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The Canadian Engineer

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The Canadian Engineer

ESTABLISHED 1893

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

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TORONTO, CANADA, OCTOBER 16th, 1908.

CONTENTS OF THIS ISSUE.

INSPECTION OF STEEL BRIDGES.

In every part of Canada we find the steel bridge. It may be that in the years to come it shall be superseded by the concrete arch, but in the meantime the steel bridge will see many years of service, and the life of these bridges will depend largely upon the thoroughness and regularity of inspection.

The great trouble is many valuable structures are never inspected by experienced men. Too few municipalities employ engineers familiar with this kind of work and trust to inspection by committees of council—committees composed of men familiar with business methods, but not familiar with bridge construction, nor the weaknesses such structures develop.

Painting and protecting steel work is necessary, and the lack of thorough painting or the substitution of a cheaper paint instead of the specified brand is one source of much damage to steel bridges. Careful inspection annually, or even semi-annually, should be made, that repainting may be arranged for before rust has injured the bridge members. Steel bridges have not been in use long enough under present conditions for one to estimate their life, but it is recognized that careful repainting will add years to that period.

It sometimes occurs that settlement takes place in the steel bridge foundations. It is not often that these settlements are uniform, but are of such a nature as to develop stresses not allowed for in the design. The tilting, if ever so little, should not be allowed, and as soon as detected efforts should be made to again true the bridge.

It sometimes happens that a two-span bridge, because of the settlement of one pier, becomes virtually a single-span bridge of twice the allowable span. Frequently this weakness can only be detected by careful inspection, or, when the inspection is not thorough, by complete failure.

Municipalities would be practising economy by securing an expert to inspect their steel bridges.

A ROYAL COMMISSION ON SEWAGE DISPOSAL.

When the oppointment of a Royal Commission is mentioned one wonders what new piece of difficult legislation now requires shelving or what blunder is to be smoothed over. We have come to look upon Royal Commissions as a peace-offering to appease an enraged public opinion or as a means of shirking responsibility.

This should not be so. Useful for the purposes mentioned as they may be Royal Commissions have a wider field, and if they were used more frequently as a means of collecting information, formulating conclusions based upon scientific data, and recommending legislation there would not be so many Commissions required to conduct post-mortem examinations.

The question of sewage disposal and water supply is the great engineering problem in Canada to-day. Sanitary questions have so long been handled in such an "I guess" spirit that funds have been wasted on incomplete plants, the taxpayer has grown weary of supplying money, and the public are wondering whether the expert

advice so often secured is based on information and experience.

What is required is a Royal Commission composed of sanitary engineers and medical health officers to enquire into the whole question and report. Scientific data bearing on this problem should be collected; a report dealing with the relations between municipalities and manufacturers, traders and others producing refuse is required; the question of stream pollution and the control of water supply is much disputed and should be passed upon. There is plenty of necessary work for a strong Commission.

Such a Commission should not be a Dominion Commission, but provincial. This subject in the last analysis finds its solution in local conditions.

CIVIC APPOINTMENTS.

The scene in the Toronto City Council last Monday over the appointment of an assistant engineer to Mr. Rust clearly points to grave defects in the system of making such appointments. In fact, if the system of making appointments cannot be rid of some of its glaring defects it will become impossible to induce men of standing to allow their names to be put up to auction, as it amounts to at present.

Before the Board of Control look for a man and induce him to put up his name for an office and arrange a salary to be paid, we suggest that the Board should first ascertain if the Council as a whole are agreed upon the advisability of any such appointment.

The debate on Monday was not as to whether Mr. C. H. Mitchell was a fit and proper man for the position, but was solely taken up with a discussion as to whether a salary of $4,000 was an excessive salary or not, and as to whether the appointment was necessary or not.

The whole question of the appointment of an assistant city engineer appeared to come before the Council as a surprise packet, on which they had no information to go upon, so the recommendation of the Board of Control and of the City Engineer was thrown out. When the necessity of a new or extra appointment to the civic staff appears necessary to the Board of Control, it surely stands to reason that the duty of the Board is to first ascertain whether the Council are agreed upon the general principle of that necessity and what the salary attached to that position should be.

If the Board of Control had obtained the consent of the Council to the principle of the appointment before approaching any applicant much valuable time would have been saved and the spectacle of a debate dealing with personalities and insinuation would have been saved the Council.

We ask, is it fair that a professional man, engaged in a lucrative practice, should have his name advertised generally as being appointed to a position by the Board of Control and then to be told that the Council have not made up their minds as to whether any such appointment shall be made or not?

Yet such is the inevitable result of the system adopted. We are constantly being treated to the information that so-and-so has been appointed at such and such a salary, only to find that such appointments are ethereal.

We believe there is much to be said in favor of the system by which, on a new appointment being required, that the Council as a whole agree to advertise such an appointment at a fixed salary, and if it be found impossible to obtain a first-class man at the amount named, then the amount must be increased. The salary which an engineer should obtain is only his market value.

An advertisement of his character published in the Canadian papers, engineering and otherwise, would tend to throw the position open to the market and save such gross insinuations as were made last Monday that the applicant was the nominee of some individual alderman. We would even go so far as to suggest as in Great Britain in connection with civic positions that "personal canvassing be a disqualification." Applications stating qualifications could be sent in to the Board of Control, and along with the head of the department a selection could then be made for further and more acute investigation so that the best qualified man might be spotted.

The present system lays itself open to underhand and secret work of an objectionable character. There is generally the suspicion, as was clearly evinced on Monday that the recommendation was not altogether above board, only a suspicion, 'tis true, without a shadow of foundation—yet it did its work.

It is only too well known that civic appointments are very apt to be made personal affairs, and that the man with the most pull has the best chance of arriving. We hear opposition raised to this condition of things on all hands. What we want is a strong man on the Council who will be ready to force through reforms which will tend to make all such appointments of a nature that the best man will have the best chance, and that at least when a man is practically asked to apply for a position he will have fair and considerate treatment, and that a debate of the tone and character of last Monday will become an impossibility.

EDITORIAL NOTES.

A significant statement is made by the Western Factory Insurance Association of the United States. This is that its record of customers who are enlarging or proposing to enlarge their plants is very large. Many plants which are now working at half time or on short hours are nevertheless planning or building extensions and otherwise preparing for a renewal of manufacturing activity after the election.

* * * *

A man fairly well known in engineering and insurance circles of London, Mr. Michael Longridge, has compiled a report for an engine and boiler insurance company which insures against the breakdown of machinery. He says the reason there are more breakdown in gas engines than steam engines is the increased speed at which gas engines are driven and the complication of their parts. In steam engines the most fruitful source of breakdowns is their valve gear, which cause 28 per cent. of the accidents. But in gas engines it is 43 per cent. Cylinder breakdowns are twice as numerous in gas as in steam engines.

* * * *

A decided factor in the pine lumber situation is the reduced cut this season. Twenty-two producers, who last year cut 276,000 feet in Canada, this year cut only 98,000,000. It is noticeable, too, that only two of these operators were affected by bush fires, and that they have cut not more than a million apiece. At the same time it is to be borne in mind that there are some millmen who have already two years' cut on hand, and whose bankers are likely the cause of their not having gone in to cut more this year. News from the United States is that the white pine market, which has been variable and fitful, will stiffen and become active when the Presidential election is over. Yellow pine in the Southern States shows a decrease in production of 453 million feet at 325 sawmills this year compared with last. The cut this year, according to the "American Lumberman," has been 65 per cent. of a normal year, while shipments have been about 75 per cent. Hardwoods are not easy to obtain in the United States at present prices.

Considerable alteration has been made in the Engineering Department of the University of Manitoba since last season, and the drafting room is now fitted up very completely, and has 35 of the latest design drafting tables with cast iron frames and an electric drop light for each table.

A good deal of interest is being taken in the engineering course of the University of Manitoba about which we will have something to say later.

A HIGH-DUTY TURBINE PUMP.*

The general design of the pump tested is exposed by Fig. 3, which shows it to consist essentially of two shrouded runners, or pump wheels, mounted on the same shaft in a double case. The case is so partitioned that the water is drawn from the source of supply and put under pressure by the first wheel, and then delivered to the suction chamber of the second wheel. The second wheel then imparts to the water the same amount of energy it receives from the first

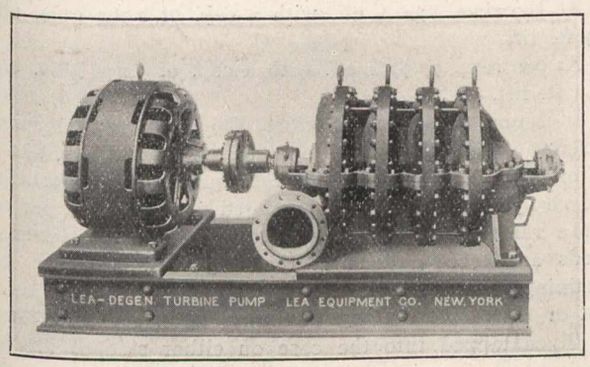


Fig. 1.

wheel, thereby increasing the pressure, and then delivers the water into a spiral discharge conduit terminating in a diverging nozzle connecting with the main pipe.

Outline Dimension of Pump.

Diameter of suction pipe	10 inches
Diameter of discharge pipe	10 inches
Outline diameter of each wheel	24 inches
Number of blades	8

Novel Features of the Pump.

The special features of the pump which represent patented advantages are as follows:—

The case is divided through its horizontal diameter by bolted flanges so that its top half can be quickly freed and lifted off without disturbing either suction or discharge connections, thereby affording easy access to the internal parts of all the stages at once.

By means of bolted circumferential divisions of the case, provision is made for either using the suction and discharge end of a case together as a single-stage pump, or for adding as many intermediate sections as may be necessary to afford any desired pressure at any fixed speed. Additional stages can, therefore, be installed after a pump has been in operation without wasting any parts of the existing case.

A special arrangement of double cup-leather packing is used for both the suction and discharge ends and for the intermediate sections. The cup leathers are held against a flat collar, on extended pump-wheel sleeves, in such a manner that the leathers can follow up as they or the collars are worn, or the shaft may be shifted at will in either direction, with the leathers following, without changing the location of the leather with relation to the shaft collar, thus making a practically water-tight joint at all times. A spiral spring is used between each pair of cup leathers to ensure their seating against the collars before pressure is put on the pump. Provision is made for setting out the leather packing on the suction end of the shaft by the water pressure of the high side of the pump.

On the outside of main bearings at each end is placed a ball thrust-bearing, with adjusting collars, for shifting the shaft endways to balance the end thrust of the pump runners. The balancing is accomplished by means of variation in the width of water space on both sides of the wheels between the rim of wheel and the case. Experiment showed that as the wheel was moved laterally in the case, the pressure between the wheel and case increased on the side where the clearance was greatest, and was reduced on the opposite side.

General Description of Tests.

The pump was driven by a General Electric direct-current multi-polar dynamo of 385 amperes and 220 volts capacity used as a motor, and directly connected to the pump shaft.

It was arranged (Fig. 3) to lift water by suction, about seven feet, from a well fed from the Raritan Canal, and to deliver it through a 10-inch throttle-valve, C, to a 6½-inch bell-shaped nozzle, H, to a weir tank, M, which was about 25 feet long by 10 feet wide and 10 feet deep, whence the water flowed through a rectangular notch 3.02 feet wide in a ¼-inch beveled iron plate, L, set in the middle of the end of the tank about 7 feet above the bottom.

A pitot tube, I, was applied under the nozzle, and its indications used as a means of quickly adjusting the discharge of pump to the several amounts of flow necessary for the tests.

The amount of water flowing was calculated from the weir height by the Francis formula—

$$Q = 3.33\ (l - 0.2\ h)\ h^{\frac{3}{2}}$$

The weir heights were taken with a hook-gauge, O, in a barrel, N, communicating with the tank by an inch pipe, P, having an open end square with the flow of water at a oint 13 feet back of the notch. The surface of the water approaching the weir was made perfectly smooth by means of a grill lattice 6 feet from the discharge nozzle and dam-boards set by trial.

The zero of the hook-gauge was determined daily with a straightedge, and checked by a surveyor's level. Readings of the gauge could be easily made to 1/64 of an inch. The leakage of the weir was frequently determined. It remained practically constant at 18 gallons per minute, which was added to the quantity calculated by the weir formula.

The total lift of the pump was determined by adding the vacuum shown by a mercury gauge, E, to the pressure above the atmosphere shown at F, the pipe diameter being the same as both points.

At F both a pressure gauge and a mercury tube were used during most of the tests, the gauge being calibrated by a Crosby testing apparatus. To secure a smooth surface in the main pipe for measuring the pressure at E and F,

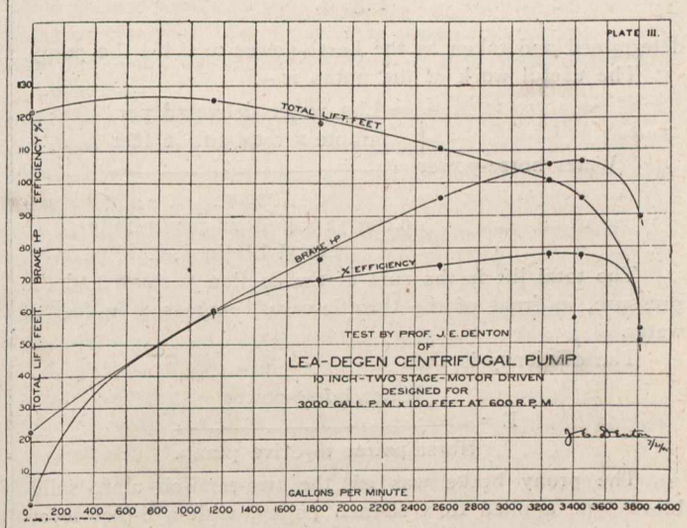


Fig. 2.

the latter was taken through a 1/32-inch hole, Q, at Fig. 3 in the top of a ⅛-inch polished brass tube,* with a pointed closed end lying against the current.

Method of Procedure.

The pump was designed by Mr. Degen for practically equal efficiency for the range of speed between 400 and 600 revolutions per minute. Therefore, an efficiency test was made at 400, 500 and 600 revolutions, respectively.

* Result of tests by James E. Denton, M.E.

* The tube was located 2½ inches from the side of the pipe. Experiment showed that at the highest rate of flow there was an increase of ½ pound pressure when the 1/32-inch hole was moved from the point 3⅞ inches inside the pipe to a point ½-inch within it. The position of the tube in the pipe is not a factor in the test since it was the same at E and F, and the velocity was equal at these points.

At each speed the steps in the determination of the maximum efficiency were as follows:—

The pump was primed† with the throttle-vale, C (Fig. 3), closed. The throttle-valve was then set wide open and connection made with the mercury columns, which had been previously filled with water between the mercury and the cock connecting them to the main pipe. The speed was then adjusted by a rheostat, and the required data were observed at five-minute intervals until the average of the readings was practically constant. The throttle-valve was then reset to secure a series of reduced rates of flow, which, by preliminary tests, were known to be sufficient to establish the Gallons-Lift curve (Fig. 2). No data were recorded at a speed varying more than two revolutions from the assigned speed, a skilled assistant devoting his attention to this point. After the Gallons-Lift curves were secured, the pump was disconnected from the motor, and the power of the latter absorbed by a prony brake over the same range of watts applied to drive the motor during the pump tests. Thereby the Brake HP-Watts curves* were established.

From these curves the horse-power corresponding to the watts applied to drive the motor during the pump tests was

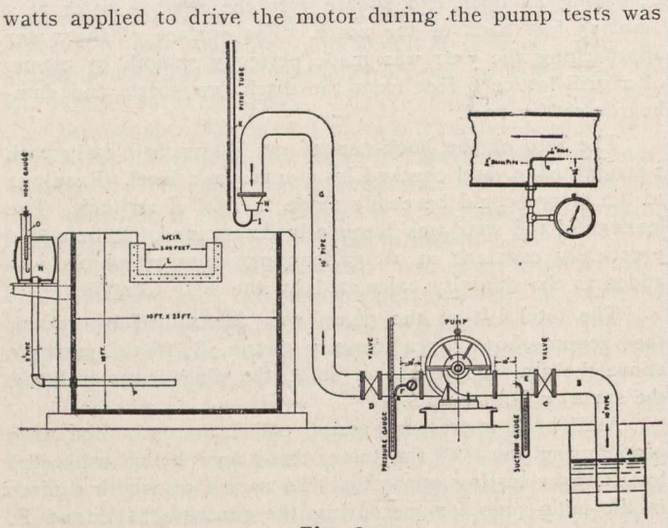


Fig. 3.

determined and taken as the horse-power to drive the pump.

The useful work of the pump is—

$$\text{Water horse-power} = \frac{\text{Lbs. water delivered per minute} \times \text{total lift in feet}}{33000}$$

$$= 0.000252 \times \text{gallons per minute} \times \text{total lift in feet.}$$

The total lift is the sum of the suction vacuum and the pressure, in front of the throttle-valve, expressed in feet of water.

The efficiency is then

$$E = \frac{\text{Water horse-power}}{\text{Horse-power to drive pump.}}$$

The prony brake was of the two-semi-circular, solid-block type applied to a 28-inch pulley, with a 6-foot lever-arm acting on a knife-edge on a tested platform scales. It was carefully balanced with its pulley by mounting the whole combination, with a mandril through the pulley on straight-edges. A copious stream of water applied to a nipple in the top block, through a long, vertical, flexible hose and a hand-tightened wheel, with a leverage of 1,000 to 1, enabled the highest loads to be maintained indefinitely with a very steady equipose of the scale-beam. The electrical readings were made from a Weston instrument from the laboratory of the Stevens Institute.

* For 400 and 500 revolutions these curves are straight lines, but at 600 revolutions the straight line does not obtain, probably because the speed had to be regulated by changing the position of the brushes.

† The priming was done by water from the city mains acting through a 1¼-inch Penberthy ejector, no foot-valve being used on the suction pipe.

The ratio of the quantity of water given by the weir to that given by the pitot tube is shown in column 8. This ratio is the value of the coefficient C in the formula for cubic feet per second.

$$Q_1 = C \times \text{area of nozzle} \sqrt{2g \times \text{pilot head.}}$$

Conclusions.

The tests show that the pump afforded the following results under conditions of maximum efficiency:—

At 400 revs. 77.7% eff. with a cap. of 2,296 gals. under 43.6 ft. lift.

At 500 revs. 77.6% eff. with a cap. of 2,794 gals. under 67.4 ft. lift.

At 600 revs. 77.97% eff. with a cap. of 3,235 gals. under 100.7 ft. lift.

In round numbers, therefore, the capacity at maximum efficiency is directly proportional to the revolutions, and the lift, or head, is proportional to the square of the revolutions. At each speed the efficiency averaged more than 76 per cent. over a range of 600 gallons of capacity for the lower two speeds and 900 gallons at the higher speed, the head remaining nearly constant.

Test of Effect of Altering Clearance upon the End Thrust.

Pipes tapped into the case on either side of the high wheel were connected to the two ends of a U mercury tube. With the shaft in the position, in which it had been adjusted for the test, there was no difference of pressure shown by the mercury, and there was no evidence of labor in the thrust bearings for this position during the several days of operation of the pump for the tests of efficiency. When the shaft was moved 7-32-inch laterally from this position the mercury showed an excess of pressure of ⅞-inch on the side of the wheel upon which the clearance had been increased.

ENGINEERING SOCIETIES.

ARCHITECTURAL INSTITUTE OF CANADA.—President, A. F. Dunlop, R.C.A., Montreal, Que.; Secretary, Alcide Chaussé, P.O. Box 259, Montreal, Que.

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

CANADIAN STREET RAILWAY ASSOCIATION.—President, E. A. Evans, Quebec; Secretary, Acton Burrows, 157 Bay Street, Toronto.

CANADIAN INDEPENDENT TELEPHONE ASSOCIATION.—President, J. F. Demers, M.D., Levis, Que.; Secretary, F. Page Wilson, Toronto.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—413 Dorchester Street West, Montreal. President, J. Galbraith; Secretary, Prof. C. H. McLeod. Meetings will be held at Society Rooms each Thursday until May 1st, 1908.

QUEBEC BRANCH OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS.—Chairman, E. A. Hoare; Secretary, P. E. Parent, P.O. Box 115, Quebec. Meetings held twice a month at Room 40, City Hall.

TORONTO BRANCH OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS.—96 King Street West, Toronto. Chairman, C. H. Mitchell; Secretary, T. C. Irving, Jr., Traders Bank Building. Regular monthly meeting, October 29th.

MANITOBA BRANCH OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS.—Chairman, H. N. Ruttan; Secretary, E. Brydone Jack. Meets first and third Friday of each month, October to April, in University of Manitoba.

ENGINEERS' CLUB OF TORONTO.—96 King Street West. President, J. G. Sing; Secretary, R. B. Wolsey. Meeting every Thursday evening during the fall and winter months. October 22nd, "Toronto Harbor," paper by Mr. W. J. Fuller.

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

CANADIAN MINING INSTITUTE.—413 Dorchester Street West, Montreal. President, W. G. Miller, Toronto; Secretary, H. Mortimer-Lamb, Montreal.

A PAGE OF COSTS

ACTUAL, ESTIMATED and CONTRACTED

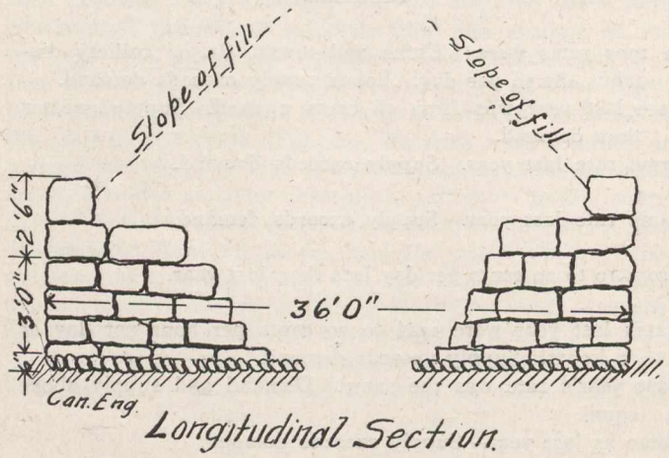
RATES OF WAGES OF UNSKILLED LABOR IN CANADA, 1908.

LOCALITY.	RATE.	REMARKS.
Nova Scotia—		
Sydney	Cities and towns, $1.50 per day; colliery districts, $1.25 per day.	In 1907 rates were: Cities and towns, $1.50; colliery districts, $1.38 per day. Labor supply exceeds demand.
Halifax	15 to 19 cents per hour, according to ability	Rate last year was from 16 cents upward. Supply greater than demand.
Westville	$1.40 per day	Same rate last year. Supply exceeds demand.
Prince Edward Island—		
Charlottetown	$1 to $1.25 per day	Same rate last year. Supply exceeds demand.
New Brunswick—		
Moncton	$1.50 per day	From 10 to 20 cents per day less than last year.
Quebec—		
Quebec	$1.50 per day of ten hours	Rates last year were 17½ to 20 cents per hour per day of 10 hours. Supply exceeds demand.
Sherbrooke	$1.35 to $1.50 per day of ten hours.	Last year's rate was the same. Demand and supply about equal.
St. Hyacinthe	$1.50 per day of ten hours	Same as last year. Supply exceeds demand.
Hull	Corporation laborers, $1.75 per day of ten hours	Same as last year. Demand and supply about equal.
Ontario—		
Ottawa	$1.25 to $1.60 per day of nine hours.	Rates last year were $1.25 to $1.75 per day of nine hours.
Belleville	$1 to $1.50 per day of ten hours	Rates last year were $1.25 to $1.75 per day. Supply exceeds demand.
Kingston	$1.25 to $2 per day of nine hours	Last year's rate: $1.40 to $1.75 per day of nine hours. Demand for labor greater than supply.
Peterborough	$1.60 per day of nine hours	Rate is 15 cents per day less than last year. Supply exceeds demand.
Niagara Falls	$1.25 to $1.50 per day of nine hours.	Rate last year was $1.50 to $2 per day. About one-third of unskilled labor unemployed.
St. Catharines	$1.50 to $1.75 per day of nine hours.	Rate last year was $1.75 to $2. Not much demand for labor.
Hamilton	17½ to 25 cents per hour	Rate last year was 18 cents per hour. Supply exceeds demand.
Brantford	12½ cents per hour	Rate last year 13½ cents. Supply greater than demand.
Guelph	$1.75 to $2 per day	Same as last year.
Berlin	$1.50 to $1.90 per day	Same as last year. Supply greater than demand.
Woodstock	$1.25 to $1.50 per day	Rate last year was $1.65 per day. Supply greatly exceeds demand.
London	$1.50 per nine-hour day	Rate last year was $2 per nine-hour day. Supply greater than demand.
St. Thomas	15 to 17 cents per hour	Last year's rate was $1.50 to $1.75 per day. Men are plentiful.
Chatham	$1.50 per day of ten hours	Ten per cent. lower than 1907. Supply exceeds demand.
Windsor	$1.50 to $2 per day	Rate last year was $1.50 to $2.50 per day. Supply equal to demand.
Sault Ste. Marie	$1.75 per day of ten hours	Unchanged from last year. Supply exceeds demand.
Port Arthur	17½ cents per hour	Last year's rate was 20 to 25 cents per hour. Supply rather in excess of demand.
Manitoba—		
Winnipeg	15 to 20 cents per hour	Rate last year was 20 to 25 cents per hour. Supply exceeds demand.
Brandon	17½ cents per hour	Rate is 2½ cents per hour lower than in 1907. Supply exceeds demand.
Saskatchewan—		
Moose Jaw	20 cents per hour	Rate last year was 22½ cents per hour. Supply exceeds demand.
Regina	$1.50 per day	Rate last year was $2 to $2.50 per day. Supply exceeds demand.
Alberta—		
Calgary	25 cents per hour	2½ cents per hour less than in 1907. Supply greater than demand.
Edmonton	25 cents per hour per day of nine hours	Same rate as in 1907. Supply greater than demand.
British Columbia—		
New Westminster	$2 per day of ten hours	Rate last year was $2.50 per day of ten hours. Supply exceeds demand.
Victoria	$2.25 per day of eight hours. Some laborers were working for $1.50 per day, but $2.25 was the general current rate	Unchanged from last year. Supply exceeds demand.
Nanaimo	$2.50 per day of nine hours	Same rate as last year. Supply greater than demand.

The rates of wages published in this table are based on information forwarded to the Department during the month of July, 1908, by correspondents to the "Labor Gazette" resident in the several cities of Canada.

DRY MASONRY CULVERTS.

Among the many classes of culverts constructed, none is more lasting than a well-built dry masonry culvert. Where large stones with well-defined faces can be secured, such as from rock cuttings on railroad work, these culverts can be built strong and with a very neat finish. Care should



Longitudinal Section.

always be taken to secure good, firm bottom, and the foundation course should be placed well below the bed of the stream, and thus prevent undermining of the walls.

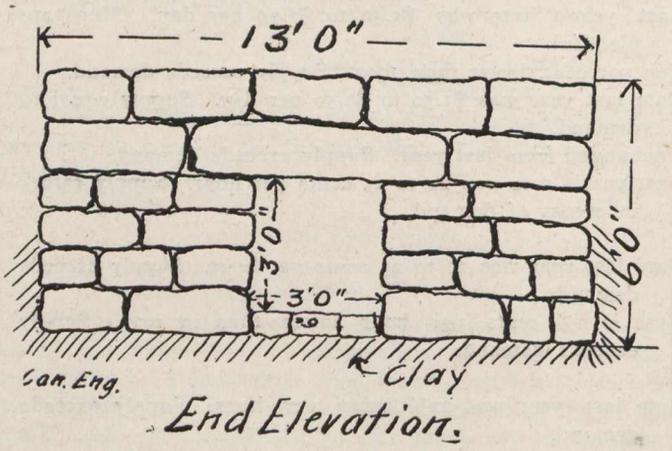
We give here the cost of a 3 x 3-foot dry masonry culvert, 36 ft. long:—

Excavation for foundation	20 cu. yds.
Laborers, 22 hours at 20 cents per hour, or 22 cents per cu. yd.	$ 4 40
Headman, 60 hours at 40 cents.....	24 00
Laborers, 130 hours at 20 cents.....	26 00
Team and teamster, 40 hours at 45 cents.....	18 00
Derrick, 40 hours at 15 cents.....	6 00
	$74 00

The culvert contained 50 cu. yds. at a cost of $74, or $1.48 per cu. yd.

The stone for this culvert was taken out of a rock dump some twenty feet away. Some of the large covers had to be handled 400 feet.

The derrick used was the ordinary three-leg derrick, legs 20 feet long, and the derrick boom was 24 feet long,



End Elevation.

one set reaching the full length of culvert, the derrick cable being operated by horse power, pulling through block and tackle.

When the dump reached the culvert, care was taken that large stones were not allowed to slide and injure it. This was not charged against the culvert.

RAILROAD EARNINGS.

	Week Ending.	1907.	1908.	Change.
C.N.R.	Sept. 30	$206,200	$313,900	+ $107,700
C.P.R.	Sept. 30	2,021,000	2,104,000	+ 83,000
G.T.R.	Sept. 30	1,163,778	1,050,600	— 113,178
Montreal St.	Oct. 3	68,000	70,914	+ 2,914
Toronto St.	Oct. 3	66,899	67,655	+ 756

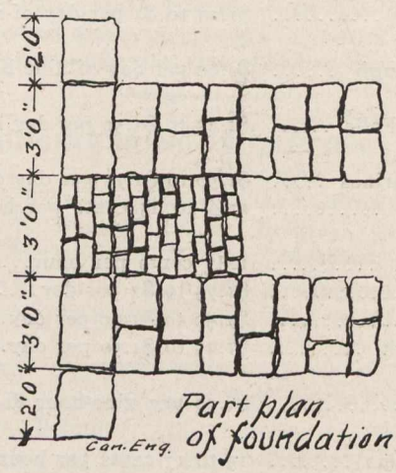
METHODS OF MELTING SNOW AROUND SWITCHES.*

By James S. Lang, M.E., E.E.

One of the great costs of railway operation in the snow belt is the keeping of switches and interlocking plants free from ice and snow. Snow and sleet storms, leaky tanks and tenders and drips from cars and engines all assist in making in winter time the life of the section foreman one continual worry.

Various schemes have been proposed to free the track and interlocking mechanism of snow and ice, but they all have the great disadvantage of necessitating an extensive and costly installation under and around the rails and switch mechanism. This fact alone has rendered them impracticable, even if it were not necessary to remove such installations whenever it became necessary to tamp the ties or make other track repairs; also, the metal fittings are short lived in railroad yards, due to the action of the acid from the sparks and cinders. Such installations are also liable to derangement, or even to be put entirely out of commission at the critical time of a blizzard in case of a derailment, which is more likely to occur at the time of a storm than at any other.

During the past year a new system of snow melting has been used at several of the large terminals. Its practicability has been demonstrated during the past three winters



Part plan of foundation

at one of the busiest terminals in the country, with the result that delays due to snow and sleet storms have been almost entirely eliminated.

An extremely low cost, both of installation and operation, is possible on account of the small amount of apparatus required in comparison to the number of switches protected. Instead of requiring piping or permanent apparatus for each switch, several switches are handled with no more apparatus than is necessary for one, and nothing that might in any way interfere with either the operation or the repair of switch or track is used. Even complicated and busy yards may be taken care of by the regular track and interlocking forces without any extra help whatever. The saving in operation by this method as compared with the usual method of hand cleaning will pay the entire cost of installation in a single large storm.

The melting of the snow or ice is effected by applying to it a flaming fluid, which continues to burn while in the snow, melting and finally evaporating the greater portion of it. The character of the fluid is such that the flame is easily maintained, regardless of high winds or drifting snow.

The fluid is applied by the regular track force by means of a safety distributing can, and the height and extent of the flame can be regulated with ease. No injury to track results, as the temperature of the rails is not raised to the usual summer heat, while the fluid, being a hydrocarbon, acts as a preservative of the ties. At night the light given

* From a paper read before the Railway Signal Association at Chicago.

off by the flame by rendering the forms of the men visible lessens the danger of personal injury.

One of the first steps in installing this system is necessarily the installation of sufficient storage capacity for the fluid. This would vary in proportion to the number of switches which it was desired to keep operative, the average severity of the storms and the facilities for obtaining the fluid. The fluid is obtainable in the open market at from three to five cents a gallon, and may be obtained free of cost by railroads operating their own Pintsch gas plant.

At one plant, where this system has been in use, the tank, having a capacity of several thousand gallons, was connected with the compressed air used by the interlocking system, and when about 10 pounds air pressure was admitted to the tank, the liquid was forced, through buried piping, to the several drawing outlets located in various parts of the yard.

The storage arrangements may, therefore, vary from only a single 200 gallon iron drum, elevated upon blocking, where only a few switches are to be looked after, to a tank of several thousand gallons capacity feeding various lines of underground piping, in yards where the number of switches is large and the territory extensive, or where it is inconvenient or dangerous to cross tracks, or where there is no convenient nearby location for a tank.

The supply stations for the distribution of the fluid are provided with safety self-closing faucets, and drawing gauges, which enable the operator to readily tell, when the cans are being filled, how much fluid they contain, and how much is being used.

Below are given data derived from experience in a storm occurring during the past winter at one of the busiest yards. In comparison with the results obtained by the hydrocarbon system is given a careful estimate of corresponding cost of hand-cleaning, based upon the experience of previous years and corresponding snowfall.

Hand-cleaning Yard Switches.

150 extra men, 24 hours each, 360 hours, at 20 cents	$720 00	
33 regular men (including foremen), 30 hours each	181 70	
Meals: 150 men, three meals each, 450 meals; 33 regular men, three meals each, 99 meals; or a total of 549 meals, at 20 cents	109 80	
		$1,011 50

Using Snow Melting System.

No meals (men enabled to leave for meals).		
No extra men.		
Regular men, 20 hours each (duration of storm 24 hours, absent four hours for meals)	$121 80	
Hydrocarbon, 1,900 gallons at 4 cents	76 00	
Incidental charges and rentals, which might regularly be charged to storm in question	66 60	
		$ 264 40
Saving effected in one storm		$ 747 10

This severe storm was taken care of without a single delay chargeable to snow, and switch failures were less than one per cent. of the usual number.

COST OF SEWER CONSTRUCTION

In Canada it is seldom that sewer construction work is now awarded according to unit prices. A certain section is now designated and bulk tenders called for. During 1907 the city of Sydney, N.S., laid some 6,570 feet of sewer. The sections were of various lengths, and the size and depth of sewer varied. The following table gives the cost of 16 sections.

Laborers were paid 17½ cents an hour.

Foremen were paid 40 cents an hour.

Length in feet.	Size.	Average depth.	No. of man-holes.	No. of lamp-poles.	Cost. Labor.	Material.	Total.	Cost per Lineal Foot. Labor.	Material.	Total.	Material.
		Ft.									
111.3	8 in.	7	.	.	74.37	41.24	115.61	.668	.370	1.04	Clay.
297.5	8 "	7.5	1	1	211.68	105.23	316.91	.711	.354	1.06½	"
271.7	8 "	10.9	1	.	332.53	106.92	439.45	1.224	.394	1.62	"
72.0	8 "	10.5	.	.	80.38	23.69	104.07	1.116	.329	1.44½	"
142.5	8 "	8.6	.	.	133.47	46.80	180.27	.936	.329	1.26½	"
250.0	6 "	7	.	1	204.32	79.33	283.65	.817	.317	1.13½	"
83.3	6 "	7.5	.	1	57.31	16.73	74.04	.688	.201	.89	"
568.7	8 "	10.8	1	1	1233.65	392.54	1626.19	2.169	.690	2.86	50% rock
1350.3	15 "	8	6	1	1381.16	1163.76	2544.92	1.023	.862	1.88½	30% rock
93.0	18 "	.	.	.	59.25	116.85	176.10	.637	1.257	1.89½	Clay.
90.9	24 "	6.7	2	.	100.58	157.87	258.45	1.106	1.737	2.84½	"
754.9	15 "	9.3	3	.	873.39	596.19	1469.58	1.157	.789	1.94½	"
831.9	12 "	9	3	.	874.88	628.64	1503.52	1.051	.756	1.81	"
390.5	8 "	8.2	1	.	366.96	185.40	552.36	.939	.474	1.41½	"
145.0	24 "	.	.	.	351.57	331.21	682.78	2.425	2.284	4.71	"
1219.0	20 "	5.6	6	.	2267.28	2950.03	5217.31	1.860	2.420	4.28	"

COST OF CONCRETE SEWER BLOCKS

The City Works Department, Halifax, N.S., made during the winter of 1906 concrete sewer block. The quantity and cost was as follows:—

48 in. 1,277 blocks. 36 in. 739 blocks—20 in. x 30 in. 287 inverts. 413 sides—14 in. x 21 in.

1,111 inverts. 681 sides. 457 tops—12 in. x 18 in.

1,412 sides. 682 tops. 30 in. 739 blocks.

4 catchpit covers.

Total number of batches made, 1,341. No. of cu. ft., 9,621.44.

Each batch averaged 7.17 cu. ft., including facing.

Labor, 5,050 hours at 16 to 24c., cost $ 838 76 = 8 7/10c. per cu. ft.		*$ 0 62 6/10
Cement, 1,733 bus. at 80c. = 14 4/10c. per cu. ft.	1,386 40	* 1 03
Sand, 2,850 bus. at 6c. = 1 7/10c. per cu. ft.	171 00	12 7/10
Gravel, 2,684 bus. at 6c. = 1 4/10c. per cu. ft.	141 04	10½

* Per batch.

Stone, 5,364 bus. at 7c.....	375 48	
= 3 8/10c. per cu. ft.....		28
Paper	26 82	
= 28/100c. per cu. ft.....		02
Soap, 255 lbs. at 7c.....	17 85	
= 18/100c. per cu. ft.....		01 3/100
Coal	48 95	
= ½c. per cu. ft.....		03 6/10
Total cost	$3,006 30	

=31¼c. per cu. ft. =$2.24 2/10 per batch. =$8.44 per cu. yd.

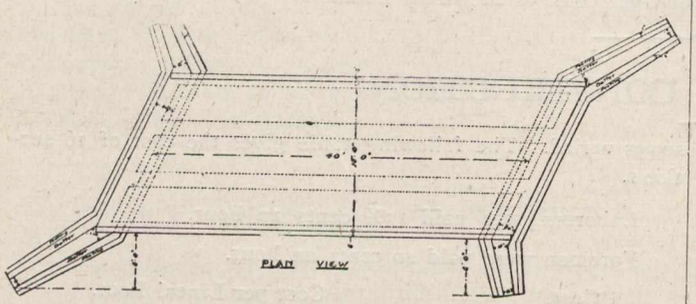
The above includes cleaning moulds, moving and storing blocks and every expense incident to the cost of manufacture except the cost of water used.

REINFORCED CONCRETE HIGHWAY BRIDGES AND CULVERTS.*

By Owen M'Kay, O.L.S. and C.E.

Having prepared plans and specifications and superintended the construction of five reinforced concrete highway bridges and culverts in the Township of Sandwich South, County of Essex, Ont., during the year 1907, I submit the following paper, referring to these structures, accompanied with plans and specifications, for the consideration of the members of this Association.

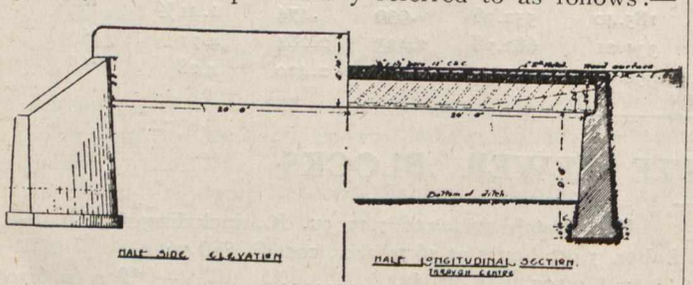
The abutments in all of these bridges were constructed of concrete masonry, without reinforcements,



Plan View of Concrete Culvert over Pike Creek, Essex County, Ont.

and the floor system where the clear spans were 8 feet, 10 feet and 14 feet consisted of a solid slab 8 inches thick in the middle and tapering to 6 inches at the sides, with the two ends resting on the abutments and reinforced with the Kahn bar system of reinforcements, excepting the 14-foot span, which was changed to 10 inches in thickness in the middle and 8 inches at the sides.

In the two bridges, with clear span between abutments of twenty (20) feet and forty (40) feet, respectively, the floor slabs in each bridge are supported by four beams or girders built into the abutments, and both girders and floor slabs reinforced by the Kahn bar system, and more particularly referred to as follows:—



Half Side Elevation and Longitudinal Section, Concrete Culvert over Pike Creek, Essex County, Ont.

1st. Bridge over Pike Creek. Clear span between abutments, 40 feet; width of roadway between railings, 16 feet. The two outside beams or girders are 18 inches in width and 34 inches in depth from bottom of girder to top of floor, but in the two outside girders the concrete was built up to the height of three (3) feet above the floor and six inches in width, and suitably to form a mailing. The two inside girders are 20 inches by 36 inches. The length of girders and reinforced steel were made 42 feet to allow for overlapping 12 inches on the abutment, which latter was carried up between the girders and around them to the top of the floor, so as to make a continuous wall.

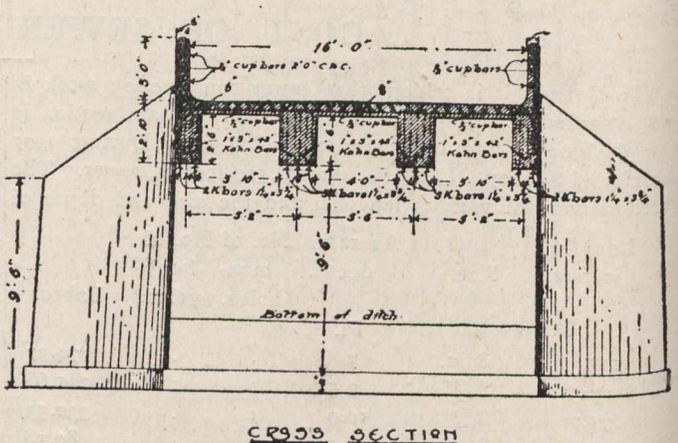
The steel reinforcements used in these girders were two 1¼ by 3¾ and 1 in. by 3 in. Kahn bars, 42 ft. long in the outside girders, and three bars 1¼ by 3¾, and two bars 1 in. by 3 in., 42 ft. long, in each of the inside girders.

The bars used in the floor were ½ in. by 1½ in. by 16 ft. 6 in., spaced 12 in. apart with ½ in. round rods placed between beams to provide against longitudinal strains.

This bridge, as well as the others referred to above, was designed to carry a 15-ton road roller, or 150 pound live load, uniformly distributed over the entire surface.

The concrete in the lower part of the abutment was composed of one part of Portland cement to six parts of gravel.

In the girders and floor, and one foot beneath, it was made of one part Portland cement to one-half part sand and four parts stone crushed to pass through a ¾-inch ring, excepting the upper 1½ inch of floor and exposed faces of beams and girders, which were faced with cement mortar in the proportions of one part cement to two parts of clean, sharp sand. The concrete was



Cross Section Concrete Culvert over Pike Creek, Essex County, Ont.

mixed by a concrete mixture, the girders, railing and back filing between and behind the girders being all completed in one day, and the floor slabs on the following day, in order that the completed bridge should conform as nearly as possible to a monolith.

Two months after the bridge was completed it was tested by passing over it a threshing machine engine weighing nine tons, coupled to a wagon carrying a water tank weighing about three tons.

This load passed over the bridge several times, with speeds increasing from about two miles to seven miles per hour, but we could not detect the slightest deflection or vibration in the bridge, and the effect of the load was not noticeable in any way.

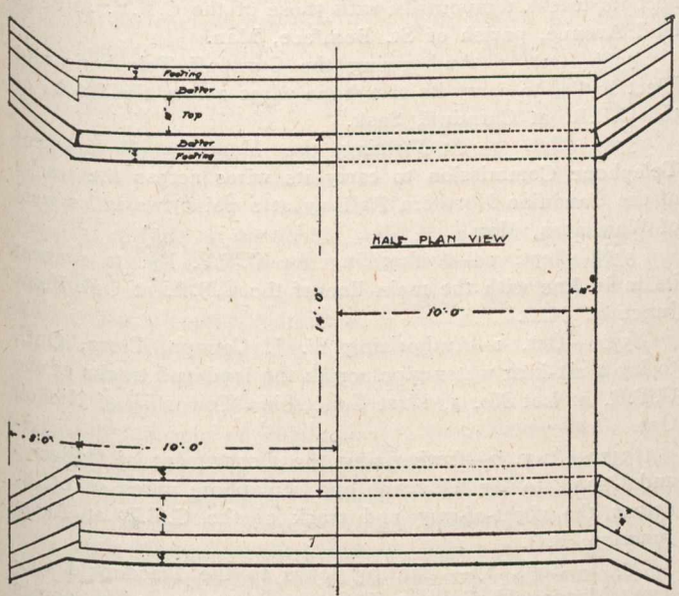
The cost of this bridge was as follows: Abutments and wings, 66 3-10 cubic yards of concrete masonry in abutments and wings, at $9 per cubic yard, $596.70; 41 6-10 cubic yards in floor slabs girders and railings, at $9 per cubic yard, $374.40; 7,143 pounds of reinforced Kahn bars at 3½ cents per pound, $250; engineering, superintendence and other incidental charges, $95; total cost of bridge, $1,316.10.

The above cost includes excavation, forms, removal of old bridges, etc.

* From the 1908 Proceedings of the Association of Ontario Land Surveyors.

Plan No. 2.—Bridge over Little River, Sandwich South. Clear span between abutments, 20 feet; width of roadway between railings, 16 feet. This bridge was built after the same design as the Pike Creek bridge above referred to, but the girders were 12 in. by 22 in. and 16 in. by 24 in. for the outer and inner girders, respectively, and the railings were composed of 8-inch copings and gas pipes.

Plan No. 3.—Bridge over Sullivan Creek. Clear span 14 feet, and a roadway 18 feet in width. This bridge has concrete abutments and a reinforced slab floor resting directly on the abutments. The slab is 10



Half Plan View of Concrete Culvert over Sullivan Creek, Essex County, Ont.

inches thick at the centre and nine inches at the sides, and the reinforcement consists of Kahn bars ½ in. by 1½ in. and 16 ft., spaced 9 in. centres; it is designed for a 10-ton roller, or 100 pounds per foot. The remaining flat top culvert, 10 ft. and 8 ft. spans, have floors 8 in. thick at the middle and tapering to 6 in. at the sides, with smaller sized bars.

The cost of the girder bridge over Little River was as follows: 44 cubic yards of concrete in abutments, including excavation and moulds, at $7.50 per cubic yard, $330; 15 cubic yards concrete in floor and beams, at $9 per yard, $135; gas pipe railings and copings, $35; steel reinforcements, $98; cost of construction, $598; incidental costs, $70; total cost, $668.

The cost of the slab floor culverts were as follows: Culvert, 14 ft. span, $325; culvert, 10 ft. span, $267.50; culvert, 8 ft. span, $235.

With reference to the steel reinforcements, the Trussed Concrete Steel Co. of Canada, head office, Toronto, furnished the plans of floor systems for each bridge, showing all necessary details with regard to the thickness of floor, the different sizes of the bars and rods, and the spacing of the same for the specified loads the bridge was intended to carry, and the engineer has only to check over the calculations to satisfy himself that the bridge will carry the designed load with safety.

It is well known that concrete masonry has great compression strength, but is weak in tension. As the lower portion of the concrete beam is subject to tension, the steel rods or bars should be of such design as will develop the full strength of the bar without slipping in the concrete, and it must also have sheer members attached to the bars to overcome the sheer and other internal stresses in the concrete due to the external loading.

The Kahn system of reinforcement, I believe, fulfils these conditions, as the diagonals are so distributed that they resist internal stresses, prevent slipping of the bars in the concrete, are rigidly attached to the main tension bars so that no riveting or placing of bolts is required in the field, and these diagonals are not in the way of tamping the concrete, and can be easily put in place by ordinary labor.

However, there are numerous other bars in the market for the engineer to choose from.

As many contractors and some engineers have the impression that iron rods or bars placed near the bottom of the concrete is all that is necessary, I beg to call their attention to a paper written by Mr. L. G. Robinson, C.E., in the December number of "Applied Science," published by the University of Toronto Engineering Society, in which the requirements of steel reinforcements in concrete is treated in a comprehensive and very intelligent manner.

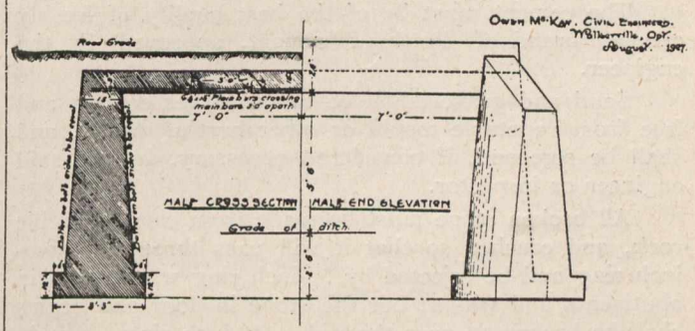
In conclusion, I am of the opinion that steel reinforced concrete bridges will in the near future not only replace the old wooden culverts and bridges, but will come into general use in bridges up to spans of 100 feet or more, owing to their relatively low cost, simple construction, adaptability to all conditions of soil and locality, and their durability.

If due care is taken in construction, these bridges will last indefinitely, with no expense for repairs.

I have attached to this paper plans of the bridges and an extract from the general specifications.

Extract from the General Specifications for Concrete Bridges in the Township of Sandwich South, County of Essex, Ontario.

All work must be done in workmanlike manner and in accordance with the plans and specifications furnished by the township engineer and to his entire satisfaction.



Half Section and End Elevation Concrete Culvert over Sullivan Creek, Essex County, Ont.

Anything omitted from the plans, but which is necessary for the satisfactory completion of the work must be provided by the contractor without further charge.

The engineer shall be the sole judge of the meaning of the plans and specifications.

Excavation.—The contractor shall excavate the foundations to the depths and dimensions shown on plan, and such further dimensions as will allow for the necessary curbing of the concrete work.

All masonry must be made of concrete. The floor and beams of bridge shall have the required cross-section and spacings shown on detailed plans.

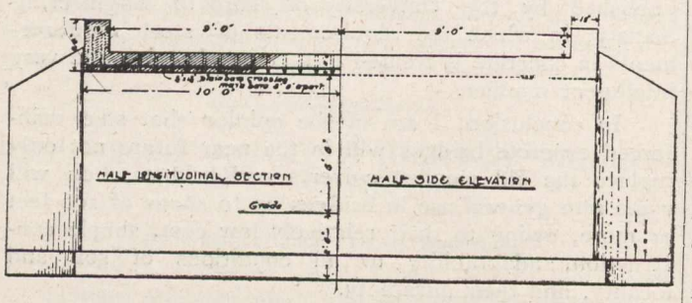
The abutments and wings shall be made of concrete masonry composed of one part of American or Canadian Portland cement of approved brand, three parts of clean, sharp sand, and five parts of crushed stone. Gravel may be substituted for crushed stone in abutments, at the discretion of the engineer.

The upper 1½ inches of floor shall consist of one part of Portland cement to two parts of clean, sharp sand, thoroughly mixed and applied before the remainder of the concrete work in floor shall have time to set.

The concrete in the body of the floor and beams shall consist of one part of cement to two parts of sand and four parts of crushed stone.

All exposed places of the bridge shall have a coating of cement mortar one inch thick, composed of one part of Portland cement to two parts of clean, sharp sand, which will be applied at the same time as the backing, and the whole rammed while fresh to insure a perfect bond.

Moulds for concrete shall be composed of two-inch plank dressed on the inner side and both edges to a uniform thickness, and shall be made stiff to prevent distortion during filling; moulds must be left on the masonry as long as may be required by the engineer.



Half Longitudinal Section and Side Elevation of Concrete Culvert over Sullivan Creek, Essex County, Ont.

Before laying the steel reinforcement, the forms shall be covered with a layer of cement mortar, one part of cement to three parts of fine gravel, on which the steel shall be laid according to detailed drawings, after which the concrete shall be immediately deposited and thoroughly tamped around to form a perfect bond.

The concrete shall be mixed in a medium wet condition.

The cement must be of the best quality of freshly ground brand of Portland cement, approved by the engineer.

Sand and gravel shall be clean, rather coarse, and free from vegetable mould or other hurtful matter, and shall be screened, if considered necessary, by the said engineer or inspector.

All broken stone must be made from clean, durable rock, and crushed so that it will pass through a two-inch ring and be rejected by ¼-inch ring where used in abutments and wings; but the stone in floor and beams shall be broken to pass through a ¾-inch ring. Within these limits the entire product of the crusher must be used.

The contractor must not make any alterations or changes in the work without the consent of the engineer in writing.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

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

5356 to 5358—Sept. 29—Authorizing the Bell Telephone Co. to place its wires across the tracks of the C.P.R. at Bury Station, Que.; William Street, Chatham, Ont., and three-quarters mile south of Mount Tremblant Station, Que., respectively.

5359—Sept. 29—Authorizing the Malahide and Bayham Telephone Co.operative Association to place its wires across the tracks of the G.T.R. at public road near Con. 11 Lot 29, Township Bayham, and Con. 6, Lot 1, Township Middleton, Ont.

5360—June 2—Directing the G.T.P. Ry. Co. to lay its lines or tracks across the lines or tracks of the Winnipeg Electric Street Railway Co. on Pembina Highway, Winnipeg, Man.

5361—Oct. 1—Approving revised location of the G.T.P. Ry. Co. from east line of Sec. 7, Township 53, Range 4, to Sec. 14, Township 53, Range 6, west of the fifth meridian, Alberta.

5362—Sept. 30—Authorizing the G.T.P. Telegraph Co. to place its wires across the track of the C.N.R. at Earl (Nutana), Sask.

5363—Sept. 30—Authorizing the Manitoba Government Telephones Commission to place its wires across the track of the C.N.R. Co., half mile north of Fairview, Man.

5364—Sept. 18—Directing the C.P.R. Co. to carry freight traffic over its Moose Jaw Branch from mileage 14.5 to mileage 63, subject to the condition that the speed of trains passing over the said portion of its line does not exceed fifteen miles per hour.

5365—Sept. 14—Authorizing the G.T.P. Ry. Co. to connect its tracks temporarily with those of the C.N.R. at Scotland Avenue, parish of St. Boniface, Man.

5366—Oct. 1—Authorizing the Carnduff Telephone and Electric Co. to carry its telephone wires across the tracks of the C.P.R. at Carnduff, Sask.

5367—Oct. 1—Authorizing the Manitoba Government Telephone Commission to carry its wires across the tracks of the Canadian Northern Railway at a point two miles west of Wawanesa, Man.

5368—Sept. 14—Authorizing the G.T.P. Ry. to connect its main line with the main line of the C.P.R. at Oak Point Junction, Man.

5369—Oct. 1—Authorizing W. J. Connon, Elora, Ont., to lay a six-inch water pipe across the land and tracks of the G.T.R. at Lot No. 5, First Concession Township of Nichol, Ont.

5370—Aug. 7—Authorizing the Department of Railways and Canals to lay telegraph and semaphore wires of I.C.R. across the right-of-way and track of the G.T.R at Aston Junction, P.Q.

5371—Sept. 17—Granting leave to the Macdonald College, Macdonald College, P.Q., to lay water pipe across lands and track of G.T.R. at Ste. Anne de Bellevue, P.Q.

5372—Oct. 2—Authorizing the G.T.R. proposed deviation or alteration in the location of the main line of its railway already constructed between a point east of Argyle Street, Caledonia, Ont., and also a point south of Inverness Street, Caledonia.

5373—Oct. 6—Authorizing the corporation of the city of Toronto to lay certain water pipes on the Esplanade, short distance west of Market Street, under tracks of G.T.R., Toronto, Ont.

5374—Oct. 6—Authorizing Mrs. M. A. Roy, Montreal, proprietor of the St. John's waterworks, to lay a water main under the G.T.R. at St. James Street crossing, St. Johns, P.Q.

5375—Oct. 6—Authorizing the corporation of the city of Toronto to construct a brick sewer under the G.T.R. at Greenwood Avenue from the crossing of the G.T.R. north to Danforth Avenue, Toronto, Ont.

5376—Oct. 6—Granting leave to the Commissioner of the Transcontinental Railway to cross with their tracks the tracks of the C.P.R. at grade at a point near St. Basile Station, County of Portneuf, P.Q.

5377—Oct. 6—Approving location of proposed station of the M.M. and S. Railway. Station No. 1606 + 47, parish of Nicolet, County Nicolet, P.Q.

5378—Oct. 6—Granting leave to the British Columbia Telephone Co. to erect, place and maintain its wires across the track of the C.P.R. Co. at Clayburn, B.C.

5379—Oct. 6—Granting leave to the British Columbia Telephone Co. to erect, place, and maintain its wires across the track of the C.P.R. at Abbotsford, B.C.

5380—Oct. 6—Authorizing the C.P.R. to construct, maintain and operate a branch line or spur near Mayook, B.C., to and into the premises of the Rock Creek Lumber Co.

5381—Oct. 7—Granting leave to the Wheatley Telephone Co. to erect, place and maintain its wires across the P.M. Railway, Township of Romney, County Kent, Ont.

5382—Oct. 7—Authorizing Township of Morris, County Huron, Ont., to lay a twelve-inch tile drain across the lands and underneath the track of the G.T.R. by means of the culvert of the G.T.R. at a point south of the public road between Concessions 7 and 8 of Township of Morris, Ont.

(Continued on Page 748.)

CONSTRUCTION NEWS SECTION

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

TENDERS.

Nova Scotia.

YARMOUTH.—Tenders will be received up to October 27, 1908, for the construction of a three storey building on Cliff Street, Yarmouth, N.S., for the Yarmouth Young Men's Christian Association. Specifications may be seen at the Y.M.C.A. Rooms, or at H. G. Tedford's, Collins Street.

New Brunswick.

ALMA.—Tenders for Point Wolfe Bridge will be received at the Department of Public Works, Fredericton, until Monday, 2nd day of November, 1908, at noon, for rebuilding Point Wolfe Bridge, parish of Alma, Albert county, N.B., according to plans and specifications to be seen at the Public Works Department, Fredericton, N.B., and at the office of Walter B. Dickson, Esq., M.P.P., Hillsborough, Albert county, N.B., and at the office of Geo. D. Prescott, Esq., M.P.P., Albrt county, N.B. John Morrissy, Chief Commissioner, Department of Public Works, Fredericton, N.B.

ELGIN.—Tenders for River View Bridge will be received at the Department of Public Works, Fredericton, until Monday, 2nd day of November, 1908, at noon, for rebuilding River View Bridge over Pollet River, parish of Elgin, Albert county, N.B., according to plans and specifications to be seen at the Public Works Department, Fredericton, N.B.; at Goddard Bros.' store, Elgin, and at the store of Mr. I. C. Prescott, Albert, Albert county, N.B. John Morrissy, Chief Commissioner, Department of Public Works, Fredericton, N.B.

MONCTON.—Tenders for the branch line, Harmony to Elmira, will be received up to and including Saturday, October 31st, 1908, for the construction of a line of railway from Harmony Station, on the P.E.I. Railway, to Elmira, a distance of about ten miles. Plans and specifications may be seen at the following places: The station master's office, Souris, P.E.I.; the resident engineer's office, Charlottetown, P.E.I., and at the chief engineer's office, Moncton, N.B., where forms of tender may be obtained. D. Pottinger, general manager.

ST. JACQUES.—Tenders for Silver Stream Mouth Bridge will be received at the Department of Public Works, Fredericton, until Monday, 2nd day of November, 1908, at noon, for rebuilding Silver Stream Mouth Bridge, parish of St. Jacques, Madawaska county, N.B., according to plans and specifications to be seen at the Public Works Department, Fredericton, N.B.; at Maxime Cormier's, Esq., Edmundston; at Charles Cyr's, Esq., St. Leonard's, and at Jesse W. Baker's, Esq., Baker Brook, Madawaska, N.B. John Morrissy, Chief Commissioner, Department of Public Works, Fredericton, N.B.

Ontario.

OTTAWA.—Tenders for the purchase of secondhand machinery will be received at this office until 16 o'clock on Wednesday, the 21st October, 1908, for the purchase of the following secondhand dredging machinery: One vertical boiler, 53 by 96 inches, tested to 180 pounds, cold water pressure, without fittings; one pair of dredging engines, 8 by 12 inches, with drums and swingers, staff frictions complete, without fittings; one A frame for dredge; one boom, complete; one dipper arm; one dipper in fairly good condition; one swinger table; three spuds or anchors. Any further information may be had on application to J. H. McClellan, superintendent of the Trent Canal, Peterborough, Ont. L. K. Jones, Secretary, Department of Railways and Canals.

OTTAWA.—Tenders for Trent Canal will be received until 16 o'clock on Tuesday, the 20th October, 1908, for the works connected with the construction of Section No. 7, Ontario-Rice Lake Division of the canal. Plans, specifications and the form of the contract to be entered into can be seen on and after the 26th September, 1908, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Trent Canal, Peterboro', Ont., at which places forms of tender may be obtained. L. K. Jones, Secretary, Department of Railways and Canals.

PORT BURWELL.—Tenders for Port Burwell breakwater extension and dredging will be received at this office until 4.30 p.m. on Tuesday, November 3, 1908, for the construction of an extension to the breakwater and dredging at Port Burwell, Elgin county, Ontario, according to a plan and specification to be seen at the offices of J. G. Sing, Esq., engineer-in-charge, Confederation Life Building, Toronto; H. J. Lamb, Esq., engineer-in-charge, London, Ont., on application to the postmaster of Port Burwell, Ont., and at the Department of Public Works, Ottawa. Nap. Tessier, Secretary, Department of Public Works.

RONDEAU.—Tenders for Rondeau breakwater and dredging will be received at this office until 4.30 p.m. on Friday, October 30, 1908, for the construction of a breakwater and dredging at Rondeau, Kent county, Ontario, according to a plan and specification to be seen at the offices of J. G. Sing, Esq., resident engineer, Confederation Life Building, Toronto; H. J. Lamb, Esq., resident engineer, London, Ont., on application to the postmaster at Rondeau, Ont., and at the Department of Public Works, Ottawa. Nap. Tessier, Secretary, Department of Public Works. (Advertised in the Canadian Engineer.)

CONTRACTS AWARDED.

Quebec.

MONTREAL.—The contract for a small conduit to be laid in connection with the waterworks improvement scheme at Montreal has been let to the Rexford-Bishop Co. at the price of $21,813.

MONTREAL.—Tenders were opened for a reinforced concrete wall and supply conduits for the pumps at Point St. Charles wheelhouse. Engineers estimate, $20,721; the Rexford-Bishop Co., $21,813; P. McGovern, $37,637.50; J. Leahy & Co., $34,690; Henault & Heffernan, $41,058.50, and the Hilder Daw Construction Co., $34,500.

Ontario.

HAILEYBURY.—The tender of the J. H. McNight Construction Co. for the laying of a water main on Brewster Street was opened, and it was found that the firm was willing to do the work for $1,290, half of which they would take in debentures.

KINGSTON.—The contract for the new dome for the city hall was awarded to R. N. F. McFarlane, of Kingston, at $12,135. A second tender was submitted at $12,550.

Manitoba.

WINNIPEG.—The Dominion Bridge Co. have secured the contract for the structural steel work of the new Fort Garry terminal freight shed, contract price being in the neighborhood of $18,000. The same company will also supply the steel for the alterations on the Carleton Hotel, Winnipeg. Steel for both will be shopped in their Winnipeg works. Messrs. Carter-Halls-Aldinger have the contract for the alterations on the Carleton Hotel.

WINNIPEG.—The contract has been let for the G.T.P. and C.N. Railway new freight sheds, which involves an outlay of $92,749. J. H. Tremblay, of St. Boniface, secured the contract. The new freight sheds will be closely connected to the Fort Garry depot. The contract is for two large sheds, 500 feet long, one being 40 feet and the other 60 feet wide, both sheds to be built of structural steel, and will be ready in February, 1909, so that work on them will begin at once.

Foreign.

EAST WALPOLE, MASS.—F. W. Bird Co., East Walpole, Mass., has awarded to the Aberthaw Construction Co., Boston, Mass., the contract for building two reinforced concrete lime kilns. These are to be built with hopper bottoms, and one of the conditions is that they shall be made as nearly air-tight as possible.

PORTLAND, ME.—It was recently reported that the Aberthaw Construction Co., Boston, Mass., had been awarded the general contract for the erection of a six-storey reinforced concrete store and office building for ex-Mayor J. P. Baxter at Portland, Me. This concern has since received orders to handle in addition the brick, the finished carpentry, and the metal lath partitions. They will be in the market for a considerable amount of metal lath.

RAILWAYS—STEAM AND ELECTRIC.

New Brunswick.

MONCTON.—The Smart-Turner Machine Co., Limited, Hamilton, are supplying the Intercolonial Railway with a compound Duplex Pump.

Ontario.

BELLEVILLE.—Application will be made at the next session of Parliament for the incorporation of the Belleville Radial Railway, a company to have power to construct and operate an electric railway in the city of Belleville.

HAMILTON.—According to a letter received from Mr. John Patterson, from London, England, he has made the necessary arrangements for building the Hamilton, Waterloo & Guelph Railway. Mr. Patterson has sailed for home.

WELLAND.— The N., St. C. & T. have commenced grading and driving piles on the south side of the Welland River for their bridge.

Manitoba.

BRANDON.—The operating department of the Canadian Northern Railway will take over the new Brandon-Regina line immediately, the Railway Commission has granted its permission. In accordance with railway law the Commission has to receive two weeks' notice. M. H. McLeod, general manager; J. R. Cameron, general superintendent; A. Shields, master mechanic, and H. A. K. Drury, resident engineer of the Board of Railway Commissioners, are engaged in an inspection of the line, including bridges, stations and the track itself.

LUMSDEN.—Mair and Sons received instructions to commence work on the Bulyea-Regina stem of the C.P.R. Mair and Sons have a contract from Bradley to grade three miles at Craven and immediately north of that town.

WINNIPEG.—Parties are at work surveying a right-of-way for the Great Northern Railway entrance into Winnipeg. The company's surveyors have already completed their work from Greenbush, Minn., to Noyes, the first station south of the border, and the new road will probably connect here with the line already built from Dugdale. From Dugdale the road will be extended almost in a direct line to St. Norbert. The road will lie between the Red River and the C.P.R., thus cutting into the C.P.R.'s freight business in the rich country through which it runs. From St. Norbert the new road will cross the river and aprallel the C.N.R. almost to the limits of the city, where it will describe a detour and enter from the westward. The line will enter the city between Ross and Pacific Avenues, where the company owns property in common with the Northern Pacific, and although it is likely that the Great Northern's passenger trains will enter the union station, it is most likely that they will build freight sheds on the Ross Avenue property. Those who are in the know say that the line will be running within a year.

WINNIPEG.—Before winter sets in, 50 miles of track will be laid west of Superior Junction. At the St. Boniface end the track had been laid to a point about 25 miles east of Rennie, and by January 1st, 1909, it would be possible to run out from St. Boniface for some 110 miles east. Altogether, on district F it was likely that from 150 to 160 miles of track would be laid before the depth of winter. At the present moment full gangs of men were working on all the contracts, the total number employed being from 5,000 to 5,500. It was expected that the majority of these men would work right through the winter. On the 120 miles or so of district F, east of Superior Junction, the contract for which had been let recently, supplies were being rapidly got in for the purpose of preliminary work.

British Columbia.

PENTICTON.—R. A. Henderson, C.E., and party, left for Keremeos, having completed the location of the old railway survey line between Midway and Penticton. For the past three weeks the party, comprising about a dozen men, have been rushing work on the portion of line between Carmi and Penticton. It is understood that a one per cent. grade has been secured, the most difficult portion of the route being the descent of Ellis divide near the head of Ellis Creek to Penticton. In order to make the grade a distance of seventy miles is traversed between Carmi and Penticton, which are situate only twenty-one miles apart. Descending Ellis Creek to near Campbell & Kay's sawmill, the survey line turns up Penticton Creek, passing around the mountain. It then runs south along the west side of the mountain, and crosses Penticton Creek, from which point it gradually descends to the flat. The party under H. E. C. Carry, which has been working all summer between Nicola and Okanagan Lake are now reported bushing their survey down Trout Creek, and may be expected to arrive in Penticton any day. The next move will be watched with interest.

LIGHT, HEAT, AND POWER.

Ontario.

MONTREAL.—The proposed contract between the city and the Roberts Company for light and power has not been executed, nor is it likely to be. This means that the Montreal Light, Heat and Power Company have the field to themselves.

NORTH BAY.—The North Bay Light, Heat and Power Company advise the town that at a meeting of the shareholders on October 2nd, the board of directors were empowered to sell to the town of North Bay the Gas and Electric plants, price to be fixed by arbitration and that the directors may accept satisfactory approved bonds of the town in payment of same.

OSHAWA.—The corporation of Oshawa will make application at the next session of Parliament for power to construct and operate an electric light and power plant.

Saskatchewan.

PRINCE ALBERT.—The by-law providing for the building and equipping of a fire hall in Prince Albert East, the installation of an electric fire alarm system, and the purchase of a hose wagon, and other equipment for the central fire hall was carried by a large majority.

Foreign.

GREAT FALLS, MASS.—A considerable portion of the power to be made available by the development at Great Falls, Mont., will be used by the Boston and Montana Smelter. The development, which is beginning to take shape in accordance with plans by Chas. T. Main, engineer, Boston, Mass., will comprise two powers. The upper and Coulter's, Crooked, and Rainbow Falls, three miles down the river, will include a 25-foot crib dam with masonry head gate, and waste gate structures. A steel penstock 22 feet in diameter will conduct the water 2,500 feet to the power-house. The dam at the lower development, twelve miles below Great Falls, will be of the

same construction; there will be a canal about 500 feet long, below which will be the power-house. At both developments the head will be over 100 feet, and at each a 30,000 horse-power equipment of wheels and electrical apparatus will be installed. Mr. Main has already organized his engineering corps which is now busily engaged in making surveys and preparing plans. Work on the coffer dams has begun; it is expected to rush everything through to completion at the earliest possible date.

SEWERAGE AND WATERWORKS.

Quebec.

MONTREAL.—Advance sheets of the annual report of the Water Department of Montreal show that the consumption of water for the year 1907 amounted to 12,439,889,245 gallons, making an average of 109.06 gallons daily for each citizen great or small. This estimate was based on the number of strokes of the pistons of the pumps, and it is only fair to say that discrepancies have been found between this method of calculating and the results as shown by meter in connection with the high-level pumping station, the meter indicating considerably less. As against the daily per capita use of water of 109.06 gallons last year are 104.77 in 1906, 103.87 for 1905, 97.57 for 1904, and 88.60 for 1903, thus illustrating the annual per capita increase.

Ontario.

TORONTO.—The Cameron Septic Tank Co., of Chicago, have reported to the Board of Control that they are prepared to grant to the city the right to install the sewage disposal plant under their patent rights for the sum of $6,250. This position includes all necessary sketch drawings and other information required in designing the plant, or, if the Board prefers, the company is prepared to furnish the plans and detail drawings and make monthly inspections of the plant during construction for the additional sum of $3,125. The offer was referred to the City Engineer and City Solicitor.

Saskatchewan.

PRINCE ALBERT.—The by-laws to provide money for relaying the wooden waterpipes with iron ones and for extending the waterworks and sewerage systems carried.

TELEPHONY.

Nova Scotia.

YARMOUTH.—The sale of the plant and franchise of the Yarmouth Telephone Company to the Nova Scotia Telephone Company, has been completed.

British Columbia.

PENDER ISLAND.—The completion of the telephone line, which will now connect South Pender with Pender Island, is a source of satisfaction as another step forward. The work has been under the supervision of Allan Porter, who is extending the line to Mayne Island, which will give the latter connection with Salt Springs and Victoria.

CRANBROOK.—A telephone company has been formed in Cranbrook, to be known as the Kootenay Telephones, Limited, which will be capitalized at $200,000. They have purchased the Cranbrook Telephone Company's system and will operate within the boundaries of British Columbia.

MISCELLANEOUS.

Quebec.

MONTREAL.—Mr. F. W. Cowie and his staff of engineers are now engaged in drawing up a comprehensive plan of harbor improvements, to extend over the next 25 years. These works, as well as those already completed and in course of construction, are of the utmost importance, not only to Montreal but to Canada as a whole, as upon the rapid and efficient handling of goods at the port of Montreal depends much of the trade of the country.

Ontario.

COBALT.—The Smart-Turner Machine Company, Limited, are supplying the Coniagas Mines, Limited, with one of their Duplex fire pumps.

LONDON.—There is a prospect of London getting natural gas at the rate of 35 or 40 cents per 1,000 feet. The request of the London and Western Counties Pipe Line Co. to be allowed to pipe natural gas for distribution through London streets has been referred by the Board of Works to the city solicitor, who will scrutinize the existing agreement with the City Gas Company.

PORT ARTHUR.—The work of repairing the service dam which was washed away by the floods this spring has been commenced by Stewart & Hewitson. The work has been hung up for some time on account of the injunction which was placed on the work.

SMITH'S FALLS.—Engineers are in Smith's Falls this week, making surveys of the proposed new bridge across the Rideau River, in the eastern end of the town.

TORONTO.—The Canadian Buffalo Forge Company, capitalized at $100,000, with headquarters and factory at Montreal, has opened a branch office in the Traders Bank Building, Toronto. Ernest B. Allen, B.Sc., is resident manager.

Manitoba.

WINNIPEG.—The Canadian Engineer paid a visit last week to the Western Iron Works, who report that business is picking up very satisfactorily, and Mr. Eade, the energetic manager of the works, was very pleased with the outlook for the coming fall and spring. They have no large contracts under way, but are kept busy with smaller work.

WINNIPEG.—The University of Manitoba Engineering Department are installing a complete cement testing plant, and already several of the smaller machines are in place. All the machines are manufactured by Riehle Bros., and the large testing machine, which is a 200,000 pound one, is now being erected, and when this is completed the University of Manitoba will have a very satisfactory and complete cement testing plant. Professor E. Brydon Jack, head of the Engineering Department of the University, is personally supervising the installing of the machines.

Saskatchewan.

BATTLEFORD.—The new bridge over the north channel of the Saskatchewan is now open to traffic, having last week been subjected to severe tests with the heaviest traction engine in the province. It is expected that the bridge over the south channel will be ready for traffic within a couple of months.

British Columbia.

VANCOUVER.—Messrs. George W. Fraser, and his assistant, D. V. Ritchie, both of Ottawa, have returned from the North. They were the representatives of the Dominion Government on the survey, which for this portion of the work was carried out by an American party in charge of Mr. F. Morse, of Washington, D.C. They report that the delimitation of the international boundary between Alaska and the Canadian Yukon south of Mount St. Elias, and in the vicinity of Alsek River, extending over a distance of seventy miles, has been completed. It has occupied two years. Permanent monuments were erected, and the line was cleared of trees through the wooded tracts.

Foreign.

WARRINGTON, ENG.—The Peter Hooker, Limited, have taken over the business of the Kewell Engineering Company, and will continue the business of manufacturing limit gauges, measuring machines, micrometers, surface plates, etc.

PERSONAL.

MR. J. M. McGREEVY has been appointed assistant roadmaster for the Nelson section of District 3 of the C.P.R.

MR. JOHN L. STUART, S.P.S. '07, has resigned from the City Engineers' staff, Toronto, and accepted a position in Pittsburg, Pa.

MR. JOHN MOONEY, Sarnia, Ont., has been appointed assistant superintendent of motive power of G.T.P., with headquarters at Rivers, Man.

MR. ALEXANDER DOW, of Detroit, has been retained by the city of Toronto as consulting engineer in connection with the municipal light and power distribution scheme.

MR. J. M. R. FAIRBAIRN, formerly C.P.R. division engineer at Montreal, has been appointed principal assistant engineer of the Canadian Pacific.

MR. C. B. BROWN, formerly of St. John, has been appointed division engineer of the Eastern Division of the Canadian Pacific, with office at Montreal, Que.

MR. FRANK TAYLOR has been appointed division engineer of the Lake Superior Division of the Canadian Pacific, with office at North Bay, Ont.

MR. G. L. WETMORE has been appointed division engineer of the Atlantic Division of the Canadian Pacific, with office at St. John, N.B.

MR. ELWOOD GRISSINGER, E.E., A.M.A.I.E.E., has opened an office at 924 White Building, Buffalo, N.Y., as a consulting electrical and mechanical engineer.

MR. K. A. MACKENZIE, B.A.Sc., editor of "Applied Science," Toronto University, has returned from the Yukon, where he was engaged as mining engineer on one of the Guggenheimer properties.

MR. A. G. McFarlane, hitherto one of the assistant district engineers on District F of the National Transcontinental Railway, has been promoted to the position of chief engineer of District D.

MR. W. G. BLIGH, M. Inst. C.E., and author of "The Practical Design of Irrigation Works," is making a short visit in Toronto. Mr. Bligh has just returned from the Irrigation Convention at Vernon, B.C., and is on his way home to England.

MR. R. S. LEA, consulting engineer, of Montreal, has just returned from a trip to Europe, during which he visited several of the most important water filtration and sewage disposal plants and experimental stations in Great Britain and the Continent.

MR. HARRY PENNINGTON, Lumberman's National Bank Building, Houston, Texas, has been appointed Texas agent for the Wheeler Condenser and Engineering Co., of Carteret, N.J. Mr. Pennington has been engaged in the practice of mechanical engineering in Houston for a number of years, and has been identified with many of the large enterprises in that section, having had charge during the past seven years of engineering construction work costing over $2,500,000. He is at present consulting engineer for the Galveston waterworks, engineer for Houston and Fort Bend counties, president of the South-Western Engineers' and Architects' Clubs, and Chief Engineer Officer of the State of Texas.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

(Continued from page 744.)

5383—Oct. 7—Granting leave to the Wheatley Telephone Co. to erect, place and maintain its wires across the track of the P.M. Railway on the east side of the 18 and 19 sideroad, Township of Romney, County Kent, Ont.

5384—Oct. 6—Authorizing the C.P.R. to construct branch line to and into the premises of the Peel Lumber Co., Lot 75, parish of Peel, County Carleton, N.B.

5385—Sept. 15—Dismissing complaint of Stockton & Mallinson, Limited, Regina, Sask., re alleged unreasonable rates charged on oranges from points in the State of California, U.S.A.

5386—Oct. 6—Granting leave to the British Columbia Telephone Co. to erect, place and maintain its wires across the track of the C.P.R. at Clayburn Station, B.C.

5387—Sept. 1—Dismissing complaint of the Canadian Canners, Limited, complaining against rate of forty cents per hundred pounds charged on carload of canned vegetables, Trenton to Englehart, Ont., shipped on the T. and N.O. and Central Ontario Railways; also on the C.P.R.

5388—Oct. 6—Granting leave to the British Columbia Telephone Co. to erect, place and maintain its wires across the track of the C.P.R. at Mission Junction, B.C.

5389—July 29—Dismissing application of Doolittle & Wilcox, of Dundas; J. R. Murray, of Terra Cotta; Walter Webster, of Inglewood; Thos. Foster, of Cheltenham; Mr. Cummings, of Terra Cotta; Mr. Fleming, of Glen Williams; Hugh Logan, of Glen Williams; William Logan, of Glen Williams; T. McBride, of Terra Cota; R. Carl, of Credit Forks; John Webb. of Inglewood; J. Maloney, of Schaw, and D. Robertson, of Milton, stone quarry operators of the Province of Ontario, for an order disallowing the proposed increase in freight rates for the carriage of stone upon the railways of the C.P.R. and the G.T.R.

5390—Aug. 13—Dismissing application of Alex. Pilon, of Casselman, Ont., for order fixing additional sum to be charged by C.A.R. Co. for switching and handling of traffic to and from siding.

5391—Sept. 14—Ordering the C.P.R. to refund to the Independent Lumber Co., of Regina, Sask., demurrage charges on car No. 56928 at Craik, Sask., and Nos. 29401 and 56512 at Regina, Sask.

5392—Oct. 6—Ordering J. H. Cockburn to construct and maintain a suitable culvert under the C.N.O.R. to carry off the water at Lily Lake, one-quarter of a mile south of C.N.O.R. station, Lake Joseph, Township of Humphrey, Ont.

5394—Sept. 15—Ordering the C.P.R. to construct a spur track or transfer track from its line of railway at Holmfield, Man., to the line of the C.N.R.

MARKET CONDITIONS.

Toronto, October 15th, 1908.

Features in the building trade are by no means prominent this week. Conditions in the cement trade have not improved, bricks are quiet, lumber cannot be termed active, while structural steel shows limited activity. We speak now of the local situation. In the United States, a decline is reported in structural steel contracts placed, pig-iron has been more active, however, and bar-iron is easy, with light demand. European war clouds have made a flurry in tin, Singapore being quite strong, but the metal sagged back after a few days' fever. Copper has felt the European uneasiness, too, but prices in New York Tuesday were much as before.

Among Toronto machinery dealers we can find no particular stir. This, however, is not the busiest time of year for them. Planers and lathes are moving, but not busily; some gas engines are always selling. It is noticeable, in contractors' supplies, that the demand is for goods immediately required, and that no one apparently, is doing any speculative ordering.

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

Antimony.—Price unchanged at 8¾c., with moderate demand here, but prices are advancing outside.

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

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

Boiler Plates.—¼-inch and heavier, $2.40. No special activity. Boiler heads 25c. per 100 pounds advance on plate.

Boiler Tubes.—Demand limited. Lap-welded, steel, 1¼-inch, 10c.; 1½-inch, 9c. per foot; 2-inch, $8.50; 2¼-inch, $10; 2½-inch, $10.60; 3-inch, $12.10; 3½-inch, $15.30; 4-inch, $19.45 per 100 feet.

Building Paper.—Plain, 30c. per roll; tarred, 40c. per roll. Weather still too fine to make demand brisk.

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

Cement.—The market is lower; cement can be had in 1,000 barrel lots at $1.80 per barrel, including the bags, which is equal to $1.40 without bags. Overproduction is evident, and demand is not brisk in a wholesale way. The smaller dealers, however, are busy selling small quantities.

Coal Tar.—In improved request: $3.50 per barrel the ruling price.

Copper Ingot.—Still active; prices unchanged at 14¼c.

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

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

Roofing Felt.—There is much more demand and a better feeling. Price $1.80 per 100 pounds.

Fire Bricks.—English and Scotch, $32.50 to $35; American, $28.50 to $35 per 1,000. Demand continues fair.

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

Galvanized Sheets—Apollo Brand.—Sheets 6 or 8 feet long, 30 or 36 inches wide; 10-gauge, $3.05; 12-14-gauge, $3.15; 16, 18, 20, $3.35; 22-24, $3.50; 26, $3.75; 28, $4.20; 29 or 10¾, $4.50 per 100 pounds. Fleur de Lis—28-gauge, $4.30; 26-gauge, $4.05; 22-24-gauge, $3.50. Queen's Head—28-gauge, $4.50; 26 gauge, $4.25; 22-24-gauge, $3.70.

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

Iron Pipe.—Black, ¼-inch, $2.03; ⅜-inch, $2.25; ½-inch, $2.63; ¾-inch $3.56; 1-inch, $5.11; 1¼-inch, $6.97; 1½-inch, $8.37; 2-inch, $11.16; 2½-inch, $17.82; 3-inch, $23.40; 3½-inch, $20.45; 4-inch, $33.48; 4½-inch, $38, 5-inch, $43.50; 6-inch, $56. Galvanized, ¼-inch, $2.86; ⅜-inch, $3.08; ½-inch, $3.48; ¾-inch, $4.71; 1-inch, $6.76; 1¼-inch, $0.22; 1½-inch, $11.07; 2-inch, $14.76. Rather more movement following the natural fall demand.

Lead.—Active, but slightly irregular. We still quote $3.90.