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MISSING

The Canadian Engineer

WEEKLY

ESTABLISHED 1893

VOL. 18. TORONTO, CANADA, JANUARY 21st, 1910. No. 3

The Canadian Engineer

ESTABLISHED 1893.

Issued Weekly in the interests of the

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

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Present Terms of Subscription, payable in advance:

Canada and Great Britain:		United States and other Countries:	
One Year	$3.00	One Year	$3.50
Six Months	1.75	Six Months	2.00
Three Months	1.00	Three Months	1.25

Copies Antedating This Issue by Two Months or More, 25 Cents.
ADVERTISEMENT RATES ON APPLICATION.

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Address all communications to the Company and not to individuals.
Everything affecting the editorial department should be directed to the Editor.

NOTICE TO ADVERTISERS.

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

Printed at the Office of the Monetary Times Printing Co., Limited, Toronto, Canada.

TORONTO, CANADA, JANUARY 21, 1910.

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THE TWENTY-FOURTH ANNUAL MEETING OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS WILL BE HELD IN OTTAWA, ONT.,

JANUARY 25th, 26th, 27th, 1910.
IT WILL BE A VERY LIVE MEETING.
YOU WILL THOROUGHLY ENJOY IT.

THE FIRST DAY WILL BE DISCUSSION.
THE SECOND DAY EXCURSIONS AND RECEPTIONS.
THE THIRD DAY MORE DISCUSSION.

OTTAWA.

The selection of the city of Ottawa as the meeting place of the twenty-fourth annual meeting of the Canadian Society of Civil Engineers makes that city, for a week at least, a place of particular interest to engineers, whether members of the society or not.

Ottawa is an important city, not only because of her fifty odd millions of assessment and her eighty thousand population, her one hundred and fifty miles of street and one hundred and seventy-three million dollars clearing house returns, but also because she is the centre of great water power possibilities; is beautifully situated on the banks of the Ottawa River; is the seat of the Government of the Dominion of Canada, and is an educational, legislative and judicial centre.

Built upon high ground, amid picturesque surroundings, with wide, well-kept streets, attractive houses, parks and squares, it is inviting to the traveller, no matter whether business or pleasure bent.

The manufacturer also has an interest here. He finds this city convenient to large forest areas, the centre of rich mineral deposits, the neighbor of large water falls —some harnessed—and a city well provided with transportation facilities. The Ottawa River and the Rideau Canal offer water transportation facilities—limited, it is true—yet sufficient. The railways—all of them—reach Ottawa. North, south, east and west, they radiate from this legislative hub.

Ottawa must soon become a manufacturing and commercial centre. Cheap power, sufficient raw material and adequate transportation facilities are good cause for growth.

COLLINGWOOD SCHREIBER, C.M.G.

The council of the Canadian Society of Civil Engineers honored itself when it honored Mr. Collingwood Schreiber by electing him honorary member of the society.

Born in Essex, England, in 1831, at twenty-one he came to Canada, and was appointed assistant engineer of the Hamilton-Toronto Railway. In the half century since, the distance he has travelled spans the gap between a junior assistant and the consulting engineer of the greatest engineering organization of the Dominion—the Department of Railways and Canals for Canada.

In 1852 the railway and canal system of Canada was truly a "wee infant," and as Mr. Schreiber looks back over the years of growth and the development of the St. Lawrence and Great Lakes canal system; the uniting of the Maritime Provinces with the Canadas by the Intercolonial; the bringing east of the Great North-West and the making possible a Dominion by the building of the Canadian Pacific; the moving northward three hundred miles our north boundary by the building of the Grand Trunk Pacific, it must be with great pleasure and not a little pride that he remembers his personal connection with all these nation-building problems.

A Brown, a Blake, a Macdonald, a Mackenzie, a Cartier, a Tupper or a Laurier may be convenient names for historians to associate with Canada's growth and expansion, but let us not forget the hours of patient toil, the days of planning and designing and constructing done by the Canadian engineer who, in 1855-60, was a consulting engineer in Toronto; in 1860 was appointed superintendent of the Northern Railway; from 1873 to 1880, chief engineer of Canadian Government Railways; from 1880-1893, chief engineer of the Canadian Pacific Railway, and in 1893 entering the service of the Canadian Government as Deputy Minister of Railways and Canals, and who is to-day consulting engineer of that department.

Many know Collingwood Schreiber, the engineer—few know Collingwood Schreiber, the man. A tireless worker, he mixed but little with the world outside his own circle. He had not time for those social and political functions where he of the glad hand appears, disappears and appears, and becomes known.

Always in the thick and torrent of great work, he has kept for himself clear and clean that most prized of attributes—a good name.

May he remain in our midst for many years that he may continue to receive the good wishes and kind words of his fellow-practitioners!

THE ENGINEER AND BOARDS OF HEALTH.

Lord Strathcona offers to send out from England at his own expense a sanitary expert to Montreal to advise the city council in the matter of typhoid prevention.

Five years ago the city of Winnipeg engaged the services of a sanitary expert from the United States to advise on sewerage.

Last year Toronto engaged the services of two sanitary experts—one from the States and the other from England—to advise on sewage disposal.

Last year Toronto engaged the services of a sanitary expert from the United States to prepare plans for a water filtration plant.

Last year the Quebec Provincial Board of Health engaged the services of a sanitary expert from the United States to make sanitary rivers surveys with reference to pollution. In the last instance the expert has been permanently adopted.

Canadian engineers must conclude as follows:—Either that Canada is ignorant of the existence of any Canadian engineers competent to give an opinion on engineering hygiene in connection with any place larger than a village, or that Canada possesses no sanitary experts connected with the engineering profession of an efficient calibre.

Either the one or the other of the above conclusions must be correct, as it will surely not be maintained that, other things being equal, Canada prefers to employ engineers other than Canadian.

We are constantly being met with the phrase: "So-and-So is not a Canadian; he cannot understand local conditions." Yet when it is a question of important work of a large character, the man chosen to design and control has had no chance whatever of grasping or becoming familiar with either climatic or other local conditions.

Several years back what we are now saying of Canada might equally well have been said of the United States. It cannot, however, be said of the United States at the present day. Why? Because ever since the birth of the Massachusetts and other State Boards of Health, with their experimental and sanitary research stations, there have been trained a body of practical and efficient sanitary engineers, the usefulness of whose work has been felt throughout the whole country.

Where, throughout the Dominion of Canada, can anyone point to a centre for the practical demonstration of hygienic engineering and its application to Canadian conditions?

McGill University provides a special school course for sanitary engineering. We understand that Toronto is about to follow suit. A school training, however, will not make an expert, nor will it impress the outside public with faith in practical efficiency.

Generally speaking, if there was no other choice to be made, the public would rather appoint as engineer a competent contractor's foreman than a raw, inexperienced graduate from a school.

Where is the remedy? The remedy is to be found in studying conditions existing in the United States for the past thirty years. The conditions in the States may be summed up as follows:—

Every State Board of Health has formed a practical training centre for the moulding of sanitary engineers. No expense has been grudged by the communities in providing experimental laboratories. A body of engineers has been kept in constant touch with the evolution of types of construction and processes. Reports (both chemical and engineering) have been published without stint, fear or secrecy. Failures have been advertised in large type as well as successes.

The cream of these trained engineers have acknowledged the experiences of older countries; have visited time and again in Great Britain and Europe; returned, criticized and lectured, and have duly impressed their own countrymen with the elasticity and broadness of their knowledge.

The States looks to one of its own children for the best and most complete advice, and even we here in Canada recognize the development of efficiency on the other side of the line.

Is not this a question which the Canadian Society of Civil Engineers should, and can, take up? By representations made to governing bodies, such as Provincial Boards of Health, may not the importance of the employment of the sanitary engineering expert be made apparent?

Take conditions in a large Province such as Ontario. We have a Provincial Board of Health, composed entirely of medical men, with a medical man as secretary, a bacteriologist and an experimental station, whose doors are closed to the engineer.

Once ever quarter this Board meets. Plans and detail drawings for proposed sewerage, sewage disposal, and water supply are submitted by outside engineers **for medical judgment.** These plans, representing immense communal cost, are not even examined by anyone with an engineering training. They are either, for some reason or another, passed or disapproved. If passed, then the Board wipes its hands in the matter, and relinquishes all further authority.

What does the community obtain in the shape of benefit from this casual and one-sided professional administration?

Compare the above useless mockery of administration with that of any of the State Boards of Health of America. With the latter every plan submitted is carefull examined by a competent sanitary engineer. The ground is visited and conferences made, if necessary, with the designing engineer. If the plans are passed, either with or without engineering amendment, the Board's authority and interest does not automatically cease to exist. Engineering visits are made as the work proceeds; the works are examined and tested on completion; examinations of effluents are continued, and valuable data collected, which is handed out for use to other communities or is of use within the State. Here we have a living and useful machine which in every case works smoothly, making for usefulness and efficiency, providing value to the State and requiring no apology for its existence.

Just as soon as our governing bodies recognize the necessity of efficiency in sanitary engineering will there arise in this country a class of sanitary engineers who will inspire confidence in the public mind and automatically remove the necessity of (supposed or otherwise) seeking for foreign advice.

May we recommend the above remarks to the consideration of the Canadian Society of Civil Engineers at their annual meeting at Ottawa?

PROGRAMME OF TWENTY-FOURTH ANNUAL MEETING OF CANADIAN SOCIETY OF CIVIL ENGINEERS.

The annual meeting for the election of officers and members of council for the year 1910, and for the transaction of business, will be held in the City Hall and in the Russell House, Ottawa, as follows:—

Tuesday, 25th January.

10.00 a.m.—Meeting in the Council Chamber, City Hall, for the nomination of scrutineers, receiving the report of council, reception and discussion of reports of committees, and general business of the Society.

12.00 a.m.—His Worship, the Mayor, will welcome the Society to Ottawa.

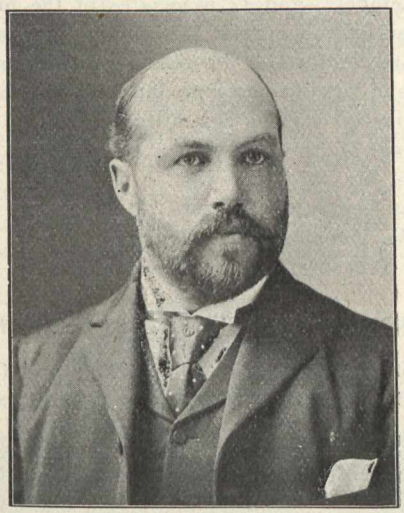
1.30. p.m.—Complimentary luncheon by the members of the Ottawa Branch in the dining-room of the Russell House.

3.00 p.m.—Continuation of business meeting for the discussion of reports, etc. It is expected that Sir Sandford Fleming and Mr. T. C. Keefer, C.M.G., Past President of the Society, will address this meeting.

8.00 p.m.—Meeting in the dining-room of the Russell House. Address by the retiring President, Mr. G. A. Mountain, and other addresses.

Wednesday, 26th January.

Members are invited to visit the following works and places of interest under the guidance of members of the



Mr. Geo. A. Mountain, President of the Canadian Society of Civil Engineers.

Ottawa Branch of the Society. The several parties will leave the Russell House at 10 a.m. and in the afternoon at 2.30 p.m.:—

The Ottawa Electric Power House.
Mr. J. R. Booth's Mills.
The E. B. Eddy Co. Mills.
The City Waterworks.
The Chaudiere Dam.
Dominion Archives.
The Royal Mint.
The Observatory
The Edinburgh Mills.

8.00 p.m.—Members' Dinner, Russell House dining-room.

Thursday, 27th January.

10.00 a.m.—Meeting in the City Hall, reception of reports of scrutineers and general business. If necessary an afternoon meeting will be held, commencing at 3 p.m.

3.00 p.m.—(Or immediately on adjournment of the afternoon meeting of the Society). Meeting of the newly elected council.

Tickets for the dinner (price $3.00) may be obtained from the Secretary of the Ottawa Branch, Mr. S. J. Chapleau.

The annual meeting button will be honored in all parts of the Parliament Buildings, and will secure free transportation on the Ottawa Street Railway lines.

The members of the Ottawa Branch who will act as guides on Wednesday will wear buttons numbered from 1 to 10 inclusive.

By the kindness of the Grand Trunk, Canadian Pacific, Intercolonial and other railways in the Eastern Passenger Association, members and their families who have paid full One Way First-Class Fare going to the meeting in Ottawa will be returned free on presentation of a certificate signed by the ticket agent from whom the ticket has been procured at the point of commencement of the journey. The certificate is to be signed at Ottawa by the Secretary of the Society.

CANADIAN SOCIETY OF CIVIL ENGINEERS—SOME NOTES ON THE BRANCHES AND BRANCH OFFICERS.

Ottawa Branch of the Canadian Society of Civil Engineers was organized January 18th, 1909, all the prominent engineers residing in and about the city taking part.

At present there are 51 members, 58 associate members, 55 student members, and 14 associates of the branch.

The rooms of the branch are at 177 Sparks Street, and while small are comfortably furnished for the purpose of giving reading and writing accommodation to the members, and for the meetings of various committees, etc.

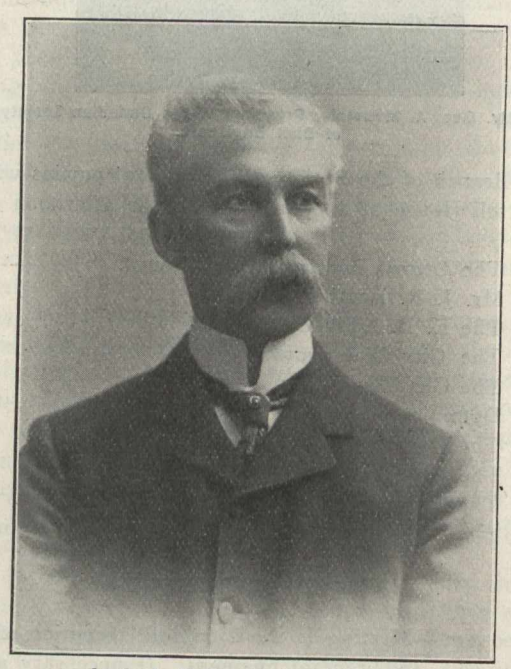
The officers of the branch for the present term are:—Chairman, Mr. W. J. Stewart.

Managing Committee, Messrs. A. Bruce, A. A. Dion, A. T. Phillips, M. Donaldson, N. Cauchon.

Secretary-Treasurer, S. J. Chapleau.

CHAIRMAN OF THE QUEBEC BRANCH

Mr. L. A. Vallée, M. Can. Soc. C.E., and Chairman of the Quebec Branch of the Society, was born in Beauport,



Louis A. Vallee, M. Can. Soc. C.E.

County of Quebec, P.Q., in 1851, educated at Laval Normal School and private tutors. He joined the construction of Sherbrooke Eastern Townships and Kennebec Railway in 1870, and the North Shore, after the Quebec, Montreal, Ottawa & Occidental Railway Survey Staff, in 1872, and was assistant and resident engineer, while the road was under construction and in operation until 1882, and then transferred to the Quebec Public Works Department as Government Engineer and Director of Railways for the Province of Quebec, which position he holds at the present time.

THE MANITOBA BRANCH OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS.

This branch was organized in December, 1907. The number of members at present is 150. The branch meets on the first Thursday during the months of November, December, January, February, March and April, in the University of Manitoba. The present officers of the branch are as follows:—Chairman, J. E. Schwitzer; executive committee, J. A. Hesketh, P. Turnbull, Charles H. Dancer; secretary-treasurer, E. Brydone-Jack; auditors, H. A. Bowman, Frank Lee. In addition to these officers, they have a Standing Committee; one on Papers and Discussions;

E. Brydone-Jack, C.E., Winnipeg, Man., Secretary of the Manitoba Branch of the Canadian Society of Civil Engineers.

one on Research and Investigation; and one on Library. The Committee on Papers and Discussions consists of J. A. Hesketh, E. P. Fetherstonhaugh, E. H. Harrison, and G. A. Bayne. The Committee on Research and Investigation consists of E. Brydone-Jack, E. P. Fetherstonhaugh, and R. D. Wilson. The Committee on Library, E. P. Fetherstonhaugh, J. Woodman, W. A. Duff, and W. L. MacKenzie.

CHAIRMAN OF THE VANCOUVER BRANCH

Mr. Geo. H. Webster, Chairman of the Vancouver Branch of the Canadian Society of Civil Engineers, was born at Creemore, County Simcoe, Ontario, on 31st January, 1858, and educated at Creemore Public School, and Ontario Model School, in Toronto. In May, 1873, was successful candidate

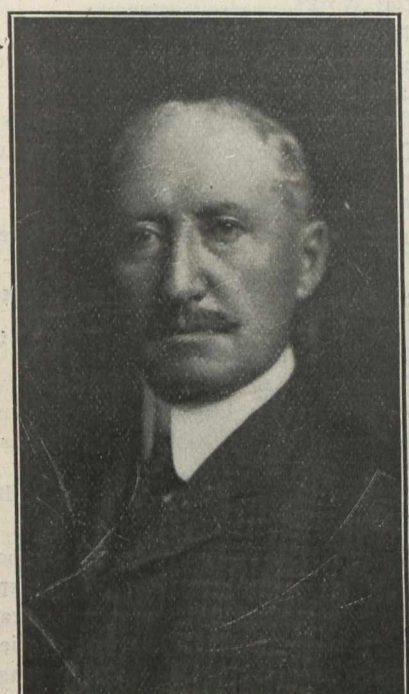
Geo. H. Webster.

in a competitive examination for a vacant Studentship in the Engineering Department of the Northern Railway of Canada at Toronto, and was apprenticed to that company for five and one-half years under the late Owen Jones, Chief Engineer.

From 1879 to 1882, he was assistant engineer of the amalgamated Northern & Hamilton, and Northern Western

Dr. John Galbraith, Toronto, Ont., Immediate Past-President of the Canadian Society of Civil Engineers.

Railways, in charge of maintenance of track, buildings and bridges. During this period the gauge of the Northern Railway was changed from five feet six inches to four feet eight



Col. H. N. Ruttan, Winnipeg, Man., Vice-President of the Canadian Society of Civil Engineers, and nominated for President for 1910.

and one-half inches, and had charge of organization and detail work involved in changing 200 miles of main line and sidings in twelve hours which was accomplished without any hitch or delay.

In 1882 he resigned from the N. & H. and N. W. Railway and went to Winnipeg and took charge of the C. W. Moberly Engineering and Contracting Company work.

In 1883 he entered the services of the Manitoba & North Western Railway Company at Portage la Prairie, as assistant engineer, being later made chief engineer, building the line from Minnedosa to Yorkton, the Shell River branch and the Saskatchewan and Western Branch.

In 1898 he was transferred to Winnipeg as chief engineer and land commissioner of the Manitoba and North Western Railway.

In 1900 he received the appointment of resident engineer for the C.P.R., Winnipeg, in charge of main and branch lines from Fort William to Moose Jaw. In 1901 he was transferred to Montreal and appointed General Tie Agent for the entire system, and organized that department, and in January, 1903, was appointed the first Right-of-Way and Lease

Mr. Peter Gillespie, B.A.Sc., Secretary Toronto Branch of the Canadian Society of Civil Engineers.

Agent for the entire system, and organized that department also.

In 1904, on account of ill-health, was transferred to Vancouver and appointed Division Engineer of Pacific Division, and in 1905 he left the railway company and became President and Chief Engineer of the British Columbia General Contract Company, but is now carrying on a consulting engineer's practice in Vancouver.

Mr. Webster was elected a member of the Canadian Society of Civil Engineers in 1887, and a member of the American Railway Engineering and Maintenance of Way Association.

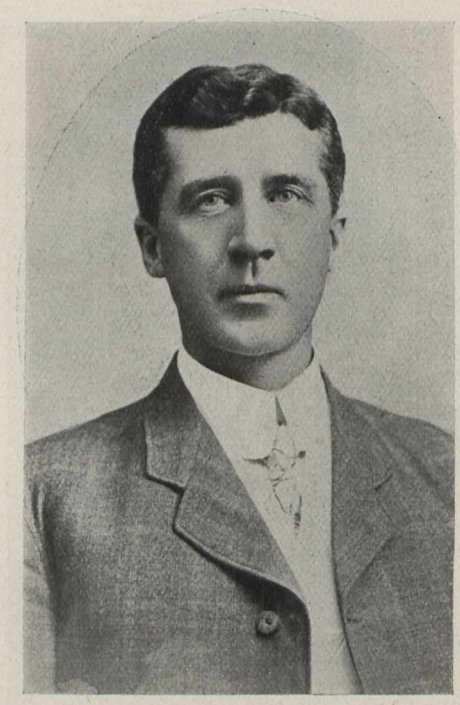
In 1906 Mr. Webster was elected to the council of the Canadian Society of Civil Engineers.

NEWTON JAMES KER, CITY ENGINEER, OTTAWA.

Newton James Ker was born at Brantford on May 6th, 1866, and was educated at the Brantford Collegiate Institute, after which he entered the office of his uncle, Mr. P. A. Peterson, at that time chief engineer of the Canadian Pacific Railway at Montreal.

The first work of importance upon which Mr. Ker was engaged was the construction of the Canadian Pacific Railway into Montreal from Lachine to Windsor Street. He was then engaged upon the Canadian Pacific Railway Esplanade entrance into Toronto, the construction of the Canadian Pacific Railway Bridge over the Thames and approaches at London, Ont., under Mr. W. T. Jennings, C.E.; the Detroit extension at Windsor, having charge of that section running out of Windsor, and subsequently, of the division between Windsor and Chatham, under Malcolm H. McLeod, C.E.

Mr. Ker was on his way to accept a position on the Virginia, Roanoke & Ironton Railway, Virginia, when he was



N. J. Ker.

offered a position by Mr. Jennings, then City Engineer of Toronto. His first work in Toronto was in connection with the arbitration between the city and the old Toronto Street Railway Company. He subsequently had charge of the reconstruction of the system from a horse-car to an electric system, acting as engineer for both the Toronto Railway Company and the City of Toronto.

During his ten years' service in the City Engineer's office, Toronto, Mr. Ker filled the position of engineer in charge of roadways, engineer in charge of sewers, assistant engineer on waterworks, engineer in charge of the Queen Street subway and Island survey, lake under current observation chart, of Toronto Bay, and many other works of importance.

In 1899 Mr. Ker was appointed Assistant City Engineer of Ottawa and engineer in charge of the main drainage system, a work which was built within the estimated cost of $500,000.

In 1900 he was appointed City Engineer of Ottawa and during his regime, under which great improvements have been made in Ottawa, he has spent over $6,000,000 on civic works. This embraces permanent pavements, drainage systems, subways, bridges, the establishment of the civic asphalt plant and blacksmith shops, and other works, as the work in Ottawa is entirely carried on under what is known as the day labor system. Mr. Ker is also manager of the Ottawa Waterworks, which has a capacity of 32,000,000 gallons per day at the main pumping station, which is operated by water power, being one of the largest and finest on the continent. There are also two auxiliary outlying stations, one of which is operated by steam, the other by electric power. The construction upon the new aqeduct and intake pipe, costing $300,000, is now well under way. The Wellington Street viaduct, estimated cost of which is $75,000, is also under construction at present.

In addition to his other duties, Mr. Ker is superintendent of parks and street commissioner, having charge of the direct supervision over street cleaning, scavenging system and snow cleaning, all of which are carried on by day labor.

Mr. Ker is a member of the Canadian Society of Civil Engineers, and has served on the Council of that body.

OTTAWA CIVIC WORKS.

Newton J. Ker, M. Can. Soc. C.E.

Ottawa's civic works are under the control and supervision of the Engineering Department.

During the last ten years over $6,000,000 has been expended and fully 75 per cent. of this has been expended under what is known as the Day Labor System.

Briefly, the works may be classified as follows:—

1st.—Water Works.
2nd.—Bridges, Subways & Viaducts.
3rd.—Roadways, Pavements and Walks.
4th.—Drainage.
5th.—Park Management.
6th—Special Works.
7th.—Collection and Disposal of Refuse.

All of these may again be divided into two departments, Construction and Maintenance.

The staff is composed of the following officials:—

1.—The City Engineer, who is also the manager of the waterworks.
2.—The Assistant City Engineer.
3.—An Assistant Engineer in charge of Pavements and Sewers.
4.—An Assistant Engineer in charge of Special Works and Viaducts.
5.—A Street Foreman.
6.—The Engineers at the Pumping Station.
7.—A Superintendent of Mains.
8.—An Inspector of Water Services and Drains.
9.—A Scavenging Inspector.
10.—A Foreman in charge of the City Yards, Blacksmith, Carpenter and Machine Shop.

While in the season and when required, a superintendent of the civic asphalt plant, and street sprinkling inspector, and the many foremen on construction works, are engaged whenever their services are necessary. The force varies in number from 200 to 800 men, during the different seasons of the year.

The office staff is composed of a draughtsman, chief clerk, second clerk and stenographer.

Where works are carried on so extensively by day labor the Department in addition to the usual engineering duties of planning and supervision, really assume the duties of a large contracting firm, purchasing hundreds of thousands of

dollars worth of material and hiring and managing men, with all the multitudinous details that that involves.

Water Works.

The city depends for its water supply entirely upon pumps operated by water power. The recently annexed suburbs of

Waterworks Aqueduct, Ottawa, construction under C.P.R. tracks and Sawyer-Massey warehouse.

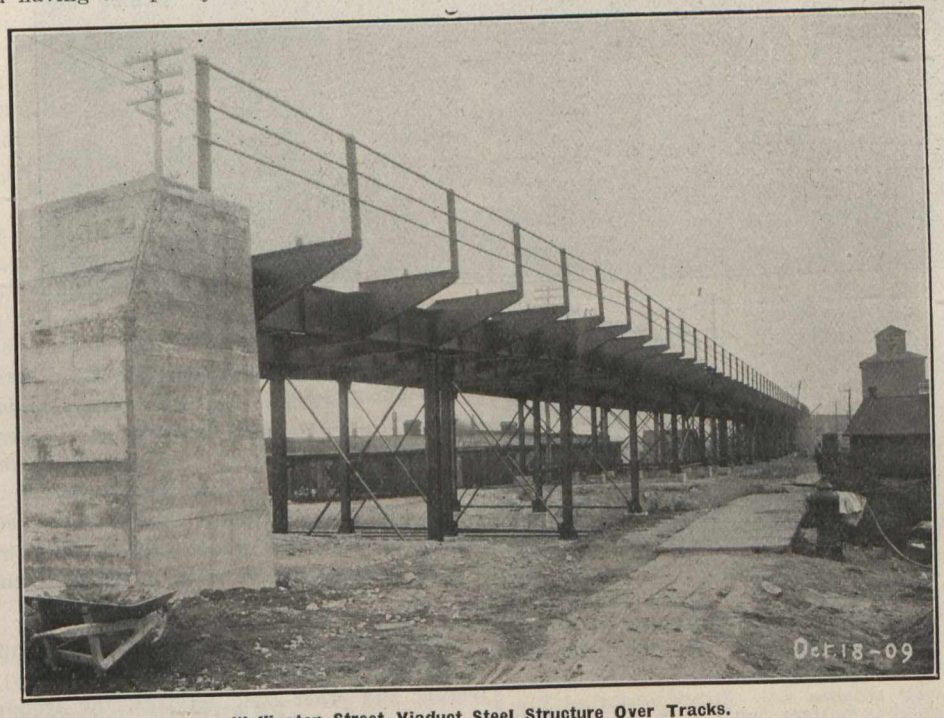
Ottawa East, and Hintonburgh, each have small plants; the former operated by electric power and having a capacity of about 1,400,000 Imperial gallons per 24 hours; the latter operated by steam and having a capacity of about 1,600,000 Imperial gallons. These plants are held in reserve, being always ready to start up should there be any serious trouble at the main pumping station.

There are now installed in the main pump house, machinery capable of pumping over 30,000,000 Imperial gallons per 24 hours. The aqueduct, which at the present time conveys water from Nepean Bay to the pump house, was built in 1873-4, and is too small to furnish power to run these pumps. The old 40-inch steel clear water pipe will only supply 16,000,000 Imperial gallons per day, with safety at low stages of water, while the daily consumption of water is frequently above this figure. In view of these facts and also taking into consideration the construction of the new dam across the Ottawa River, above the Chaudiere Falls, which will permanently raise the water levels in Nepean Bay and thereby render the work in the river section more difficult and costly, it was decided to estimate and plan for a new aqueduct and clear water pipe. This was done, the estimated cost of the aqueduct being $227,700, and that of the clear water pipe being $89,500. The work consists of a cut through solid rock 27 feet wide with an average depth of 25 feet; the construction of the necessary head works at the river, all of concrete, with racks, screens, gate valves, stoplogs, stoplog houses, etc. The aqueduct is covered by a concrete arch 2 feet in thickness at the crown, and where it passes under the C.P.R. yard is reinforced by 1-inch square steel bars, spaced 6 inches centre to centre and No. 10 gauge, 3-inch mesh, expanded metal.

The new aqueduct starts in Nepean Bay, Ottawa River, leaving it with an easy curve and passes under the C.P.R. yard and runs down Ottawa Street to a junction with the old aqueduct at the pump house, where it will be widened. The total length of this work is 2,500 feet. Near the head, there are two setts of stoplogs to control the flow of water, one set being about 200 feet below the other.

In the aqueduct a new clear water pipe is being constructed of concrete reinforced with expanded metal.

The inside diameter of this concrete pipe is 43 inches, and it extends from the pump house to the lower sett of stoplogs. From this point across and up the Ottawa River, a 42-inch steel pipe 3/8-inch thick, is to be laid to the intake crib. The total length of the clear water pipe from the pump house to the intake crib is 5,500 feet. A considerable quantity of rock will have to be removed in the bed of the river in order to keep the pipe below the hydraulic gradient, and flexible



Wellington Street Viaduct Steel Structure Over Tracks.

ball joints will be used where necessitated by the character of the river bed.

A great deal of concrete was laid last winter, some when the temperature was 10 below zero. It was not injured by the frost in any way.

Up to the time of writing, about $65,000 has been expended on the work.

Subways and Viaducts.

A well defined policy is being carried out by the city which is surely and steadily doing away with all level crossings.

In the past five years a subway costing $60,000 was built at Elgin St. under the G.T.R. tracks. The Bank Street subway was also built at a cost of $100,000. Somerset Street bridge has been widened and the G.T.R. bridge at Preston Street is being widened at an estimated cost of $16,000.

Wellington Street Viaduct.

Wellington Street is the main thoroughfare leading into the city from the west and is crossed at present by four railway tracks within less than 1,000 feet. These tracks were formerly protected by gates but accidents were frequent and there was much delay in traffic. The character of the ground is such as to render the construction of the viaduct over the tracks, with short approaches, comparatively easy as the tracks lie in a hollow. The length of the steel viaduct over the tracks is 522 feet. This portion of the work was constructed by the C.P.R. The balance of the work was done by the city and comprises the earth filled approaches, 565 feet in length, which are upheld by masonry retaining walls. The city will also do the creosote wood block paving on tarred plank foundation and macadam roadways at either end, and lay the sidewalks.

The width of the road is 30 feet, with an 8-foot sidewalk on the south side only, there being little or no pedestrian traffic on the north side of the street.

Plans and estimates have also been prepared for a three-arch concrete subway on Lyon Street under the G.T.R., estimated cost of which is $47,000.

Permanent Pavements.

During the first ten years permanent pavements costing $1,008,000, have been laid by the city, there now being 18.38 miles, nearly all of which are asphalt or concrete. Two years ago the city installed its own asphalt plant which has been in successful operation ever since. The cost of the pavements has been materially reduced, while repairs have been more promptly carried out. This season 8.08 miles of concrete walks were laid, making a total now of 143½ miles of concrete walks in the city, nearly all of which have been laid on what is known as the outside line, adjoining the curb, as it has been found in winter, the snowplowing which is undertaken by the city, is more easily carried out by having the walks in this location. Both snow cleaning and street sprinkling are carried out by the day labor system with satisfactory results. In snow cleaning the ordinary sidewalk plows drawn by horses are followed by walkaway plows which throw the snow further out in the roadway where it is there rolled with large wooden rollers.

The annexation of the various suburbs, increasing the area of the city by 54 per cent. last year necessitated the construction of drainage systems for the different municipalities taken in. The most important works at present under way are the Ottawa South & Hintonburgh drainage systems. The estimated cost is upwards of $300,000, which includes the necessary septic tanks and bacteria beds. The city has expended in the past ten years $1,029,000 on drainage works. When the work now under way is complete, Ottawa will be one of the best drained cities on the continent.

Wellington Street Viaduct, Ottawa, Concrete Abutments and Masonry Retaining Wall.

Parks.

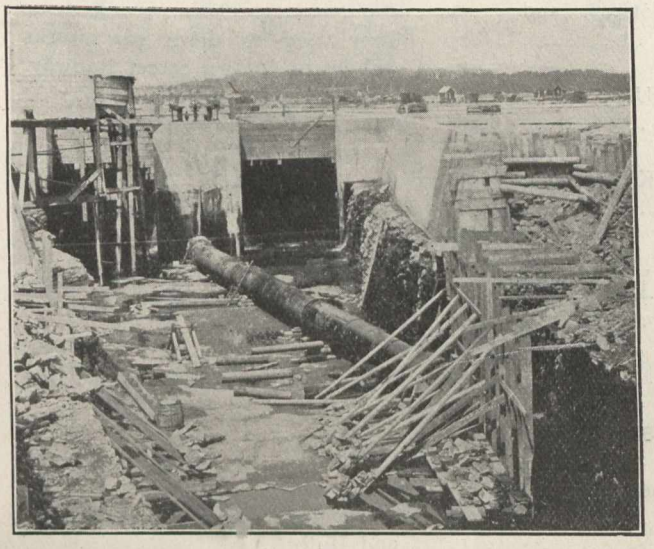
In lieu of water rates (water being supplied free by the city to all Government lands and buildings) and for fire protection and other civic services, the Dominion Government grants the Ottawa Improvement Commission the sum of $115,000 a year which is spent on parks and driveways in and about the city. In addition to these parks there are still 12 parks and squares maintained by the corporation. The city also looks after the planting and trimming of trees on the streets.

Collection and Disposal of Refuse.

A site for an incinerator has just been purchased and an incinerator will shortly be installed for the destruction of city refuse and garbage. The city scavenging system has been in operation for the past four years, the refuse and garbage being collected separately. The refuse has been used to fill up low lying lands and the garbage has been disposed of to contractors who remove it outside the city limits.

Special Works.

Plans and estimates have recently engaged the attention of the Department for the proposed steel and concrete grand



Waterworks Aqueduct, Ottawa, showing construction of concrete retaining wall and 42-in. steel clear-water pipe.

stand at the Exhibitnon Grounds, capable of seating 10,000 people. One section of the building is to be used for fire and police station. The estimated cost is $90,000.

Plans and estimates are also being prepared for a special high pressure fire protection system, giving 120 pounds pressure at the hydrants throughout the central portion of the city where insurance risk is heaviest, buildings highest and pressure the lowest, due to the physical conditions.

Chaudiere Dam.

A work, which is not in any way under the control of the city, but which has proved of great benefit to the Waterworks Department, is the new Chaudiere Dam recently built. The affect of this dam has been to raise the level of water in Nepean Bay, Ottawa River, from 8 to 10 feet, thereby giving the power plants, including the waterworks, that much more effective working head. The dam is constructed of reinforced concrete with 22-ft. openings for stoplogs, there being 15 feet of water on the sills.

In addition to the asphalt plant, the city maintains two storage yards, a blacksmith and carpenter shop, and press house, where repairs, building snowplows, and other work necessitated by the carrying on of these large undertakings, is carried out.

MISSING NUMBERS.

Copies of the Canadian Engineer for June 5th, 1908, and February 5th, 1909, are required. For copies of these issues we will extend your subscription one month. Circulation Department, Canadian Engineer, Toronto.

THE GREAT CHAUDIERE DAM, OTTAWA, ONTARIO.

Douglas L. McLean, B.Sc.

The Great Chaudiere Dam, situated just above the crest of the Great Chaudiere Falls, Ottawa, Ont., was built in 1908-09 by the power owners of the Ontario and Quebec sides of the Ottawa River. The engineers, well-known in hydraulic power development work, were William Kennedy, jr., Montreal, and J. B. McRae, Ottawa. The contractors were Quinlan & Robertson, Montreal. The dam is of steel and concrete construction and is of the pier-and-sluice type. The sluice openings are closed by massive fir stop-logs, which are moved by a powerful electric winch operated on the bridge floor of the structure.

Before going into details of design or construction an outline of the conditions at the Chaudiere leading up to the building of the dam will be given.

The Ottawa River on which the Chaudiere Falls are situated, has a drainage basin of 34,623 square miles above the City of Ottawa, and a length of over 450 miles with a drop from head waters to the level below the falls of some 1,100 feet. Mean yearly precipitation (average for 38 years) was 31.6 inches. The run-off (average for 38 years) was 53 per cent. of the precipitation. The maximum discharge at the Chaudiere Falls was 193,000 cubic feet per second in 1876. A very good idea of this tremendous rush of water may be obtained from photograph "Dam in Spring Flood of May 1909." The minimum discharge at the Chaudiere Falls was 11,000 cubic feet per second in 1906. See photograph "Dam in Low Water of Fall of 1908," and compare this condition with that in photograph mentioned above.

The yearly mean run-off for year of average discharge (1860) was 46,000 cubic feet per second.

The available storage above Ottawa was 14,500 square mile feet.

This storage would increase the minimum flow to 28,000 cubic feet per second.

Construction, December 1st, 1908.

From these figures it will be seen that the Ottawa River is capable of developing enormous quantities of hydraulic power, which, with the proposed government improvements, will be made steady and reliable during all seasons. The largest single power is located at the Chaudiere Falls in the Cites of Ottawa and Hull. Leases for power here were taken out about 1851 and were, for the most part, Crown leases, issued by the Government of Upper Canada. The condition of the different powers at the Chaudiere may be summarized as follows:—

No.	Owner.	Title of Property	Quality of Electrical h.p. before new dam was built.	Uses of Power.
		Ontario Side.		
1.	Ottawa City		*1,000	Pumping domestic water and fire protection.
2.	Bronson's	Riparian Crown Acre	3,000 2,600	Power sold to the Ottawa Electric Company.
3.	Ottawa Street Railway	Lessee Government Hydraulic Lots Q. and part of R. and T.	2,600	Power used to drive Street Railway.
4.	Ottawa Investment Company	Government water lots S. and part of R.	400	Power used to drive saw works sub-let to Ottawa Street Railway.
5.	Ottawa Power Company	Government lots U.V.W.X.Y. and Z.	7,500	Power used in carbide works.
6.	Ottawa Electric Company	Government lots K.L.M.N.O. and P.	5,000	Power used to supply electric light and power.
7.	J. R. Booth	Government lots H.I. and J.	9,000	In pulp mills.
8.	J. R. Booth	Government lots B.C.D.E.F. and G.	7,000	In sawmills, etc.
	Total Ontario side		35,700	
		Quebec Side.		
9.	Ottawa & Hull Power Company	Riparian and Quebec Government	7,000	Electric light and power in Ottawa and Hull.
10.	E. B. Eddy	Riparian Owner	14,000	Pulp and paper mills.
11.	City of Hull	Brewery Creek	550	Pumping, water and fire protection.
	Total Quebec side		21,550	
	Grand total Ontario and Quebec sides		57,250	

* Normally

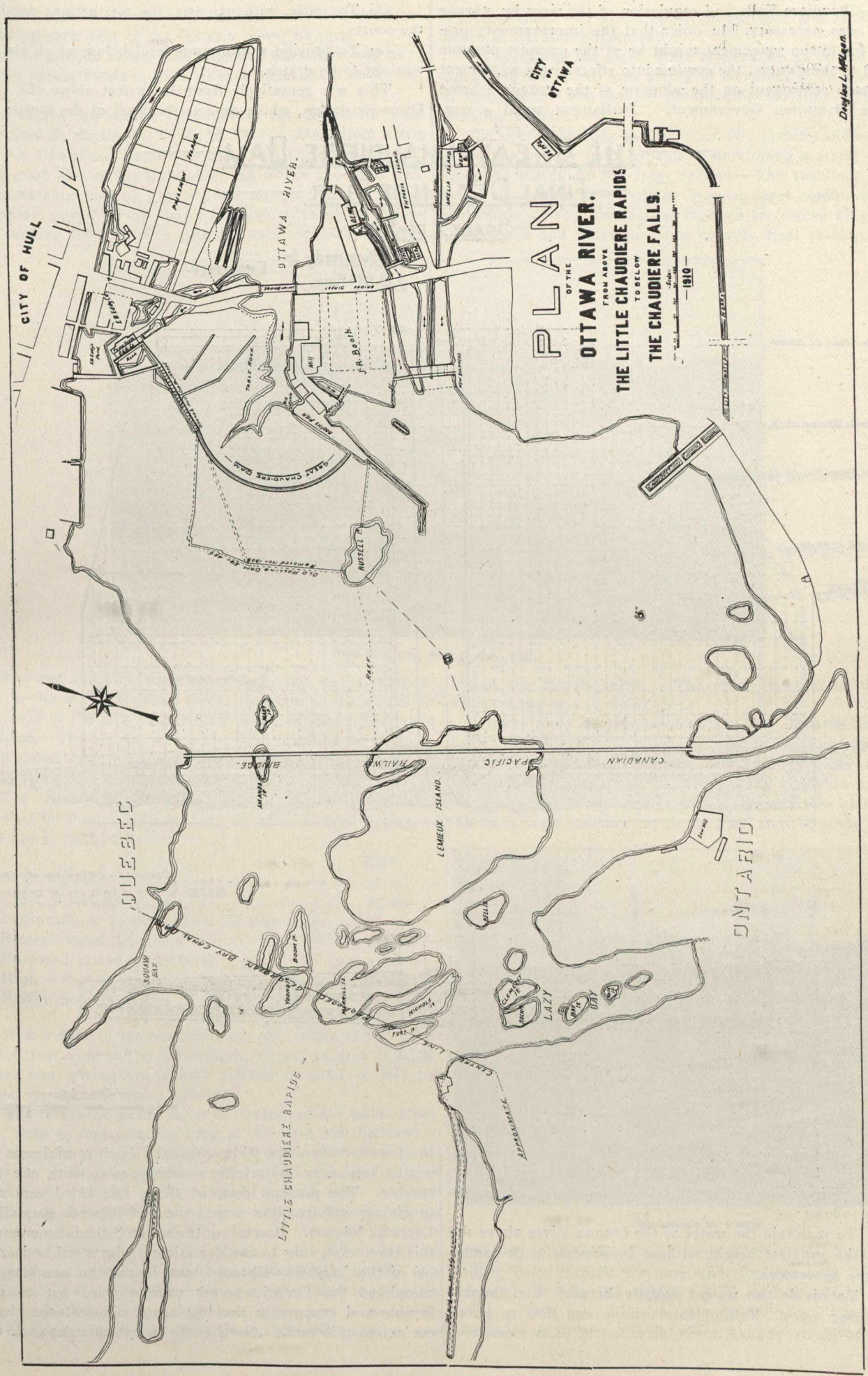
The original developments did not form part of any comprehensive scheme for the economic development of the total power available. This resulted, as the demand for power increased, in a number of developments, which were not very efficient. This was due, for the most part, to inadequate head or tail-races. Another loss was the water that escaped through the leaky dams and wasted over the falls. These conditions, together with low water and frazil ice, were not seriously felt till after the fire of 1900, as up till then, most of the power had been used for sawing lumber, which was always done before winter set in. After the fire, however, a large proportion of the power was used to generate electrical energy and to run industries that required a steady supply of power. Consequently the low water and the frazil ice, which formed above in the Remoux and Little Chaudiere Rapids, caused much inconvenience and sometimes caused the plants to shut down temporarily. This shortage gave rise to considerable competition between the power owners individually and between the Ontario and Quebec parties collectively. Each side claimed that the other was using more water than entitled to. In some instances, when a company attempted to make an improvement in their works, even though such were below the governing bulkheads, they were prevented from doing so by injunctions served by the other companies who were afraid that, in some way, they were trying to increase their intake.

This state of affairs lasted several years, and gave rise to a number of lawsuits. The chief point in dispute was whether the bed of the river was owned by the Federal or Provincial Government. This question, which was of so much importance, not only in this case but also in the case of all rivers forming part of an inter-provincial boundary, would never have been settled till passed upon by the Privy Council of England. This decision could only have been obtained after much delay and at the cost of very heavy legal expenses.

Consequently to avoid both the loss of time and heavy law costs, which would have resulted from leaving the matter to the courts to decide, the various interests represented, began negotiations, hoping that by a policy of give and take, they might reach an agreement as to the division of the water. After an alternate exchange of views, covering several years, they were finally successful and an agreement, satisfactory to all parties, was adopted and executed on December 27, 1909.

At the same time as the agreement was signed, the Ontario and Quebec parties purchased the water rights at the Little Chaudiere Rapids. This freed them from any claim for damages and also enabled them to make the minimum level, to which the water was to be held by the new dam, sufficiently high as to partially drown these rapids and so help, to a great extent, the difficulty with frazil ice.

The increasing value of the water powers at the Chaudiere contributed largely to the settlement of 1907, as all the hydraulic lessees wished to develop their properties to their maximum capacity. To effect this a new dam, at the head


PLAN
OF THE
OTTAWA RIVER,
FROM ABOVE
THE LITTLE CHAUDIERE RAPIDS
TO BELOW
THE CHAUDIERE FALLS.
1910
CITY OF HULL
OTTAWA RIVER.
CITY OF OTTAWA
Douglas L. McLaren.
QUEBEC
ONTARIO
LEMIEUX ISLAND.
LITTLE CHAUDIERE RAPIDS
APPROXIMATE
CANADIAN PACIFIC RAILWAY BRIDGE.
J.R. Booth
MILL
TABLE ROCK
GREAT CHAUDIERE DAM
OLD ROLLING DAM REMOVED NOV. 1909
RUSSELL PT.
REEF
LAZY BAY
SQUAW BAY
BAY CANAL
YOUNGS POINT
NICHOLS PT.
FURT PT.
CENTRE LINE

of the Chaudiere Falls and regulation of the river by storage dams, was necessary. In order that the improvements provided for in the agreement might be of the greatest possible benefit to the owners, the coming into effect of the agreement was made contingent on the adoption of the storage scheme by the Dominion Government. Parliament voted a considerable sum for the storage dams, so the power owners proceeded with the new or "The Great Chaudiere Dam."

The objects desired and obtained by its construction were as follows:—

(1) To maintain the water of the Ottawa River above the falls to the greatest height without interfering with parties not in the agreement.

(2) To divide the waters equally between the Ontario and Quebec sides. Half of this volume and flow to go to each.

(3) To settle, without costs, the two actions pending in the courts.

(4) To provide a minimum level below which the water was not to be drawn.

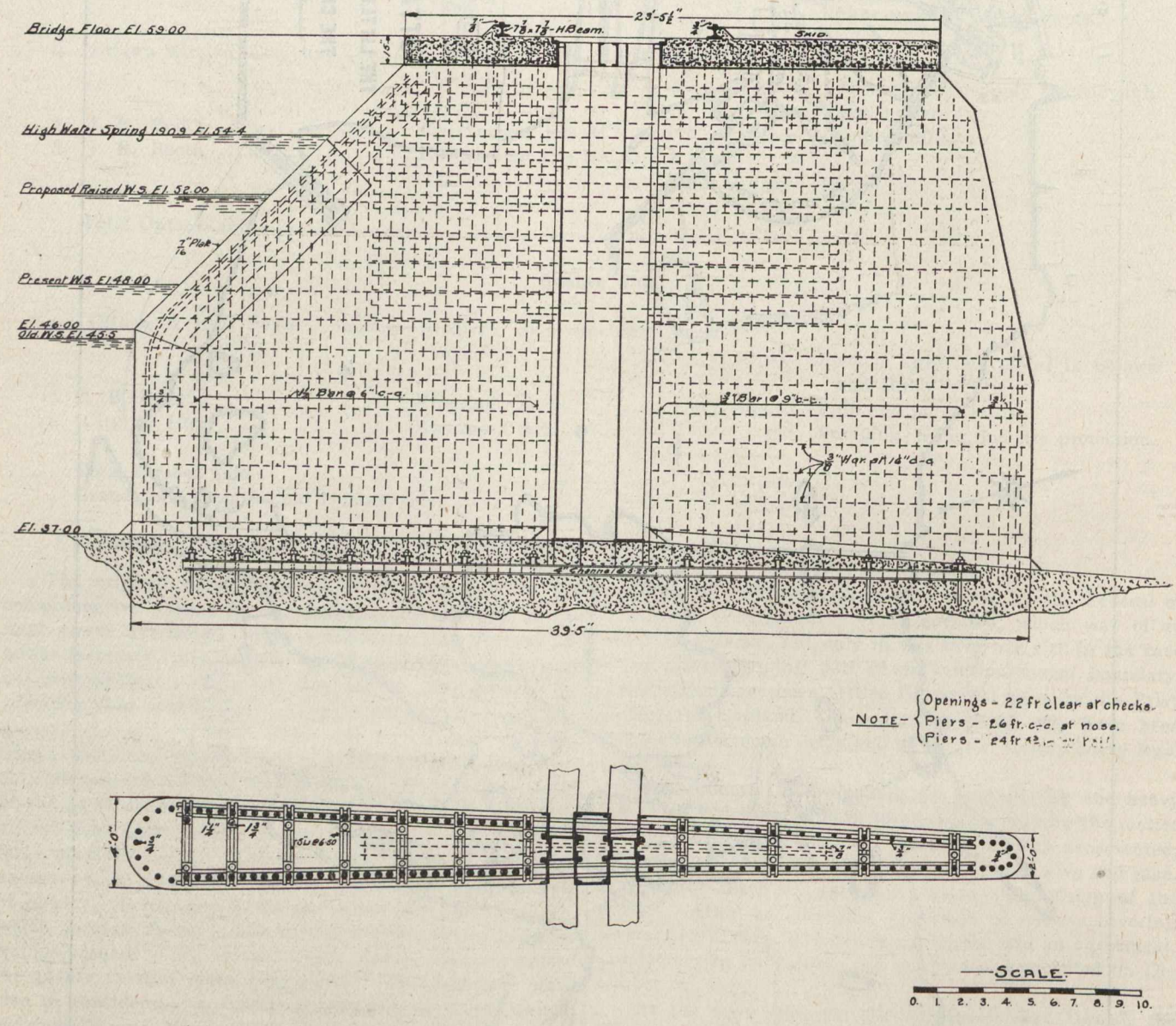
This was tentatively fixed at 52 feet above the City of Ottawa's datum, whose zero is the level of the lowest sill of the lowest rock of the Rideau Canal. Such a minimum level would help very materially in doing away with the frazil trouble. The present level, of 48.00, has aided very much in giving sufficient flow across the reef between Russell and Lemieux Islands. Heretofore the water had to come through this channel, owing to the damming up by frazil and anchor ice of the Lazy Bay Channel, and before the new dam was completed the Ontario power owners were put to much trouble and expense in keeping a sufficiently large channel cut across this reef. Not having to cut this channel, there

THE GREAT CHAUDIERE DAM.

FINAL DESIGN OF PIER.

SCALE ¼ IN = 1 FT.

Wm Kennedy Jr
J.B.McRae. Engineers.



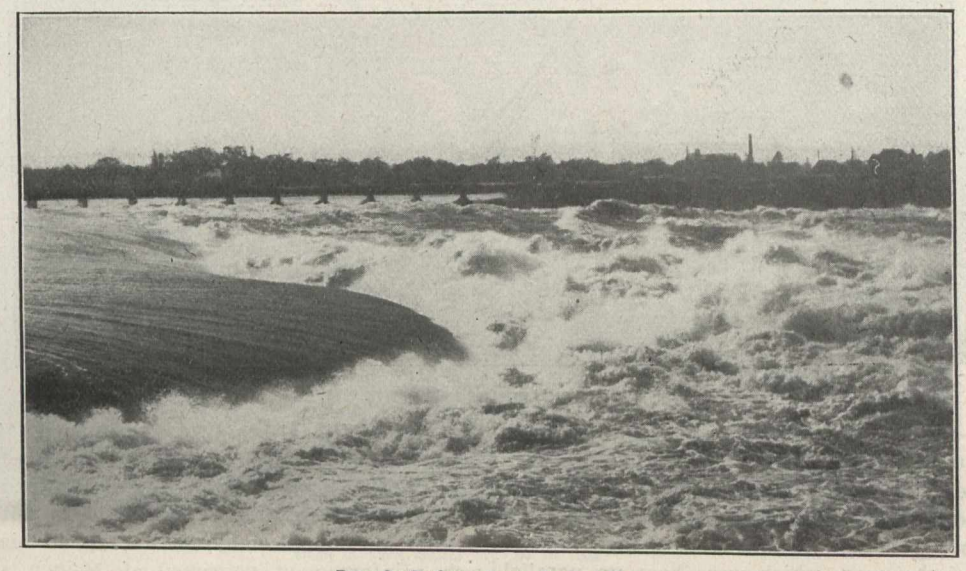
NOTE— Openings - 22 ft clear at checks.
Piers - 26 ft. c-c. at nose.
Piers - 24 ft 4½ in. at rail.

SCALE.
0. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

being now sufficient water over the reef, means a considerable saving each year to the Ontario power owners.

(5) To provide a dam with sufficient discharge way as to allow the spring floods to pass without appreciable backwater effects.

To obtain the results cited above, the Chaudiere Dam was located as shown on "Plan of Ottawa River from above the Little Chaudiere Rapids to below the Chaudiere Falls." A very good idea of the location of the works and their general appearance may be gained from the photograph "Dam in January 1909." This shows the dam without its bridge floor, starting from Booth's pier at lower right-hand corner of photo and reaching with its 51 piers and 50 sluice openings, in the arc of a circle, across the river to the abutment at the end of the Ottawa & Hull Power Company's new steel bulkhead. The arc, on which the piers are laid out radially, has a radius from pier-head centre to centre of arc circle, of 566.33 feet and a length of 1,300.189 feet.



Dam in Spring Flood, May, 1909.

The governing elevations, which are all referred to Ottawa City datum (can be seen on plan of final design of pier) are as follows:—

	Elev.
Stop log-sill	37.00
Crest of old dam	45.50
Beginning of 45 deg. batter on pier nose	46.00
Present water level	48.00
Proposed raised water level	52.00
High water of 1909	54.40
Bridge floor elevation	59.00

With a flood of 193,000 cubic feet per second and 50 openings 22 feet wide and 17.5 feet high, we get an area of 19,250 square feet, giving an average velocity of some 10 feet per second through the sluice openings.

The piers, the most important feature of the whole structure, were 39 feet 5 inches long at the base and battered to give a 23 feet 5½ inch bridge floor support at elevation 57.75. They had a clear height from stop-log sill to bridge floor of 22.00 feet. Their cross sections at base were modified ellipses, as the ellipse, according to tests in Europe, affords the least obstruction to flowing water. In order that any debris, which might pass the noses of two piers might not wedge between their downstream ends, owing to the convergence by their radial setting, the piers were made 4 feet wide at the nose or upstream end, tapered to 2 feet at the tail or downstream end. This gives, between piers, 22 feet of a clear sluice-way at the upstream entrance and 22 feet 5¾ inches at the downstream exit.

In designing the piers, water at elevation 52.00 and causing a pressure of 100 tons acting at elevation 42.00 was used in conjunction with an ice pressure of 200 tons acting at elevation 50.00.

To counterbalance the effect of this turning moment an anchorage of rock bolts capable of developing a stress of 200 tons was placed in the front section. The resultant stress acting 10 feet in front of the stop-log post combined with the weight of the pier acting through its centre of gravity and the ice and water pressure brought final resultant well within the middle third. The chief function of the rear anchor bolts was to resist shear.

These piers were founded on the solid Trenton limestone bed-rock. Where fissures or cracks occurred, a cut-off trench of 1 : 3 : 6 concrete was put in. This same mixture (1 : 3 : 6) was used in the foundations, while above elevation 37.00, in the piers and bridge floor 1 : 2 : 4 concrete was the order; 1¾-inch round anchors (21 to the pier) were securely grouted into the solid rock. These were set in pairs, having their upper ends secured by nuts and washers over two 5-inch channels at 6.50 lbs., which rested on four 4-inch channels at 5.25 lbs., two on each side of the pier. These 4-inch channels were placed with lower flanges at elevation 35.50

Anchorage of Piers.

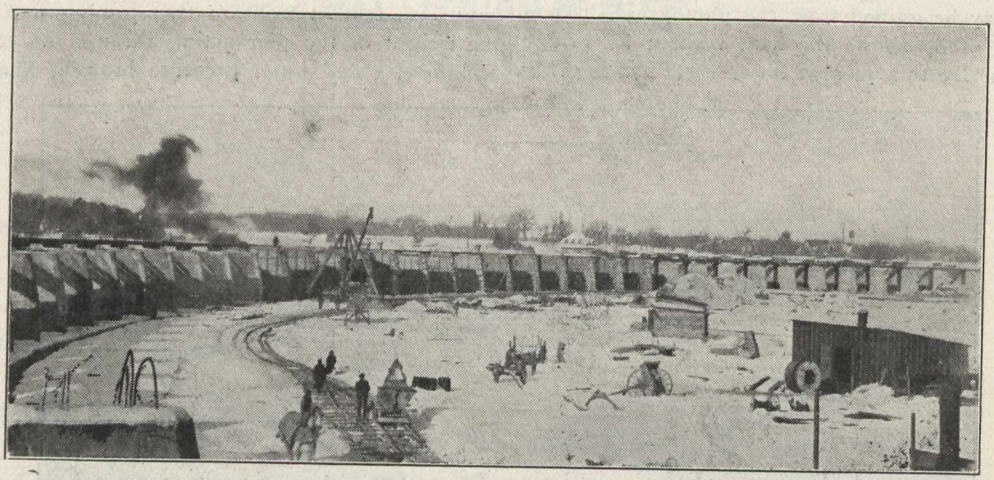
and ran the length of the pier. A space between each pair of channels allowed the vertical reinforcement to pass from the under side where the upset ends of the rods were secured by nuts and washers to the channels, through and up with centres 6 inches from outside of pier to beneath the nosing plate and bridge floor, where the rods were bent in a semi-circle, like hairpins, and came down to be secured underneath the pair of channels on the opposite side of the pier. In the upstream portion or that above the stop-log posts, the vertical rods were 1¼-inch round at 6-inch centres, while below the posts, or downstream, they were ¾-inch round and 9-inch centres. Running outside of these upright rods were ⅜-inch horizontal round rods spaced at 16-inch centres and wired to the vertical members. There were also nine ¾-inch rods in the rounded ends of the nose, which were bent up parallel to the latter; a like number of ⅝-inch rods were used in the downstream ends. These rods were set in the foundation matrix and not connected with the system of anchors. Above elevation 46.00 ⅞-inch rods, 21 feet long, in sets of three were put in horizontally to bind the upstream and downstream portions together.

To protect the concrete on the face of the upstream batter from the pounding of ice or logs, ½-inch rounded nose plates 11 feet 7½ inches long were securely anchored to the concrete backing.

A double system of stop-log checks was thought advisable. This member was composed of eight 12-inch channels at 25 lbs., eight 3 × 2½ × 7-16 angles with ½-inch plates and anchors. The total weight of post per pier was 9,517 lbs.

The sills were each a 15-inch channel at 33 lbs., and were placed at elevation 37.00. They were solidly bedded by forcing 1 : 2 mortar through 1½-inch holes in the upper surface of the channels. They were also anchored by 1¾-inch bolts.

With the 1 : 2 : 4 concrete surrounding the steel reinforcement, the pier became a permanent structure securely bound to the solid bed-rock on which it rested.



Construction, December 16th, 1909.

An additional rigidity was imparted by the reinforced bridge floor, which united the tops of the piers. This floor was 23 feet 5½ inches wide and 15 inches deep. It was reinforced by ¾-inch straight round rods at 6-inch centres on the bottom and by ½-inch rods on top at 6-inch centres. The web reinforcement consisted of ¼-inch stirrups wired to right angles to the main reinforcement in the top and bottom tension members; ¼-inch rods at 14-inch centres, ran at of slab. The floor was divided into two parts by the stop-log opening, which was 4 feet 5 inches wide. This opening was divided in the centre into two parts by two 12-inch channels at 20.5 lbs., separated by bolts and piping. This left 19 inches for each stop-log way. The two sides consisted of a 3 × 3 × 7-16 angle on a 12-inch channel at 20.5 lbs. anchored to the floor slabs. The angles were so placed as to form checks for a wooden covering of the opening. The upstream portion of floor carried the winch rail, poles for winch wire, etc., while the downstream carried the other

Reinforcement in Piers.

winch rail and two skids (at 16 feet centres), which supported the stop-logs when not in use. The winch rails consisted of a ⅞-inch bar on upstream rail and ¾-inch on downstream rail, curved to proper radius, and riveted to an 7-⅞ × 7⅞-in. H beam. The top flooring consisted of 1 in. of

Fir stop-logs 23 feet 9 inches were used.

Two hundred pieces 18″ × 16″ × 24″

Two hundred pieces 16″ × 16″ × 24″

One hundred and fifty pieces 19″ × 16″ × 24″ were ordered.

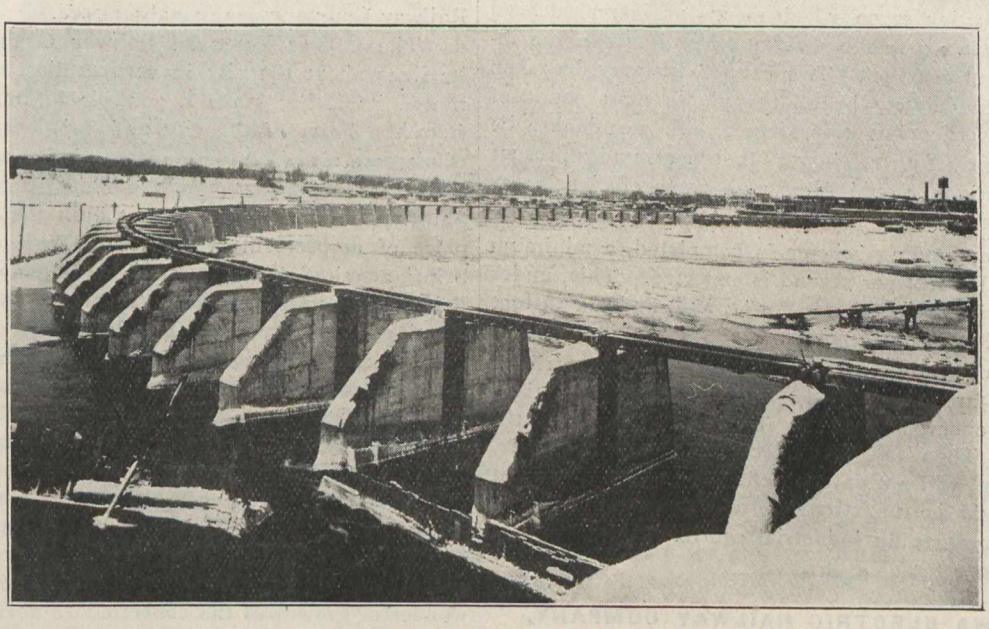
Dam in Low Water of Fall of 1908.

1 : 2 mortar. Expansion joints of tar paper, lead and asphalt were laid every fifth pier.

The stop-log system of regulation, which has attained its greatest efficiency in the Ottawa Valley, was the one unanimously decided on by the Power Owner's Commission,

The 16-inch and 18-inch logs were made up in sets of two, held together by eight ⅞-inch bolts.

The winch for handling these logs was a powerful machine capable of lifting 35 tons. It also was able to force the logs down and had a lateral movement for serving the two



Dam in January, 1909.

consisting of George H. Millen, W. H. Baldwin, William Kennedy, jr., and J. B. McRae, after inspecting the leading dams and power developments in Michigan and Minnesota, U.S., and consulting experts in the use of bear-trap dams, Tainter gates and stony sluices.

checks. It was run by a 50 horse-power D.C. motor operated at 600 volts. A small boiler was also installed and used to thaw out the checks and logs when needed.

The electric current for running the winch was turned on January 12th, 1910, so that from the time the contractors

started on August 8th, 1908, there has elapsed one year and five months. This does not, however, give a correct idea of the speed with which the first portion of the work was put in. On August 8th, 1908, the contractors started work and by December 20th, 1908, had completed the structure with the exception of bridge floor and accessories, which were put in during the following summer and fall.

Photographs entitled "Construcion December 1st, 1909, and Construction December 16th, 1909," will give a very good idea of the way the major portion of the work was pushed.

The concrete in the central section of piers was poured in zero weather and special precautions were taken to ensure a good quality of work. The sand used in the concrete was heated by blowing steam through it and the mixer was fed by a steam jet, which thoroughly heated the mix. This was poured into the pier forms, which had previously been saturated with live steam, for 24 hours. The steam was kept on under the tarpaulins for another 12 hours and then sawdust and manure were packed on the top of the moulds. The forms were left on till the following summer.

It will be seen that all this work necessarily involved a large expenditure. The total cost of the dam amounted, in round numbers, to $225,000. Against this expenditure we have the following gains: The law costs saved; the frazil trouble lessened; the saving of leakage through the old dam, which from one survey in 1904 amounted to 4,000 cubic feet per second out of a total flow of 11,500 cubic feet per second; and most important, the increased head.

The average available head at the Chaudiere, during low water, previous to the construction of the new dam, was about 30 feet; the corresponding low water flow, 11,000 cubic feet per second. This is equivalent on a 24-hour power and efficiencies used in good practice, to 27,500 horse-power. Only some 60 per cent. of this, however, was available, due to leakage through the old dam, so that 16,500 horse-power gives a better idea of what could be obtained.

It is proposed to hold the surface of the water above the new dam, to elevation 52.00, which means an increased head of 8 feet. Allowing 2 feet for variation and losses, the increase in head will be 6 feet. This cannot, however, be taken advantage of immediately by all the plants on account of their low headworks, but this defect will, no doubt, be remedied in the near future. The 36 foot head, under present low water conditions, would give, with some efficiencies as above, 33,000 horse-power.

When the impounding scheme is completed, a minimum flow of 28,000 cubic feet per second is expected. This, under a 30 foot head, gives 70,000 horse-power, and, under a 36 foot head, will give 84,000 horse-power.

The Cities of Ottawa and Hull, who did not contribute to the scheme, are also greatly benfited by having their pumping water ensured to them. This adds greatly to the fire protection. Then too, the effects of increased power, given by the dam, will not only benefit the power owners but will materially aid in the stirring growth that is to bring Ottawa to the front as an industrial centre.

THE OTTAWA ELECTRIC RAILWAY COMPANY.

Ottawa is without doubt one of the best served cities of its size in America in the way of street railways. The routes are conveniently laid out; the car service is good; the equipment is modern. In no city in the temperate zone is street railway travel so comfortable. On the coldest day in winter, the cars are as comfortable as on the balmiest day of summer, every car being heated by electricity, and kept at a uniform temperature. Compared with the discomfort of travel in winter in the street cars of some cities, Ottawa cars are bliss.

The first street railway in Ottawa was the old fashioned horse car line, which was incorporated in 1866, and granted a perpetual franchise by the city. A twenty-minute service was provided by the six cars in use, but when the bad road seasons came, in spring and fall, it was often found necessary to suspend the service. In winter the service was by sleighs, and strange as it may seem, the charter of the present company permits it to run a sleigh service in winter. This was not because it was feared it would be impossible to keep the line open, but at the outset it was unknown how great the expense would be, the whole proposition of electric railways in Canada being only an experiment.

The horse car line suffered with every other business concern in the period of depression following 1874, and for years the receipts of the company were cut down to half what they had been, and for twelve years up to 1882, no dividend was declared.

At this time the company possessed nine cars and fifty-five horses, the cars moving at an average speed of six miles an hour.

In February of 1891, however, a new company, The Ottawa Electric Street Railway Company, was incorporated with Messrs. Thomas Ahearn, Warren Y. Soper, William Scott, D. C. Dewar, and R. Quain as provisional directors. In June of the same year J. W. McRae was elected president; G. P. Brophy, vice-president, and William Scott, D. C. Dewar, Thomas Workman, R. Quain and P. Whelan, directors. J. E. Hutcheson was appointed superintendent, J. D. Fraser, secretary-treasurer, and Thomas Ahearn, general manager. In May the first ground had been broken, and at the formal opening of the line, on June 27th the directors of the new company gave a banquet to leading citizens in honor of the event.

In 1893, with the consent of the City Council, the Ottawa City Passenger Company and the Ottawa Electric Street Railway Company were amalgamated.

The Ottawa Electrical Railway Company has extended its lines about the city in various directions as traffic warranted it; it has made it possible for many to live remote from the heart of the city and enjoy the green trees and wholesome air of outlying places; it has given the people of Ottawa access to parks and bathing places in all directions. Shortly after the road was first built the company started a place of amusement at Rockcliffe Park. On that property being acquired by the city the company acquired land at Britannia, 9 miles up the Ottawa, and opened a park there, erecting pavilions, building a long pier out over the sandy beach, and providing bathing and boat houses for the convenience of patrons. Britannia had long been a favorite resort for Ottawans, but as soon as street railway connection was provided, people began to go there by thousands.

The number of men employed by a railroad is a good index of growth. In 1894 the Ottawa Electric Railway employed 200 men; now there are 650 men in the service of the company. In 1891 the company carried 1,520,000 people; in 1908 there were 14,000,000 passengers carried. Such is the wonderful growth of the concern.

The directors and officials at present are Thomas Ahearn, president; P. Whelan, vice-president; Warren Y. Soper, Thomas Workman, Senator George Cox, and George P. Brophy, directors; James D. Fraser, secretary-treasurer; J. E. Hutcheson, superintendent.

The company operates on 45 miles of track and has 150 passenger cars.

THE OTTAWA ELECTRIC COMPANY.

What is now the Ottawa Electric Company is the result of an amalgamation in 1894 of the Chaudiere Electric Light & Power Company, the Standard Electric Company, and the Ottawa Electric Light Company.

The Ottawa Electric Company generates electricity for light and power in two hydraulic and one steam stations at 2,300 volts, two phase 60 cycles. No. 1 hydraulic station is located on Head Street; in it are installed four 700 K.W., two phase Westinghouse alternators, three of which are direct connected to three sets of Smith-Vaile and Stillwell-Bierce water wheels. Each set of wheels is composed of three 39-inch runners, and develops 1,000 horse-power under 25 feet head, each operating at 180 revolutions per minute. The fourth 700 K.W. unit recently installed is connected to a set of three Dayton-Globe water wheels of 1,000 horse-power. There are two exciter sets comprising a D.C. generator, 125 volts, 56½ K.W. driven by, and direct connected to a pair of 15-inch water wheels; 500 volts direct current for elevators is obtained from a 300 K.W. rotary converter.

The switchboard in this station comprises four generator panels, two exciter panels, D.C. and A.C. panels for the rotary, and one A.C. power panel. The head of water at this station varies from 25 feet to 29 feet.

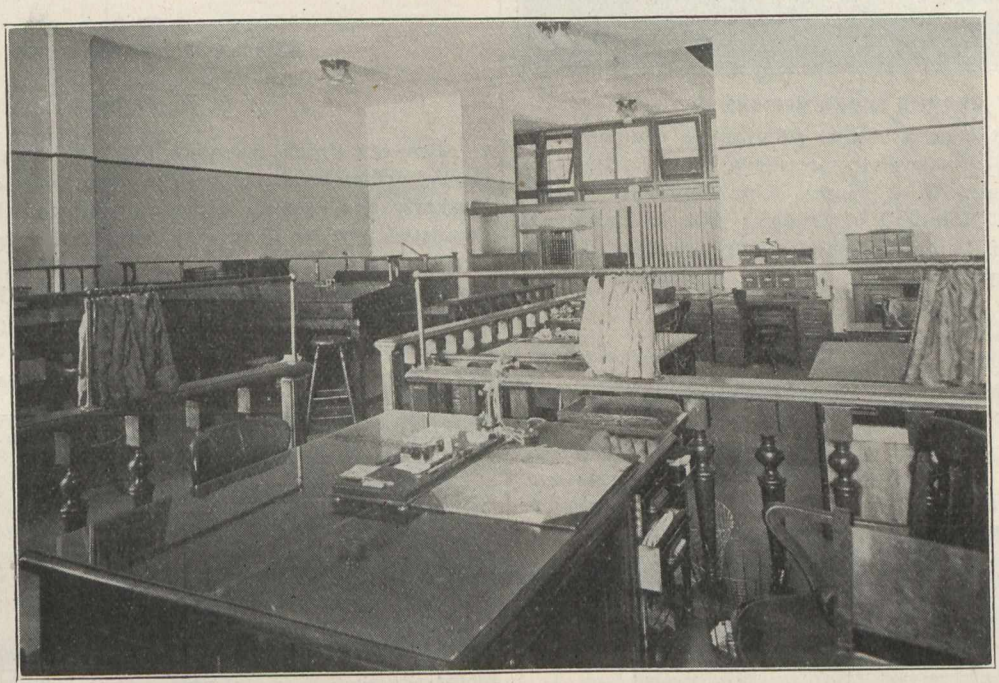
No. 2 station now being remodelled will be the main receiving and distributing station, and is located on Amelia Island. Here are to be installed two 1,300 K.V.A. Westinghouse two phase revolving field, 2,300 volt, generators direct connected to two units of S. Morgan-Smith water wheels 1,760 horse-power each, operating under 33 feet head at 180 revolutions per minute. One K.W. D.C. 125 volt exciter direct connected to a set of water wheels of 150 horse-power and a motor driven exciter set. The motor is two phase 2,200 volts 180 horse-power, and the exciter is 120 K.W., 125 volts.

The switchboard equipment consists of two exciter pedestals, two machine pedestals, two machine instrument posts, and one post carrying exciter instruments and synchroscope. There are also two receiving panels for power generated in other stations, and two phase distributing panels for lighting and power circuits. Lombard governors with remote electric control are installed in both No. 1 and No. 2 stations. Provision has been made in No. 2 power house for duplicating the present installation.

The steam reserve of No. 2 station is located on Britannia Street. A Westinghouse-Parsons turbo-generator set of 1,500 K.W. is used here together with the necessary switchboard apparatus. Steam is obtained from six Babcock and Wilcox tube boilers of 2,400 horse-power capacity. This unit has given excellent service; during a period of low water in the fall of 1908 it was not shut down for three months, and during that time it carried loads as high as 2,400 K.W. for considerable periods.

It has always been the aim of the Ottawa Electric Company to provide uninterrupted service to its customers, and this station has materially assisted in carrying out this purpose.

There is also installed in No. 3 station two Goldie-McCulloch compound engines of 1,200 horse-power belted to a 750 K.W. 500 volt D.C. generator for railway service and used by the Ottawa Electric Railway as a steam reserve when required.



ACCOUNTING DEPARTMENT.

The company has the city thoroughly covered with its lines, which extend also into the suburbs in all directions for several miles.

The peak load in winter approximates 6,000 kilowatts for all classes of service, and the K.W. hours generated per day during the winter average about 70,000. The rate for lighting is eight cents per K.W. hour with a discount of 10 per cent. for fifteen days. Alternating current power is sold at $25 per horse-power per year, and $30 per horse-power per year for direct current on flat rate. There is also a combination rate for power of $1 per month per horse-power of motor capacity installed, and in addition one cent. net per K.W. hour on meter. A considerable number of customers avail themselves of this rate which has proven simple and satisfactory. Serving a population of 85,000 the installation is equal to 16,550 kilowatts.

The company recently remodelled its office building throughout; the photographs of the offices are here shown. So great has been the growth of the business that it has recently been found necessary to take over the entire building

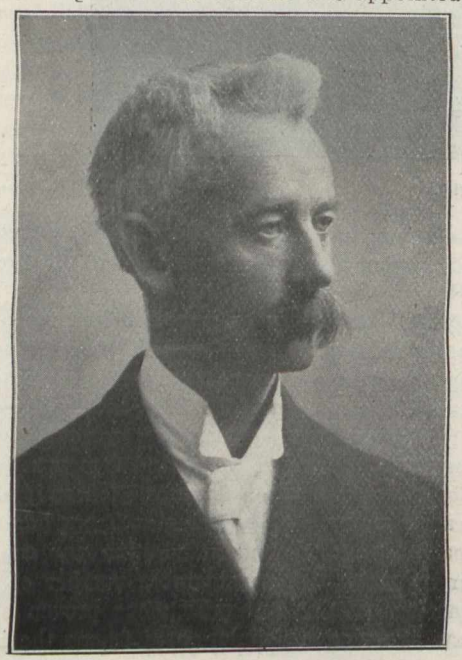
(66 × 30 ft., four floors) for the company's own use. The merchandise and fixture department occupy the entire top floor, the second floor is occupied by the accounting department, president's office and board room, the ground floor is taken up by general offices, and the basement contains merchandise and lamp stores.

GROUND FLOOR OFFICES.

The men at the head of this progressive company are: President, Mr. T. Ahearn; vice-president, Hon. E. H. Bronson; other directors, W. Y. Soper, Levi Crannell, Thomas Workman and H. Robillard of Ottawa; Mr. J. Haney and E. R. Pencock, of Toronto; general superintendent, Mr. A. A. Dion; secretary-treasurer, Lt.-Col. D. R. Street.

R. W. FARLEY.

Richard William Farley, City Engineer, Hull, Que., was born at Hull, 17th January, 1861. He is a member of the Canadian Society of Civil Engineers and member of the Governing Board of the Association of Land Surveyors of the Province of Quebec. In 1882 he was appointed agent of



R. W. Farley.

Lands and Forests under the Quebec Government, with residence at Hull, and held this position for a number of years. In 1893 he was elected to Hull City Council, representing Ward 1 from that date till 1898, holding the position of chairman of the joint committee whilst the bridge over Gatineau River was under construction. During the years 1895-6-7 he occupied the position of chairman of waterworks but resigned this office in 1898 to become city engineer, this latter position he held until the spring of 1902 when he resigned to take up private practice.

From 1902 to 1908 his time was devoted to hydraulic and municipal engineering, including waterworks, sewerage and street construction in the towns of Buckingham, Hawkesbury and other surrounding municipalities. He was engineer of Hull at the time that city was almost destroyed by fire in April 1900, and was largely instrumental in the widening of the principal streets, the reconstruction of the city on improved lines, the inaugurating of the present street lighting system and the construction of the present pump house and waterworks system, which were built after his designs.

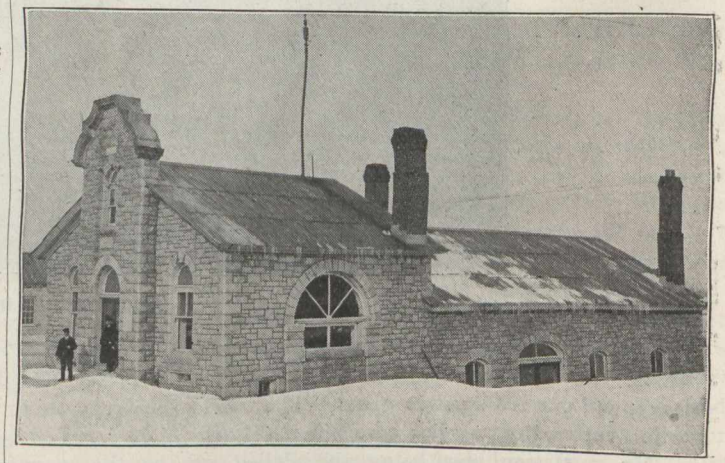
In May 1908 Hull Corporation having recovered from the financial depression caused by the fire of 1900 he again assumed the position of city engineer and is now engaged in the construction of a main sewerage and the enlargement of the waterworks system and other civic improvements.

HULL'S POWER-HOUSE.

R. W. Farley.*

Brewery Creek, a branch of the Ottawa River, takes its rise immediately above the Chaudiere Falls and circling in a northerly and easterly direction, encloses the more densely populated portion of the city before it again joins the river some two miles below.

The present corporation power-house is located upon this stream one-half mile from the river and where the flow contracting between limestone banks, takes a drop of eighteen feet. The city not only owns and operates its own water-



Power House Hull City.

works system but likewise its own street lighting plant and system. The present building, erected eight years ago, is of stone on concrete foundation and consists of electric light station 40 × 28 feet, in front, with pump house 40 × 64 feet in rear.

The water in the river is at all times from six to twelve feet higher than the creek. The flow into the latter being controlled by concrete bulkhead and stop logs at Aylmer Road Bridge, which crosses the stream 400 feet from the river. It is not possible to use the additional head at the

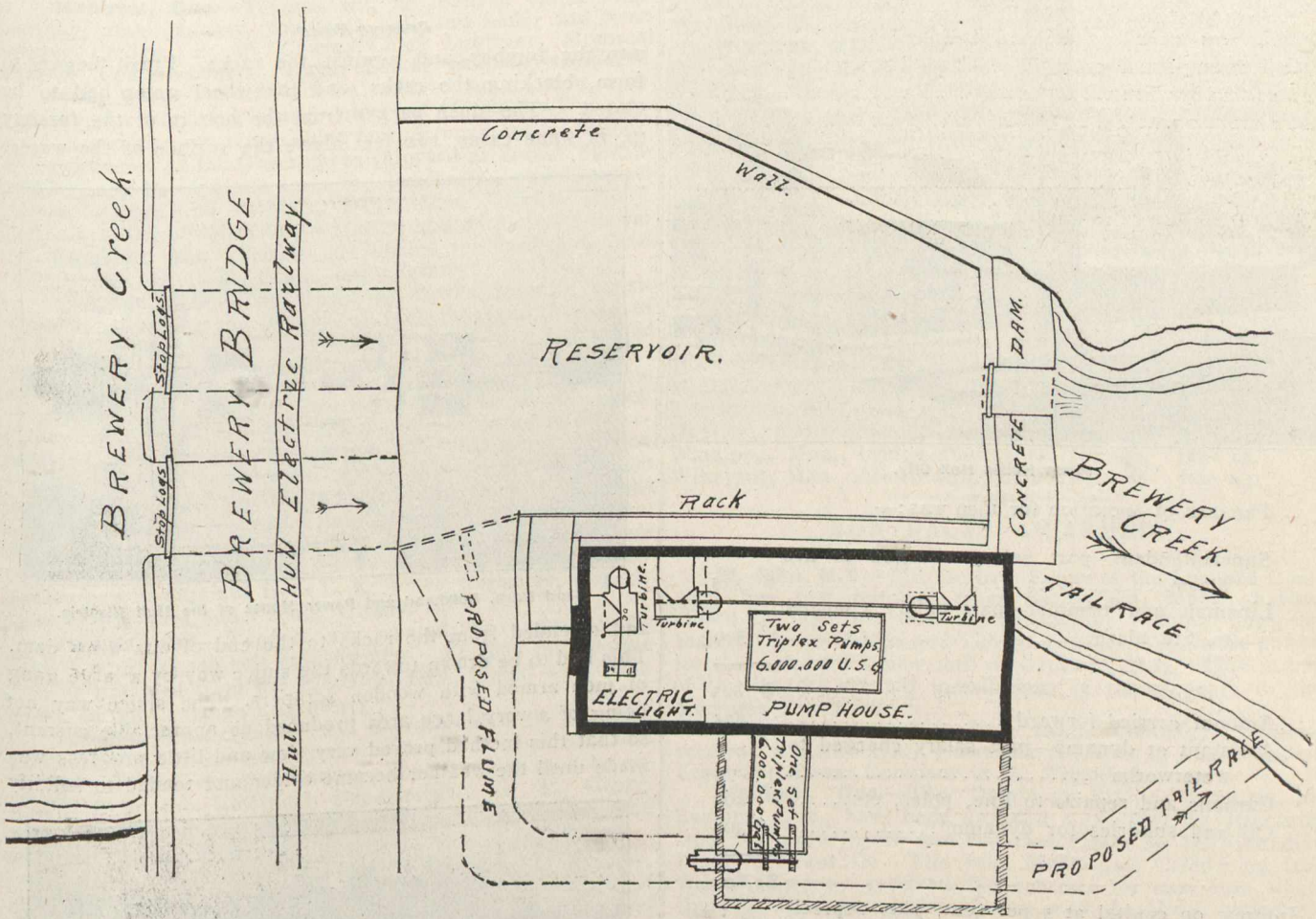
* [Mr. Farley is city engineer of Hull, Que., a member of the Canadian Society of Civil Engineers and an Ontario and Quebec Land Surveyor.—Ed.]

pumping station owing to the damage which would be occasioned to private property along the banks between the Aylmer Road Bridge and the power house. Otherwise a head of twenty-two feet could be maintained at the latter point.

The pumping plant is located upon the lower or basement floor of the power house, and in rear of the lighting station. It consists of two sets of triplex, double acting pumps, 15-inch cylinder, 18-inch stroke, having a daily capacity of 3,000,000 U.S. gallons per set. These pumps are of the Worthington pattern and were built by the John McDougall Company, Montreal. These pumps are driven by two 45-inch McCormack turbines, set in steel penstocks and located at either end of the pump house. The wheels are connected to pumps by jack shaft and pinion gear and so arranged that one or both wheels can be coupled to the pumps, as found necessary or desirable. The building is steam heated and the wheels are piped so as to permit of steam being used to thaw out any ice which may form therein. But very little trouble is encountered with frazil owing to the length of slowly moving water in the creek being covered with ice throughout the whole winter season.

The water pumped is taken from the river immediately above the falls and is brought to the pump-house by a clear water pipe of cast iron, 30 inches in diameter, laid in a trench cut in the rock which forms the bed of the creek. It extends from the pump-house to the river a distance of 2,800 and thence out into the river some 450 feet to a point 150 feet above the new power dam, recently erected at the head of the Chaudiere Falls. At this latter point a wooden inlet crib, 26 feet by 32 feet, has been sunk in fifteen feet of water. This inlet crib is so arranged that the water is drawn from the down stream end thereof and passes through double screens before entering the clear water pipe. This clear water pipe is laid on a grade of 1 in 1,000 and delivers water to the pumps under a head of six to twelve feet.

Owing to the rapid growth of the city, the Council has decided to increase the pumping capacity and a contract has recently been let to the William Hamilton Company for a triplex double acting piston pump, 21-inch cylinder, 30-inch stroke, and having a capacity of 6,000,000 U.S. gallons per day. This pump is now being constructed at Peterborough, and will be in operation **early next summer.** The new pump will be housed in an addition to the present power-house, which is being enlarged for this purpose, and will be operated by 56-inch Sampson wheel. This latter will sit in **open flume,** at present being excavated along the front and east side of pump-house, the tail race being carried under the enlarged building to creek in rear. This flume and tail race will be of sufficient capacity to permit of the operation of an additional wheel and pumping unit when found desirable.



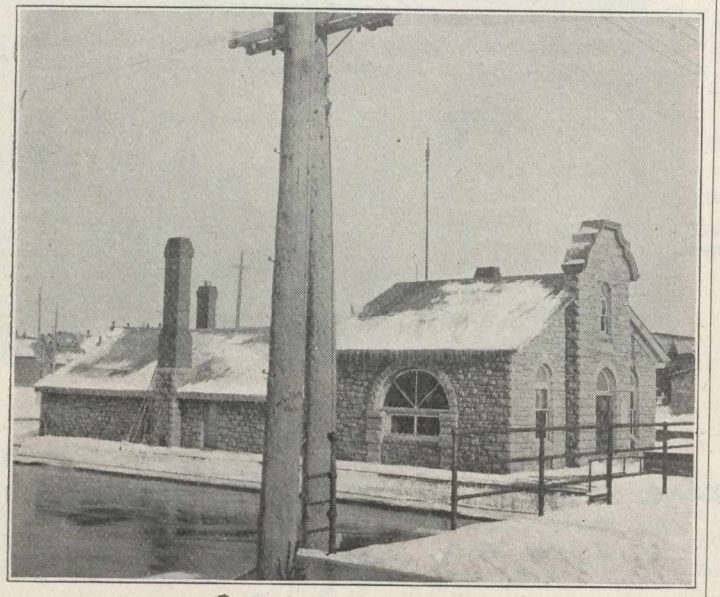
Power House, Hull City.—R. W. Farley, City Enigneer.

The lighting plant consists of brush arc dynamo—6.6 amperes, 11,000 volts—belt connected to 36-inch Trump wheel. Three circuit marble switchboard, together with the dynamo, are situated upon an upper floor in front of building, and all machinery in the power station is in full view of the men in charge from any portion of the building. One hundred and ten Adams Bagnel direct current enclosed arc lamps are at present in use in the city streets and, as they are constantly being added to, the present dynamo will, doubtless, be taxed to its full capacity of 150 lamps before many months.

The street lighting has now been in operation for nine years, and is run in connection with the fire alarm system. The man in charge of the latter is likewise in charge of street lights. He is assisted by one trimmer and occasionally employs outside help for line work or for installing new lamps and circuits. There is likewise one man at dynamo who assists at other work in power-house.

Some items of cost may be of interest in this connection.

The amount charged against capital account, to the present time, amounts to the sum of $29,300. This includes power-house, poles, wires, lamps, etc.



Pump House Hull City.

The cost of operation for 1909 was:—

Superintendent—part salary charged to fire alarm	$ 325
Lineman and trimmer—part salary charged to fire alarm	500
	$ 825
Amount carried forward	825
Assistant at dynamo—part salary charged to waterworks	275
Carbons and repairs to line, poles, etc.	400
Oil and sundries for dynamo	300
	$1,800
Interest on capital at 5 per cent. plus depreciation at 5 per cent. = 10 per cent.	$2,930
	$4,730

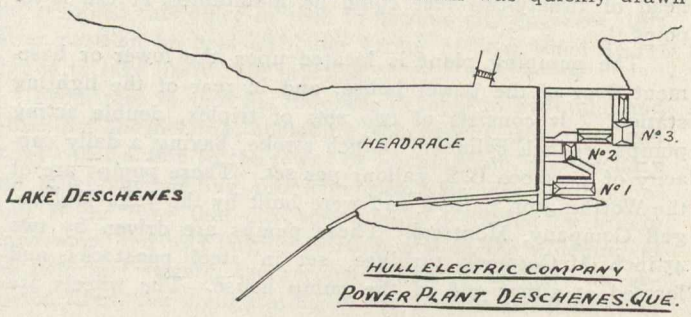
Say $43 per lamp per annum. The lamps are run on an all-night schedule every night in the year.

ICE TROUBLE AT HULL ELECTRIC POWER HOUSE.

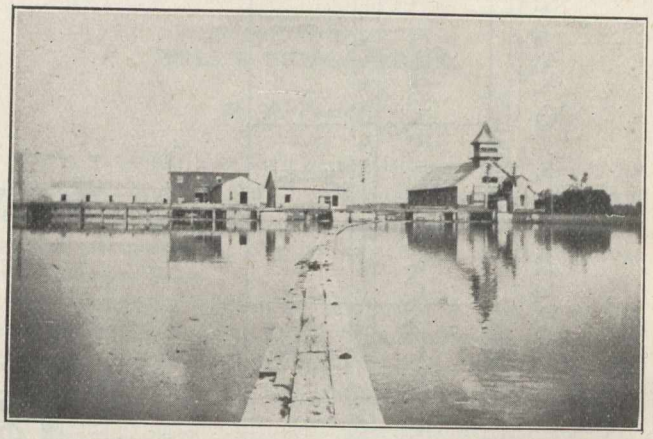
It will be seen from the enclosed sketch that the power plant is located at the foot of Lake Deschenes, and in consequence comparatively free from frazil ice trouble.

The only time of the year that any bother is experienced from this source, is before the lake freezes over; a sudden change in temperature accompanied by a strong wind will often cause the formation of frazil. However, the number of times the plant has had to shut down from this cause has not proved frequent enough to warrant the installation of a steam plant for protection against frazil.

Following the first ice formation on the lake this year, there was a fall of snow accompanied by sleet, and a strong south-west wind. This broke up the lake ice, and drove a slushy mixture into the head race which was quickly drawn



into the forebay and against the racks. Frazil began to form, blocking the racks, and the wheel gates had to be closed. The slush packed from the bottom of the forebay to, in some cases, two feet above the surface of the water,



Head Race, Bulkhead and Power House of the Hull Electric.

and extended from the racks to the end of our wing dam. This had to be drawn towards the sluice way by a large gang of men armed with wooden scrapers. The sluice way not being of a very large area produced no appreciable current, so that this method proved very slow and little progress was made until the weather became colder and tended to solidify

Forebay at Hull Electric Power House. Forebay full of Slush, Frazil Ice, etc.

the mass. Virite was then used to advantage. About 300 lbs. of this explosive was used before a channel was opened up through the ice pack to the lake.

These ice troubles during the winter months increase the cost of operation of our power plant over 50 per cent.

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.

St. John, N.B.—The general committee of the council have asked for permission to invite tenders for the construction of pavements at an estimated cost of $87,000. Mr. William Murdoch is city engineer.

Montreal, Que.—Tenders will be received up to Wednesday, 26th January, for steel hull and boiler for boom dipper dredge. F. W. Cowie, Chief Engineer, Montreal Harbor Commissioners. David Seath, Secretary-treasurer.

Sorel, Que.—Tenders will be received up to noon, 29th January, for supplying 75,000 cubic feet of round white pine timber, and also for 12,500 cubic feet of round spruce timber, to be delivered at the Government shipyard at Sorel. Specifications may be obtained from the Purchasing and Contract Agent, Marine and Fisheries Department, Ottawa. G. J. Desbarats, Deputy-Minister of Marine and Fisheries, Ottawa.

Kingston, Ont.—Tenders are invited for hardware, sand and rubble. H. B. R. Craig, city engineer.

Kingston, Ont.—The Board of Works recently considered tenders for the supply of four thousand barrels of cement. The tender of H. Chadwick at $1.69 a barrel had been recommended for acceptance, but the board decided either to purchase on the open market or invite new tenders.

Ottawa, Ont.—Tenders will be received up to 16 o'clock Friday, 28th January, for the supply of 140,000 barrels of cement required for the construction and maintenance of the various canals of the Dominion, and to be delivered in such quantities, at such places and at such times as may be directed. Dealers in cement may tender for the total quantity required, or for such portions thereof as may suit their convenience. Specifications, forms of tender and full information can be obtained from L. K. Jones, Secretary, Department of Railways and Canals, Ottawa.

Toronto, Ont.—Tenders are wanted for approximately 8,000 k.w. of 13,200 volt transformers. Further information may be obtained from the Electrical Department, City Hall. (Advt. in the Canadian Engineer.)

Toronto, Ont.—Tenders will be received until Tuesday, February 8th, for the construction of feeder conduit runs and manhole at the Terminal Station. Specifications may be obtained from the Electrical Department. G. R. Geary, (Mayor), Chairman, Board of Control. (Advertised in the Canadian Engineer.)

Toronto, Ont.—Tenders will be received up to Monday, the 24th inst., for all trades required in the erection of Office, Warehouse and Cold Storage Building at Front and John Streets, Toronto. Plans and all particulars at office of F. H. Herbert, Architect, 65 Adelaide Street East.

Toronto, Ont.—Tenders will be received up till noon, January 31st, for all trades required in the erection of a branch building for the Canadian Bank of Commerce, at the corner of Bloor and Dufferin Streets. Plans and specifications may be seen at the office of the architects, Darling and Pearson, 2 Leader Lane, Toronto.

Toronto, Ont.—Tenders addressed to Mr. H. F. McNaughten, Secretary, Public Works Department, Parliament Buildings, will be received until noon, Tuesday, February 1st, for the completion of the court house in Kenora. J. O. Reaume, Minister of Public Works, Department of Public Works, Ontario.

Waterloo, Ont.—Tenders will shortly be invited for electrical equipment in connection with the new plant. Geo. Grosz, engineer; Ford S. Kumpf, secretary light commission.

Winnipeg, Man.—John Gunn & Sons, who were recently awarded the contract for the substructure of the Louise Bridge, at $13,809, have asked to be relieved of the contract claiming that a mistake had been made in estimating the cost of the work. It is probable that new tenders will be invited.

Winnipeg, Man.—Tenders will be received up to Monday, February 28th, for the erection of five-wire fence and gates along both sides of the city's transmission line right-of-way between Winnipeg and the Brokenhead River. Plans and specifications may be obtained at the office of the power engineers, Smith, Kerry & Chace, Carnegie Library building, Winnipeg. M. Peterson, Secretary, Board of Control.

Winnipeg, Man.—Tenders will be received up to Tuesday, February 15th, for erection of the power terminal station at Winnipeg. Plans, specifications, etc., may be obtained from the power engineers, Smith, Kerry & Chace, Carnegie Library building. M. Peterson, Secretary, Board of Control.

TENDERS PENDING.

Fuller information as to these tenders pending may be found in the issues of the Canadian Engineer referred to.

Place and Work.	Tenders close.	Issue of.	Page.
Howick, Que., bridge abutments	Jan. 25.	Jan. 14.	39
Midland, Ont., electric equipment	Feb. 1.	Jan. 14.	46
Wetaskiwin, Alta., gas well	Feb. 15.	Jan. 14.	46
Dauphin, Man., office fittings	Jan. 24.	Jan. 14.	39
Winnipeg, Man., bridge abutments	Jan. 22.	Jan. 14.	39
Winnipeg, Man., electric equipment	Feb. 15.	Jan. 14.	39

CONTRACTS AWARDED.

St. John, N.B.—Mr. Herbert Evans of the Leonard Company has just returned from Springfield, Mass., having closed the contract with the Nepisiguit Lumber Company there for large Corliss and Tangye engines, 1200 horse-power, for this company's new mill at Bathurst, N.B. This is one of the largest sawmill installations of recent years in the Maritime Provinces.

Montreal, Que.—The John Inglis Company, Toronto, received a contract for penstocks required by the Canadian Light and Power Company at St. Timothee.

Montreal, Que.—The Dominion Bridge Company, of Lachine, Que., have been awarded a contract for structural steel for power racks and tail race bridge by the Canadian Light & Power Co. The John McDougall Caledonian Iron Works Company received the contract for cast iron wheel chamber drain pipe in connection with the above company's plant for the development of power at St. Timothee.

Verdun, Que.—Following is a list of tenders received for the installation of pumps in the new municipal power house:—

(x) Laurie & Lamb, Montreal	$2,300
Canadian Buffalo Forge Co., Montreal	1,170
Peacock Brothers, Montreal	1,920
Drummond, McCall & Co., Montreal	1,600
For a 250 h.p. boiler, the following bids were considered:	
(x) Polson Iron Works Co., Toronto	$4,615
Robb Engineering Co., Amherst, N.S.	4,990
Babcock & Wilcox, Montreal	5,500

(x) Accepted.

Toronto, Ont.—Dr. Sheard recommends to the controllers accepting the tender of the Berna Motor & Taxicab Co., Ltd., for $9,700 for two auto trucks for street sprinklers. The price for one is $4,850. The Denis Motor Water Sprinkler Co. tenders at $4,800, and Joseph Hollin's tenders at $4,665 for the Leyland motor, but Dr. Sheard considers that the highest priced machine is the best value.

Winnipeg, Man.—The contract for the construction of a subway under the Canadian Northern tracks at Pembina

Street has been awarded to Thomas Kelly & Sons at a price in the neighborhood of $50,000.

Medicine Hat, Alta.—Clay Products Plant. Following contracts have been awarded by Warren Overpack, 404 N. Des Moines St., Webster City, Ia.; E. Leonard & Son, London, Ont., for furnishing three high-pressure boilers; Murray Iron Works, Burlington, Ia., for furnishing a 120- horsepower Corliss engine; National Pump Co., Upper Sandusky, O., for furnishing pumps; Brownell Co., Dayton, O., for furnishing a 500-horsepower heater; Stewart Machine Co., Winnipeg, Canada, for furnishing the following: One 42-in. gap lathe, one iron planer, one 30-in. drill press, force draft blower, Minneapolis Steel Machinery Co., Minneapolis, Minn., post cap, base plates, I-beam lintels, line shafting boxes, and part of pulleys.

RAILWAYS—STEAM AND ELECTRIC.

Fort William, Ont.—Double-tracking and extensions to the street railway, including the purchase of four new cars, which will cost $137,000, will be made here shortly. A. McNaughton, Clerk.

Hamilton, Ont.—The chief particulars of the nine double truck cars which the Ottawa Car Company are building for The Hamilton Street Railway, are as follows:—

Length over end sills	30 ft.
" of rear vestibule	6 ft.
" " front "	6 ft.
" over all	43 ft.
Width over side sills	7 ft. 8 in.
" at belt rail	8 ft. 2 in.
Seats—Longitudinal.	
Upholstering—Rattan.	
Inside finish—Cherry.	
Seating capacity	40
Trucks mounted on Brill 27-G-1.	

St. Thomas, Ont.—The Michigan Central Railway contemplate the erection of new shops and roundhouse here.

Winnipeg, Man.—The Canadian Northern Railway has awarded to Thomas Kelly & Sons a contract for the construction of a subway at Pembina Street, at an estimated cost of $50,000.

Prince Rupert, B.C.—Tracklaying on the first hundred-mile section of the Grand Trunk Pacific Railway will be begun here before the end of the month. Additional rolling stock supplementing the shipment forwarded in December is now en route from the East. The next few weeks will also witness the arrival of steel material for the bridges on the sections 50 miles out from the northern terminal city.

Vancouver, B.C.—A traverse survey for the proposed line of the Canadian Northern railway through the Fraser river valley between Hope, at the west slope of the Hope Mountains, and New Westminster bridge, a trifle under 70 miles, has been completed. The engineering party in charge of W. K. Gwyer, reached the last mentioned point Monday afternoon. Its members will begin next Monday the work of making the first location. They will start at Hope and work down the valley. The results already accomplished are regarded as very satisfactory by Thomas H. White, chief engineer, whose headquarters are in this city. Further reductions in the grades are expected after the completion of the location work. The maximum grade amounts to four-tenths of one per cent. between Hope and a point farther down the valley a distance of 14 miles, and even this grade occurs at only two or three places in two miles of that distance. The grade for the remainder of the route is virtually a river grade, equivalent to one-tenth of one per cent. Two small tunnels may have to be driven, one 15 miles below Hope, and the other at Sumas mountain. The river bank is followed nearly all the way down, the only exception being between Rosedale and Chilliwack, where the route has been located at a distance of about two miles from the Fraser. The entire line between Hope and the Yellowhead pass via Kamloops has been located with the exception of a stretch of fifty miles between Tete Jaune Cache and Yellowhead pass. This work is now being done by C. F. Hanington and a large survey party which is now working east from Tete Jaune Cache at the base of the western slope of the Rockies.

Seattle, Wash.—Plans and specifications for the new Grand Trunk Pacific pier to be erected at a cost of $300,000 on the site of the present Flyer dock, according to the statement at the local headquarters on Monday, will be ready within six weeks, and contracts will then be awarded for immediate construction.

SEWERAGE AND WATERWORKS.

Hamilton, Ont.—City Engineer A. F. Macallum has prepared plans for sewerage for the east end annex.

Albany, N.Y.—Steps are to be taken by State Commissioner of Health E. H. Porter to stop the pollution of the Niagara River in the city of Niagara Falls, N.Y., where it is stated garbage is thrown into the river through a chute below the Falls. The attention of the State Department was called to the matter by Charles A. Hodgetts, Chief Health Officer of Ontario, who stated that a petition from the city of Niagara Falls, Ontario, asking for authority to operate a similiar chute in that city, had been denied by the Provincial officials, and asking that, if possible, steps be taken to prevent the pollution of the river on the American side.

LIGHT, HEAT, AND POWER

Montreal, Que.—The project of damming the St. Lawrence has been favorably reported on by the International Waterways Commission which recently held a meeting at Buffalo.

Bridgeburg, Ont.—The Canadian Niagara Power Company will erect a power plant here at a cost of $6,000.

Fort William, Ont.—The ratepayers have voted to expend $19,000 for lamps and line work in connection with the electric light system.

Preston, Ont.—The ratepayers will vote on an $18,000 by-law to install an electric power distribution plant. H. C. Edgar, clerk.

MISCELLANEOUS.

Fredericton, N.B.—The Dominion Bridge Company has commenced active work on the erection of the four new steel spans which will complete the Fredericton-St. Marys Highway Bridge here.

Moncton, N.B.—Mr. J. Edington, city engineer, has outlined plans for another reservoir in connection with the water supply. The estimated cost of the work is $212,000.

St. John, N.B.—Included in the estimate of expenditures on account of the Light Department for 1910 is an item of $23,500 for 314 arc lamps at $75, while considerable will be spent by the Fire Department on hydrants, hose, and fire alarm supplies generally.

St. John, N.B.—The following amounts have been voted by the council in connection with work to be done during this year:—Schools, $136,418; public works, $78,000; sewerage maintenance, $15,000; interest, $27,575; lighting, $26,500; police, $48,000; fire, $65,000; ferry, $10,400; city debentures, $54,571; free public library, $5,750; exhibition purposes, $636; street lighting debentures, $12,375; total $480,227.

Montreal, Que.—On Tuesday, January 11th, Mr. F. W. Cowie of the Montreal Harbor Commission, delivered his first lecture on harbor engineering in the new course provided at McGill University for the engineering students. Over 100 attended.

Ottawa, Ont.—City Engineer N. J. Ker has suggested to the civic waterworks committee that two pumps and electrical equipment for the generation of power be installed to increase the fire pressure.

Fort William, Ont.—The ratepayers recently voted to expend $21,000 on telephone construction and $10,000 for the construction of a subway and dock.

Fort William, Ont.—The council have practically decided to purchase four new street cars. Write Mayor Peltier for details.

Thorold, Ont.—The town council have endorsed plans to allow several of the Niagara power companies to enter the town and supply power.

Toronto, Ont.—The Grand Trunk Railway have decided to control the movements of their trains on the Toronto-North Bay and Hamilton-Allandale divisions by telephone

and the installation of necessary equipment will begin immediately.

Souris, Man.—The C. P. R. has purchased four hundred acres adjoining this town, presumably for a shop site to serve the southwestern lines which converge here.

Melville, Sask.—Cushing & Weir have been granted a ten-year franchise to erect an electric light and power plant here at a cost of $30,000. The municipality will probably purchase the plant at that time.

Edmonton, Alta.—Messrs. Phalon & Shirley, of Omaha Neb., contractors, have eighty miles of the contract on the G. T. P. west of the McLeod River, and will start hauling supplies this week.

Vancouver, B.C.—F. C. Gamble, engineer of the provincial public works department at Victoria is considering plans for the construction of a sewer on Nanaimo Street.

Vancouver, B.C.—P. Welsh, Spokane contractor, of the firm of Foley, Welsh & Stewart, was awarded the contract for the construction of sixty-five miles of the coast section of the V. V. & E., Abbotsford to Hope. They will immediately rush construction.

PERSONAL.

Messrs. J. H. Walker and J. R. Dixon, of the Cleveland Bridge and Engineering Company, Limited, Darlington, England, recently arrived in Canada. They may prepare a tender for the construction of the Quebec bridge.

Mr. D. H. McDougall, formerly of the Steel Company, was recently appointed superintendent of the Dominion Coal Company.

Mr. J. J. Wright, who has been connected with the Toronto Electric Light Company for twenty-seven years, and who has been general manager of the company for a number of years, has been made second vice-president and consulting engineer. His place as general manager has been taken by Mr. H. McRae, who was formerly gen. man. of the Electrical Development Company, and who was succeeded in that position by Mr. R. J. Fleming when the control of that company changed hands some time ago.

Mr. James V. Costigan announces that he has associated with himself, Mr. E. H. Cahoon and Mr. C. F. Beck, under the corporate name of The Portage Engineering Company, with offices in the Doyle Block, Akron, Ohio.

ENGINEERING SOCIETY NOTES.

National Association of Cement Users.—The sixth annual convention of The National Association of Cement Users will be held at Chicago, Ill., February 21-25, 1910, the headquarters being at the Auditorium Hotel. A very complete programme has been arranged.

Central Railway and Engineering Club of Canada.—At the regular monthly meeting of the above society, held at Toronto, on Tuesday evening, January 18th, Mr. James Bannan, chief stationary engineer at the City Hall, Toronto, read a paper on "Temperature Regulation," and Mr. C. A. Jefferis, the retiring president, received a suitable gift in recognition of his services durng the past year.

The automatic control of artificial temperature is a comparatively new art, said Mr. Bannan. With the crude methods of heating employed by our ancestors, nothing of this sort was possible and even with the advent of more modern steam systems the operators were for years forced to be content with such regulation of temperature as could be obtained by manually operating heater drafts, ventilators, etc. As heating appliances approach perfection, however, and the knowledge of hygiene becomes more widely disseminated the question of temperature in our living and working rooms has gradually assumed the importance it deserves, and to meet the demands for means of automatically controlling these temperatures, various appliances have from time to time been placed upon the market. It is a matter of anxious interest in this connection, as showing the difficulty of the problem, that out of the many appliances introduced for this purpose very few have proved practicable. And out of the many hundreds of patents that have been issued for automatic temperature regulation only a few are required to cover the appliances that are in successful operation today. A temperature regulator is an automatic device which will open or close as required to produce a uniform temperature, the valves which control the supply of heat to the various rooms although these regulators are often constructed so as to operate the dampers of the heater. They differ from damper regulators for steam boilers by the fact that the latter are unaffected by the temperature of the surrounding air, although acting to maintain a uniform pressure and temperature within the boiler, while the former are put in operation by changes of temperature in the rooms, heated from a hygienic point of view. The close regulation of temperature in a building is important and from an economic point of view it is even more important.

Many systems of heat regulation are in use and are doubtless worthy of extended notice, but the systems most used and giving the best satisfaction are the Nash, the Johnson and the Power systems. In any of these three systems the motive force for operating or closing the valves which regulate the heat supply is obtained from compressed air, which is stored in a reservoir by the action of an automatic motor. The thermostat acts with change of temperature to turn off or on the supply of compressed air. When the air pressure is in the valves supplying heat they are closed, when if they are opened by a strong spring placed on the spindle of the valve the compressed air is supplied at a pressure of about 15 pounds to the square inch, which is operated automatically to maintain a given pressure. An air pipe leads from the air compressor to the thermostat and another from the thermostat to the diaphragms in connection with valves or dampers. The action of the thermostat is simply to operate a minute valve for supplying or wasting compressed air in the pipe leading from the thermostat to the diaphragm valves.

WEEKLY EARNINGS

NAME OF COMPANY	TRAFFIC RETURNS			
	Week Ending	1910	Previous Week	1909
Canadian Pacific Railway.	Jan. 14	$1,342,000	$1,315,000	$ 970,000
Canadian Northern Rail'y..	"	185,700	174,000	117,200
Grand Trunk Railway	"	725,025	654 885	645,218
T. & N. O.....	Jan. 7	30 899	.....	17,002
Montreal Street Railway...	Jan. 15	72 660	73 085	65,717
Toronto Street Railway....	"	74.021	74.415	65,935
Halifax Electric.....	Jan. 14	3,436	3,555	3,129

RAILWAY EARNINGS AND STOCK QUOTATIONS

NAME OF COMPANY	Mileage Operated	Capital in Thousands	Par Value	RAILWAY EARNINGS. Date from	Date to	1910	1909	STOCK QUOTATIONS TORONTO Price Jan. 14 '09	Price Jan. 6 '10	Price Jan. 13 '10	Sales Week End d Jan. 13
Canadian Pacific Railway...	10,048	$150,000	$100	Jan. 1	Jan 14	$2,657.000	$2,068 000	175	180	181	179½ 170
Canadian Northern Rail'y.	3,180	.....	.....	"	"	360,600	263,500	.....	.....	.....	.....
*Grand Trunk Railway	3,536	226,000	100	"	"	1,679,910	1,181,458	*1st. pref. 103½, 3rd pref. 50½, ord'y 20½.			
T. & N. O.....	264.74	(Gov. Road)	.....	"	Jan. 7	30,899	17.002	.....	21	220¾	....
†Montreal Street Railway...	141.79	18,000	100	"	Jan. 15	145.745	143 249	.....	.....	.....	....
Toronto Street Railway,...	114	8.000	100	"	"	148.436	131,746	111	128	127	126½ 87
†Halifax Electric.....	13.3	1,400	100	"	Jan. 14	6 991	6,416	.....	.....	.....	....

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

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, January 20th, 1910.

In the United States markets, pig-iron shows an upward tendency, generally speaking, although prices have altered but little. Enquiry has broadened, in some cases, and now covers the second half of the year. Negotiations for a heavy tonnage of steel making grades are again going on, and it reported that considerable business has already been closed. Foundry grades are less active, but the outlook is hopeful from a seller's standpoint. January is usually a very poor month in the trade but from present appearances it will not be much if any behind November and December. It is yet rather early to make any positive statement regarding the probable tonnage that will be disposed of during the month. Some sellers who were expecting $17, Valley furnace, a short time ago, are now securing $17.25 to $17.50 for the second quarter and it is said that they are asking $18 for delivery during the second half of the year. Whether this price will be reached or not is still to be seen, but there is every indication that the price will at least be higher in the second than in the first half. Reliable reports from the Cleveland district, the centre for Lake Superior ores state that the tonnage already sold for 1910 delivery far exceeds the expectations of the most optimistic, two or three of the leading forms having already sold their entire production. It is estimated that the total sales of Bessemer and non-Bessemer ores aggregate fully as much, already, as the sales made during the entire season of 1909.

European markets continue to show the strong tone which recently developed and it would appear as if the general outlook throughout not only Great Britain but Germany Belgium and France is decidedly better than it has been for many months past. Cable advices continue to show an upward trend in prices with a disposition on the part of holders to ask for advances.

Enquiries received locally reflect improved conditions throughout the whole country, and also the opinion of users of pig that the present is a good time to cover for their requirements. Good orders have been booked during the past week or ten days and enquiries now being received by importers are very large. It is practically impossible to contract for Canadian made pig-iron for delivery during the first half of the year. Consequently consumers have to look to outside sources. It is anticipated that the imports of the year will considerably exceed those of 1909. People who are delaying purchasing will almost certainly, have to pay advanced prices, as import of iron is constantly edging upwards and will probably continue in its present course for some time.

This week ,dealers in different lines of iron and steel products have no alterations to report. The tone is firm, in sympathy with the basic markets but the supply is still fully equal to demand, and as a result the general level of prices is unaltered.

Following is the list of prices:—

Antimony.—The market is steady at 8 to 8¼c. (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 ⅜-base; tire steel, $1.00 for 1 x ⅜-base; toe calk steel, $2.35; machine steel, iron finish, $1.90; imported, $2.20. (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; tarred 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 2¼ cents extra, or 10c. per bbl. weight. (26, 86, 164).

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

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

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

Explosives and Accessories.—Dynamite, 50-lb. cases, 40 per cent. proof, 15c. in single case lots, Montreal. Blasting powder, 25-lb. kegs, $2.25 per keg. Special quotations on large lots of dynamite and powder. Detonator caps, case lots, containing 10,000, 75c. per 100; broken lots, $1; electric blasting apparatus:—Batteries, 1 to 10 holes, $15; 1 to 20 holes, $25; 1 to 30 holes, $35; 1 to 40 holes, $50. Wire, leading, 1c. per foot; connecting, 50c. per lb. Fuses, platinum, single strength, per 100 fuses:—4-ft. wires, $3; 6-ft. wires, $3.54; 8-ft. wires, $4.08; 10-ft. wires, $5. Double strength fuses, 4-ft., $3.75; 6-ft., $4.29; 8-ft., $4.82; 10-ft., $5.37. Fuses, time, double tape, $6 per 1,000 feet; explohmeters, fuse and circuit, $7.50 each. (83).

Galvanized Iron.—The market is steady. Prices, basis, 28-gauge, are:—Queen's Head, $4.10; Colborne Crown, $3.85; Apollo, 10¾ oz., $4.05. Add 25c. to above figures for less than case lots; 26-gauge is 25c. less than 28-gauge, American 28-gauge and English 26 are equivalents, as are American 10¾ oz., and English 28-gauge. (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 carring $1.50 freight rate to Montreal, $2 to $3. Shingles: Cedar shingles, same conditions as laths, X, $1.50; XX, 2.50; XXX, $3. (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 is unsettled and uncertain, as dealers are compelled to meet competition from all sources. Prices are easy and approximately as follows:—$31 for 6 and 8-inch pipe and larger; $32 for 5-inch and 4-inch at the foundry. Pipe, specials, $3 per 100 pounds. Gas pipe is quoted at about $1 more than the above. (74, 188).

Pipe.—Wrought and Galvanized.—Demand is much better and the tone is firm, though prices are steady, moderate-sized lots being: ¼-inch, $5.50 with 69 per cent. off for black, and 48 per cent. off for galvanized; ⅜-inch, $5.50, with 59 per cent. off for black and 44 per cent. off for galvanized; ½-inch, $8.50, with 69 per cent. off for black, and 59 per cent. off for galvanized. The discount on the following is 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: $2.20 for 3-16; $2.30 for ⅛, and $2.10 for ¼ and thicker; 12-gauge being $2.30; 14-gauge, $2.15; and 16-gauge, $2.10. (111).

Rails.—Quotations on steel rails are necessarily only approximate and depend upon specification, quantity and delivery required. A range of

(Continued on page 44).