptance as models by railway engineers in all parts of the world. But the materials and methods hitherto adopted in the construction of the roofs, smoke hoods, and flues of such buildings are scarcely worthy of equal commendation.

Owing to the rapid corrosion of metal exposed to the steam and sulphurous fumes, the life of structural steel work in locomotive sheds cannot be taken at more than about 15 years. Consequently the cost of maintenance and renewal has been found to be so heavy as to encourage a return to the employment of timber, a material whose durability and resistance to fire are increased rather than diminished by exposure to gases of the kind which cause injury to iron and steel.

Nevertheless, in buildings where the risk of fire is by no means small, and where the consequences of a serious fire would be fraught with much inconvenience and expense, apart from the monetary value of the structures destroyed, it is particularly desirable that the materials of construction should be capable of effective resistance both to fire and to corrosion.

Although this double qualification is clearly possessed by ferro-concrete, as proved by numerous practical tests, no railway engineer in this country has yet taken the initiative of employing it in locomotive depot design.

Less hesitation has been evinced in the United States and on the Continent in this direction, one of the best examples of construction being the depot of the Jura-Simplon Railway at Renens, near Lausanne, erected from the designs of Professor Bosset, acting for the State Service du Controle.

The result of investigation into the types of locomotive sheds favored by railway companies in different countries induced Professor Bosset to recommend the British form of design, with the proviso that all parts usually built in steel or timber should be of ferro-concrete.

Having adopted the type of depot with parallel tracks, it was easy to provide for flat roofing with openings at regular intervals for glazed lanterns. The problem of reproducing the smoke hoods and flues in the material selected was solved by moulding the hoods with thin side plates of fine concrete suitably reinforced, suspended from the roof by steel rods capable of adjustment by turnbuckles. Sockets were

formed in the roof slabs to receive the upper end of the hoods and the lower end of the smoke flues, each of the latter being fitted with a butterfly valve and finished by a weather cone.

No difficulty was presented by the design of the terrace roof and lanterns, but it may be mentioned that special precautions were taken to preclude the penetration of rainwater into the joints of the smoke flues, and all the gutters were lined with sheet zinc with expansion joints, this provision being thought desirable in view of the considerable variations of temperature prevailing and the great length of the guttering. The zinc was laid on strips of bitumenized paper, for the purpose of permitting the metal to move freely under the influence of temperature variations.

All details of the ferro-concrete work were executed in general accordance with the Hennebique system, and the experience of several years has amply justified the selection of the material and method of construction adopted by Professor Bosset.

It is more than a little surprising that British railway engineers should adhere so faithfully to materials of a perishable nature in the design of locomotive depots. In buildings of that class one would naturally expect to find every detail constructed so as to be capable of withstanding the corrosive vapour and fumes which work such havoc in steelwork, and to be capable of affording full protection against the risk of fire. In the course of a few years, however, we may find railway engineers wondering why they persisted so long in using steel and timber for structures where ferro-concrete is admittedly superior in every respect.

The engineering and electrical exhibit at the Canadian National Exhibition, which commences on August 29th and ends September 14th, will be especially interesting this year. The manager, Dr. Orr, states that every inch of space has been applied for, and that he is having considerable difficulty in arranging the requirements of the different would-be exhibitors. Of course, as time goes on, there are one or two who drop out, and, therefore, while there is usually a waiting list, it frequently happens that firms who at first had little hope of being admitted are ultimately found room for. This year the same state of affairs prevails, only to a little greater extent. The American Foundryman's Exhibition, recently held in Toronto, attracted the attention of several firms of importance, with the result that two or three decided to exhibit at the Canadian National on an extensive scale. The consequence is that there are rather more applications for space than usual. Among the prominent exhibitors are The Hawley Down Draft Furnace Company and the Quartz Crucible Company, both of Chicago, who will show convertibles and crucibles for the first time at any Exhibition in Canada. Altogether, there is no doubt but that the engineering and electrical exhibit will be well above the average standard.

NEW LOCOMOTIVES.

A short time ago we mentioned that the C.P.R. had placed an order for twenty locomotives with the Locomotive and Machine Company of Montreal. These locomotives are to be delivered in September and of the following dimensions and fitted with special equipment:

Type of locomotive	Consolidation.	10-wheel.
Weight on drivers	168,000 lbs.	142,000 lbs.
Total weight of engine	192,000 lbs.	190,000 lbs.
Driving wheel base	15 ft. 10 in.	14 ft. 10 in.
Total wheel base, engine	24 ft. 4 1/2 in.	26 ft. 1 in.
Total wheel base, engine and tender	53 ft. 3 1/4 in.	54 ft. 6 1/2 in.
Cylinders	22 1/2 x 28 in.	22 1/2 x 28 in.
Piston valves, diameter	11 in.	11 in.
Drivers, diameter	58 in.	63 in.
Driving journals	Main 9 1/2 in.; others 12 in.	Main 9 1/2 in.; others 12 in.
Working steam pressure	180 lbs.	180 lbs.
Boiler, type of	Ext. wagon top, radial stay.	Ext. wagon top, radial stay.
Firebox, length	96 3/8 in.	102 3/8 in.
Firebox, width	65 1/4 in.	69 in.
Tubes, number and diameter	240 2-in., 24 5-in.	240 2-in., 24 5-in.
Tubes, length	14 ft. 2 1/2 in.	14 ft. 4 in.
Tank, capacity	5,000 Imp. gals.	5,000 Imp. gals.
Coal capacity	10 tons.	10 tons.
Brakes	Westinghouse.	Westinghouse.
Brake-beams	Simplex.	Simplex.
Couplers	Tower	Tower.
Valve gear	Walschaert.	Walschaert.
Superheater	Vaughan-Horsely.	Vaughan-Horsely.

*An engineering correspondent in The Times.