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MISSING

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The Canadian Engineer

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THE KENORA ARBITRATION.

The value of undeveloped water power is a question that has been very much discussed, both in Canada and the United States. Elsewhere in this paper will be found a summary of the expert evidence given before the arbitrators in the case of the Hudson Bay Company, the Keewatin Power Company and the town of Kenora. The evidence submitted covered many pages of manuscript, and was drawn out by questions propounded by some of the leading lawyers in practice before the Ontario Bar.

We consider ourselves fortunate in that we are able to secure the services of a prominent consulting engineer to condense this evidence for us, retaining the more substantial definite information produced by the various witnesses.

The evidence given varied as might be expected, because the different witnesses were looking at the situation from different viewpoints, but in every case the reasons for the value placed upon the site are given, and it will be for each of our readers to place his value upon reasons assigned. We had at one time intended stating which parties subpoenaed each witness, but upon our reading the evidence we decided that we would leave that for the reader to answer for himself. From the context and from some of the conclusions arrived at this will not be hard to decide.

It is interesting to note in Mr. Herschell's evidence that he considers that the profit for power has been, and is, declining, and that it is not now the profitable business it was a few years ago.

CLASSIFICATION ON THE G.T.P.

The Lumsden inquiry at Ottawa is bringing out some interesting facts in connection with classification of material on railroad construction. The reports of the Government and G.T.P. engineers differ very materially. Mr. Woods, assistant chief engineer of the G.T.P., specifies some sixty odd locations in which he considers the over-classification has been very great, but as might be expected, the terms in which he describes these over-classifications are just as elastic as he charges the classification has been. What per cent. of reduction in rock he expects to be made because he has described the cut as classified "too high," it would be hard to learn.

Classification of material on railway work is very seldom a matter of actual measurement. In some cuts it is possible to measure accurately the different materials, but in very many instances this is out of the question.

The resident engineer on railway work must be an arbitrator, and he must be an arbitrator without being arbitrary. It is quite possible for the politician to imagine circumstances and conditions that would make "graft" possible; therefore, it is of the greatest importance that the men selected as resident engineers—the men who

make these classifications—shall be men of good judgment and undoubted integrity as well as men of good technical skill.

To travel over the work after it has been completed will not give one a correct idea of the conditions during construction. We do not mean by this that clay will turn into solid rock in a night, but the trimmed cut one month or one year after it has been completed will present an appearance entirely different to the working cut.

Just as the chief engineer of a road or a large work must spend more time adjusting men than adjusting plans, so must the resident engineer spend more time in deciding classification than in taking measurements.

POLITICS AND RAILWAY BUILDING.

Each great movement in railway building in Canada has had coupled with it scandal scare. A year or so ago it was the G.T.P., and for some weeks it looked as if the Laurier Administration would have difficulty in retaining the confidences of the Canadian Parliament.

This month it is the Alberta and Great Waterways Railway that has attached itself to the Rutherford Administration in Alberta, and made it possible for the opponents of this Administration to criticize with some force the agreement that has been signed by the Government and the railway.

Elsewhere in this issue will be found the main features of the agreement, and in detail the specifications under which this road is to be built. Whatever may be said of the agreement from a financial point of view, most will recognize that the railway has made a very successful bargain. The guarantee is large; the conditions of payment are favorable; and the possibilities for heavy passenger and freight traffic are great.

The great wonder is that at a period when the large Canadian roads are laying down 80 and 100-pound steel that this 350 mile road should be allowed to use 56-pound steel, and that the road, passing through such fertile country where the traffic is likely to be heavy, the specifications should allow for a curvitude as high as 6°.

It appears that to-day, as twenty-five years ago, one of the most promising construction and financial enterprises that can be taken up in Canada is a railway charter, supported by Government guarantee.

AN ENGINEERING CENTRE.

It is just a little over seven years since the dream of housing the engineering societies of New York in one building became a reality through the generosity of Mr. Andrew Carnegie.

Last month the Founders' Societies held a dinner to celebrate the anniversary of the event and to congratulate each other on their seven years of harmony and success.

They have succeeded in that time in bringing together fifty-three societies that are connected with the profession embraced in the broad term engineering.

It is gratifying to learn that the Engineers' Club, Toronto, is preparing to move into larger quarters, and that they will be able to offer inducements to the various technical societies of Toronto to join them.

A central building, equipped with a splendid technical library, a large lecture hall and committee-rooms will soon build up a centre that will be a new influence in the Province and the Dominion.

The problems that arise in applying science to every-day work are so varied that the architect, the chemist, the engineer—electrical, mechanical, hydraulic, sanitary and railway—the financier and the business man have so much in common that they naturally come together, not only in business, but socially.

The scheme will be a financial success, but that is less important than the fostering co-operation and fraternity among the various professional men.

EDITORIAL NOTES.

The Private Bills Committee of the Legislative Assembly, Toronto, have refused the city of Toronto power to expropriate the Toronto Street Railway. They did, however, give the city permission to build an underground railway.

* * * *

The system of accepting the lowest tender but one has on other occasions been adopted by the council of the city of Toronto. Would it not be fairer to everybody to announce that as their method of awarding tenders? A city like Toronto, which spends so many millions annually on public works, cannot afford to even, in open council, depart from what is understood to be established custom. The company who were in the recent awarded favor because they were a local firm would be the first under other conditions to make known their discontent with the award, and to state emphatically that the contract should be awarded to the lowest tender.

ONTARIO GOOD ROADS ASSOCIATION.

The Ontario Good Roads met in Toronto, March 2nd, 3rd, and 4th, 1910. This was the most successful convention yet held and the large attendance and great interest taken in discussions is evidence of the hold the good roads movement has upon the people of the Province.

Mr. W. H. Pugsley, Richmond Hill, Ont., in his presidential address said in part:—

Within a few years every county in this Province will have established a good roads system.

In this Province there are about 35 counties eligible to receive aid from the Provincial Good Roads Fund. Of that number 16 have already taken advantage of the provisions of the Act. The Provincial Government has paid to these 16 counties an aggregate sum of about \$700,000.

It is necessary to educate the people to the importance of good roads—how it pays, by lessening the wear and tear on horses and vehicles, saves time owing to the greater speed at which it is possible to travel, increases the selling price of property, and in a hundred ways conduces to the comfort and prosperity of the community.

It is also necessary to educate the automobiles as to the part that they could play in helping to secure good roads.

One of the greatest obstacles in the way of persuading the farmers to undertake the betterment of the roads is the automobile.

The argument of the farmer is "if we make a good road it will be immediately monopolized by the automobiles, and we ourselves will have to take the back roads."

It has been seriously proposed in England to have roads specially set aside for automobiles.

I have no doubt that in time the horses will become educated as well as the drivers of horses, and an educated horse may sometimes retrieve the situation even when it has a foo.

driver, but how are we to educate an automobile how to act when it has a fool driver?

Mr. Pugsley stated that difference in conditions had prevented York County from establishing a county road system, the north having porous soil and gravel and the south having clay and not much good road-making material.

We are now at work on a scheme whereby the city of Toronto and the county will designate a system to which the city will contribute a substantial sum.

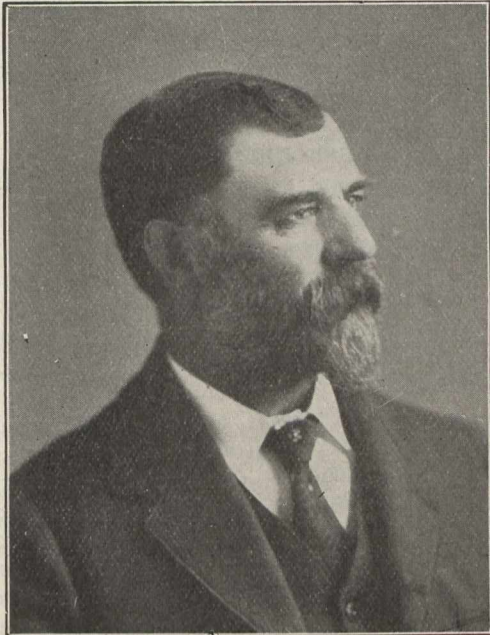
Geo. S. Henry, Oriole, ex-warden of York, told how the statute labor system looking after roads was followed by the township system and the county system.

The local improvement system as used in cities is not applicable in the county because one man might have to pay on half a mile of frontage.

He referred to the decrease in the rural population, and the effect of that on the cost of living.

It's for the cities to improve the highways and to improve the standard of living in the country, so that we can keep our population in the country.

Toronto's foundation was due to its excellent agricultural surroundings. Those surroundings have enhanced the city's



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

position much, and it's for the city to return something. We're justified in asking the cities for financial aid.

Government Standard.

The Government standard for county roads was expounded by Mr. W. A. McLean, C.E., Provincial Engineer of Highways. The system of handling the work, and its supervision, was of first importance. Every county undertaking a system of county roads is expected to have a county superintendent. The Government standard is made flexible to suit the circumstances in any locality.

Replying to questions Mr. McLean said there was no standard yet set for upkeep; the most desirable method was to keep the roads constantly in strict repair.

Abolish Statute Labor.

Mr. George C. Diehl, C.E., of Buffalo, County Engineer of Erie County, New York State, in the course of an interesting address on the system of highway construction and management in his State, unhesitatingly recommended that statute

labor should be abolished. New York State had, he said, in a hundred years spent \$200,000,000 on labor on the highways, with scarcely a cent's worth of permanent work to show in return, but in the past two years, with compulsory money system, it had built 6,000 miles of macadamized township roads, as good as any State, State-aided, or Federal roads.

To Amend Our Law.

Mr. Diehl suggested two ways of improving the state of the law in Ontario; increasing the amount of the aid from the Province, not necessarily to 50 per cent., but somewhat on the plan of New York State, where the aid is given in proportion as the community requires it; and having Provincial supervision for all the roads, the township officials working under the direction of trained Provincial supervisors.

Speaking of the proportion that cities should bear of the cost of road improvement in the counties, he told that Buffalo, about Toronto's size, has, during the past five or six years, paid \$1,000,000 towards building county roads, the city paying 85 per cent. of the Erie County road tax. The territory extends for a radius of approximately 25 miles south and east, covering about 200 square miles; New York city and Buffalo together paid about 95 per cent. of the total cost of road making in the State.

As to automobiles, Dr. Diehl said that about five per cent. both of motorists and of horse-drivers were "road hogs." It was not fair to blame the other ninety-five per cent. for their selfishness or folly.

Indians Not Taxed a Cent.

In reply to a question by Chief Elliott, Mr. Diehl stated that in the United States they thought the Indians had been treated badly enough, so they built any roads through the reserves without taxing the Indians in the township peopled by them for one cent. Special Highway Superintendents were to be appointed for each reserve by a bill now before the State Legislature, and the State would give each of them an appropriation for each road and bridge in the reserve.

Concrete vs. Steel.

Mr. Frank Barker, C.E., County Engineer of York County, gave a comparison of steel and concrete bridges. He said the popular belief in the superior durability and fire-proof quality of steel was not based on sufficient foundation. Concrete possessed greater economy for compressive stresses, but was not capable of resisting tensile stresses as steel would, concrete was flood-proof, frost-proof, rust-proof, and fire-proof. Steel, embedded in concrete, takes on the permanency which it lacks of itself.

Favors Provincial Commission.

In his paper on "Ontario Highways, Past, Present, and Future," Mr. H. J. Bowman, C.E., of Berlin, speaking of the need of specially constructed roads for automobile traffic, said there had to be a coating of oil or tar to keep the binding in place. It was out of the question that the farmers should pay for these. Motor-car owners would think very little of a tax of \$10 a year, in fact he thought they would gladly pay much more for the use of good roads. He advocated a Provincial Highway Commission to take charge of a road system apart from politics.

May It Come Quickly.

Mr. G. M. Farrington, of Prince Edward County, thought we were on the eve of a great revolution in road building. He hoped it would come quickly, so we in this generation could enjoy its benefits. Good roads increased the value of farms.

Longer Hind Axles.

"Preparation and Use of Road Metal," was dealt with by Mr. A. McG. Rankin, of Collins Bay, Councillor of

Frontenac County. He advocated the use of a traction engine and also of a scarifier, as these had been found very useful in his county. He said hind wheels running in the track of the front wheels, did great damage to the road; hind axles should be longer than front by twice the width of the tires.

Views of Improved Roads.

A number of views of New York State roads were shown, being explained by Mr. James Sheppard, of Queenston, who recently attended a good roads convention in that State. Mr. Sheppard was in charge of the good roads train which a few years ago built several miles of model roads in the twelve eastern counties of the Province.

Massachusetts and Autos.

The Massachusetts highway system was the subject of a paper in the afternoon by Mr. Harold Parker, of Boston, Chairman of the State Highway Commission. The automobile problem, said Mr. Parker, had become very important to Massachusetts, the number of registered autos having increased from 3,500 in 1903 to nearly 25,000 last year. These machines are under the direction and control of the Highway Commission, which issues licenses to operate them or revokes them, and keeps a register. A tax is placed on each machine, based upon its horse-power, of 50 cents per horse-power. This tax produced \$350,000 a year, which was spent by the commission in maintaining the roads. A force of inspectors or detectives is kept, and the commission exercises the functions of a court. When a person is killed by an automobile, the operator's license is suspended, and not restored until it is shown that the death was not due to serious fault of his.

Counties Pay One-fourth.

Mr. Parker said that the State pays the entire first cost of road building, and the counties are charged up with one-fourth of it. The whole maintenance of the State roads is met by the commonwealth by a direct tax. From \$500,000 to \$700,000 a year is spent for construction, 30-year bonds being issued.

County Control of Bridges.

Mr. W. H. Hoyle, M.P.P., for North Ontario, outlined the salient features of his bill to amend the municipal act, giving the County Councils exclusive jurisdiction over county roads and bridges; to have disputes settled by the County Judge, with appeal to the Ontario Railway or Municipal Board; to have every bridge constructed under standard specifications furnished by the Department of Public Works, and to provide for the issue of twenty-year debentures to pay for constructing or reconstructing the county bridges.

The Motorists' Claims.

A paper defending the automobile's place in modern highway traffic was read by Mr. W. G. Trethewey, of Toronto, representing the Ontario Motor League. The league, he said, desired good fellowship between its members and other users of the roads. Under a competent driver the auto was the safest vehicle on the road, because always under control, which the horse was not. Motorists would not object to paying a tax for the maintenance of roads, as is done in some States. Horses would grow accustomed to the automobiles, and roads could be built of material of greater specific gravity, and oiled. The motor-car could be very useful on the farm, one car doing the work of six teams. It had come to stay.

Narrow Tires Expensive.

Wide tires were strongly advocated from the manufacturers' point of view by Mr. Oliver Hezzlewood, of Tor-

onto. A narrow tire on an old wagon with a heavy load, he said, would cost more in harm to the road in one trip to market than would buy a new wagon. Speaking also on behalf of the Ontario Motor League, he said its aim was to secure scientifically constructed roadways for the reasonable use of all vehicular traffic. The league impressed upon its members their obligation, as gentlemen, not to stand upon their legal rights, but to do to others as they would have others do to them, and would "read the riot act" to any offenders who were reported to the Executive.

Cost of Road-making.

"The Cost Data of Road Building" was the subject of a paper by Mr. C. R. Wheelock, C.E., of Orangeville, Peel County Engineer. The ordinary outfit for road-making would cost about \$3,800. If stone-crushing machinery were needed, it would cost about \$1,300 more. The cost of road building depended on several items, labor, material, etc., for which Mr. Wheelock gave a mass of figures.

Keep off the Water.

"Keeping the water off the roadbed and good drainage are the fundamental principles of good road building," said Mr. H. G. Bleecker, of Belleville, Superintendent of Hastings County Roads, in his address before the Ontario Good Roads Association yesterday morning.

In the discussion of this paper it was brought out that the underdraining of a road was more important than the putting of "metal" on it.

Concrete Highway Bridges.

Every bridge should be made strong enough to bear a 15-ton roller, said Mr. James A. Bell, C.E., of St. Thomas, City and County Engineer. Iron bridges had first replaced wood, then came steel, pin-connected, with wooden floors, and later riveted steel, with concrete floors, this being a model of excellence of its kind. The latest and best kind of bridge is that of concrete reinforced with steel rods.

Up to a length of 40 feet, beam bridges could be built more cheaply than arch bridges, because there is less strength of abutments needed, as the strain is all downwards, with no back push. Some people objected to the beam bridges as not having such graceful lines, but they could be made decorative by panelling and balustrades, but there was more strength in the rods than in the beams. Bridges under sixteen feet could best be made of a single slab of concrete. Steel was at its strongest when made, while concrete became harder with age.

Inspection Is Important.

Good inspection was of the utmost importance. Along with the durability, strength and utility, beauty should not be overlooked. The best inspectors he found were third-year School of Practical Science men, as a young man starting out in life was on his honor and felt his reputation was at stake.

Economic Benefits.

That no good road could be built for less than \$1,000 a mile was the assertion of Mr. C. J. Foy, K.C., of Perth, ex-Warden of Lanark County. A road built for \$2,500 a mile would inure more to the benefit of the community, as the maintenance account would be much less. The economic value of the time saved by the farmer through having good roads was an important thing to be considered.

How to Deal With Quicksand.

In the course of an address on "Road Machinery," Mr. Jas. L. Taylor, Hamilton, Superintendent of Wentworth County Roads, said the best way to deal with quicksand was to sink a well just over the shoulder of the road down to the

hardpan, and crib it up with two-foot tile. Three such wells in a mile and a quarter of bad road in his county had sufficiently drained it. A boggy road had been remedied by a V-shaped trench filled with stones. He pleaded for a fair treatment of superintendents by County Councils.

To Improve Old Gravel Roads.

"The reconstruction of old gravel roads" was dealt with by Mr. J. M. Young, of Harriston, Superintendent of Wellington County. He reduced the width to 24 feet, except near towns, where it was made 30 feet. The grass sides were cut away, and the roadbed uniformly drained, springs being remedied by tile draining. The old roadbed was ploughed up as far out as the gravel had spread, generally fifteen feet, then the girder was put on, surplus earth being levelled off towards the fences. The chief difficulty was in getting experienced girder operators.

To Maintain Earth Roads.

Speaking of earth roads, and how most economically to maintain them in ideal condition, Mr. W. B. Rittenhouse, of Beamsville, gave it as his experience that tile or underground drainage was better than surface drainage in nearly all cases, in providing a good bottom. He cautioned against undertaking many macadam roads except for main highways. After cutting up and grading the road, the speaker said they got the traffic directed along the centre of the road by driving a wide-tired wagon carefully along the centre of it, and all others will follow that track; when ruts form, the road is dragged and levelled again. It costs less when a good road was once made, to keep it good by constant care. Most road work should be done early in the season when the earth is soft and miry; it could be done then more easily and better.

Don't Build Roads Too Wide.

Mr. H. R. Jupp, of Orillia, County Road Superintendent of Simcoe County, said he would never build a road wider than 24 feet; that was sufficient for all kinds of traffic, and a wider road, while looking well, cost too much to build and maintain.

"Steel Highway Bridges" was the subject of a paper by Mr. A. W. Connor, C.E., Toronto. The most important means to the preservation of steel bridges, he said, was keeping them well painted. The surface should be clean and dry before painting, as rust would spread under paint.

Financial Condition Good.

The auditor's report, which was adopted, showed a balance on hand of \$272.84, there being \$233 left over from last year, the county grants amounting to \$120, and Government grant to \$200. The expenses totalled about \$280.

Officers Elected.

The following officers were elected for the ensuing year: President, W. H. Pugsley, Richmond Hill; Vice-President, Thos. L. Kennedy, Cooksville; Secretary-Treasurer, Col. J. E. Farewell, Whitby; Assistant Secretary, W. A. McLean, Toronto; Executive Committee, R. H. Jupp, Orillia; Warden Hall, Prescott; K. W. McKay, County Clerk of Elgin, and L. A. Hamilton, Lorne Park.

PREPARATION AND USE OF ROAD METAL.*

A. McC. Rankin, Collins Bay, Ont.

The preparation and use of road metal covers a very large field, but this paper is intended to cover a few of the essential points and bring about a healthy discussion on the subject and an exchange of ideas.

We will not deal with the cost of the material on the road as it depends so much on the size of the plant, class of stone, and the length of haul, and for this reason it is not fair to compare the cost of road construction in one section with that of another section even in the same township. The cost of laying the metal on the road should be reduced to a minimum, which can only be done when all the teams are working to full capacity with the least handling of material that is possible.

The preparation of the material may be divided under two heads. The preparation of the material to be placed on the road and the preparation of the road to receive the material.

Whether the source of the metal be a quarry or field stone sufficient coarse material should be piled convenient to site for crusher, and arrangements made for keeping a surplus of coarse material on hand as well as supplying the crusher, and a bin of sufficient capacity to provide against a temporary shut down to the crusher for minor repairs or adjustment. The time and labor saved in loading from a bin against loading from a pile will far more than pay for the sinking fund and interest on the cost of the bin.

The metal should be screened on coming from the crusher, first separating out the dust and chips up to ½-inch, then sorting out the 1-inch and 2½-inch and tailings. Where new construction work is being done, the proportion of tailings and 2½ should be much greater than where repair or reconstruction work is being done; also very hard or tough metal will stand to be more finely broken than the softer metals.

In preparing the road surface to receive the metal, the surplus dust or fine material on the surface, as well as the false berm at the edge of the ditch, which has been formed by the growth of grass and collection of dust, should be removed as it holds the water and softens the roadway. To do this the use of a scarifier is used to advantage to loosen up the material so that the grader can do with one cut what it would take three or four cuts to accomplish with unloosened material.

It is not advisable to place the metal on a smooth hard surface of a macadam roadway as it takes more material than is necessary to form a good wearing surface, as a thin layer of metal will not bond on the smooth surface. The old surface should be roughened to give a bond between the old and new metal. To accomplish this the scarifier drawn by a traction engine is the most economical method.

The traction engine should also be used for hauling the grader.

After the material has been loosened it should be trimmed with the grader and the broken stone spread and levelled and rolled with the steam roller.

By the use of the steam roller a thinner coat of metal can be put on and bound into the loosened macadam below and a good road formed at once instead of allowing the traffic to kick the loose stone about and take a long time to make a possible road.

It is not only the automobiles that are damaging our macadam roads, but the narrow tires on the vehicles and also the hind wheels running in the same track as the front wheels.

If the Legislature could be prevailed upon to pass an act compelling all vehicles to have the hind axle longer than the front axle by twice the width of the tire, then our macadam roads would not rut so soon and would cost much less for repairs as the rutting causes the water to lie on the road and soften the binding and metal and increase the wear.

*Read at the Ontario Good Roads Association.

THE Sanitary Review

SEWERAGE, SEWAGE DISPOSAL, WATER SUPPLY AND
WATER PURIFICATION

THE DOMINION GOVERNMENT AND EVIDENCE OF RIVER POLLUTION.

We have before us a report in the shape of a Government blue book, edited by Dr. P. H. Bryce, chief medical officer, Department of the Interior, dealing with the work done last year by the "Standing Committee of the Senate on Public Health."

The subjects taken up were: "Sewage Disposal," "Pollution of Rivers, Streams and Lakes," and "Public Water Supplies."

It is extremely gratifying to find the Canadian Government is now devoting time and energy to collecting evidence with a view to prospective legislation in these matters.

In the preface we find the remark: "It is necessary to get information and evidence from persons who have made a **life study** of the above subjects."

Those who gave evidence consisted of five medical men and one city engineer, viz.; Montizambert, Bryce, Hodgetts, Amyot, and Starkey (medical men), and Mr. Rust, city engineer, Toronto.

In proportion to the number of medical representatives, the engineering profession was not very much to the front, numerically speaking; and some of us may even question the prefatory suggestion that a city engineer has the time and opportunity to make a life study of the above problems.

We are glad, however, to find that with these five medical men and one engineer "a remarkable unanimity existed in the opinions expressed as to the present unsatisfactory status of legislation affecting public health, especially with regard to these several matters related above. Does not the word "remarkable" as applied to this "unanimity" appear slightly unnecessary when we consider that there exists no Dominion legislation whatever with reference to these particular matters?"

The first two or three pages of the report are taken up by Dr. Bryce in discussing the legal aspects of the British North America Act as it affects the Dominion Government in legislating on health matters. Some doubt appears to exist as to whether such matters should be controlled (legally) only by the Provinces, or whether the Dominion Government has any right to interfere.

The pollution of the Ottawa River by the sewage from Ottawa city is taken as an example of inter-provincial complication. The Province of Ontario may do injury to the Province of Quebec and the laws affecting river pollution may differ in these two Provinces.

Whatever the British North America Act says or does not say, it appears that a general Dominion Act is immediately required dealing with such inter-provincial questions, and with the question of pollution of rivers in general. Not only is this an inter-provincial question,

but it is also an international question. American and Canadian waters are polluted by both nations, and until some international agreement can be arrived at little can be done with many of our rivers and lakes to restrict sewage pollution.

On the question of turning crude sewage into large bodies of water, the "engineer" appears to have been left entirely on his lonesome.

The report states: "This, with an almost unanimous voice, is condemned in the evidence; one gentleman (Mr. Rust), however, stating that this method has hitherto prevailed in most of the cities and towns of North America, and he seems to think, when we consider the purifying effects of "oxidation," "sedimentation" and "dilution," that it may be safely carried out into large bodies of water."

How familiar this glorious trinity of words sound to those who remember the agitation to keep Toronto's crude liquid sewage out of Lake Ontario.

The report goes on: "This gentleman does not, however, explain how the neighboring towns are to be protected, and his views were combatted by the following opinions from other evidence."

The "lonesome engineer" is then completely sat upon and vanquished by one of the five medicos, who explains at some length that chemical contamination may come and chemical contamination may go, but microbes go on for ever.

Dr. Starkey states: **These pathogenic organisms unfortunately live so long that they may be carried far.**

. . . They may be washed down into streams and lakes, so that **none of these, in inhabited districts, are safe sources of water supply.** What a sweeping, general, inclusive, conclusive, broad, exact and scientific statement this is! The "lonesome engineer" must have felt very lonesome, indeed.

But let us get on. "Assuming the necessity for sewage purification, the methods to be adopted are discussed at length in the evidence. It is stated: "We can devise a scheme to get rid of them all (microbes)."

The above is an exact quotation from the report, including microbes and everything.

Earle Bernard Phelps will open his eyes in astonishment when he reads that these five medicos and one "lonesome engineer" have solved the problem of the sterilization of sewage effluents. "Phelps," the foremost world's expert in disinfecting processes as applied to sewage, spends years in obtaining data and results that point to a possible bacterial removal of 98 to 99 per cent. by chlorine methods. Ten thousand bacteria per c.c. left out of every 1,000,000 per c.c. in the crude sewage. The Canadian Senate Commission at one session by discussion only "get rid of them all."

That's the way to do things.

The methods described are: "The Irrigation System," "The Chemical System," "Intermittent Sand Filtration," "Contact Filters," "Percolating Filters," and lastly, but not least, "The Septic Tank System." Nowhere, however, is it explained how any of these systems "get rid of them all."

It is never referred to or pointed out that the most recent system adopted for the removal of putrescibility, viz., "biological filtration following the removal of solids," will only remove about 80 per cent. of the total initial bacteria. Two hundred thousand bacteria per c.c. left out of every 1,000,000 per c.c. in the crude sewage.

The ordinary old text book references to the above systems are indulged in. The newer knowledge relative to biological treatment is ignored. Contact beds are described, and not a single reference made to the fact that these beds, when standing full of sewage, exclude oxygen, and simply act as "septic tanks," and that the whole "contact bed theory" has been shown by Professor Dunbar, of Hamburg, to be based on an erroneous assumption and principle, is useless and harmful to oxidation in aërobic action, as compared with the percolating filter when maintaining an equilibrium between retention, absorption and oxidation. Mention is made of less area being required by percolating filters, but the obvious reason is not explained or referred to.

The effluent from a percolating filter is described as clear, practically, as the effluent of a good sand filter.

May we respectfully ask the editor of this report to turn to page 8, Vol. V., "Contributions from the Sanitary Research Laboratory and Sewage Experimental Station, Massachusetts Institute of Technology, and read as follows:—

"The liquid flowing from a modern trickling filter looks to the untrained eye like the original sewage. The organic matter of the sewage is no longer 'burned up' to harmless mineral matter; indeed, there is almost as much organic matter in the effluent as in the raw sewage, and sometimes more. What change, then, has taken place to justify the use of the term 'purified?' The answer lies in the fact that the organic matter has been changed but not removed. To carry out the simile, the organic matter, though not burned, has been charred or partly oxidized, and this charring process has been sufficient to rob it of its putrescibility."

With reference to "Septic Tank System," we have the old, worn-out legends repeated. Hungry bacteria devour everything until only liquid remains. (See Dunbar, "Principles of Sewage Disposal," page 93): "The reactions taking place during sludge digestion have hitherto been assumed to be due to the action of bacteria, but the assumption has been made without experimental foundations." Then read on as to what follows:—

Here is an example from the report: "This period (twenty-four hours) of time is sufficient for such a complete sedimentation and liquefaction of solids to be effected that the tank effluent should contain but a few grains per gallon of fine suspended matter."

And this is British territory. There has been printed and published a fifth report of the Royal British Commission on Sewage Disposal. The man who talks of a complete "liquefaction of solids" and a few grains of fine solids in the effluent liquor has presumably made a life study of the subject.

Well, what is the good of talking? What is the use of repeating all the evidence of the Royal Commission on the increase of solids in the septic effluent and the evidence that 75 per cent. of the solids are not liquefied? What is the good of pointing out that the effluent is bacteriologically as impure as the incoming sewage, and that according to the Hamburg experiments, it was found to require just six times the area of filter for septic liquor as for non-septic liquor? Not a bit of good! Ottawa is apparently too far removed from the experimental work of other nations to benefit by them.

The report concludes with what appears to be some of the evidence, which reads like a round table chat on the subject. Here is a sample:—

Hon. Dr. De Verber asked Mr. Rust: "What amount of sewage could be discharged into a running stream so that it would not be unpleasant or dangerous to health?"

Mr. Rust replied that at a standard of Mr. Hering a flow of two or three million gallons of water in twenty-four hours could receive the sewage of 1,000 population, taking it at 100 gallons per head, without creating any nuisance."

Is this a piece of inspired impromptu evidence, or has Hering actually laid down this standard?

A stream of 2,000,000 gallons in twenty-four hours is equal to the discharge of a 12-inch pipe at a gradient of 1 in 115. The discharge from the 1,000 people is equal to a 4-inch pipe at 1 in 155. This proportion of 1 in 20 will produce no nuisance whatever. The five medicos appear to have left the "lonesome engineer" alone on this proposition. No doubt the name of "Hering" caused a thoughtful silence.

The funniest thing in the whole report is, however, to be found in the last paragraph of the section dealing with sewage disposal. Here the now well-known and oft-quoted "general conclusion" of the fifth report of the Royal Commission is actually given as a quotation from an English technical journal, "The Surveyor":—

"It is practicable to purify the sewage of towns to any degree required, either by land treatment or by biological filters," etc. (For the rest, see the report.)

Is it not gratifying to find that these gentlemen have found time to glance at the "Surveyor" while devoting their lives to the study of the above subjects?

Note.—With reference to the above report, it is only fair to state that the witnesses, apart from Dr. Bryce himself, appear to have had very little to do or say. Practically the whole of the matter dealing with sewage disposal is under the name of Dr. Bryce.

The report represents about five-sixths Dr. Bryce, while here and there disjointed remarks made by the others are quoted and carefully edited by Dr. Bryce.

THE NAVIGABLE WATERS PROTECTION ACT.

Bill B. an Act to amend the Act respecting the protection of navigable waters has been introduced by Hon. N. A. Belcourt. The clause that is of interest to sanitary experts is as follows:—

"19a. No person shall throw or deposit, or cause or permit to be thrown or deposited, any sewage,

offal or refuse animal or vegetable matter of any kind whatsoever, into any river, stream or other water, any part of which is navigable or which flows into any navigable water."

THE DISINFECTION OF SEWAGE AND SEWAGE FILTER EFFLUENTS.*

By Earle Bernard Phelps.

Review by T. Aird Murray, C.E.

The previous chapters have dealt with experiments carried out at Boston in connection with effluents from percolating filters and with crude sewage, and also compared results with those of German conclusions.

CHAPTER III. (Concluded).

Disinfection of Septic Sewage.

Red Bank, a town of 6,800 inhabitants, situated on the Navesink River in Monmouth County, was chosen as the base for experimental work in disinfecting septic sewage.

The experiments are of great importance, especially in this particular case, where the partly purified effluent reaches shellfish areas. The question of the practicability of disinfecting an effluent which has only undergone septic action, is one of valuable consideration in connection with sewage discharges into tidal basins.

Phelps admits that it was at once recognized that more chloride of lime would be required than in treating non-putrescible effluents, or even crude sewage.

We reproduce a plate showing the disposal works at Red Bank. After passing through grit chambers the sewage enters a septic tank of a capacity equal to about an 8½ hour dry weather flow. The two tanks shown were formerly utilized as filters, and were converted in conjunction for disinfecting purposes, presenting a joint capacity of 14,000 gallons. Each tank held about forty-five minutes flow.

The receptacles c and d provided a capacity of 240 gallons each for the preparation of the chloride of lime solution. An automatic dosing tank supplied the disinfectant to the sewage before it entered the sterilizing tanks. The arrangement kept the flow of chlorine solution proportional to the flow of sewage.

During the investigation free chlorine was never found in the effluent. This is important in view of the well known effect that chlorine has in destruction of fish life. One of the chief objections to disinfecting sewage discharging into tidal water, has been the fear that chlorine would kill the fish in the neighborhood.

Results are given of weekly average tests from July 20 to September 28th, 1907. The average amount of available chlorine used was 11.5 parts per 1,000,000. The average per cent. removal of total bacteria was 99.7 at the end of 45 minutes, and the corresponding B. coli removal 99.96. In 90 minutes the average per cent. removals were 99.8 and 99.97 respectively.

During the period August 19 to August 31, the available chlorine was reduced to about 7.5 parts per million. The results, which are not included in the above averages, show a total bacterial removal of 95 per cent., and 94.3 per cent. in B. coli after 45 minutes. It is thus apparent that much of the chlorine is absorbed by the septic sewage without any great disinfecting efficiencies.

* Published in contributions from the Sanitary Research Laboratory and Sewage Experiment Station, vol. X.

Eighty-four per cent. of the tests showed bacteria in the effluents of from 100 to 1,000 per c.c.; while in 6 per cent. of the tests the numbers were not less than 5,000. The average initial number of bacteria to the sewage was 900,000 per c.c.

Phelps states that "the disinfection of septic sewage evidently requires so much chlorine that the expense will be considerable. It will probably be found to take twice as much chlorine for septic sewage as for crude sewage."

The above experiments appear to point to the advisability of either simple straining or ordinary sedimentation, when a non-putrescible effluent is not demanded. Nothing is gained by allowing septic action to take place prior to disinfection, in fact the cost is doubled. If septic action is insisted upon, then the sewage must be disinfected previous to the treatment in the septic tanks. No experiments were made, however, as to the results of septic action with a sewage which has previously undergone disinfection.

In view of Phelps conclusions, the engineer in providing disinfection for sewer effluents discharging into tidal basins or large bodies of water will probably choose for removal of solids some such form of tank as the Dortmund allowing a rate capacity of from 1½ to two hours with an upward velocity flow of about 1/10th of inch per second, thus avoiding septic action as much as possible. It is, however, not quite apparent whether, when disinfection is demanded, it will not prove both more efficient and less costly to provide a non-putrescible effluent prior to disinfection in such cases.

We still feel that a great deal more information and comparative cost data are required to allow of exact determination in connection with the advisability of disinfecting either settled or crude sewage, rather than expending so much more capital in obtaining a non-putrescible effluent first, and so saving the constant and permanent cost for the extra amount of chlorine required.

Disinfection of Trickling-Filter Effluent at Baltimore.

A brief report is given of the work done at the Walbrook testing plant, in connection with the new sewage disposal plant at Black River. The sewage disposal plant is to consist of—screening, sedimentation, percolating filters, and final sedimentation.

About 50,000 gallons of sewage per day was collected at the testing station, and treated in a grit chamber, septic tank, percolating filters, and sedimentation tanks.

Less chlorine was used at Baltimore than at Boston, the available amount being 2.2 parts per million as compared with 3.4. The effluent from the Baltimore filters was in a better condition than that at Boston. The average disinfection results practically agree with those at Boston, although Phelps is of opinion that even better results could have been obtained by the use of three parts per 1,000,000 of available chlorine. The B. coli results showed less efficiency per cent. removal than the total bacteria. An attempt is made to explain this by assuming the presence of another organism which fermented the bile medium. However, a review of the results, generally, point to the entire feasibility of practical disinfection.

Phelps concludes as follows: "The application of three parts per million of available chlorine in the form of bleaching powder to a trickling filter effluent, similar to those in which experiments were made, effects satisfactory disinfection. The removal of bacteria from the effluent averages 95 per cent., making the removal for the whole purification process 98 to 99 per cent. of the number in the crude sewage. The cost of disinfection ranges from \$1 to \$1.50 per million gallons of sewage, depending chiefly on the size of the plant. Effluents of higher degrees of purity can be disinfected at

still lower cost. Five parts per million probably represents the maximum amount of chlorine required for the treatment of trickling filter effluents of poorer quality."

Phelps is careful to point out that the above results do not amount to sterilization, but may be reasonably called "practical disinfection." Considerable extra cost is required to obtain, but a slight improvement.

Crude sewage, if disinfected to the same efficiency standard as above, requires from five to ten parts of available chlorine at a cost of from \$1.50 to \$3 per million gallons.

Septic sewage requires the application of from 10 to 15 parts of chlorine, costing from \$3.50 to \$5 per million gallons.

Phelps is also careful to explain that the above data has only general application and that sewages vary so much in character and stability that no hard and fast figures can be given.

We have shown that the results obtained are much more favorable than those of the German, or in fact of any results elsewhere. We see no reason, however, to doubt the accuracy of the conclusions. The "hall mark" of absolute fairness stamps every paragraph of the report. There is no straining to obtain preconceived results, and the whole of the experimental work has evidently been accomplished with strict observance to detail and general efficiency.

It must not be concluded that the results are such as to warrant sewage being directly termed drinking water. Further dilution, however, will easily effect a reduction of bacteria so as to bring the total count within the standard of drinking water required of slow sand filtration.

A 98 to 99 per cent. reduction of intestinal bacteria means 98 to 99 per cent. less chance of typhoid, and surely that is something gained.

But the main crux of the whole question is. Is it cheaper to apply sand filtration as a supplementary process to sewage disposal in order to reduce the number of bacteria, or is it cheaper to use chlorine at the cost rates of from \$1 to \$1.50 per million gallons for non-putrescible effluents.

Again is it cheaper to pay from \$1.50 to \$3 for the disinfection of crude sewage, where a non-putrescible effluent is not demanded, rather than go through the several processes of sewage disposal. This applies only to cases of discharges into tidal basins or large bodies of water.

The question of disinfecting a septic effluent, we think, may be left out of consideration, as impracticable because of cost and little or no consideration gained.

We will suppose the case of a city discharging its settled crude sewage into Lake Ontario, and that the city draws its water from the same lake which is thus subject to contamination. Now if it was desired to reduce the chance of disease infection from sewage pollution, two courses would be open to that city: (a) The further treatment of sewage by filtration until a bacterial removal of from 98 to 99 per cent. was gained; or (b) the immediate disinfection of the settled crude sewage by an expenditure of from \$1.50 to \$3 per each 1,000,000 gallons of sewage discharged.

Assuming the daily discharge to be 30,000,000 or 10,950,000,000 gallons per annum, then we would require for disinfection an annual expenditure of from \$16,200 to \$32,400 depending on the strength of the sewage. The average annual cost being \$24,000. This sum capitalized at 5 per cent. would represent an immediate expenditure of \$480,000.

It is safe to estimate that a sewage filtration plant giving equal bacterial removal efficiency, could not be installed under a capital expenditure of \$1,000,000, and 5 per cent. of this amount capitalized must be added as an annual payment for operating expenses and depreciation fund.

It therefore would appear that in the above case, when the sewage enters a sufficiently large body of water capable of effecting chemical purification by dilution, a city may save even \$500,000 in obtaining an effluent practically biological harmless to a water supply drawn from the same source by the adoption of methods of disinfecting crude settled sewage in lieu of supplementary sand filtration, applied to the effluents from percolating filters.

In the case of small towns discharging sewage into small inland streams, the production of a non-putrescible effluent will in almost every case be demanded, apart from the question of disinfection or otherwise. As previously pointed out, disinfection will not prevent but only retard putrefaction. This process, if allowed to take place in streams, forms the chief cause of nuisance, depleting the water of its available oxygen, destroying fish life, and gradually converting a stream into an open sewer.

In producing a non-putrescible effluent no greater reduction than 80 per cent. of bacteria can reasonably be expected by the use of percolating filters. Circumstances, therefore, arise when it is necessary to treat such an effluent for a further bacterial removal.

Assuming, for the sake of illustration, a small town of say 2,000 inhabitants, with a per capita water consumption of 60 gallons per day, producing 120,000 gallons of sewage per day or 43,800,000 gallons of sewage per annum. The number of bacteria in sewage varies considerably, depending on dilution and other factors, but for purposes of illustration we may assume a bacterial count of say 1,000,000 bacteria per c.c. in the above case.

The sewage discharges into a small stream eventually used for drinking purposes, the proportion between sewage and stream discharge being as 1 to 100. It is assumed that a bacterial purity of effluent is required which will not increase the total number in the stream by more than 100 per c.c. The stream being 100 times greater in volume than the sewage discharge the sewage effluent should, therefore, present less than 10,000 bacteria per c.c., or an equivalent bacterial reduction from the number in the crude sewage of 99 per cent.

If tankage for the removal of solids be adopted, followed by percolating filters, we may assume a total bacterial reduction of 80 per cent., representing the removal of 800,000 bacteria from the original 1,000,000, and leaving 200,000 per c.c. to be yet dealt with.

In order to satisfy the above assumed standard of not more than 10,000 bacteria per c.c. in the effluent we require a further percentage reduction of something like 96 per cent. In fact a 96 per cent. further reduction would just leave 8,000 bacteria per c.c. in the effluent, adding 80 per c.c. to the stream water after dilution.

This further reduction may be obtained by either sand filtration or disinfection: The question again is, which is the cheaper and most practical method for a small municipality of the above population?

In order to treat 120,000 gallons of percolating filter effluent per day by sand filtration to obtain a reduction of 96 per cent. of bacteria, the rate of filtration should not exceed 1,000,000 gallons per acre with medium coarse sand. A filter 75 by 75 feet would therefore be required, and such should be in duplicate to allow of surface removal of sand and cleaning from time to time. The filters, operated by a head pressure, as in ordinary slow sand filtration, built complete at three feet deep with under drains, concrete walls foundations, and frost protection cover would cost approximately \$5,000 (the average cost of sand filtration in the U.S. approximates \$30,000 per acre for open filters). The operating expense would add about \$500 per annum to the cost of the primary works. The

annual cost of sand filtration, allowing 5 per cent. on the capital cost added to operating expenses, would thus be \$750 per annum.

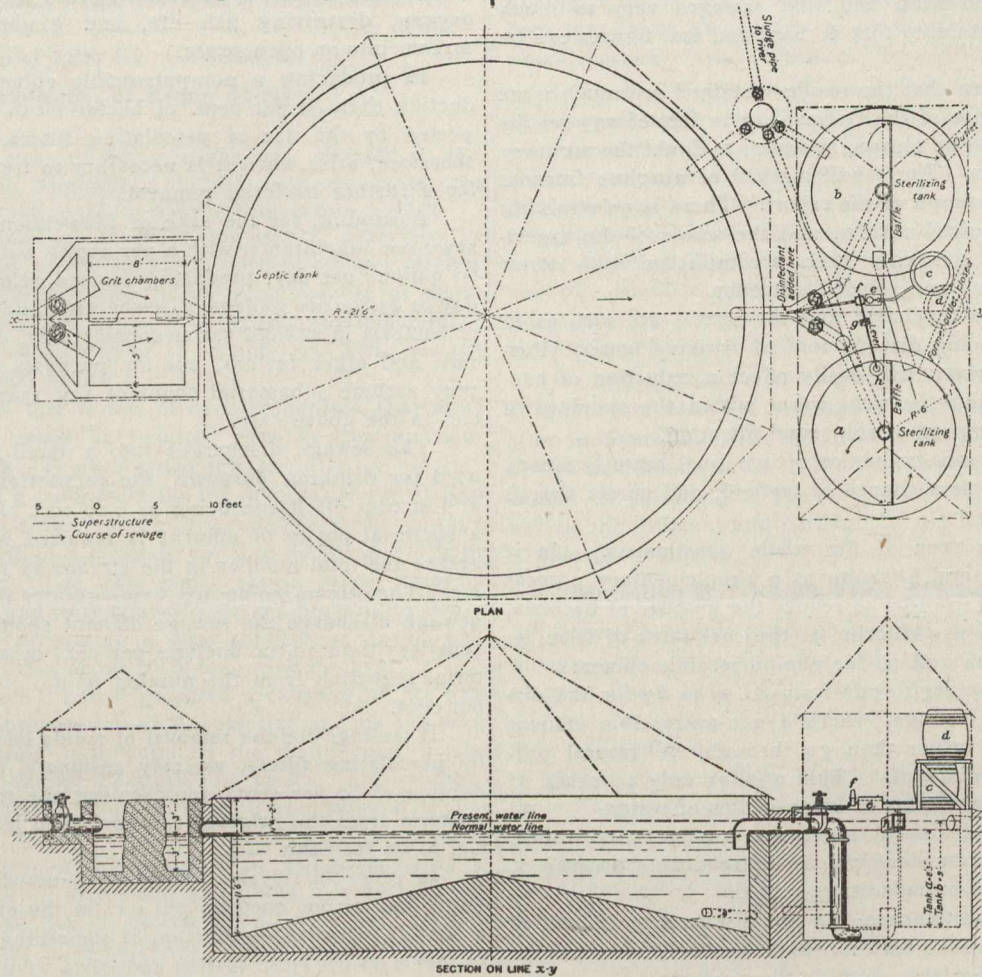
According to Phelps the effluent from the percolating filters can be disinfected to the extent of a bacterial removal of 96 per cent. for a sum ranging from \$1 to \$1.50 per million gallons.

The plant necessary for disinfection may be very simple, consisting, in fact, only of a disinfectant contact sedimentation tank and automatic regulating boxes for the supply of the chlorine. A tank 20 by 10 feet and 6 feet would give a one and a half hour contact period. The whole cost of the disinfecting plant should not exceed \$1,000. Allowing \$66 per annum based on the top cost, viz., \$1.50 for disinfecting 44 million gallons per annum and adding to this 5 per cent. on

It must not, therefore, be concluded because Phelps obtained certain results from certain percolating filter effluents, that we are bound to obtain the same results from other percolating filter effluents.

Second to the valuable information which has been added to our knowledge of disinfecting processes, we think that an outstanding feature consists in an evident conclusion, that whether disinfection is an immediate requirement or otherwise, it must generally follow or be an adjunct to the ordinary methods as now applied for obtaining a non-putrescible sewage effluent.

This means that disinfection will not become a substitute for the methods as now employed, and that any up-to-date methods of sewage disposal are in a position to have disinfection added in its cheapest form at any time if required.



PLAN OF SEWAGE-DISPOSAL WORKS AT RED BANK, N. J.

the cost of the apparatus we have an annual expenditure for disinfection of \$116 as against \$750 per annum for sand filtration.

On the basis of even the above somewhat hypothetical figures and circumstances, it must be at once apparent that Phelps' investigations are bound to play an important part in the future problem of dealing with sewage disposal methods.

If all rivers were of the same volume and of the same degree of purity, and if all sewages were of the same volume relative to the volume of river water, and all of the same strength and degree of impurity, only then would it be possible to lay down exact data and standards relative to sewage disposal. The facts being altogether otherwise, and exactly similar conditions being seldom repeated, every problem of sewage disposal must be to a certain extent determined on its own merits, subject to particular local conditions.

BACTERIA IN DRINKING WATER.

The following report shows the condition of Lake Ontario water at the City of Toronto intake on February 25th, 1910:—

The result of the analysis showed colonies of bacteria present in the following quantities per cubic centimeter:—

- Shore crib, 1,290.
- Manhole, 1,020.
- South end tunnel, 1,080.
- North end tunnel, 990.
- Tap, 1,020.

A report from Chatham, Ont., shows a higher count in the river water but a much lower count after passing through the filter.

The number of bacteria found in the river as compared with the count after passing the filter is as follows:—

River Thames, 2,900 bacteria to the cubic centimeter.

Sedimentation basin, 1,230 to the cubic centimeter.

Tap on filter, 175 to the cubic centimeter.

Harrison Hall, 475 to the cubic centimeter.

These figures would seem to show that splendid work is being done by the filter basin at the local waterworks.

THE ALBERTA AND GREAT WATERWAYS RAILWAY.

The Alberta and Great Waterways Railway made an agreement with the Alberta Government to build a line from Edmonton north-easterly to a point at or near Lac La Biche; thence to a point near Fort McMurray, approximately 350 miles. By Act of Parliament the company are allowed to borrow to the extent of \$40,000 per mile of railway (including sidings).

The Alberta Government guaranteed the bonds of the company to the extent of \$20,000 per mile on condition that the road be built according to the following specifications; that the Government act as treasurer for the fund; and that the road pass the Government engineers inspection.

There were a number of minor conditions, but they are mostly covered by the specifications.

Specifications for Construction of Road.

Specifications for works of construction and equipment of the Alberta and Great Waterways Railway:—

1. This railway shall be constructed in an equally substantial manner, and of the general character of that of the Crow's Nest Pass Railway between Lethbridge and Kootenay Lake, the whole to be executed to the entire satisfaction of the chairman of the executive council of Alberta.
2. The railway shall be a single track line with a gauge of 4 81-2 with necessary sidings.
3. The alignment, gradients and curvature shall be the best the physical features of the country will admit of; the maximum grade not to exceed fifty-three (53) feet to the mile, and the minimum curvature not to be of less radius than nine hundred and fifty-five (955) feet or six (6) degrees.
4. In all wooded sections the land must be cleared to a width of not less than fifty (50) feet on each side of the central line; all brush and logs must be completely burnt, and none thrown on the adjacent land.
5. All stumps must be grubbed out within the limits of cuttings under three feet in depth, or embankments less than two feet in height.
6. All stumps must be close cut where embankments are less than four feet in height.
7. The railway must be enclosed, except where it passes through stretches of forest lands, with substantially built legal fences of wire or wood; with the necessary gates or crossings to accommodate the farmers.
8. Road crossings with cattle guards shall be provided at all public highways crossing the railway at rail level where fencing is necessary, and railway crossings with sign boards shall be provided at all public highways crossing the railway on a level with the rails.
9. The width of cuttings at formation level shall be not less than twenty (20) feet embankment, not less than fourteen

(14) feet when settled in place. The slopes of cuttings and embankments shall not be less than one and a half (1½) feet horizontal to one (1) foot vertical in earth and one (1) foot horizontal to four (4) feet vertical in rock cuttings excepting in cases where the character of the material warrants a sharper slope.

10. Efficient drainage must be provided by open ditches and underdrains.

11. All bridges, culverts, and other structures must be of ample size and strength for the purpose intended. Piers and abutments of truss bridges of well-driven tamarac, white or Norway pine. Douglas fir or cedar piles or of cribwork of tamarac, white or Norway pine. Douglas fir or cedar timber resting on a solid natural foundation or on a foundation of well driven piles; as described above, filled with stone.

12. Culverts under embankments over twelve feet in height must be well built, strong second-class masonry, concrete iron pipes or double strength vitrified clay culvert pipes made of durable and suitable materials, thoroughly permanent in character, and equal in every essential particular to the best description of like work employed in similar work in the Dominion.

13. Open or beam culverts in embankments of about twelve (12) feet height and under, shall be of strong second-class masonry, concrete, or of walls of cedar timber not less than ten (10) inches square, or of well-driven piles of cedar, white pine, tamarac, or Norway pine, not less than fourteen (14) inches at the butt, with stringers of sound pine, white oak, Douglas fir, of tamarac timber not less than 12 x 14 inches. The span shall not exceed fourteen (14) feet in the clear.

14. Box culverts under embankments less than twelve (12) feet in height shall be of strong second-class masonry or cedar timber not less than 10 x 10 concrete, or double strength vitrified clay culvert pipes.

15. The rails shall be of steel, weighing not less than fifty-six (56) pounds per lineal yard of approved section and with the most approved fish-plates.

16. The railway shall be well balasted with either prairie loam or other suitable material for depth of not less than ten (10) inches under the sleepers and properly trimmed off and boxed up.

17. The sleepers shall be eight (8) feet long and six (6) inches thick and if hewn on two sides they shall have a face of not less than six (6) inches, if squared the face shall not be less than eight (8) inches.

18. Through sidings not less than 1,800 feet in length between switches shall be provided at suitable places and as nearly as practicable at average distance of nine (9) miles apart, or such other distance or distances as the minister may in writing approve with additional sidings of such length and number as may be necessary for the traffic similar to the Crow's Nest Pass Railway.

19. Station houses and water tanks of the general character of those built on the Crow's Nest Pass Railway shall be provided at as nearly eighteen miles apart as practicable or such distance or distances as the said chairman of the executive council may in writing approve.

20. Engine houses, workshops, coal sheds, etc., shall be provided at division and terminal stations, all to be sufficient to meet the requirements of the traffic of which the said chairman of the executive council shall be the sole judge.

21. Sufficient rolling stock necessary to accommodate and conduct promptly and efficiently the traffic and business of the line shall be provided by the company, of which the said chairman of the executive council shall be the judge

CONSULT OUR CATALOGUE INDEX on page 6.

We can put you into immediate touch with the principal manufacturers of and dealers in all kinds of engineering and contracting equipment. A postcard to this department will insure the receipt of the desired catalogue.

22. Trestle and pile bridges shall be constructed according to the Crow's Nest Pass Railway standard plans of white or Norway pine, tamarac, Douglas fir and white oak.

23. Upon the application of the company the chairman of the executive council may make such modifications in the foregoing specifications as he may deem advisable.

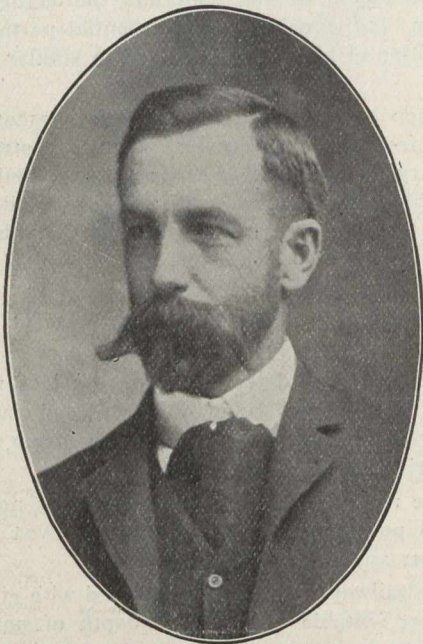
THE CANADIAN MINING INSTITUTE.

The twelfth annual meeting of the Canadian Mining Institute was held in Toronto, March 2nd, 3rd, and 4th.

The attendance was large, the papers presented covered almost every phase of mining work, and on public policy and Institute matters the discussions were exceedingly lively.

Mr. W. G. Miller, the retiring president, in his presidential address spoke in part as follows:—

"The year has been a period of steady and substantial



W. G. Miller, President of the Canadian Mining Institute, 1909.

growth and activity, although no developments of a sensational character have been witnessed. Almost every year sees the exploitation of new mining camps in Canada." He then referred to the sensational strikes in Porcupine, and Portland Canal in British Columbia.

The amalgamation of large industrial concerns was a good move, provided these industries are not unduly handicapped by over-capitalization.

"Notwithstanding the prices of metals generally having been somewhat lower than prices during 1908, the value of mineral production for 1909 should show a gain of a few millions. Ontario, I believe, will be chiefly responsible for this.

Less Dependent.

"Canada has become less dependent on foreign smelters and refiners. The Granby copper smelter in British Columbia is the finest in the world, also work in metallurgy has greatly advanced in Ontario lately."

He was pleased that more railroads were being built. It is said 65 per cent. of freight in the United States carried by railroads was minerals. "Conditions will be the same in Canada in a short time, which looks very encouraging." It was said that the three greatest railways in the world would

spend \$60,000,000 in building new lines. These would make accessible to the miner and prospector vast mineral-bearing territory.

"In the vicinity of the Great Bear Lakes and the Great Lakes there promise to be mineral deposits, but under present conditions it is impossible to explore the country."

Law Is Weak.

"In all mining legislation two classes have to be considered, namely, the poor man or prospector, and the capitalist. The tendency is, when laws are made with the object of preserving both the rights of the prospector and the rights of the capitalist, confusion arises. The weaknesses in the mining laws of the various provinces of Canada are due to this. If only one class was to be considered, the laws could be made much simpler.

"In Ontario and British Columbia one of the great weakness is blanketing. This is due largely to permission to stake by proxy. A man is not permitted to stake two, three, or more claims on his own license, but by getting licenses in the name of his relatives and others, he can secure many. An acreage tax is the best remedy, the best preventive to blanketing and tying up mineral laws."

"The prevention of mine accidents is a subject that has received careful attention in Canada. With regard to the inspection of the metal mines of Ontario, with which I happen to be familiar, I may say that I do not know of any metal-mining State in the Union where the inspection has been more systematic. Accidents will always be more numerous where there are many small mines or prospects than where the same number of men are employed in a few large mines. The inspection, including analyses and other tests of explosives, is a subject with which mine managers cannot be expected to deal. It offers a field of work for the Government."

A Record.

The productions for 1909 in the various provinces, are:— Nova Scotia, \$12,598,004; New Brunswick, \$623,333; Quebec, \$6,526,185; Ontario, \$36,729,089; Manitoba, \$790,495; Saskatchewan, \$410,069; Alberta, \$5,953,928; British Columbia, \$22,798,909; Yukon, \$3,985,751. Totalling \$90,415,763.

This is the largest production ever recorded in Canadian history.

Outside of the technical papers read—of which there was some fifty-three—the most interesting discussion was on a motion by Mr. R. W. Bugstock, of Cobalt, seconded by D. J. E. Hardman, of Montreal, "That the Canadian Mining Institute regrets that the chairman of the commission on conservation should publicly have made statements reflecting

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Dear Sirs,—We placed an advertisement with your paper a short time ago to the effect that we were open to receive catalogues from manufacturers and as a result we are in receipt of many from all parts of the United States and Canada—south to Denver, east to Halifax and west to Vancouver, thus showing how widely read the Canadian Engineer is.

B. F. MITCHELL,

Sec. Edmonton Engineering Society,

Feb. 19th, 1910.

Edmonton, Alta.

on the mining and metallurgical practices of Canadian companies, without being fully acquainted with the actual facts."

The motion carried and every attempt to open the question and secure another vote failed.

The officers elected for 1910 are as follows:—President, Dr. Frank D. Adams, McGill University, Montreal; Vice-Presidents, A. B. W. Hodges, Grand Forks, B.C.; R. W. Leonard, St. Catharines. Councillors, Selwyn G. Blaylock, Moyie, B.C.; Robt. A. Bryce, Cobalt; Arthur A. Cole, Cobalt; John A. Dresser, Ottawa; Chas. Fergie, Montreal, Que.; R. T. Hopper, Montreal, Que.; G. G. S. Lindsey, Toronto; J. J. Penhale, Sherbrooke, Que.; J. B. Tyrrell, Toronto; O. E. S. Whiteside, Coleman, Alta.

Banquet Closes Convention.

The twelfth annual meeting of the Canadian Mining Institute was brought to a successful and creditable conclusion last night by a liberally attended banquet at the King Edward Hotel. Every part of the Dominion was represented, and the various phases of Canadian mining in their relation to the Federal and Provincial Governments were the main topics of discussion.

The first toast, to "The Dominion and Provincial Parliaments," was proposed by Mr. G. G. S. Lindsey, K.C., of Toronto. In responding, Hon. Frank Cochrane, Minister of Lands, Forests and Mines of Ontario, paid a tribute to the Canadian Mining Institute, and the value of its suggestions in mining matters. Mr. Ralph Smith, M.P., of British Columbia, argued strongly for the co-operation of the Dominion and Provincial Governments in mining matters. He stated that the list of fatalities in the coal mines of British Columbia for the past five years was greater than in any other country in the world.

Mr. F. T. Congdon, M.P., of the Yukon Territory, in responding to the same toast, advocated the institution of a code of mining laws uniform in character over the whole Dominion, and applicable to miners in every part of the country.

"Mining Industries" was proposed by Dr. A. B. Willmott, of Sault Ste. Marie, and responded to by B. B. Lawrence, consulting mining engineer of New York, and by Eugene oCste, of Toronto. With the toast to "Our Guests" were coupled the names of Col. A. M. Hay, of Toronto; Dr. R. H. Richards, of Boston, Mass.; and Dr. J. D. Irving, of New Haven, Conn.

Dr. Frank D. Adams, Montreal, President-elect of the Institute, Dean of the Faculty of Applied Science, and Logan Professor of Geology in McGill University, proposed the toast to "Sister Societies," which was responded to by Mr. A. R. Ledoux, of New York City, and Dean Galbraith, of the Faculty of Applied Science, University of Toronto. With "The Press" were associated the names of Col. A. M. Hay, Toronto; Mr. Frederick Hobart, editor of Engineering and Mining oJurnal, Brooklyn, N.Y.; Mr. J. C. Murray, B.Sc., of Toronto, editor of The Mining Journal, and Mr. E. A. James, B.A.Sc., editor of The Canadian Engineer.

NEW INCORPORATIONS.

Chatham, Ont.—Charles Austin Company, \$100,000. C. Austin, G. A. Gray, R. Killip.

Niagara Falls South, Ont.—St. David's Mountain Spring Water Company, E. W. Murphy, C. Lahey, G. D. Palmer.

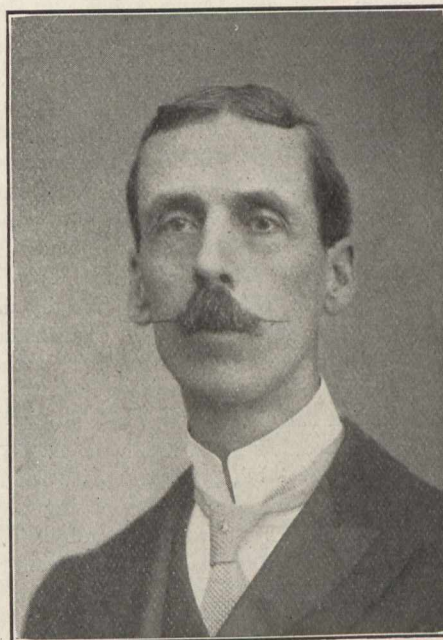
Lindsay, Ont.—John Carew Lumber Company, \$200,000. J. Carew, F. J. Carew, G. Carew.

Orillia, Ont.—Severn River & Lake Couchiching Navigation Company, \$100,000. T. W. Wood, Orillia; L. Sinclair, M. R. Edgar.

THE SECRETARY OF THE CONSERVATION COMMISSION.

James White, secretary of the Commission of Conservation for Canada, was born at Ingersoll, Ont., in February 1863, and received his early education at the Aitkins private school and Ingersoll Collegiate Institute; graduating from the Royal Military College at Kingston in June 1883. He received an appointment as topographer on the staff of the Geological Survey of Canada the following January and made surveys on the Rocky Mountains in 1884 and 1885, being associated at that period with the late Dr. Dawson.

In 1886 he made surveys in the Madoc, Ont., gold district; while during 1887-1890 he was engaged in investigating the phosphate district in Ottawa County, Quebec. In 1891-1893 he made surveys in the Kingston and Pembroke, Ont., mining district. Being appointed geographer and chief draughtsman to the Geological Survey in 1894, which position he continued to fill until 1899, when, the vacancy occurring he was appointed chief geographer of the Department of the



James White.

Interior. Under his guidance this branch was built up and map-work so organized that in 1909 nearly 80,000 maps were published.

In 1903 Mr. White was sent to London with the Alaska Boundary Commission during the trial of the famous Boundary Dispute; made investigations respecting fast transatlantic passenger steamships (the "All Red" Line) in 1906; in November 1909 on the formation of the Commission of Conservation he was appointed secretary.

Mr. White is probably best known to the engineering profession, through the medium of his publications. In 1906 he published the Economic Atlas of Canada, which he regards as his "chef-d'œuvre"; he has also published "Altitudes in Canada," "Dictionary of Altitudes," "Derivation of Place Names in Canada," several articles respecting the Ashburton Treaty, Oregon Boundary, Labrador Boundary, etc.; he is a Fellow of the Royal Geographical Society, member of the National Geographic Society, Canadian Society of Civil Engineers, Champlain Society, American Academy of Political and Social Science, etc.

THE KENORA ARBITRATION.

With the taking up of the awards by the parties interested two long-standing arbitrations have been brought to an end. The disputes have been dragged along through the courts since 1906 and related to the value of a partially undeveloped water power on the Winnipeg River expropriated by the municipality of Kenora.

The lands in question were situated on both sides of the Winnipeg River. One acre was originally held by the Keewatin Power Company, the other eleven acres on the other side of the river by the Hudson's Bay Company. In June, 1904, the Corporation of Kenora expropriated the properties, paying the Keewatin Company a sum of \$100, and the Hudson's Bay Company a sum of \$1,687.50.

In commencing the arbitration, however, the Hudson's Bay Company placed a valuation on their property of \$1,600,000, and the Keewatin Company of \$400,000. The difference in the valuation is explained as being the difference of the land as land and the land as a site for the Kenora power plant with a great potential future. It may be stated that when the suit was first begun the Crown claimed to have control of the river-bed and Power Company, but the claim was settled in favor of the Hudson's Bay Company.

The Board of Arbitration included, in addition to His Honor Judge Winchester, Mr. W. T. White, representing the Hudson's Bay Company; Mr. Hy. Holgate, representing the town of Kenora; and Mr. W. F. Tye, who joined the board in October as representative of the Keewatin Company.

The awards of the arbitrators are in favor of the Hudson's Bay Company for \$45,000, and the Keewatin Power Company for \$35,000, or a total of \$80,000, to be paid by the municipality of Kenora. The arbitrators were unanimous.

The effect of the judgment declaring the Crown lease invalid and of the award, is to give the town of Kenora not only the lands involved but the absolute title to the water power in addition for the \$80,000, whereas under the original clauses they would have got the land, paying a price for it, but the water power could only have been got by paying a yearly rent to the Government. The rent would be subject to revision every ten years, and naturally as the value would increase there could be expected a corresponding advance in the rental.

Because of the great interest in the value of water powers we give here a summary of the evidence put in by the expert witnesses called.

Leonard Davis: Thought \$350,000 was reasonable cost of development and \$100,000 to complete it. The real value of the undeveloped water-power was what the water rights could fairly earn; it would have to be attractive as an investment. This kind of investment involved higher rates of interest than regular form of security; especially where the market was speculative; if power could be sold the risk decreased. If the market was speculative the investor must be given a chance of making more than if there was a certainty of selling power.

An investor here would expect to get a return of 10 per cent for his money. Taking the cost at \$350,000—sinking fund, 2 per cent., equal \$7,000; insurance and taxes 2½ per cent., equal \$8,750, and interest, 7 per cent., equal \$24,500; equal \$49,000, plus \$6,000 for operation, gives \$55,000, or \$22 for 2,250 horse-power. There was nothing in sight in 1904. The present lighting load was 700 horse-power to flour mill, to flour mill 1,000 horse-power, or a peak load of 1,000 k.w. The power for lighting should be fairly sold at \$25 per horse-power, giving \$17,500, and 1,000 at \$10 would be \$10,000, or a total of \$27,500, thus showing an annual deficit of \$27,500.

On the basis of 5,000 horse-power, the investment was \$450,000, and the annual charges would be \$67,500, and the cost of producing the power would be \$13.50. He agreed with Mr. Smith's rate of charge in making up of the annual cost.

Of the 500 horse-power, for which there was a market in 1904, he would capitalize it at 10 per cent., equalling \$5,000, or a rental of \$1 per horse-power. The balance of power—4,500 horse-power—there was no present sale for, and the future sale was prospective. The present installation had an annual charge of \$45,500. Bonds at 7 per cent. equal \$24,500; depreciation, 2 per cent. equals, \$7,000; insurance and taxes 2 per cent., equals \$7,000, making a total of \$38,500. General expenses, \$5,000; wages and supplies, \$8,000; repairs, \$2,000, equals \$15,000; making a grand total of \$53,500, a cost per horse-power of \$17.40.

Estimating the power sold at \$25 and 600 horse-power, it would equal \$15,000, and 1,000 horse-power at \$10 would equal \$10,000, making \$25,000, leaving a deficit of \$43,500—\$25,000, equals \$18,500. There was no market for 2,500 horse-power, and the plant was of no use commercially beyond 1,600 horse-power. Another 900 horse-power might be sold for power at say \$15, yielding say \$13,500, but still a deficit of \$5,000 would have to be met, so that even with a market of 2,500 horse-power, it could not pay.

If the town could take 2,000 horse-power, at \$25, equalling \$50,000, then 1,000 horse-power to the milling company at \$10 equals \$10,000, and the balance—2,000 horse-power at \$10 per horse-power, but assumed at \$15 per horse-power, then the receipts would be \$90,000, leaving an annual profit of \$22,500, or a profit of \$4,500 per horse-power, but this was purely speculative, as we could not tell when it would be realized. It must be discounted to its present worth. It may be fifteen or twenty years before they could sell the whole 5,000 horse-power, and he assumed the period as fifteen years, and for a prospective proposition of this kind an investor would expect 20 per cent. for so distant a venture. This made capitalization rate for unused power \$22.50 per horse-power, on a basis of \$4.50 profit. That would be in 1919, or fifteen years from the date of expropriation, and, discounted to present worth, would be \$1.45 per horse-power year.

For 4,500 horse-power, being the balance of unused power, it would be \$6,525, figuring as at 1904. He took \$10 for 1,000 horse-power because that was what was being received and \$15 for what was not being sold. They had, at the end of fifteen years, a speculative value of \$22.50 per horse-power, for the undeveloped water rights. That would be the whole value. The whole question was one of market.

Another assumption was made after twenty years, in which nothing could be paid for the speculative part. He thought the whole water-power in 1904 was worth \$10,000 cash. The population in 1904 should have been 15,000 to make it a commercial proposition. There was no justification for a larger development. It would not pay to operate an electric railway in Kenora, and the line of the G.T.P. would be more economically worked by steam than by electricity on account of the cost of installation.

Cecil B. Smith, of the firm of Smith, Kerry & Chace, Toronto:—Mr. Smith assumed an available market close by with a demand for the whole power. An 8,000 horse-power development could have been put in for \$300,000. He would compare the cost of producing hydro-electric power with the cost of a similar steam power installation. Hydro-electric power would cost \$9 per horse-power per annum. Steam power with full load would be worth \$50, and on a partial load \$40, then \$40—\$9 would equal \$31, making a difference of

capitalization equal to \$3,000,000. The probable consumption of power at Kenora was 700 k.w., or 900 horse-power.

A plant equipped for 3,100 horse-power would have operating costs of \$36,000. This, on a basis of selling 1,800 horse-power, brought it to \$19 per horse-power. The cost of producing power was \$10, and it ought to be sold at the mill at \$20. The potential value of water was \$2 per horse-power. Steam cost, \$44; electrical power, \$19. The difference was \$25, and represented \$20,000 per year profit on the same to the mill of 2,000 horse-power, and the potential value of \$2 for 3,200 horse-power equalled \$6,400, making a total of \$28,400, representing a capitalization of \$568,000, which was the value of the power site.

Interest at 5 per cent., sinking fund at 2 per cent., insurance and taxes $2\frac{1}{2}$ per cent., repairs and maintenance $2\frac{1}{2}$ per cent., wages \$6,000, equalled 12 per cent. and wages. If 2,500 horse-power were produced, the cost would be \$14.50 per horse power, with power house for 5,000, but not fully equipped. The cost, if the full 5,000 horse-power were produced would be \$9 per horse-power.

Mr. Smith knew of no reason why millers should come to Kenora except because of arrangements with the railway for trans-shipment and as the cheap power question was not important in milling—it only amounted to one cent per barrel—it was a minor consideration.

The railway connection was a possible customer for electric power. But the plant was too small if the railway were electrified. Nitrogen might be manufactured there. The development as it was, was not such as would be taken up commercially.

Power for flour mills cost more to produce than the town got for it. He would estimate the revenue at \$5 per head per annum. A population of 38,000 would be required to use up the power.

The present sale of light and power ought to carry the investment, so that the future business would be clear profit. A cheaper method of development might have been designed.

The cost of producing 2,500 horse-power equalled \$14.50 per annum, and carried the burden of the full hydraulic work exclusive of machinery for the remainder of the power. The carrying of this burden was unavoidable. The western outlet was more suitable for a large pulp industry than was the eastern. It was commercially possible to develop on the west side.

A pulp mill at Niagara Falls paid \$5 per horse-power for water. A firm at Ottawa paid \$10 per horse-power for water. The water could also be diverted from the east to the west channel by placing a dam in the east channel. He knew of \$2 being paid for water on the Trent Valley, but not \$4. In the case of the \$2, the Government had spent \$25 per horse-power, and the owners \$50 per horse-power in developing. This was a 4,000 horse-power plant, paying an annual rental of \$8,000 on the Government's expenditure of \$100,000. This at 5 per cent. was \$5,000, leaving \$3,000 for the water, but the dam was no doubt, underestimated, so the "water" charges would be less or perhaps nothing if the dam cost \$160,000.

Power was sold in Ottawa at \$15 per horse-power; for \$20 in Peterboro, and \$15 in Orillia; at Bracebridge \$12, and at Port Arthur, \$18. In dealing with the Niagara power the basis was \$12 per horse-power, but it varied with the size of the development, down as low as \$8 or \$9 per horse-power on a capital cost of \$60 or \$70 per horse-power.

The Belgo-Canadian Company at Shawinigan had, as a basis, \$5 for water. Power at Shawinigan was sold at \$10 per horse-power, and it was transmitted to Montreal at \$15.

The Ontario Hydro-Electric Commission would deliver power at Toronto at \$18.10. The estimated demand for power in Ontario was about 300,000 horse-power.

The development at the west branch should cost \$65 or \$70 per horse-power, on the basis of a 20,000 horse-power. If the town developed say, 800 horse-power at the west branch, the power developed at Kenora would cost \$16.50 per horse-power per year. Their firm paid \$10,000 for a 2,000 horse-power site near North Bay. This site had a 90-foot head, and, by storage, the horse-power could be increased to 4,000. The controlling factor was the stability of the market for power. The pulp industry could afford to pay \$10 for power, but a pulp industry in order to live would have to get from 5,000 to 10,000 horse-power.

The Kenora development was an ideal one, but it would cost \$125 per horse-power to develop on the west side of the east branch for half, or, say, 2,500 horse-power.

Douglas C. Cameron, formerly mayor of Kenora: The town made a definite offer to the Hudson Bay Company of \$25,000. Mr. Willis Chipman, C.E., of Toronto, advised that if they made the offer \$30,000 he would recommend the company to sell it. Then, on August 28th, 1902, Mr. Chipman wrote that the company would not sell but would lease the power to the town. In 1903 the town got authority to appropriate the power on both sides of the river. He thought he could put in a sufficient development for \$100,000, or, say, \$125,000. Mr. Cameron tried to interest grain men in building mills at Kenora, but they thought Kenora not the right point to make flour. They would not increase their mill capacity at Kenora because it was easier to transport the grain in bulk than it was as flour. They were building at Port Colborne and would use 2,000 horse-power, for which they would pay \$8 per horse-power. There was a saving of ten cents per barrel over Kenora by manufacturing at Port Colborne, and so they would not extend their Kenora mills. The only industry he could see for Kenora would be a pulp mill, and it would afford to pay \$5 to \$6 per horse-power for water power; it would not require electric power. The mining industry had died out, the lumber business was decreasing and the furniture industry was not likely. He did not believe this power would ever be sold except at a very low rate. They had in the past three years cut out half their saw mill plant and moved it away. The capacity of the New Keewatin Lumber Mills was less than of the old ones.

In 1893 there was a power on the west of the west branch of the Keewatin called the Dick Banning power with three wheels installed for driving a sawmill. This power could be increased by widening the canal in the rock. They bought it with nineteen acres of land and the plant for \$35,000, being the value placed upon it by Thomas Pringle. It was then the only water power there, and they could have developed it to a large amount as they had the whole of the Lake of the Woods.

The water power itself was valued at \$8,000, which covered the land, the power and the development. They offered this power for sale, holding it from 1893 to 1897, when it was sold during the mining boom to the Ottawa Gold Mining and Production Company for \$25,000. This power had since been further developed and was operating a mill of four to five thousand barrels of flour per day, about 2,000 horse-power. The Lake of the Woods Milling Company's power was adjacent to this one, and there was the development of the Keewatin Lumber Company, further west on the same bay, and all were of the same character, and all three were in Keewatin.

He was mayor of Kenora when the town took over the electric light and telephone services. This was done be-

cause they thought the rates were too high, but they were about the same now, and could not be lowered because the revenue was required to maintain the service. He was before the Private Bills Committee when the Act was obtained to permit the town to expropriate. Senator Gibson appeared for the Keewatin Company. He said this development had cost \$500,000, and they were prepared to fully develop power and sell the town water power developed for \$7.50 per horse-power, per year.

Flour mills would not be interested in Kenora for years to come, and the town had not increased in the last three years.

They got 24-hour electric power at the Welland Canal at \$8 per horse-power per year. Freight rates were such that they could not afford to ship wheat to the Lake of the Woods and grind it and then ship the flour back.

Henry N. Ruttan, Winnipeg: He knew the east channel in the natural state when there was at least 5,000 horse-power available. For valuation purposes he divided it into three parts, the first part to be used for civic purposes, such as lighting, pumping water and general motor service, say 1,000 horse-power. Second, he assumed a contract for 1,000 horse-power for flour mills, and third, unappropriated, 3,000 horse-power. The first item was worth as to water power the difference between water power and steam power. The power for milling he estimated at \$25, and the balance of unused power at \$400. This made:—

1,000 H.P. at \$45.70	=	\$45,700.
1,000 H.P. at \$25.	=	25,000.
3,000 H.P. at \$4	=	12,000.
Total	.....	<u>\$82,700</u>

And this, capitalized at 5 per cent., amounted to \$1,654,000. Power for flour mills in Winnipeg was at the rate of \$35 and at Fort William it was \$25.

He estimated the cost of development at \$300,000, operating charges 11 per cent., or \$33,000, and attendance at \$9,000, making \$42,000 of an annual cost, or \$8.40 per horse-power. Steam power he valued at \$60. This, less \$8.40, equals \$51.60 per horse-power of a saving over steam power, which, on 5,000 horse-power, equals \$258,000, and capitalized at 5 per cent. equals \$5,160,000. But power would not be worth that amount. The value, of course, depended upon the use being found for the power. He expected in a few years all power would be taken up and used by the electric railways and the establishment of additional flour mills. Land and water rights went together. The actual value of power to the town in 1907 was \$1,654,000, being a rental value of \$82,700, had it been obliged to have the power and use steam. This was what they could afford to pay the owner for it. Rental to the owner for unused power should be \$4 undeveloped, and on this basis the capital would be \$400,000. His reason for basing the value of \$4 on undeveloped power. "If I owned the power, I would not let it go at any less than that. I would hold it." It is almost impossible to tell precisely what the real value of that water power is. Power saleable is so large and prices so great that \$4 rental is a very small part. Value is a question of market, present and prospective. Producer gas power would cost two-thirds of steam power.

Hedley Shaw, of the Hedley Shaw Flour Milling Co.: The capacity of the flour mill building at Kenora is 5,000 barrels a day, with machinery installed for 2,500 barrels.

They have a contract with the town to deliver power at the mill for \$10 per horse-power per year. The mill was a mile from the power house. They had an option on 1,000 horse-power, in addition to the 1,000 horse-power they were at present using. They did not want the additional power, and so did not use the option, because they could manufacture in other localities to better advantage than in Kenora with power at \$10, at points on the Welland Canal, for instance, on account of transportation. Power on the Welland Canal was as cheap as at Kenora, and materials in raw state were cheaper than taking it at Kenora, manufacturing there, and then shipping East, and all their product manufactured at Kenora must go East, so that cost of manufacturing there was increased over other localities. They milled in transit at Kenora; grain was stopped off there, and the charge was one cent per hundred for stop-off. That would not apply at Fort William, as it was a point for terminal freight rates.

With them, this amounted to 2,500 barrels per day, and, in three hundred working days, 600,000 barrels of flour per year, or, say, three million bushels of wheat. At one cent per hundred that would be \$18,000 for stop-off charges, which was a handicap over Fort William. The handicap was worse as you went east, because the freight on wheat was lower than on flour; they could take it from Fort William to Port Colborne elevator for 1½ cents per bushel. The Fort William to Toronto rate on flour was 15 cents per hundred, and to Montreal, for export, 14½ cents, lake and rail. By getting wheat at 1½ cents to Port Colborne they got competition between rail and water to Montreal or New York and thus secured a lower through rate. They paid 20 per cent. more in wages at Kenora than on the Welland Canal, on account of the higher cost of living at Kenora. Winnipeg had an advantage over Kenora because one could distribute west from Winnipeg and could not do so from Kenora. They also had a local trade. Compared with Montreal, Kenora was the better site for domestic milling, but for export it was not better situated. Montreal was not as well situated as Port Colborne for export. It was better for them to have to increase their output by establishing mills in the east, rather than to expand at Kenora, and that was what they were doing. In respect to other manufacturers, Kenora was in the same position. Freight was a greater consideration than power in dealing with heavy freight. Labor conditions also applied. The cost of making barrels was less in Ontario east of Fort William than at Kenora. The cost per barrel was five cents more at Kenora than on the Welland Canal. They got power at \$8.00 at Port Colborne. Power at Kenora cost about 1½ cents per barrel of flour; if at \$25,000, it would cost 3¾ cents per barrel, or 2¼ cents per barrel more, that would be at \$25,000 for power. The stop-off cost \$18,000. They paid \$10,000 for power, so that if they paid \$25 per horse-power, and had no stop-off, they would save \$3,000 a year. Freight rates were against Kenora, both east and west. As for Eastern trade, Kenora had an advantage over Winnipeg of 2½ cents a barrel, with power at Kenora at \$10 and \$35 at Winnipeg.

For export business, Port Colborne was the best place, and with power at \$10 Kenora was better than Winnipeg, and equal to Port Arthur. Labor was easier in a large place, and Winnipeg offered a market for mill refuse. He would prefer to pay \$20 for power at Fort William than \$10 at Kenora.

Alex. Pringle, Consulting Engineer, Montreal: The cost of the work was increased by reason of the stoppage of the work in the summer for some time, thus forcing the work into the winter. The present work cost \$358,000, and \$100,000 would be required to complete it. A little less than 5,000

horse-power could be delivered on the buss bars. Kenora was marketing all the power it could sell at present. He could not name any industries likely to locate there. \$25 per horse-power would be a fair price for the town to pay for power used for municipal work. The Province of Quebec was preferable for the pulp industry. Shawinigan sold power at \$10 to secure the location of industries. He would place no value on the undeveloped power unless he had a franchise from the town. He valued the power at \$2 per horse-power, or say \$10,800 with the town franchise, because he saw no prospect of further market for power. The cost of the work was not very unreasonable. He did not take steam into consideration in arriving at the value of the water power. The present prices in the town's contract with the milling company were ridiculous. All other sales of power were speculative. If the price of the power sold were higher, the value of the power undeveloped would be higher also. The power was a favorable one to develop.

Clemens Herschell, C.E., New York: The valuation of lands and water rights came up frequently in practice, in cases where he had advised. He had examined the ground, and had read the evidence of Messrs. Smith, Ruttan and Kennedy. The Lake of the Woods had three artificial outlets. An artificial outlet was one that was controlled by man, and that had a depreciating effect on the eastern outlet, because it was subject to the other two outlets as to the quantity of water, making the east branch an undesirable power site, as its rights were not defined, making it liable to litigation, so that a prudent purchaser would not invest in it. It was impossible to say how much power was appurtenant to the east branch.

He thought the development was properly designed and built; the cost of \$350,000 was not excessive, and \$100,000 to complete it was all right, making a total of \$450,000, or \$90 per horse-power, which was a fair price for development.

In considering the price to sell power at, he would keep in mind two possible competitors, but would not be afraid of steam power, which would cost more. The elements that went to make up value were:—facility of development, height of fall, size of block of power to be developed, ice troubles, market for sale of power, demand for it, facility of securing skilled and unskilled labor, population, and, above everything, freight rates for general manufacture. There were two classes of power, one local for lighting and traction and the other for manufacturing on a larger scale. For the latter, freight rates were the important consideration. Without favorable freight rates a manufacturer would not settle down. In that case, there was also the possibility of competition arising from the development of the two other outlets. Owing to the importance of freight rates, powers in the central part of Ontario were in competition with Kenora. This was a matter of experience in the business. The effect of competition would be to reduce the value of a water power. It was governed by the law of supply and demand, and nothing else, having regard to the other considerations also.

Six or seven hundred h.p. was too small to develop in the east branch or anywhere else. As at 1904, the west branch possibilities would have a depreciating effect on the east branch, as the west branch might be developed at any time, being then partially developed, and the fact of it having been lying so long incomplete shows that the place was undesirable to settle in for manufacturing purposes, for had it been desirable, it would have been completed.

In 1904, the owners of the east branch, having no franchise or contracts for power, their water rights were worth nothing, or some nominal sum, according to how eager

a man was to start in an investment of that sort. If a man paid \$1,000, that would be a buyer's price; if he paid \$5,000, that would be a fair price between man and man, and if he paid \$10,000, he would pay too much. This covered everything—water and land rights—and an obligation or assurance that the level of the Lake of the Woods be kept up, and a settlement as to how much water might be drawn out by each.

He did not think that a prudent purchaser would invest his money in the property which the town was expropriating, and unless something more than lighting and traction was in sight, an investor would have no use for such property. The town saw victory, and saw no such word as fail, and rushed in where an ordinary individual would not.

The Hudson Bay land was more valuable than the Keewatin property, as it gave access to the power. The denser the population, the more power sites were worth as a rule. Prices for power had been declining, and there was not much in the business now.

SOCIETY NOTES.

Central Railway and Engineering Club of Canada.—The above society will meet at the Prince George Hotel, Toronto, on Tuesday, March 15th, at 8 p.m. when Mr. M. J. Quinn, manager National Equipment Company, Toronto, will read a paper on Sewage Disposal and Water Supply.

Dominion Land Surveyors.—The annual meeting of the Association of Dominion Land Surveyors closed with a banquet in the Russell hotel. The president, Mr. R. E. George was toast master. Senator Casgrain replied for the Senate, and Dr. Cash, M.P., for the House of Commons. Mr. George Rainboth proposed the toast to the Profession and Mr. C. A. Magrath, M.P., responded.

An excellent paper was given in the morning by W. M. Tobey, M.A., D.L.S., of the observatory, entitled, "A Comparison of Geodetic and Astronomic data and results deduced therefrom," and another by A. O. Wheeler, D.L.S., of Calgary, describing the work of the Alpine Club of Canada. In the afternoon R. E. Young, D.L.S., president for the Association gave an interesting paper on the North Land of Canada.

The officers elected for the coming year are: Dr. W. F. King, of Ottawa, honorary president; Mr. Thos. Fawcett, of Niagara Falls, president; Mr. P. R. A. Belanger of Ottawa, vice-president; Mr. A. W. Ashton, of Ottawa, secretary-treasurer; executive, Messrs. J. D. Craig of Ottawa; C. F. Aylesworth of Madoc, Ont.; and F. T. Nash of Ottawa.

Nova Scotia Society of Engineers.—Mr. T. J. McKavanagh, Chief Electrician of the Cable Steamer Minia, will read a paper on "Submarine Cables," at the regular monthly meeting of this Society, held on Thursday, March 10th, at 8.15 p.m., in the Nova Scotia Technical College, Spring Garden Road, Halifax.

Engineering Society, McGill.—The first annual dinner of the Faculty of Applied Science was held in the Place Vigier Hotel, on the evening of Tuesday, March 1st, and in numbers and enthusiasm was one of the best of its kind ever held at McGill.

The guest of honor was Hon. Sydney Fisher, Minister of Agriculture. The guests numbered many prominent engineers, including Controller Wanklyn, Mr. John Kennedy, Dr. Milton Hersey and Mr. F. W. Cowie. Mayor Guerin was also present.

The toast master's chair was occupied by Mr. O. N. Brown, President of the Applied Science Undergraduate's Society, who proposed the toast to "The King." "Our Guests," was proposed by Mr. W. A. Robertson and responded to by Hon. Sydney Fisher, Mayor Guerin and Mr. F. L. Wanklyn. Mr. Fisher dwelt on the wonderful opportunities which Canada presented to the engineer. "The country," he said, "was crying aloud for men of skill in the sciences, following the steady influx of capital for development." Hon. Mr. Fisher alluded to the achievements of the agriculturalists of the three prairie provinces. It was a matter of great pride to Canada to observe the work done

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RAILWAY EARNINGS AND STOCK QUOTATIONS

NAME OF COMPANY	Mileage Operated	Capital in Thousands	Par Value	RAILWAY EARNINGS.				STOCK QUOTATIONS TORONTO					
				Date from	Date to	1910		1909		Price Feb. 18 '09	Price Feb. 10 '10	Price Feb. 17 '10	Sales Week End d Feb. 17 '10
						Jan. 1	Feb. 28.	Jan. 1	Feb. 28.	168½	181½	182½	10
Canadian Pacific Railway...	10,048	\$150,000	\$100	Jan. 1	Feb. 28.	\$11,856.000	\$9,531.000						
Canadian Northern Railway.	3,180	.....	100	"	Mar. 7.	1,616.100	1,170.000					
*Grand Trunk Railway....	3,536	226,000	100	"	Feb. 28.	6,498.691	5,173.857						
T. & N. O.	264.74	(Gov. Road)	100	"	Feb. 28.	187,355	116,975						
†Montreal Street Railway...	141.79	18,000	100	"	Mar. 5.	673,184	636,927						
Toronto Street Railway...	114	8,000	100	"	Jan. 21.	298,612	263,513						
Halifax Electric	13.3	1,400	100	"	Feb. 14	24,370	23,371						

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

WEEKLY EARNINGS

NAME OF COMPANY	Week Ending	TRAFFIC RETURNS		
		1910	Previous Week	1909
Canadian Pacific Railway	Feb. 28	\$1,511,000	\$1,414,000	\$1,371,000
Canadian Northern Railway	Mar. 7	195,100	175,400	140,200
Grand Trunk Railway	Feb. 28	804,633	711,508	681,917
T. & N. O.	"	36,426	28,048	27,687
Montreal Street Railway	Mar. 5	74,734	74,025	65,085
Toronto Street Railway	Feb. 21	76,141	74,035	65,843
Halifax Electric	Feb. 21	3,566	3,437	3,224
†London Street Railway	"	18,063	.....	17,454

†For month of January—31 days.

THE LONDON STREET RAILWAY

The annual report of the London Street Railway for 1909 shows earnings of \$238,267,023, this is an increase over last year of some \$800,000.

This Railway secured its charter in 1875, and in 1895 was changed from the horse system to an electric system. The attached statistical statement gives the earnings, the expenses, mileage of track and population served, covering a period of years.

STATISTICAL STATEMENT.

Years Ended December 31.	1901.	1904.	1908.	1909.
Gross Earnings	\$141,845.59	\$180,017.67	\$235,032.40	\$243,359.39
Operating Expenses	84,556.95	122,673.71	167,566.72	169,830.44
Expenses, P. C. of Earnings	59.6	71.0	71.3	69.8
Net Earnings	57,288.64	57,343.96	67,465.68	73,528.95
Net Income, P. C. of Capital	8.36	6.12	7.10	8.08
Passengers Carried	3,744,469	4,531,776	6,442,998	6,673,709
Car Earnings, per Rev. Pass	3.90	3.78	3.64	3.62
Transfers	568,255	768,857	1,062,306	1,015,164
Total Passengers	4,312,724	5,300,633	7,505,304	7,688,873
Car Earnings per Passenger	3.11	3.24	3.07	3.09
Car Mileage	1,228,684	1,180,378	1,427,353	1,422,223
Gross Earnings per Car Mile	11.54	15.25	16.47	17.11
Operating Ex. per Car Mile	6.88	10.39	11.74	11.94
Net Earnings per Car Mile	4.66	4.86	4.73	5.17
Number of Miles of Track	28.36	29.97	33.25	33.25
Gross Earnings per Mile of Track	\$5,001.06	\$6,006.59	\$7,068.64	\$7,319.07
Population (City Estimate)	39,059	40,104	49,431	49,507

BRITISH RAILWAY EARNINGS

The following table gives the returns from ten of the larger British railways. The ratio of earnings to expenses and the earnings per mile of track are of considerable interest.

Name of Co.	Route Miles Maintained	Gross Earnings	Operating Expenses	Ratio. P.C.	Net Earnings	Misc. Income	Net Income
Great Central	626:00	2,285,431	1,488,475	65.14	796,956	130,670	927,626
Gt. Eastern	1,161:40	3,205,013	1,936,386	60.41	1,268,627	6,450	1,275,077
Gt. Northern	747:51	3,241,846	2,031,036	62.66	1,210,810	32,357	1,242,567
Gt. Western	2,960:00	7,264,366	4,384,305	60.35	2,880,061	15,240	2,895,301
London & N.W.	1,960:20	8,131,663	5,091,171	62.61	3,040,497	74,013	3,114,510
L. & S. W.	956:66	2,961,421	1,766,351	59.64	1,195,070	6,741	1,201,811
L., Brighton	454:20	1,836,406	991,372	53.98	845,034	.....	845,034
Midland	1,468:46	6,365,096	3,819,875	60.01	2,545,221	196,657	2,741,878
North-Eastern	1,722:00	5,443,734	3,351,102	61.52	2,092,632	2,383	2,095,015
South-Eastern	622:21	1,637,176	921,712	56.29	715,464	18,977	736,441

Canadian Pacific Railway Company's statement of earnings and expenses:—

	January 1910	July 1 to Jan. 31, 1910
Gross earnings	\$6,104,426.90	\$56,029,938.32
Working expenses ..	4,787,830.51	34,643,465.92
Net profits	\$1,316,596.39	\$21,386,472.40

In January 1909 the net profits were \$389,749.83, and from July 1 to January 31, 1909, there was a net profit of \$14,430,927.19. The gain in net profits over the same period last year is, therefore, for January, \$926,846.56, and from July 1 to January 31, \$6,955,545.21.

The following are the earnings of the Toronto Street Railway for January 1910, as compared with same period, 1909:

	Jan. 1910	Jan. 1909	Increase
Gross earnings	\$326,707.62	\$288,381.16	\$38,326.46
Net earnings	151,633.66	136,155.00	15,478.66

The gross earnings for February were \$305,556.99, which compares with \$275,833.67 in February of last year, being an increase of \$30,312.32.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

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

- 9704—February 24—Authorizing the C.N.O.R. to carry its tracks across the public road at the south end of Hamner Station grounds, Tp. of Caprool, Dist. of Nipissing, Ontario.
- 9705—February 25—Authorizing the A'lke Telephone Lines to carry wires across the G.T.R. Company's tracks in the village of Phelpston, Ontario.
- 9706—February 25—Approving location G.T.P. Railway, Prince Rupert easterly, mileage 359.00 to mileage 408.69, Ranges 4 and 5, Fort Fraser District, B.C.
- 9707—February 24—Authorizing the C.N.O.R. to carry its tracks across the public road between the East Quarter of Lot 11, Con. 2, and the East Half of Lot 11, Con. 1, Tp. of Caprool, District of Nipissing.
- 9708—February 24—Authorizing the C.P.R. to construct spur in the city of Winnipeg, from a point of connection with the old spur of the Winnipeg Electric Railway Company, known as the Gas Works Spur, running north-easterly over the property of the Winnipeg Electric Railway Company, and crossing Sutherland Avenue.
- 9709—February 25—Authorizing the C.N.O.R. to construct its tracks across the public road between Part Lot 10, Con. 3, and Part Lot 10, Con. 4, Tp. of Caprool, District of Nipissing.
- 9710—February 25—Authorizing the C.N.O.R. to construct its lines and tracks across the public road through Lot 6, Con. 2, Tp. of Hutton, District of Nipissing.
- 9711—February 25—Approving location of the C.N.R. through Tps. 38 to 29, Ranges 19 to 21, West of the 4th Meridian, Alberta; mile 104.73 to 171.66.
- 9712—February 25—Declaring that Order 9226, dated January 8th, 1910, issued in connection with the application of the Western Associated Press, respecting tariffs of tolls covering telegraphic service, was intended to apply, and does apply only to telegraphic matter delivered by the Telegraph Companies at points west of and including Port Arthur.
- 9713-14-15—February 26—Authorizing the Rural Municipality of Pipestone to carry its wires across the tracks of the C.N.R. at three different points in the Province of Manitoba.
- 9716-17-18—February 26—Authorizing the corporation of the village of Sutton, P.Q., to carry its electric light wires across the tracks of the C.P.R. (Montreal and Atlantic Railway) at three different points in the village of Sutton, Quebec.

(Continued on Page 237.)

CONSTRUCTION NEWS SECTION

Readers will confer a great favor by sending in news items from time to time. We are particularly eager to get notes regarding engineering work in hand and projected, contracts awarded, changes in staffs, etc. Printed forms for the purpose will be furnished upon application.

TENDERS PENDING.

In addition to those in this issue.

Fuller information may be found in the issues of the Canadian Engineer referred to.

Place and Work.	Tenders close.	Issue of.	Page.
Edmonton, Alta., bridge	Mar. 12.	Feb. 11.	136
Moncton, N.B., railway	Mar. 15.	Feb. 18.	160
Ottawa, Ont., pine timber	Mar. 16.	Feb. 18.	160
Saskatoon, Alta., cast iron, etc.	Mar. 14.	Feb. 25.	48
Sault Ste. Marie, Ont., railway	Apr. 15.	Feb. 25.	48
Ottawa, Ont., railway	Mar. 15.	Feb. 25.	50
Saskatoon, Sask., college building	Mar. 29.	Mar. 4.	40
Fort William, gas franchise	Apr. 1.	Mar. 4.	42
Gaspé Basin, Que., pier	Mar. 18.	Mar. 4.	207
Hamilton, Ont., school	Mar. 12.	Mar. 4.	207
Ottawa, Ont., civic supplies	Mar. 15.	Mar. 4.	207
Ottawa, Ont., cast iron	Mar. 15.	Mar. 4.	207
Ottawa, Ont., waterworks supplies	Mar. 15.	Mar. 4.	207
Winnipeg, Man., cast iron	Apr. 4.	Mar. 4.	207
Sterling, Man., school	Mar. 12.	Mar. 4.	207
Yorkton, Sask., collegiate institute	Mar. 15.	Mar. 4.	207

Saskatoon, Sask.—The time for receiving tenders for University buildings here has been extended to March 29th. (See advertisement elsewhere in this issue).

TENDERS.

Montreal, Que.—Tenders will be received up till noon Saturday, 12th March, for the supply and delivery of 4,700 tons soft steam coal for the Low Level Pumping Station Point St. Charles. L. O. David, City Clerk.

Brantford, Ont.—Tenders will be received until Thursday, March 31st, for the furnishing and laying of about 2,180 feet of 12-inch extra strength sewer pipe and 705 feet of 12-inch cast iron pipe, together with 12 manholes; greatest cut 31 feet; average cut 16½ feet. T. Harry Jones, City Engineer.

Brantford, Ont.—Tenders for supplies of Cement and Sewer Pipe, will be received until March 17th, 1910. T. Harry Jones, City Engineer, Brantford. (Advertised in the Canadian Engineer).

Hamilton, Ont.—Tenders will be received until March 16th, 1910, for the erection of a school at Jerseyville, Ont. Munro & Mead, Architects, Hamilton, Ont.

Hamilton, Ont.—Tenders will be received until 12th March, for a steel building 200 feet x 90 feet, also mason work of same, for Sawyer-Massey Company. W. A. Edwards, Architect Hamilton Provident & Loan Building.

Hamilton, Ont.—Tenders will shortly be called for an asphalt road roller for heavy work. A. F. Macallum, C.E., City Engineer.

Ottawa, Ont.—Tenders will be received till March 17th, 1910, for timber, hardware, electrical and other supplies required for the Sault Ste. Marie Canal. L. K. Jones, Secretary, Department of Canals. (Advertised in the Canadian Engineer).

Ottawa, Ont.—Tenders will be received up to 10 o'clock, Thursday, 17th March, for the supply and delivery of Timber and Plank required for use on the Rideau Canal for the year 1910-1911. Specifications can be obtained from A. W. Campbell, Chief Engineer of the Department of Railways and Canals, Ottawa.

London, Ont.—Tenders will be called for at once for 2,000 feet of hose for the fire department.

Toronto, Ont.—Tenders will be received until Friday, March 11th, for enlargement of Kimberley Avenue school. W. C. Wilkinson, Secretary-treasurer, Board of Education.

London, Ont.—Tenders will be received by O. Ellwood, secretary Water Commissioners, up to noon, Saturday, March 19, for furnishing of the following supplies:—Brass fittings, hydrants, valves and valve boxes, iron castings, cast iron pipe and laying, stopcock boxes, coal, lumber, oils, lead pipe, hardware, rubber boots, rubber washers, rubber valves, rubber hose, rubber packing, flax packing, cotton waste brooms, metal polish, electric lamps, lanterns and glasses Canadian Portland cement. John M. Moore, C.E., Engineer and Superintendent.

Guelph, Ont.—The Public Works Committee have recommended the invitation of tenders for 1910, tar macadam paving, with concrete base, and a year's supply of sewer pipe and cement, while Engineer J. Hutcheon has advised the council to construct a tar macadam pavement on Waterloo Ave., at a cost of \$27,118.

Toronto, Ont.—Tenders will be received until March 22, for the construction of electric conduit at railway crossings. K. L. Aitken, electrical engineer. G. R. Geary, (Mayor).

Winnipeg, Man.—Tenders will be received until March 24th, 1910, for the construction of a Pile Protection Pier at Winnipeg Beach, Selkirk County, Man. Napoleon Tessier, Secretary, Department of Public Works, Ottawa, Ont.

Winnipeg, Man.—Tenders for the construction of extension to planing mill at Winnipeg shops, will be received until March 14th, 1910. Frank Lee, Division Engineer, C.P.R., Central Division.

Winnipeg, Man.—Tenders will be received up to April 4th, for cast iron water pipe, valves and hydrants, for extension of the waterworks system. Col. H. N. Ruttan, City Engineer; M. Peterson, Secretary, Board of Control.

Estevan, Sask.—Tenders for erection of a public school building will be received up to Tuesday, March 15th. Plans may be seen at the Builders' Exchange, Winnipeg; Wm. Zimmerman, architect, Moose Jaw. B. Glover, Secretary School Board.

Calgary Alta.—Tenders will be received until March 15th, 1910, for supplying the city with the following materials for the year: Bolts, nuts, washers, screws, boots, hose and rubber goods, blacksmith coal, electrical supplies, except w.p. wire, general hardware, iron, steel, oils, paint and greases, packing, pipes and fittings, poles, cross arms. H. E. Gillis, City Clerk.

Edmonton, Alta.—Tenders are invited until Friday, March 18th, for the erection of The Canada Permanent building, Edmonton. Plans and specifications may be seen at the Builders' Exchange and at the office of the architect. Roland W. Lines, Architect.

North Vancouver, B.C.—Tenders will be invited for 200,000 feet of sidewalk material required by this municipality. New specifications have been prepared, the tenders received in response to the last call not being satisfactory. Geo. Hanes, City Engineer.

Vancouver, B.C.—Tenders will be received until Tuesday, March 22nd, for two motor wagons and one sprinkling attachment for garbage collection. W. A. Clement, city engineer.

Vancouver, B.C.—Tenders will be received until Thursday, April 21st, for two hose wagons, two chemicals, and one aerial ladder, f.o.b. here. William McQueen, city clerk.

CONTRACTS AWARDED.

Fredericton, N.B.—The following contracts were recently awarded by Hon. John Morrissy, Chief Commissioner of Public Works:—Upper Mangerville low water wharf, Sunbury

County, to Edward S. Banks, of Upper Burton, \$2,000; Dugway Bridge, Sunbury County, to Whitman Brewer, of St. Marys, \$300; Shenstone Bridge, Albert County, to A. E. Smye, of Alma, \$4,600; York Mills Bridge, York County, to Frank Boone, of St. Marys' \$2,600; Superstructure of She-diac Bridge, Westmorland County, to Dominion Bridge Company, Montreal, \$13,000; Johnston's Cove arch culvert, Charlotte County, to Joe McVay & Son, St. Marys, contract price about \$4,000.

Toronto, Ont.—The city received the following tenders for the annual supply of lubricating oils, etc. :—
(Per Imperial Gallon)

Tender No.	Gasoline		Cylinder Engine Oil		Canadian American Coal Oil	
	cts.	cts.	cts.	cts.	cts.	cts.
1	16	29	13	10	16	
2	15	38	25	11	13	
3	18½	32	20	14½	15	
4	.....	45	24	.....	..
5	.....	37	21	.....	..
6	16	40	25	15	18	

As mentioned in last week's issue contracts were awarded as follows:—Cylinder oil—Ontario Soap and Oil Company (No. 6); Engine oil—McColl Bros. (No. 4); Gasoline—British-American Oil Company (No. 2); Best Canadian Coal oil—Canadian Oil Company, Ltd. (No. 1); Best American Coal oil—British-America Oil Company (No. 2).

Toronto, Ont.—Tenders for oil switches required in connection with hydro-electric installation have been tabulated, as follows:—

Tender No.	(Average Price per Ewitch)			
	Section A	B	C	D
1	\$670.00	\$303.33	\$670.00	\$303.33
2 (a)	717.66	250.00	.....	.....
2 (b)	735.00	345.00	.....	.....
3	.....	.....	641.70	270.00

In Section "A" the acceptance of tender "2b" of the Canadian General Electric Company, as this tender covered a very superior switch, it was recommended. In Section "B" the acceptance of tender "2a," Canadian General Electric Company was advised, while in Sections "C" and "D," No. 3 of the Canadian Westinghouse Company were recommended.

Toronto, Ont.—Fred Holmes, of Toronto, has been awarded the contract for the construction of the new wing of the Parliament buildings, which is to be erected immediately behind the present buildings. The price is \$517,634. The work will begin as soon as the weather permits on the foundation that was laid in the fall.

London, Ont.—Following contracts have been awarded in connection with equipment for Horton St. pumphouse:—Turbine pumps, J. McDougall, Caledonian Iron Works Co., of Montreal, for \$5,640; motors, dynamos, etc., Lancashire Dynamo and Motor Company, Manchester, England, \$11,032; compressors and gas engines, G. H. & H. J. Daniels, Stroud, England, \$13,000; brick and stone work, B. V. Hole, \$9,000. The motor equipment will be ready for installation on June 11.

Winnipeg, Man.—City has awarded to W. P. Lee a contract for 25,000 bbls. of cement at \$0.6406 per 100 lbs. excluding bags.

Winnipeg, Man.—The Jens Orten Boving Company, of London, Eng., have been given a contract for seven turbine governors for the new Point Bois plant. at \$23,000, while Glenfield & Kennedy, Kilmarnock, Scotland, were awarded the contract for valves at \$2,852.

Winnipeg, Man.—The municipality of Morris recently let contracts for grading, to J. & W. Preikshat, at 6½ cents per cubic yard, ditch measure, on the west side of the Red River and 7 cents on the east side. Other tenders were:—J. D. McDougall, St. Boniface, 25c. per cubic yd.; Esdras St. Germain, Winnipeg, 6½c. on west. 8c. east; D. McDonald, Verden, 8½c.; Hugh Pruden, Popular Point, 15c.; W. Shewman, Winnipeg, 8c.

Winnipeg, Man.—At a recent Board of Control meeting the tender of Thomas Jackson & Sons was recommended for a sewer on Sutherland Avenue, from Aikins to Powers Street at \$1,899.25. Tenders were also recommended for the construction of sewers as follows: McGregor Street, from Stella to Selkirk; McGregor, from Boyd to Mountain; Home Street,

from Buell to Bath. Water mains on Pritchard, Manitoba and Selkirk Avenues, from Battery to McPhillips were also recommended. Tenders were received from various parties for a portable asphalt plant but contract was not awarded.

Winnipeg, Man.—The Canadian Westinghouse Company's tender for equipment for the power terminal station, was recommended by the Board of Control, on the report of the power engineers. There were six tenders, as follows:—
Canadian General Electric Company..... \$138,250
Canadian Westinghouse Company 116,500
Siemens Bros., England 111,725
Ferranti, Ltd., England 89,850
Kolben & Company, Austria (not including testing transformers)..... 72,100
Brown Boveri, Switzerland (for power transformers only) 39,700

In regard to the tenders for the supply and erection of light, heat and power systems for the terminal station, the engineers recommended that of Chapman & Walker, Toronto, at \$8,225. There were three Winnipeg tenders as follows: Canadian General Electric Company, \$11,000; Shipman Electric Company, \$11,715, and Reese Engineering Company, \$15,064. Only one tender was received for the supply and erection of the oil and water system for the terminal station, that of Canadian Fairbanks Company for \$6,482, which was recommended. No tenders were received for the water cooling tower and accessories, the specifications being general in character. Detailed designs will be prepared and tenders again called.

Winnipeg, Man.—Canada Cycle & Motor Company have been given a contract for a "Russell" car required by the Street Commissioner.

Winnipeg, Man.—As mentioned in our issue of February 25th, the Algoma Steel Bridge Company were awarded the contract for the Louise bridge superstructure, at \$126,466. Other tenders were (cost of additional masonry being added to bid price): \$131,165, \$153,274, \$164,415, \$193,898.

Winnipeg, Man.—The following tenders were received for the erection of the terminal station in connection with the municipal power development at Point du Bois:—

Peter Lyall & Sons	\$ 94,000.00
Thomas Kelly & Sons	89,531.00
J. McDermid Company	82,006.35
C. W. Sharp & Son	113,735.15
Carter, Halls, Aldinger	90,977.71
Engineer of Construction	88,351.19
S. Brynjolsson	87,832.55
John Gunn & Sons	90,637.47
J. H. Tremblay Company	86,125.46
Claydon Bros.	78,159.51

They were referred to the engineer for report.

Saskatoon, Sask.—The Algoma Steel Company were awarded the contract for the overhead bridge at Twentieth Street, at \$14,500.

Saskatoon, Sask.—Following contracts have been awarded for annual supplies:—Iron pipe, James Robertson Company Toronto; sewer pipe, American Sewer Pipe Company, Akron, Ohio; water meters, Neptune Meter Company, New York.

Calgary, Alta.—The Canadian Pacific Railway have ordered from The Canada Cycle & Motor Company four "Russell" automobiles, for the use of the engineering staff in their irrigation department, which is centred here.

LIGHT, HEAT, AND POWER

Montreal, Que.—After a conference between the Board of Control and Mr. J. S. Norris, general manager of the Light, Heat and Power Company, an understanding was arrived at whereby the company agrees not to proceed further with court action to recover its claim of \$170,000 for street lighting for the past thirteen months but to leave the question open for negotiation between representatives of the company and the Board.

Peterboro.—The city council are preparing a by-law to raise \$70,000 to be used in developing electric power at the waterworks dam.

Parry Sound, Ont.—Council contemplate ordering extensions to electric light plant. G. Groves, superintendent.

Toronto, Ont.—The Erindale Power Company sustained a loss of \$1,200 this week by an unexpected flow of ice which

rushed down upon their new dam on the Credit River at Erindale. The ice made a gap in the centre of the dam about 75 feet in length. The damage will be repaired immediately. The Erindale dam is about 700 feet in width. The concrete which was carried away by the ice was only completed recently and had not had time to properly set. E. L. Edmonson, manager.

Nelson, B.C.—Nelson has decided to sell electric light to householders by meter hereafter, abandoning the flat rate. They will obtain an increased revenue of \$10,000 by selling electric current by meter instead of on the present basis of a flat rate. The cost of supplying meters will be \$15,000, but the city will avoid the necessity of expending from \$4,000 to \$5,000 on additional transformers and wiring.

Calgary, Alta.—The offer to take power from the Calgary Power Company at the rate of 6,000 horsepower at \$25 per horsepower for ten years, on the half-hourly daily average peak load, was adopted by the council, and the proposition will be submitted to the company.

SEWERS, SEWAGE AND WATERWORKS.

Sydney, C.B.—This municipality is applying to the legislature for power to borrow money for waterworks extensions.

Montreal, Que.—The Board of Control are asking for \$15,000 with which to engage experts in connection with water supply and filtration.

Penticton, B.C.—This municipality is considering estimates submitted by Kilmer & Tracy, Vancouver, engineers, for a domestic water supply, as follows: From Penticton Creek, \$108,707; from Chute Creek, \$131,838; pumped from Okanagan Lake, \$110,736.

RAILWAYS.

St. John, N.B.—C. O. Foss, chief resident engineer on the N.T.R. here, thinks that all the New Brunswick grading will be completed this year. The completion of the line in New Brunswick, he says, will be delayed by the construction of the steel bridges and aqueducts. The bridge over Salmon River will keep a large gang busy all summer. There will be 7,000 tons of steel in the structure. The whole work on the New Brunswick end of the Transcontinental will, he said, be completed on time. He did not think that contracts for station buildings would be called this year.

Chicoutimi, Que.—O'Brien, Gagne & Jennings have 200,000 yards of earthwork to let in contracts to suit outfits, also station work to commence as soon as snow leaves.

Montreal, Que.—The C.P.R. management has just placed orders for ten new engines of the Consolidation type, larger and heavier than those in present use with its own locomotive works at the Angus shops. Each one of these new engines will weigh 220,000 lbs. as compared with 190,000 lbs., the regulation weight of those in present use.

Montreal.—A statement was recently issued from the headquarters of the Grand Trunk Pacific showing that of the 7,900 miles authorized, 4,800 miles, or sixty per cent. were now either completed, being built, or under contract. On the main line, 3,550 miles from Moncton to Prince Rupert, a total of 3,000 miles has been placed under construction. On this there has been laid 1,795 miles of track, counting the Government section in the east and the G.T.P. proper in the west. While the Government end steel consists of a series of disconnected sections, the line of 793 miles from Winnipeg is complete, and has been in operation eighteen months. Within the past ninety days track laying has been completed 122 miles west from Edmonton to Wolf Creek. This completes steel on the prairie section of 915 miles between Winnipeg and Wolf Creek. Track laying was recently completed from Winnipeg east to Fort William, 445 miles, making a continuous stretch of steel of 1,360 miles from Fort William via Winnipeg and Edmonton to Wolf Creek. The report states that the Winnipeg-Fort William section cannot be completed for practical operation for some months, as considerable work has to be done at its east and west ends before trains can run over it. Contracts have been let from Wolf Creek west to Tete Jaune Cache in the Rockies, and one thousand teams and an army of men are now working there. Similar forces are at work on a section of 240 miles east from

Prince Rupert, closing the mountain gap. In addition to this, construction work is going on over 686 miles of branch lines in Saskatchewan and Alberta, which are being built under Provincial charters.

Toronto, Ont.—Mr. Justice Britton quashed the by-law authorizing Blanchard township to raise \$20,000 for the purpose of taking over debentures of the St. Marys & Western Railway.

Rockfield, Ont.—At the next meeting of the Board of Railway Commissioners in Guelph, the commissioners will hear argument from representatives of the G. T. Railway, Park and Island Railway, the Turnpike Trust Company and the municipalities interested, as to why an order should not issue providing for the construction at the expense of the parties interested of a bridge over the tracks of the Grand Trunk, and the Park and Island Railway, at Rockfield.

Winnipeg, Man.—The contract money on the National Transcontinental Railway has been withheld. This is due to charges of over-classification by former chief engineer Lumsden and now the subject of inquiry. At the present time there is \$4,000,000 held back on the McArthur contract.

Edmonton, Alta.—The Grand Trunk Pacific has now been completed as far as Edson, 120 miles west of Edmonton. From this point Foley, Welsh and Stewart have one thousand teams hauling supplies and cashing them along the survey as far west as Tete Jaune Cache, which is over the hill beyond Yellowhead.

FINANCING PUBLIC WORKS.

Following municipalities have sold debentures:—

Victoria, B.C.—\$184,000 schools.

North Vancouver, B.C.—\$139,000.

Richmond, B.C.—\$350,000.

Palmerston, Ont.—\$4,496 local improvements.

Thorold, Ont.—\$3,573.

Alberta School Districts.—\$12,500.

Charlottetown, P.E.I.—The Water and Sewerage Commissioners will ask the Legislature for authority to issue debentures to the amount of \$15,000 for the purchase of a new pump.

Romuald, d'Etohemini, Que.—The council recently passed a \$15,000 bonus to car-works by-law.

Quebec, Que.—City will apply to the Provincial Legislature for authorization to borrow \$200,000 for public works, \$20,000 to purchase lands and rights of servitude in connection with city waterworks; \$15,000 for works executed in Cote d'Abraham.

Woodstock, Ont.—The council have decided to borrow \$10,000 to be spent on building permanent streets.

Brantford, Ont.—Council is considering a \$100,000 market buildings by-law, while the ratepayers will vote on April 4 on a \$30,000 public schools by-law.

Brantford, Ont.—City Council made provision for a vote of the ratepayers on April 4 on three debenture propositions as follows:—Public school extensions, \$30,000; new bridge over canal, \$50,000; new market buildings, \$100,000.

Dauphin, Man.—J. W. Johnston, town clerk, offers for sale \$14,000 local improvement debentures.

Portage la Prairie, Man.—A \$20,000 new school by-law will be voted on by the ratepayers on March 22nd.

Regina, Sask.—A by-law to raise \$10,000 for the extension of the waterworks system will be voted on March 24th 1910.

Burnaby, B.C.—The council is considering a \$16,165 by-law for various purposes.

MISCELLANEOUS.

Montreal, Que.—Board of Control is asking City Council to vote \$900,000 for street repairs.

Lachine, Que.—An architect will probably be asked to prepare plans for a combination city hall, fire and police station, at a meeting to be held here this week.

Montreal, Que.—A Montreal paper says a good position is to be created by the Board of Control. It is that of Deputy Civil Surveyor. After discussing the matter the members of the Board have come to the conclusion that there is sufficient

work in the Roads Department to warrant Mr. Barlow, city surveyor being given a competent assistant.

Ottawa, Ont.—An order-in-council has been passed by the government granting a subsidy of 3 per cent. on the cost of the new dry dock which is to be constructed at Port Arthur, estimated at \$1,200,000.

Calgary, Alta.—The C.P.R. have practically completed the irrigation works in the western section of the block, comprising some 1,600 miles of canals and ditches, and plans and estimates recently submitted to the management covered the extension of the system to the eastern and central sections of the block, and involved a further expenditure of \$12,000,000.

PERSONAL.

Mr. H. Roy Miles, resident engineer, C.P.R., North Bay, Ont., has been elected to the council of the town of North Bay, Ont.

Mr. R. S. Lee, consulting engineer, Montreal, has been elected a member of the Institution of Civil Engineers, England.

Mr. F. H. McFadden is the new superintendent of the prairie division of the Grand Trunk Pacific, with headquarters at Melville, Sask. Mr. McFadden replaces Mr. Meahan who has taken charge of the mountain division.

Dr. Charles A. Hodgetts, secretary of the Provincial Board of Health, has recently been appointed by the King an Esquire in the Grand Priory of the Order of the Hospital of St. John of Jerusalem, of which His Majesty is the head.

Mr. A. J. Latronell, B.A.Sc., D.L.S., has been appointed City Engineer of Edmonton, Alta. Mr. Latronell has been acting City Engineer for two years, and his promotion has been expected for some time. Mr. Latronell graduated from Toronto University, Department of Engineering, 1903, and is an A.M. Can. Soc. C.E.

Mr. Norman D. Wilson, B.A.Sc., has commenced practice in Toronto as a surveyor and engineer. Mr. Wilson is an A. M. Can. Soc. C.E., and has had considerable experience in connection with railroad and municipal work. For the present he will have temporary offices at 41 Murray Street, Toronto, Ont.

Messrs. Jago & Harris (F. J. Jago and R. R. Carr Harris, C.E.), civil engineers and reinforced concrete contractors, have opened an office at Toronto in the Confederation Life Building. Mr. Jago will remain in charge of the Montreal office, 518 Coristine Building, while Mr. Harris will conduct affairs at the Toronto end.

Mr. B. S. Mackenzie, C.E., of the Quebec Bridge Company, is leaving Montreal to accept the position as assistant engineer on the G.T.P., with headquarters in Winnipeg. Mr. Mackenzie has been with the Quebec Bridge Company for the past six months. Previous to that he was assistant division engineer on the Eastern Division of the C.P.R., being associated with that road for ten years altogether. He is a graduate of McGill University.

Mr. S. J. Hungerford, shop superintendent for the C.P.R. at Winnipeg, has been appointed superintendent of rolling stock for the Canadian Northern Railway, with headquarters in Winnipeg. This is a newly-created office. Mr. Hungerford served for sixteen years with the C.P.R. He began railway work in 1886 with the South-Western Railway, afterwards incorporated with the C.P.R. Then he was for several years with the Central Vermont, returning to the C.P.R. in 1894.

Mr. E. W. Beatty has been appointed general solicitor for the C.P.R., with office at Montreal. Mr. Beatty is an old Ontario boy. Born at Thorold, he was educated at Upper Canada College and the University of Toronto, studying law at Osgoode Hall, with the firm of McCarthy, Osler, Hoskin & Creelman. On Mr. Creelman being appointed chief solicitor for the Canadian Pacific, Mr. Beatty, who was called to the Bar in 1901, accompanied him here, and in 1904 he was appointed assistant solicitor. His promotion creates a new office, consequent upon the appointment of Mr. Creelman as general counsel.

SOCIETY NOTES

(Continued from page 231).

there. Turning to the United States Mr. Fisher said that country in a short time would cease to export wheat and

would in perhaps 15 years time look to Canada for quantity of wheat, as it now does for quality.

Mayor Guerin eulogized the engineering profession for the work it has already done in the development of the country.

Controller Wanklyn mourned the fact that the engineering profession was the poorest paid for the hardest work. He advocated the same protection to engineers as is now accorded by the Government to doctors and lawyers.

"Alma Mater" was handled by Mr. George Murray and Principal Paterson. The latter spoke of the difficulties encountered in gaining the support of the citizens of Montreal for the University.

In a brilliant speech Mr. E. Vinet proposed "The Faculty," to which Dean Adams responded. "One of the things we must be thankful for," said the Dean, "is that we still retain our professors in spite of the high cost of living." He prophesied an aviation course on the college curriculum.

Other toasts were "Sister Universities," proposed by Prof. Evans and responded to by Mr. G. Archambanet of Laval; "The Profession," by Dr. Milton Hersey and Mr. John Kennedy, and "Sister Faculties," by Dr. Barnes and Dean Moysé.

Engineering Society (McGill).—A regular meeting of the Applied Science Undergraduates' Society of McGill was held on the evening of February 24th, when Mr. George C. Whipple, of Hazen & Whipple, New York City, read a most instructive paper on "Water Filtration in Theory and Practice." The society were honored in having at the meeting Mayor Overin and Messrs. Lachapelle, Wanklyn and Amey of the new Board of Control.

While the great epidemics have been an important influence in hastening the installation of filters, a still more potent force, said Mr. Whipple, is the public opinion that is rolling up in tremendous volumes in favor of better sanitation and greater cleanliness.

It is true that running water purifies itself but it does so only to a certain extent. These natural purifying processes may all occur and yet the water of a stream may remain unfit to drink because the processes have not been completed and the element of time has not been long enough. It is for the reason that we cannot depend upon the natural processes of purification, therefore, that artificial methods must be resorted to.

The question as to the relative merits of sand filtration ated by the lecturer as sedimentation, filtration, coagulation, aeration, disinfection and distillation. While a short description of each method was given the speaker's remarks were confined chiefly to filtration. In this connection the slow sand filtration process and that of mechanical filtration were described from the standpoint of efficiency, initial cost and cost of maintenance. Slides were shown of filtration plants in operation in various cities in the United States.

The question as to the relative merits of san filtration and mechanical filtration was sometimes a difficult one, said Mr. Whipple, depending largely on local conditions. Generally speaking, however, sand filters are to be preferred when they can be used.

In regard to purification of sewage Mr. Whipple stated that while it was a disgrace to allow our naturally pure streams to become as foul and unsanitary as many of them are, yet sanitary improvements, like all other improvements, cost money, and it is wisest to spend our money where it will go farthest. Water filtration is very much cheaper than the purification of sewage, and experience has demonstrated that from a sanitary standpoint it is more efficient.

"In conclusion," said Mr. Whipple, "while it is true that sedimentation and chemical coagulation, aeration and disinfection will improve the sanitary condition of a water it is only by filtration with or without the use of these supplementary processes, as they may or may not be necessary, that a public water supply can be secured that conforms to modern standards of hygiene and decency."

Mayor Overin and Controllers Lachapelle, Wanklyn and Averi spoke briefly in appreciation of Mr. Whipple's address, and in favor of filtration.

Others present included Dean Adams, Dr. Starkey, Dr. Milton Hersey and Mr. R. S. Lea.

The annual meeting of the society will be held on March 16th, when Dr. Barnes will deliver a paper on "The Problems of Winter Navigation."

(Continued from Page 232.)

9719—February 22—Directing that the G.T.R. keep the view at the said crossing free from obstruction by the growth of trees, or otherwise, and that, subject to this condition, the Railway Company be authorized to run its trains over the said highway crossing without limitation as to speed.

9720—February 24—Authorizing the V. V. & E. Railway Navigation Company to construct its industrial tracks across the tracks of the British Columbia Electric Railway Company and across certain streets and lanes in the city of Vancouver, B.C.

9721—February 25—Approving plans of drain to be constructed by the Township of Raleigh, under the tracks of the G.T.R. in the said township.

9722—February 25—Authorizing the C.P.R. to construct a spur for the Standard White Lime Company, Limited, at Beachville, Ontario.

9723—February 26—Approving location C.N.R. through Tps. 45 to 39, R. 18 to 20, west 4th Meridian, mileage 56.17 to 104.17, Alberta.

9724—February 26—Approving location C.N.O.R. through unsurveyed territory in the Sudbury Mining Division, mile 120 to mile 140 from Sudbury Junction.

9725—February 24—Directing that for the present and until further ordered the crossings of the G.T.R. at Trafalgar Road and Hale Street, in the Tp. of London, just east of the city of London, be protected by an electric bell to be installed within three months from date of this Order.

9726—February 25—Authorizing the city of Brantford, Ont., to construct a bridge on south Market Street over the canal of the Western Counties Electric Company, and the tracks of the Toronto, Niagara & Western, the Grand Trunk, and the Brantford & Hamilton Electric Railway Companies.

9727—February 28—Approving location G.T.P. Branch Lines Company, Yorkton-Canora Branch, from Sec. 2, Tp. 26, R. 4 to Sec. 36, Tp. 30, R. 4, west 2nd Meridian, Saskatchewan, mileage 25 to 54.70.

9728—February 28—Approving Supplement 3 to C.N.R. Standard Freight Tariff C.R.C. No. 38, giving maximum freight tolls to apply on the Pas Mission Branch between Hudson Bay Junction, Sask., and Pas Mission, Keewatin; also between stations on said branch and stations on C.N.R.'s other lines west of and including Port Arthur, Ont., and on the Qu'Appelle, Long Lake & Saskatchewan Railroad & Steamboat Company.

9729—February 28—Approving standard plans of C.P.R. for highway and farm crossings.

9730—February 28—Authorizing C.N.R. to open for carriage of traffic its line of railway from Etoimami, Sask., to Pas Mission, Keewatin, and directing that the Railway Company provide and furnish between said points a mixed train service once a week each way; the speed of trains not to exceed 18 miles per hour.

9731—February 22—Authorizing C.N.R. to open for the carriage of traffic its line of railway from Dalmeny to Laird, Sask.

9732 and 9733—February 25—Directing that the crossings of the M.C.R. immediately west of Woodilee Station, and at a point immediately west of Wyndham Station, be protected by standard electric bells.

MARKET CONDITIONS.

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

Montreal, March 10th, 1910.

In view of the discussion which is going on, concerning the probability that the Government will allow the bounties on iron and steel to expire at the end of their present term, namely, December 31st next, it may be interesting to learn upon what scale these bounties were paid during the past few years. The table which follows shows the rates during 1907, 1908, 1909, and 1910.

The bounty payments on pig-iron and steel manufactured by the electrical process do not expire with the others at the end of this year, having been extended to the end of 1912 as an encouragement to a process which is still in an experimental stage and the future of which is exceedingly doubtful. So far as the iron and steel trade is concerned, in Canada, it is not benefited by the continuance of the bounties on the electrical process. The table is as follows:—

	1907 & 1908.	1909.	1910.
Pig Iron (manufactured from Canadian ore).....	\$2.10	\$1.70	\$0.90
Pig Iron (manufactured from Foreign ore)	1.10	.70	.40
Puddled Bars	1.65	1.05	.60
Steel	1.65	1.05	.60
Mfrs. of Steel, Wire Rods	6.00	6.00	6.00
Electric Process, Pig-Iron		2.10	2.10
Electric Process, Steel		1.65	1.65

It is interesting to look back over the period in which bounties on iron and steel and the products thereof have been paid by the Dominion Government. In all up to the 31st of March, 1909, the sum of \$13,671,796 has been paid, this sum being made up as follows:—

Bounties on Pig-Iron	\$6,261,638
" " Puddled Iron Bars	113,674
" " Steel	5,660,782
" " Manufactures of Steel	1,635,702
Total	\$13,671,796

The payments began in 1895 and 1896, with \$169,215, falling to \$86,894 in 1896 and 1897, this being the smallest payment made in any one year. The following year this reached \$240,814. At the beginning of the century payments were within a short distance of the half-million mark, the following year reaching \$791,000, and jumping in 1902-03 to \$1,400,000. The \$2,000,000 mark was exceeded in 1905-06, and the largest payment ever made was in 1907-08, when not less than \$2,303,153 was distributed among the iron and steel plants of Canada, purely as a bonus. The payment in 1908-09 was about half a million less than the figure mentioned.

There were no new developments in the pig-iron markets of the United States. So far as can be seen, prices are about the same as before, and are likely to remain so for some time to come. Apparently the market is in very good shape and the coming season will see considerable activity, no boom being indicated, however, by anything that can be seen at present.

Cables from Great Britain are generally to the effect that quotations are about steady and trade is fairly active, although it is claimed that there are a few advances in price, here and there. The trade is feeling quite hopeful, from all accounts.

Locally there is no change. Things go on about as before. Demand is very fair and prices are steady. Dealers in all sorts of iron and steel products have been looking forward to advances in price but for some reason these advances fail to develop. The general feeling still is that as soon as navigation opens and outside construction is renewed the demand for bar iron and steel, plates and shapes and similar lines cannot but have the effect of forcing prices up. Meantime, the following list stands:—

Antimony.—The market is steady at 8 to 8½c. (111).

Bar Iron and Steel.—The market promises to advance shortly. Bar iron, \$1.85 per 100 pounds; best refined horseshoe, \$2.10; forged iron, \$2; mild steel, \$1.85; sleigh shoe steel, \$1.85 for 1 x ¾-base; tire steel, \$1.00 for 1 x ¾-base; toe calk steel, \$2.35; machine steel, iron finish, \$1.90; imported, \$2.20. (111, 119).

Building Paper.—Tar paper, 7, 10, or 16 ounces, \$1.80 per 100 pounds; felt paper, \$2.75 per 100 pounds; tar sheathing, 40c. per roll of 400 square feet; dry sheathing, No. 1, 30 to 40c. per roll of 400 square feet; tarrd fibre, 55c. per roll; dry fibre, 45c. (See Roofing; also Tar and Pitch). (164).

Cement.—Canadian cement is quotable, as follows, in car lots, f.o.b. Montreal:—\$1.30 to \$1.40 per 350-lb. bbl., in 4 cotton bags, adding 10c. for each bag. Good bags re-purchased at 10c. each. Paper bags cost 2½ cents extra, or 10c. per bbl. weight. (26, 164).

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

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

Copper.—Prices are strong at 14 to 14½c.

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

Galvanized Iron.—The market is steady. Prices, basis, 28-gauge, are:—Queen's Head, \$4.10; Colborne Crown, \$3.85; Apollo, 10¼ oz., \$4.05. Add 25c. to above figures for less than case lots; 26-gauge is 25c. less than 28-gauge, American 28-gauge and English 26 are equivalents, as are American 10¼ oz., and English 28-gauge. (111).

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

Iron.—The outlook is strong. The following prices are for carload quantities and over, ex-store, Montreal, prompt delivery; No. 1 Summerlee, \$21.50 to \$22 per ton; selected Summerlee, \$21 to \$21.50; soft Summerlee, \$20.50 to \$21; Clarence, \$19.50 to \$20; Carron, No. 1, \$21.50 to \$22, and Carron special, \$21 to \$21.50. (111).

Laths.—See Lumber, etc.

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

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

Lumber, Etc.—Prices on lumber are for car lots, to contractors, at mill points, carrying a freight of \$1.50. Red pine, mill culls out, \$18 to \$22 per 1,000 feet; white pine, mill culls, \$16 to \$17. Spruce, 1-in. by 4-in. and up, \$15 to \$17 per 1,000 ft.; mill culls, \$12 to \$14. Hemlock, log run, culls out, \$13 to \$15. Railway Ties; Standard Railway Ties, hemlock or cedar, 35 to 45c. each, on a 5c. rate to Montreal. Telegraph Poles: Seven-inch top, cedar poles, 25-ft. poles, \$1.35 to \$1.50 each; 30-ft., \$1.75 to \$2; 35-ft., \$2.75 to \$3.25 each, at manufacturers' points, with 5c. freight rate to Montreal. Laths: Quotations per 1,000 laths, at points 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. (112)

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

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

Pipe, Cast Iron.—The market shows a steady tone although demand is on the dull side. Prices are firm, and approximately as follows:—\$32 for 6 and 8-inch pipe and larger; \$33 for 3-inch and 4-inch at the foundry. Pipe, specials, \$3 per 100 pounds. Gas pipe is quoted at about \$1 more than the above. (74, 188).

Pipe—Wrought and Galvanized.—Demand is about the same, and the tone is firm, though prices are steady, moderate-sized lots being: ¼-inch, \$5.50 with 63 per cent. off for black, and 48 per cent. off for galvanized; ¾-inch, \$5.50, with 59 per cent. off for black and 44 per cent. off for galvanized; 1½-inch, \$8.50, with 60 per cent. off for black, and 59 per cent. off for galvanized. The discount on the following is 71½ per cent. off for black, and 61½ per cent. off for galvanized; ¾-inch, \$11.50; 1-inch, \$16.50; 1¼-inch, \$22.50; 1½-inch, \$27; 2-inch, \$36; 2½-inch, \$57.50; 3-inch, \$75.50; 3½-inch, \$95; 4-inch, \$108.

Plates and Sheets.—Steel.—The market is steady. Quotations are: \$2.30 for 3-16; \$2.30 for ¼, and \$2.10 for ½ and thicker; 12-gauge being \$2.30; 14-gauge, \$2.15; and 16-gauge, \$2.10. (111).

Rails.—Quotations on steel rails are necessarily only approximate and depend upon specification, quantity and delivery required. A range of \$30.50 to \$31 is given for 60-lb. and 70-lb.; 80-lb. and heavier, being \$30; rails, per gross ton of 2,240 lbs., f.o.b. mill. Re-laying rails are quoted at \$27 to \$29 per ton, according to condition of rail and location. (73).

Railway Ties.—See lumber, etc.
Roofing.—Ready roofing, two-ply, 70c. per roll; three-ply, 95c. per roll of 100 square feet. Roofing tin caps, 6c. lb.; wire roofing nails, 5c. lb. (See Building Paper; Tar and Pitch; Nails, Roofing). (164).

Rope.—Prices are steady, at 9c. per lb. for sisal, and 10½c. for Manila. Wire rope, crucible steel, six-strands, nineteen wires; ¼-in., \$2.75; 5-16, \$3.75; ¾, \$4.75; 1, \$5.25; 1½, \$6.25; 2, \$8; 2½, \$10; 3-in., \$12 per 100 feet. (132).

Spikes.—Railway spikes are firmer at \$2.45 per 100 pounds, base of 5½ x 9-16. Ship spikes are steady at \$2.85 per 100 pounds, base of ¾ x 10-inch, and ¾ x 12-inch. (432).

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

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

Tin.—Prices are unchanged, at 32½ to 33c.
Zinc.—The tone is steady, at 6 to 6¼c.

CAMP SUPPLIES.

Beans.—Prime pea beans, \$1.85 per bushel. (38).
Butter.—September and October creamery, 26c.; dairy, 22 to 23c.
Canned Goods.—Per Dozen.—Corn, 80 to 85; peas, \$1.05 to \$1.15; beans, 75 to 80c.; tomatoes, 82½ to 90c.; peaches, 25, \$1.65, and 35, \$2.65; pears, 25, \$1.60, and 35, \$2.30; salmon, best brands, 1-lb. talls, \$1.87½, and flats, \$2.02½; cheaper grades, 95c. to \$1.65.
Cheese.—Late makes, 1¼ to 1½c.; finest makes, ½c. more.
Coffee.—Mocha, 20 to 25c.; Santos, 15 to 18c.; Rio, 10 to 12c. (38).
Dried Fruits.—Currants, Filiatras, 5¼ to 6¼c.; choice, 8 to 9c.; dates, 4 to 5c.; raisins, Valentias, 5 to 6c.; California, seeded, 7½ to 9c.; Sultana, 8 to 10c. Evaporated apples, prime, 9½ to 9¾c.
Eggs.—No. 1 candled, 26c.; selects, 29 to 30c.; new laid, 35c.
Flour.—Manitoba, 1st patents, \$5.70 per barrel; 2nd patents, \$5.20; strong bakers, \$5.
Molasses and Syrup.—Molasses, New Orleans, 27 to 28c.; Barbadoes, 40 to 50c.; Porto Rico, 40 to 45c.; syrup, barrels, 3¼c.; 2-lb. tins, 2 dozen to case, \$2.50 per case.
Potatoes.—Per 90 lbs., good quality, 50 to 60c.
Rice and Tapioca.—Rice, grade B, in 100-lb. bags, \$2.95 to \$3; C.C., \$2.90. Tapioca, medium pearl, 4½ to 4¾c.
Rolled Oats.—Oatmeal, \$2.45 per bag; rolled oats, \$2.20, bags.
Tea.—Japans, 20 to 38c.; Ceylons, 20 to 40c.; Ceylon, greens, 19 to 25c.; China, greens, 25 to 50c.; low-grades, down to 15c.
Fish.—Salted.—Medium cod, \$7 per bbl.; herring, \$5.25 per bbl.; salmon, \$15.50 per bbl. for red, and \$14 for pink. Smoked fish.—Bloaters, \$1.10 per large box; haddies, 7¼c. per lb.; kippered herring, per box, \$1.20 to \$1.25.
Provisions.—Salt Pork.—\$30 to \$32 per bbl.; beef, \$15 per bbl.; smoked hams and bacon, 15 to 18c. per lb.; lard, 17c. for pure and 12c. for compound. (38).

* * * *

Toronto, March 10th, 1910.

With the fine weather and building activity there is an increased demand for material. Prices are firm and will improve.

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

Antimony.—Demand quiet at 9c. per 100 lbs. (111).
Axes.—Standard makes, double bitted, \$8 to \$10; single bitted, per dozen, \$7 to \$9.
Bar Iron.—\$2.00 to \$2.10, base, per 100 lbs., from stock to wholesale dealer. Market supply limited. (111).
Bar Mild Steel.—Per 100 lbs., \$2.10 to \$2.20.
Boiler Plates.—¼-inch and heavier, \$2.20. Boiler heads 25c. per 100 pounds advance on plate. Tank plate, 3-16-inch, \$2.40 per 100 lbs.
Boiler Tubes.—Orders continue active. Lap-welded, steel, 1¼-inch, 10c.; 1½-inch, 9c. per 100 feet; 2-inch, \$8.50; 2½-inch, \$10; 3-inch, \$10.60; 3-inch, \$11 to \$11.50; 3½-inch, \$18 to \$18.50 per 100 feet.
Building Paper.—Plain, 27c. per roll; tarred, 35c. per roll. Demand is good for spring requirements.
Bricks.—Prospects excellent for business in 1910. Price at some yards \$9 to \$9.50, at others, \$9.50 to \$10 for common. Don Valley pressed brick are in request. Red and buff pressed are worth \$18 delivered and \$17 at works per 1,000.
Broken Stone.—Lime stone, good hard, for roadways or concrete, f.o.b., Schaw station, C.P.R., 75c. until further notice, per ton of 2,000 lbs., 1-inch, 2-inch, or larger, price all the same. Not much doing. Broken granite is selling at \$3 per ton for good Oshawa. (164).
Cement.—Car lots, \$1.60 per barrel, without bags. In smaller parcels \$1.70 is asked by city dealers, plus bags, (26, 164).
Coal.—Retail price for Pennsylvania hard, \$7.25 net, steady. This price applies to grate, eggs, stove, and chestnut; only pea coal is cheaper, namely, \$6.00. These are all cash, and the quantity purchased does not affect the price. In the United States there is an open market for bituminous coal and a great number of qualities exist. We quote. Youghiogheny lump coal on cars here, \$3.70 to \$3.80; mine run, \$3.60 to \$3.75; slack, 2.65 to \$2.85; lump coal from other districts, \$3.40 to \$3.70; mine run inc. less; slack, 2.50 to \$2.70; canal coal plentiful at \$7.50 per ton; cox4, Solvey foundry, which is largely used here, quotes at from \$5.75 to \$6.00; Reynoldsville, \$4.00 to \$5.00; Connellsville, 72-hour coke, \$5.50. Soft coal and slack are slowly growing less scarce.
Copper Ingot.—The consumption is larger than ever, but production may be said to beat the record. Such conditions afford play for the speculators. Price here, 14¼c. per lb., and the demand active.
Detonator Caps.—75c. to \$1 per 100; case lots, 75c. per 100; broken quantities, \$1.

Dynamite. per pound, 21 to 25c., as to quantity. (83.)
Felt Roofing.—A good prospect for spring trade at an unchanged price, which is \$1.80 per 100 lbs.

Fire Bricks.—English and Scotch, \$30 to \$35; American, \$25 to \$35 per 1,000. Fire clay, \$8 to \$12 per ton.

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

Iron Chain.—¼-inch, \$5.75; 5-16-inch, \$5.15; ¾-inch, \$4.15; 7-16-inch, \$3.95; 1-inch, \$3.75; 9-16-inch, \$3.70; 3-8-inch, \$3.55; 1½-inch, \$3.45; 7-8-inch, \$3.40; 1-inch, \$3.40, per 100 lbs.

Iron Pipe.—A steady request at former prices:—Black, ¼-inch, \$2.03; ¾-inch, \$2.25; 1-inch, \$2.63; 1½-inch, \$3.28; 2-inch, \$4.70; 2½-inch, \$6.41; 3-inch, \$7.70; 4-inch, \$10.26; 5-inch, \$16.39; 6-inch, \$21.52; 7-inch, \$27.08; 8-inch, \$30.78; 9-inch, \$35.75; 10-inch, \$39.85; 11-inch, \$51.70. Galvanized, ¼-inch, \$2.86; ¾-inch, \$3.08; 1-inch, \$3.48; 1½-inch, \$4.43; 2-inch, \$6.35; 2½-inch, \$8.66; 3-inch, \$10.40; 4-inch, \$13.86, per 100 feet. (74, 188).

Pig Iron.—There is great activity and prices are maintained. Clarence quotes at \$21 for No. 3; Cleveland, \$20.50 to \$21, Summerlee, for winter delivery, \$22.50 in Canadian pig, Hamilton quotes \$19.50 to \$20 per ton. Producing plants are everywhere busy, and there is considerable business in prospect for 1910.

Lead.—An active demand at previous prices, which are \$3.75 to \$3.85 per 100 lbs.

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

Lumber.—Prices are generally firm, especially in pine. We quote dressing pine \$32.00 to \$35.00 per M; common stock boards, \$26 to \$30; cull stocks, \$20; cull sidings, \$17.50; Southern pine dimension timber from \$30 to \$45, according to size and grade; finished Southern pine according to thickness and width, \$30 to \$40. Hemlock in car lots, \$16.50 to \$17; spruce flooring in car lots, \$22 to \$24; shingles, British Columbia, are higher, we quote \$3.10, lath growing scarce and stiffening, No. 1, \$4.40, white pine, 48-inch; No. 2, \$3.75; for 32-inch, \$1.60.

Nails.—Wire, \$2.35 base; cut, \$2.60; spikes, \$2.85 per keg of 100 lbs.
Pitch and Tar.—Pitch, unchanged at 70c. per 100 lbs. Coal tar dull at \$3.50 per barrel. This is the dead season.

Putty.—In bladders, strictly pure, per 100 lbs., \$2.25; in barrel lots, \$2.10. Plasterer's, \$2.15 per barrel of three bushels.

Ready Roofing.—Little doing; prices are as per catalogue.

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

Plaster of Paris.—Calcined, New Brunswick, hammer brand, car lots, \$1.95; retail, \$2.15 per barrel of 200 lbs.

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

	4-in.	6-in.	9-in.	10-in.	12-in.	24-in.
Straight pipe per foot	\$0.20	\$0.30	\$0.65	\$0.75	\$1.00	\$3.25
Single junction, 1 or 2 ft. long	90	1.35	2.70	3.40	4.50	14.65
Double junctions	1.50	2.50	5.00	8.50	15.00	40.00
Increasers and reducers	1.50	2.50	5.00	8.50	15.00	40.00
P. traps	2.00	3.50	7.50	15.00	30.00	60.00
H. H. traps	2.50	4.00	8.00	16.00	32.00	64.00

Business moderate; price, 73 per cent. off list at factory for car-load lots; 65 per cent. off list retail. (52, 84, 138).

Steel Beams and Channels.—Quiet.—We quote:—\$2.50 to \$2.75 per 100 lbs., according to size and quantity; if cut, \$2.75 to \$3 per 100 lbs.; angles, 1¼ by 3-16 and larger, \$2.50; tees, \$2.80 to \$3 per 100 pounds. Extra for smaller sizes of angles and tees. (4, 30, 41, 50, 118, 119, 127, 132, 145, 176).

Steel Rails.—80-lb., \$35 to \$36 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. \$42.

Sheet Steel.—The market continues steady; American Bessemer, 10-gauge, \$2.50; 12-gauge, \$2.55; 14-gauge, \$2.35; 17, 18, and 20-gauge, \$2.45; 22 and 24-gauge, \$2.50; 26-gauge, \$2.65; 28-gauge, \$2.85. Quite a good demand exists, and there is prospect of higher prices.

Sheets Galvanized.—Apollo Brand.—Sheets 6 or 8 feet long, 30 or 36 inches wide; 10-gauge, \$2.90; 12-14-gauge, \$3.00; 16, 18, 20, \$3.10; 22-24, \$3.25; 26, \$3.40; 28, \$3.85; 20, \$4.15; 10½, \$4.15 per 100 lbs. Fleur de Lis—28-gauge, \$4; 26, \$2.80 per 100 lbs. A very large tonnage of all sorts has been booked. The feeling is toward an advance. (111).

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

Tool Steel.—Jowett's special pink label, 10½c. Cammel-Laird, 16c. "H.R.D." high speed tool steel, 65c. (4).

Tin.—There has been much speculation in London, but the recent level of prices has shown some disturbance. Quotations here, 34½ to 35c.

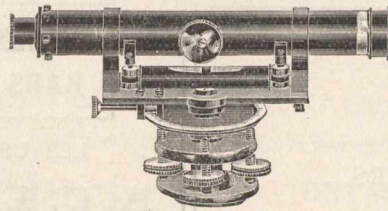
Wheellarrows.—Navy, steel wheel, Jewel pattern, knocked down, \$21.60 per dozen; set up, \$22.60. Pan Canadian, navy, steel tray, steel wheel, \$3.30 each; Pan American, steel tray, steel wheel, \$4.25 each. (132).

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

CAMP SUPPLIES.

Butter.—Dairy prints, 23 to 24c.; creamery prints, 29c. per lb.
Canned Goods.—Peas, \$1.10 to \$1.50; tomatoes, 35, 85c. to 95c.; pumpkins, 35, 80 to 85c.; corn, 80 to 85c.; peaches, 25, white, \$1.50 to \$1.60; yellow, \$1.00 to \$1.05; strawberries, 25, heavy syrup, \$1.50 to \$1.85; raspberries, 25, \$1.50 to \$1.95. (38).
Cheese.—Advanced this week ¼c.; large, 13c.; twins, 13¼c.
Coffee.—Rio, green, 11 to 12½c.; Mocha, 21 to 23c.; Java, 20 to 31c.; Santos, 11 to 15c.
Dried Fruits.—Raisins, Valencia, 5½ to 6¼c.; seeded, 1-lb. packets, fancy, 7½ to 8c.; 16-oz. packets, choice, 7 to 7½c.; 12-oz. packets, choice, 7c.; Sultanas, good, 5 to 6c.; fine, 6 to 7c.; choice, 7 to 8c.; fancy, 8 to 9c.; Filiatras currants, 6½ to 7c.; Yostizzas, 8½ to 9c.; uncleaned currants, ¾c. lower than cleaned. California Dried Fruits.—Evaporated apricots, 15 to

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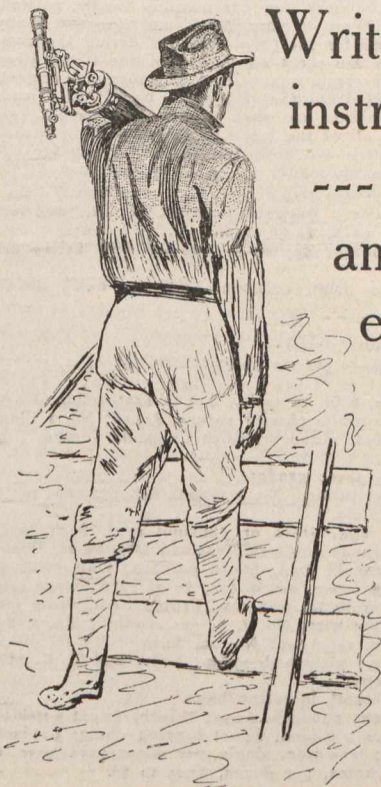
WE beg to announce that we are now manufacturing Engineers' and Surveyors' Instruments. We are the first firm in Canada to *manufacture---not assemble---* these instruments. Better products than are at present imported will be offered---and at less money.

The Kind of Level for which you now pay \$90 can be purchased from us for \$50. And as to quality:

Extra Strong, Rolled, Chilled and Hammered Gun Metal

is the material from which the limbs are made. The limb on the ordinary instrument is the weakest part---and it is the back-bone of the instrument.

The bubble is underneath the telescope---if anything drops on the instrument, the bubble is fully protected from breakage. The bubbles are extra long, and graduated to 15". All brass is checked up before AND AFTER buffing, so that a **compass** can be used accurately with all our instruments. The leveling head cannot be cramped, because the bottom plate is made much weaker than the top plate, and the bottom plate would easily adjust itself to any strain, obviating any danger of **ruining the centre**. We have invented a special **oxydizing and lacquering** process which produces an excellent black which will not blister or be affected in any way by any change in temperature---from 50 below zero to 150 above.



Write us for the next instrument you buy --- test it ten days and return at our expense if not satisfactory

We undertake to keep in repair---to a reasonable extent---all instruments purchased from us. If anything goes wrong, one of our factories is near you and at your service.

The Canadian Instrument

Scientific construction, rather than a wholesale output of instruments, is our aim. We shall make but a few instruments a day, and each one of those will be most carefully built under the supervision of an expert who has spent a lifetime with one of the biggest English manufacturers. Our plant is complete. We have been making lenses of other kinds for many years; we are universally known among the optical trade. Our instruments will be durable. The best of gun metal and brass will be used, and the vital parts will be made extra heavy. We will make a light or heavy instrument, to suit individual tastes. We will supply a light, medium or heavy tripod, a three or four screw level, etc.

In other words, ours will be

THE CANADIAN INSTRUMENT.

Buy direct from our factories.

You save the duty and the middle profit

The Consolidated Optical Company

61-67 Simcoe Street, Toronto, Ont.

Limited

Montreal

Winnipeg

Calgary

Vancouver

TENDERS, Continued from p. 50



NOTICE TO CONTRACTORS.

Sealed tenders addressed to the undersigned, and marked on the envelope, "Tender for Pump House," will be received at the office of the Commissioners of the Transcontinental Railway, at Ottawa, until 12 o'clock noon of the 15th day of March, 1910, for the construction and erection complete, on or before July 1st, 1910, in accordance with the plans and specifications of the Commissioners, of a pump house in connection with the locomotive shops of the Commissioners east of Winnipeg, Man.

Sealed Tenders addressed to the undersigned, and marked on the envelope, "Tender for Pumping Plant," will be received at the same time, and in like manner, for the pumping plant necessary to equip the said pump house, and for the installation of the same on or before August 1, 1910.

Plans and specifications may be seen, and forms of tender and full information obtained, at the office of the Chief Engineer of the Commissioners, at Ottawa, Ontario, and also at the office of the District Engineer at St. Boniface, Manitoba.

Tenders must be made on the forms supplied by the Commissioners.

Each tender must be signed and sealed by all the parties to the tender, and witnessed, and be accompanied by an accepted cheque on a chartered bank of the Dominion of Canada, payable to the order of the Commissioners of the Transcontinental Railway for a sum equal to ten per cent. (10 p.c.) of the amount of the tender.

Cheques deposited by parties whose tenders are rejected will be returned within ten days after the signing of the contract.

The right is reserved to reject any or all tenders.

By order,

P. E. RYAN,
Secretary, The Commissioners of the
Transcontinental Railway.

Dated at Ottawa, February 23rd, 1910.

Newspapers inserting this advertisement without authority from the Commissioners will not be paid for it.

RAILWAY CONSTRUCTION.

TENDERS

will be received up to 12 o'clock noon, April 15th, 1910, for the clearing, grading and bridge work on the 31 mile (more or less) section of the Algoma Central & Hudson Bay Railway between Hawk Lake Junction, Algoma Central and Hudson Bay Railway, and Hobon, Canadian Pacific Railway.

For plans, specifications and details apply to the undersigned, to whom all tenders should be addressed, or at the office of the Canadian Engineer at the following addresses:—

Toronto, 62 Church Street, Phone Main 7404.
Montreal, B33 Board of Trade Building, Phone M. 1001.
Winnipeg, Room 315 Nanton building, Phone 8142.
The lowest or any tender not necessarily accepted.

C. N. COBURN, Chief Engineer
Algoma Central Hudson Bay Railway,
Sault Ste. Marie, Ont.

WHEN WRITING TO ADVERTISERS

You will confer a favor on both advertiser and publisher by mentioning this paper.

STRUCTURAL STEEL

ANGLES	BEAMS	PLATES
BARS	CHANNELS	TEES

LET US QUOTE ON YOUR SPECIFICATION

A. C. LESLIE & CO., Limited
MONTREAL

5

16c. per lb.; prunes, 60s to 70s, 7 to 7½c.; 90s to 100s, 6½c.; evaporated apples, 8c. (38).

Eggs.—Cold-storage in market; new laid, scarce, at 30 to 32c. per dozen, in case lots.

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

Lard.—In small supply. Tierces, 15¾c.; tubs, 16c.; pails, 16¼c.

Molasses.—Barbadoes, barrels, 37 to 45c.; West Indian, 27 to 30c.; New Orleans, 30 to 33c. for medium.

Pork.—Market uncertain. Short cut, \$29 per barrel; mess, \$27. Light stocks and not much doing.

Rice.—B. grade, 3½c. per lb.; Patna, 5 to 5½c.; Japan, 5 to 6c.

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

Smoked and Dry Salt Meats.—Long clear bacon, 14¼ to 15c. per lb., tons and cases; hams, large, 14½c.; small, 16c.; rolls, 14½ to 14¾c.; breakfast bacon, 18½c.; backs (plain), 19c.; backs (peameal), 19 to 20c.; shoulder hams, 13c.; green meats out of pickle, 1c. less than smoked. Market very firm.

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

Sugar.—Granulated, \$4.95 per 100 lbs. in barrels; Acadia, 4.85; yellow, \$4.55; bags, 5c. lower.

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

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

Vegetables.—Beans, hand-picked, \$2.25; prime, \$2.15; stocks light, market firm; beets, 85c. a bag; carrots, 60 and 65c. a bag; onions, \$1.25 a bag; potatoes, best, 65 and 70c. a bag; turnips, 45c. a bag. (38).

* * * * * Winnipeg, March 8th, 1910

Winnipeg has been enjoying almost spring weather during the past week, and preparations for spring work have started in with a rush. Orders are coming in very satisfactorily from the country, and shipments are already being made through outside points. Supply dealers expect to have as much work as they can possibly take care of, and the large contractors state they will have all the work they can possibly handle, as well. Structural steel business in the West is very brisk and a great many contracts have already been closed for fire proof buildings during the coming season. No changes in price are recorded in any of the items given below, and practically the only uncertain quantities are lumber and cement. W. F. Lee & Company secured the contract for 25,000 barrels of cement for the city of Winnipeg at a fraction less than 65 cents per 100 lbs., excluding sacks. Interior work on all of the large buildings is being rushed forward very rapidly, so that every available man may be ready for the new work when the season opens up.

Present quotations are as follows:—

Anvils.—Per pound, 10 to 12½c.; Buckworth anvils, 80 lbs., and up, 10¼c.; anvil and vice combined, each, \$5.50 (111, 132).

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

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

Bar Iron.—\$2.50 to \$2.60.

Bars.—Crow, \$4 per 100 pounds. (119.)

Beams and Channels.—\$3 to \$3.10 per 100 up to 15-inch. (4, 30, 41, 50, 118, 119, 127, 132, 145, 176.)

Boards.—No. 1 Common Pine, 8 in. to 12 in., \$38 to \$45; siding, No. 2 White Pine, 6 in., \$55; cull red or white pine or spruce, \$24.50; No. 1 Clear Cedar, 6 in., 8 to 16 ft., \$60; Nos. 1 and 2 British Columbia spruce, 4 to 6 in., \$55; No. 3, \$45.

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

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

Coal and Coke.—Anthracite, egg, stove or chestnut coal, \$9.75 large lots to \$10.50 ton lots, net; Alleghany soft coal; carload lots, basis, Winnipeg, f.o.b., cars, \$6 per ton; cannel coal, \$10.50 per ton; Galt coal, \$2 f.o.b., carload lots, \$9 single ton; coke, single ton, \$7 at yard; large lots, special rates. American coke, \$11 to \$11.50 a ton; Crow's Nest, \$10 a ton.

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

Copper.—Tinned, boiler, 26½c.; planished, 29½c.; boiler and T. K. pils, plain, tinned, 45 per cent. discount.

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

Chain.—Coil, proof, ¼-inch, \$7; 5-16-inch, \$5.50; ¾-inch, \$4.90; 7-16-inch, \$4.75; ½-inch, \$4.40; 5/8-inch, \$4.20; ¾-inch, \$4.05; logging chain, 5-16-inch, \$6.50; ¾-inch, \$6; ½-inch, \$8.50; jack iron, single, per dozen yards, 15c. to 75c.; double, 25c. to \$1; trace-chains, per dozen, \$5.25 to \$6.