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MISSING

The Canadian Engineer

WEEKLY

ESTABLISHED 1893.

VOL. 19. TORONTO, CANADA, JULY 14th, 1910. No. 2.

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.

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Changes of advertisement copy should reach the Head Office by 10 a.m. Friday preceding the date of publication, except in cases where proofs are to be mailed to distant points, for which due time should be allowed.

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

Index of this issue will be found on page 53.

IRRIGATION CONVENTION.

The Western Canadian Irrigation Association will meet in Kamloops, B.C., August 3rd, 4th and 5th. Already, the "dry belt" of central Canada is taking a great interest in this gathering. The present dry season has forced upon the people in certain sections of the West the necessity of having irrigation ditches at their command. Even those who do not look upon irrigation as a necessary agricultural assistant in every season are forced to recognize its necessity in such a season as this.

Centuries ago, Asia and Africa developed extensive irrigation works. Great plains of Southern Asia and Northern Africa were the granaries of races now almost forgotten. Canals, in extent far larger than any dreamed of by modern engineers; storage basins, in size equal to large lakes; aqueducts and canals of immense proportions extend in all directions in these old countries.

More recently, irrigation schemes extended to Italy, Spain, and the Mormons of the middle Western States developed the art of irrigation to a most wonderful degree. To-day, the arid and semi-arid districts of the two Americas bear testimony to the skill and accuracy of the irrigation engineer.

In the past, Canadian irrigation schemes have been private enterprises or the undertakings of private corporations.

Lately, the Governments, both Federal and Provincial, recognizing the necessity of public control in such matters, have taken a deeper interest in this vexed question, and recent legislation indicates that, shortly, irrigation works will be under Government control, if not Government-owned.

The programme arrangement for the coming meeting includes papers by Mr. Newell, chief of the Reclamation Department of the United States; Clifford Sifton, M.P., chairman of the Canadian Conservation Commission; A. E. Ashcroft, C.E., of Vernon, B.C.; A. E. Meighen, of Kamloops, B.C. It is to be hoped that the interchange of ideas by these recognized experts on the different branches of this great problem will have a stimulating and encouraging effect on the work of irrigation in our Western Provinces.

THE GOVERNMENT AND ONTARIO'S MINING PROBLEMS.

Years ago we were taught that the chief industries of Ontario were agriculture and lumbering; more recently, manufacturing was added as an important industry of Ontario, but to-day the investor, the capitalist and the economist look upon mining as, if not the chief, at least the second in importance in the industrial life of the Province.

The Government of Ontario have nourished with great care the mining industry. They have granted bounties to certain mining ventures; they have encour-

aged discovery by ready issue of mining licenses, and they have compelled developments in the Mines Branch. The Department of Crown Lands flooded the country with reliable information as to the arrangement and deposits of geological formation of the mineral belts.

The same Government have encouraged and supported the formation of the School of Mines at Kingston. The provincial university—the University of Toronto—has been slow to recognize the important part a strong department of mining-engineering might play in the development of this large industry within the boundaries of the Province and it is only within the last few weeks that they have appointed a full professor of mining in the person of Mr. H. E. T. Haultain, M.E. The formation of this new department was most encouraging to those who had the best interest of the mining industry at heart, and now that the Provincial Government have signified their interest in this department of university work by electing to the Board of Governors of the University of Toronto a prominent mine owner and engineer, Mr. Reuben W. Leonard, of St. Catharines, there is not lacking evidence that this department will receive the attention which it has deserved, but, hitherto, has not received.

We congratulate the University on the appointment of Mr. Leonard to this position. It is fortunate that men with interests so large as his are willing to give of their time to the successful carrying on of the educational institutions of the Province.

We have no doubt that Mr. Leonard recognizes the opportunities that are now his, to develop the Applied Science Departments of the University; to encourage the study of Mining-Engineering; to raise the standard of requirements for mining men and technical colleges, and to improve the status of the mining engineer.

Mr. Leonard is a public-spirited man, having taken a very active part in the affairs of the Canadian Society of Civil Engineers, the Canadian Mining Institute, and various charitable and philanthropic societies. In the new work he will undertake he can be counted upon to give much attention and thought.

May he continue to keep in touch with the great mining industry of the Province, the men who are at its head, the consulting mining engineer and thus be able to secure for the industry a heartier co-operation between the teaching staff of our colleges and the men in the field.

RAILWAY CONSTRUCTION, BRITISH COLUMBIA.

Already the fruits of the McBride Government railway policy are in evidence. The impatience the people were disposed to show some time ago is rapidly disappearing as miles of construction work in several sections of the Province are under way.

New territory, agricultural and mineral, is being opened. Large sections of the Province are being brought in direct touch with transcontinental railways and ocean and river transportation, and business activity is noticeable in large distributing centres.

Transportation problems are the first concern of the new territory, and it is fortunate that British Columbia has enough faith in its future to develop these transportation outlets.

BRITISH RAILWAY RATES.

For years past British railways have had three classes of passenger rates—first, second and third. It is understood that a movement is on foot to abolish second class rates. The main difference between first and third class accommodation is the number of passengers allowed in each compartment. In the first class compartment three passengers are allowed in each seat and in the third five. But the difference in the fare between the two classes is very marked, and indicates why so many people in Great Britain travel third class in preference to first. It will be noticed from the following figures that the third class rate is approximately two cents a mile, while the first class rate is almost double that.

London to Liverpool (201 miles).....	$7 35	$4 00
London to Glasgow (401 miles).....	14 50	8 50
London to Edinburgh (395 miles).....	14 36	8 16
London to Folkstone (70 miles).....	2 87	1 47
London to Dublin (334 miles).....	13 40	8 12
London to Stratford-on-Avon (121 miles)	4 00	2 10
London to Plymouth (226 miles).....	9 40	4 50

EDITORIAL NOTES.

A very extensive survey is being made of the eastern boundary of the large timber reserve in British Columbia. It is expected that the work will not be completed till 1912.

* * * *

The long-continued drought has made it very difficult, and, in some cases, impossible for the lumbermen to run their logs in the northern streams. This will have a serious effect upon the timber supply at this time, and already prices are showing some advance.

PRECIPITATION FOR JUNE, 1910.

There was a great lack of precipitation throughout Canada during June, except in the Maritime Provinces and very locally in South Eastern Saskatchewan, where an amount in excess of the average was recorded.

The amount of rainfall in the Western Provinces and Ontario was, in most localities, considerably less than half the usual quantity.

The table shows for fifteen stations included in the report of the Meteorological Office, Toronto, the total precipitation of these stations for June.

Ten inches of snow is calculated as being the equivalent of one inch of rain:

Station.	Depth in inches.	Departure from the average of twenty years.
Calgary, Alta.	1.50	— 1.77
Edmonton, Alta.	2.70	— 0.71
Swift Current, Sask	2.20	— 0.85
Winnipeg, Man.	2.40	— 1.04
Port Stanley, Ont.	1.60	— 1.11
Toronto, Ont.	1.06	— 1.73
Parry Sound, Ont.	1.40	— 1.56
Ottawa, Ont.	1.40	— 1.35
Kingston, Ont.	1.00	— 2.20
Montreal, Que.	3.30	— 0.72
Quebec, Que.	2.70	— 1.60
Chatham, N.B.	4.51	+ 1.48
Halifax, N.S.	5.10	+ 1.20
Victoria, B.C.	1.00	+ 0.04
Kamloops, B.C.	1.20	— 0.08

"WINNIPEG'S HYDRO-ELECTRIC DEVELOPMENT."

The above name has been adopted by the city of Winnipeg for its big electrical plant, located at Point du Bois, on the Winnipeg River, 72 miles north-east of the city.

Winnipeg's big power plant will be finished and in operation in June, 1911, and, while it is a difficult matter to state exactly what the municipal power will be sold for, I may say that the by-law authorizing this expenditure of $3,250,000 set forth the following estimated schedule:—

(a) When the first 17,000 horse-power is developed the price at sub-station is to be $18 per horse-power per annum.

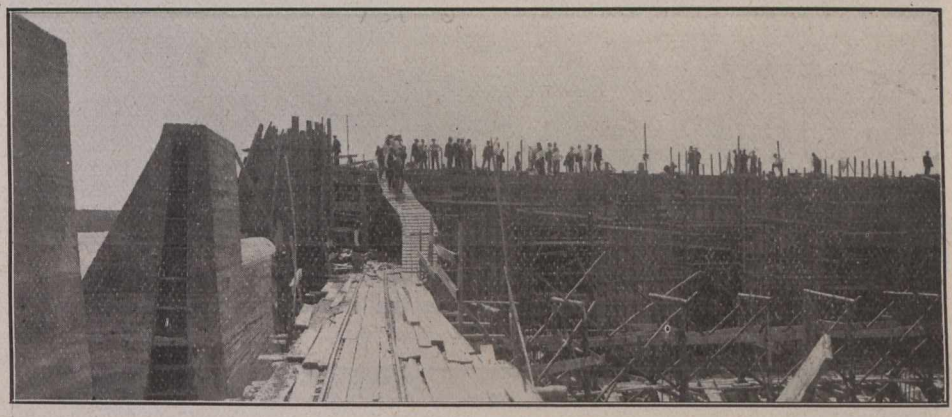
(b) When the demand allows for an additional 17,000 horse-power to be installed the price is to be $16.66 per horse-power per annum.

Twenty thousand horse-power machinery is now being installed in five huge machines, each using 75,000,000 gallons of water every twenty-four hours, and each weighing 150 tons; power to be transmitted to Winnipeg at 60,000 volts over two independent circuits of aluminum cable ⅝-inch in diameter.

Five thousand two hundred horse-power turbines being manufactured in Sweden and England, and generators being supplied by a Sheffield firm.

All electrical control and all auxiliary apparatus being manufactured in Canada.

There has already been excavated 88,000 tons of rock and 25,000 cubic yards of concrete have been laid. There are 450 men engaged excavating and in building concrete works.



Canal Wall adjoining East End of Power House.

(c) When the full capacity of the present works are put in operation—60,000 horse-power—the charge per horse-power is to be $12.50 per horse-power per annum.

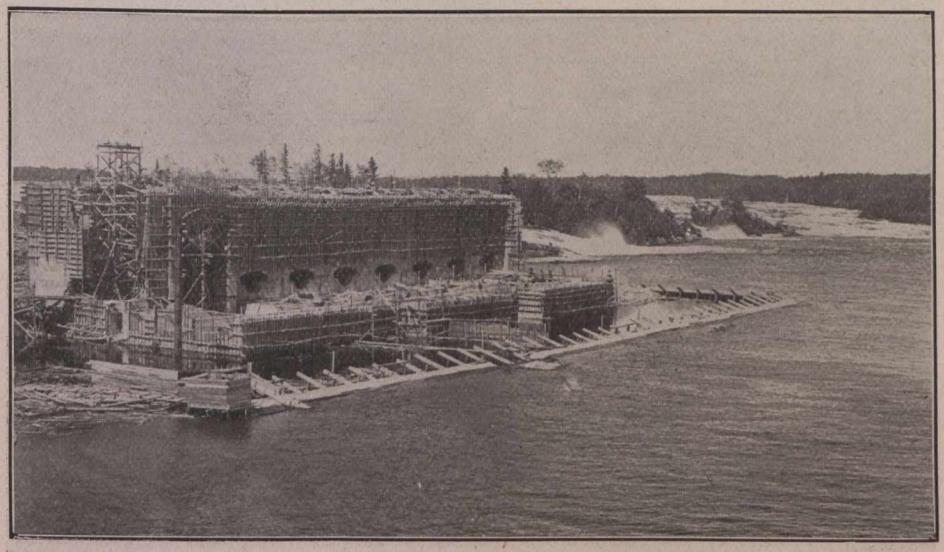
At the present time manufacturers are guaranteed that the price will be as low as in any other city in the West, including Port Arthur and Fort William.

The Winnipeg River, that supplies the water to Winnipeg's power plant, drains 50,000 square miles, and in dry weather has as large a flow as the Ottawa.

The water fall (naturally 32 feet) is increased by dams to 47 feet.

The total power available, without storage, is 60,000 horse-power. The "Mill Pond" contains 6,000 acres at the waterfall.

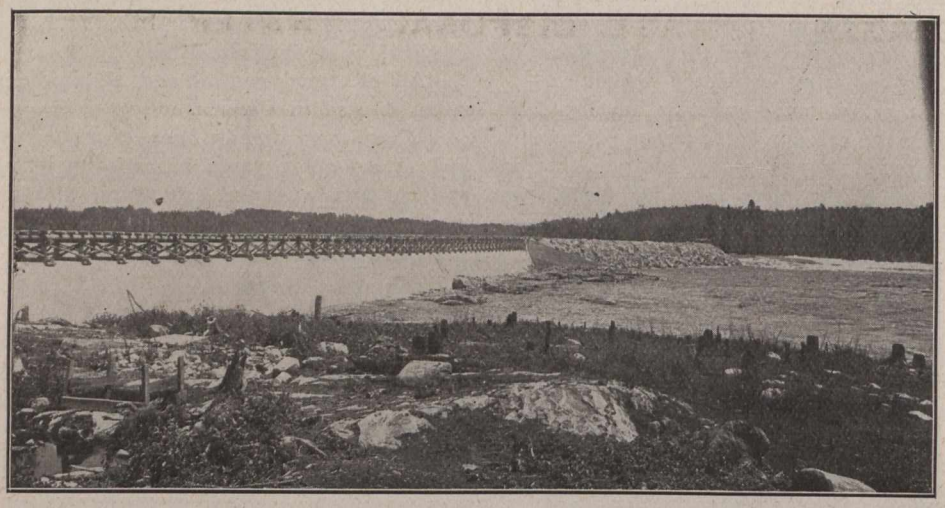
An $85,000 terminal station of red brick, trimmed with Bedford stone, is now being built in Winnipeg, and Sub-station No. 2 is being built on McPhillips Street, costing $12,000. Contracts have been let for an underground con-



View of First Section of the Big Municipal Power House, where 60,000 Electric Horse-power will furnish the City Of Winnipeg with Cheap Power and Light.

duit on King Street and on Higgins Avenue to carry 12,000 volt cable between the terminal and sub-stations. The city has recently purchased a central property for Sub-station No. 1 on King Street, near Notre Dame Avenue. The estimated cost of work, including generating station, transmission line and terminal station, all completed and equipped, is $3,250,000, and the expenditure to June 1st, 1910, has been $1,360,000, which shows a saving under estimated cost on this portion of $350,000. The city owns its right-of-way to the plant, which is 100 feet wide and 77 miles

long, and the city also acquired the right-of-way and built 24 miles of steam railroad that is now fully equipped by engine, box, platform and passenger coaches. The transmission line right-of-way adjoins the railway for a distance of some 30 miles, that right-of-way being bought from the Dominion Government.



View showing River Wall and Rockfill Dam, which will divert the Flow of the Winnipeg River to the Intake Canal.

Terminus of the 77-mile Steam Railway built by the City of Winnipeg for handling Supplies and Material for the Power Plant at Point du Bois.

That there will be a market for Winnipeg's power is shown by the fact that her manufacturing industries are increasing at a rapid pace. In 1901, according to the Government census, the total output of the Winnipeg factories was $8,606,248; in 1906 the Government census gave Winnipeg an output of $18,983,248, and on July 1st the Winnipeg Development and Industrial Bureau completed a census of all Winnipeg factories. The returns show that the annual output now exceeds $25,000,000. During the period of 1901 to 1906 the Government census shows that Winnipeg led all cities in Canada in the increase in capital invested in manufacturing, the percentage of gain for the five years being 130 per cent. The field for manufacturing in Winnipeg is large, and, while the development in the past ten years have been very great, the possibilities for the future are even greater.

Winnipeg's movement that proposes the intelligent unfolding of the advantages of electricity to her modern municipal works, her factories and homes, is a step in progress that will mean more to that city than even the most optimistic of her citizens now forecast.

THE

Sanitary Review

SEWERAGE, SEWAGE DISPOSAL, WATER SUPPLY AND WATER PURIFICATION

MASSACHUSETTS STATE BOARD OF HEALTH 1908 REPORT.

The fortieth annual report of the Massachusetts State Board of Health for the year ending November 30th, 1908, is to hand.

To the sanitary engineer interested in sewage disposal this report will prove of exceptional interest.

It contains over 250 pages, devoted entirely to a review of the valuable experimental work carried out during the past twenty-one years. The review is edited by H. W. Clark, chemist of the Board, and Stephen DeM. Gage.

The thorough scientific investigations carried out at the Laurence Experimental Station since 1888 have proved the foundation of much of our present knowledge of the principles of sewage disposal. In fact, it is no exaggeration to say that most of the modern methods based on biological principles are the direct result of the early experiments in intermittent filtration on Laurence sewage.

The editing in one complete volume of the whole of the main features of this experimental work, and the deduction of conclusions which are now more clearly made apparent in the light of fuller knowledge, provides the most valuable work on sewage disposal which it is possible for the sanitarian to possess.

One feature brought out clearly on page 263 of the report is worthy of special attention. It is generally concluded that the sewage provided by American cities is much weaker than the standard of English sewage. While this is the case, however, the sewage which has been experimented with at the Laurence Station for the last fifteen or twenty years is every bit as strong as the average English sewage.

Such typical English communities as Accrington, Birmingham, Leeds, Manchester, Rochdale, Sheffield, Chorley and Heywood all equally compare with Laurence in strength of sewage.

This fact will come to many as a surprise, as it has been customary when speaking of British as compared with Massachusetts experimental work to refer to the former as not having any exact relation to American conditions. The point would, therefore, appear that if exact application is not granted with reference to English experimental work, it cannot be granted with reference to Laurence experimental work. The real point, however, is that no experimental work has exact application unless all factors and conditions are equal.

In applying the results of experimental work the whole of the factors and conditions relating to such work must be thoroughly understood.

Too often the excuse for a particular line or method of sewage treatment is based on the simple conclusion: **"It is a success at Columbus, Ohio,"** or **"Experimental work at Massachusetts gave splendid results."** When the question is put: **"Are all the factors and conditions equal?"** no intelligent answer is forthcoming.

Many failures in sewage disposal treatment have been due to what are called "Visiting deputations." A deputation may spend much time in travelling and a short time in viewing some completed works which have been based upon exact knowledge of the local conditions and requirements. The local conditions and requirements are not, however, the main features of interest. The main features are that the works cost so much per head and produced results of a definite satisfactory standard; but the exact reproduction under different environment and conditions produces no comparison either in cost or efficiency standard.

The value of experimental work is undoubted, but we think it well to point out the danger in accepting bare conclusions without careful and studious reference to all the data connected with them.

Out of the 250 pages of the 1908 Massachusetts Report engineers will be tempted to look for conclusions and casually skip a great amount of what may at first sight appear dry and unnecessary.

Engineers may rest, however, assured that there is not a sentence published in the report which is not of prime importance, and if any information of value is to be successfully deducted and put to practical application, it can only be by a full grasp of the whole of the minute data relating to the experiments.

THE EFFECT OF A SINKING HEAD ON LARGE CASTINGS.*

By Thomas Kennedy.

Cast-iron is not a pure metal, for in addition to pure iron it always contains considerable and variable quantities of silicon, sulphur, phosphorus, manganese and carbon chemically combined with iron and carbon uncombined, existing as little, shining plates of graphite in the mass of the iron, so that on taking a wide average there is only from about 90½ to 91½ per cent. of metallic iron in practically any cast-iron. As cast-iron comes molten from the cupola, it contains, in addition to the preceding list of impurities, more or less slag—the less the better.

Large pipes are, as a rule, specified to be cast on end, with the upper end prolonged to form a sinking head, which is afterwards cut off. The object of this paper is to show the advantages of this and the desirability of it in nearly all large castings.

The author, therefore, proposes to deal with the results obtained in casting some large columns about 32 feet long,

* Read before the Association of Water Engineers, York, England.

weighing about 12 tons, where a sinking head 2 feet 10½ inches long and weighing about two tons was added. When this head was cut off and broken under the ball the fracture was so interesting that it was carefully photographed. This shows that the head, which was much larger in area than the column proper, had been most efficiently feeding the column, as the molten metal in it was contracting in setting; but it showed a good deal more than that. In the large pockets left by the receding, cooling metal there were groups of crystals of pure iron . . . grouping together so that they all interlace one with another, the other ingredients combining with some of the iron, and forming a matrix which fills the interstices. The real strength of the casting is in these interlaced groups of crystals. In the body of such a casting these crystals exist in identically the same form, but very much smaller, due to the quicker cooling, perfectly interlaced and homogeneous, owing to the great pressure above them of the slower-cooling sinking head.

The most deleterious impurities contained in cast-iron as it leaves the cupola are slag globules, gases mechanically contained in the metal, and gases technically called "occluded," or absorbed physically in the metal, all or most of which will separate out as the metal passes from the liquid to the solid state. The excess of carbon in the metal separates into little plates of graphite as the metal solidifies, and there are also crystals of a very brittle substance known as phosphide of iron and little areas of sulphide of manganese. All these substances are potentially in the metal as it leaves the cupola and goes into the ladle. As the metal is being poured into the mould still more gases are formed by the action of the hot metal on the sand of the mould; the bulk of these escape through the cores and joints of the boxes in which the mould is formed, and when ignited burn with a non-luminous flame. Now the remainder of all the impurities mentioned—slag, gases, excessive graphite, etc., are of a much less gravity than the proper metal, and if they have a free passage in the mould escape upwards to the top, but if not they remain, and the result is a porous, weak casting.

When a long column such as has been described is cast on a sloping bank instead of vertically, crystals always begin forming at right angles to the cooling surface, with the result that millions of crystals form round the mould, and the passage of impurities is seriously impeded; if the column is cast horizontally, their escape is impossible, and they remain in the top side of the casting.

In small, thin castings the cooling is so rapid, and the gate is so near the body of the casting, that sinking heads are not necessary, as the air and gases escape readily, and the impurities have no time to segregate, but, being spread more or less uniformly over the whole casting, their effect is so diminished as to be practically negligible.

A BRITISH COMMENT ON THE LINDSAY REPORT.

The "Surveyor" in its issue of June 24th comments upon the Lindsay ozone plant, and notes the weak point in the Provincial Board of Health report, viz., that no engineering examination and report was made on the plant which failed because of certain engineering features. We quote as follows:—

"The Lindsay plant may be as defective as the chemists tell us, but to the unprejudiced reader any report upon engineering works prepared by laymen will not be convincing, and the reader may well wonder whether after all these gentlemen may not have found a mare's nest. Assuming that the mixing part of the apparatus is not hopelessly inadequate, it seems possible that it was merely out of order, and that an engineer might have been able to lay his finger upon the defect and to have set it right. We are told that enough ozone was produced to do the work, and that if it had been properly mixed the work would have been done. The fact that the ozone was not mixed with the water is at the root of the matter, and a report upon the reasons why this part of the installation failed, prepared by an engineer, would be more useful than analyses made of water with which ozone had not been mixed. Having been told that the ozone was not applied, there can be no interest in daily analyses, extending over a period of three months, which are exactly what one would expect them to be. The plant at Lindsay may or may not be as bad as the report infers, but it is to be hoped in the interest of the Lindsay authorities who have purchased the plant that it is capable of being set right, and that the Board will appoint an engineer to inspect the machinery before they condemn it on the chemists' report.

ELEMENTARY ELECTRICITY.

L. W. Gill, M.Sc.

Direct current motors, almost without exception, are excited in the same way as generators are, and they are distinguished accordingly. The "shunt" motor is identical in every respect with the "shunt" generator, as shown in Fig. 32, except that there is usually no rheostat in series with the exciting circuit, the rheostat being used only when it is desired to vary the speed of the motor. The exciting circuit of a shunt motor is thus connected directly to the line, and if the line voltage remains constant, the exciting current and flux remain constant. **The speed of a shunt motor will, therefore, remain practically constant from no load to full load, and it is consequently regarded as a constant-speed machine.** The decrease in speed due to armature resistance,

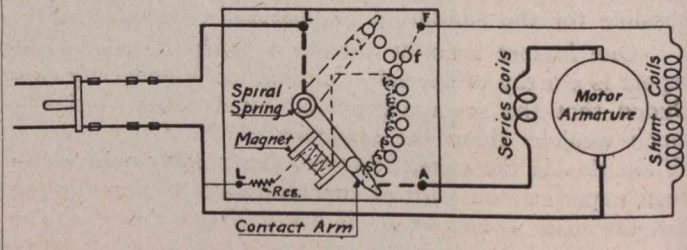


FIG. 38

which has been referred to above, varies from two per cent. in large machines to ten per cent. in small motors. In commercial work the majority of power-driven machinery runs at constant speed, and, excepting in railway service, the shunt motor is the most common type of direct-current motor in use.

If a motor has to start under a heavy load, it is desirable that it should have a large starting torque combined with a slow speed. Both these conditions are secured by using the "series" system of excitation, as shown in Fig. 36. When a motor of this class is started with a large retarding torque or load (a street car, for example) the large initial current, passing around the poles, will set up a dense magnetic flux, and the two combined will produce a correspondingly large torque. If, after this motor has attained a constant speed, the retarding torque is diminished, less current will be required to produce the driving torque, and in consequence, according to equation (16), the generated e.m.f.

must increase. But the decrease of current will be accompanied by a decrease of flux, and to maintain the generated e.m.f. the speed must increase in proportion as the flux diminishes. **The series motor will thus speed up very rapidly as the retarding torque is diminished.** If it were possible to reduce the retarding torque to zero the speed would be infinite. For this reason care must be exercised to prevent all the load being thrown off a series motor. If there is any possibility of this happening by accident, a speed-limiting device should be attached to the motor.

Since the driving torque of a motor varies directly with the strength of the current and with the density of the flux, it follows that if the permeability were constant,

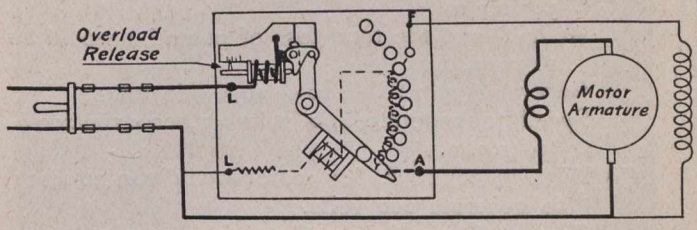


FIG. 39

the driving torque would vary as the square of the current, for in this case the flux would vary directly with the current. In the actual machine the permeability is practically constant up to the point where the magnetic circuit begins to saturate. Beyond this point the flux increases only a small amount. To maintain the generated e.m.f., the speed must increase as the flux decreases, and with constant permeability the flux varies directly with the current. Approximately, then, the speed of the series motor varies inversely with the current.

From the above it will be clear that the series motor is suitable in cases where it is necessary to have a large starting torque combined with slow speed, and an increase of speed with a decrease of load. These are the requirements in nearly all classes of railway service, and also in hoisting work, although in the latter case it is usually necessary to have a speed limit. Otherwise the motor would "run away" with a very light load. In the case of an elevator, for example, it takes a larger torque to start and accelerate it than it takes to run it, but it is not desirable to have the elevator run at a very high speed with a light load and a very slow speed with a heavy load. In a case of this kind the characteristics of both the shunt and series motor are required in a moderate degree, and to obtain these the "compound wound" motor is used. The series winding increases the starting torque, and the shunt winding fixes a lower limit for the flux, and consequently an upper limit for the speed. This type of motor is used in all cases where the starting torque must be fairly high, and the speed must not exceed a certain maximum.

Referring to Example 12, it will be noted that the current capacity of the motor in question is 200 amperes. If more current is forced through it the heat generated will cause the temperature of the armature to rise beyond the allowable limit, and if the current exceeds this amount for any considerable period of time, the resulting high temperature may damage the armature by burning the insulation on the conductors. In this particular case the current will not exceed the limit so long as the generated e.m.f. (sometimes referred to as the "counter" e.m.f.) does not fall below 188 volts. As there is no generated e.m.f. when the motor is at rest, it follows that some provision must be made to keep the current within a prescribed limit when the motor is being started; i.e., until the speed is sufficient to generate the required e.m.f. of 188 volts. This is effected by placing a resistance in series with the armature, and as the motor speeds up this resistance is gradually cut out. Resistances made up specially for this purpose are known as "starting rheostats." The connections of one of these rheostats to a compound motor are shown in Fig. 38. It will be noted that the contact arm of the rheostat is acted on by a spring which tends to pull the arm into the "off" position as shown by the dotted line, and away from the "running" position as shown by the full line. When the arm is in the "off" position, the circuit is open. As the arm is rotated in the clockwise direction, it first touches the outer button, marked "f," and thus closes the exciting circuit; when it comes in contact with the fourth large button the armature circuit is closed with all the resistance in series with it; and finally, when the arm reaches the "running position" the resistance is all cut out. The arm is held in the running position by means of the electromagnet, which is excited by a small coil connected either in series with the exciting circuit of the motor or directly across the line. In the figure it is shown connected directly to the line and in series with the armature resistance, together with an additional high resistance which reduces the strength of the current. The object of the spring and electromagnet is to prevent an excessive flow of current through the armature of the motor in case the line voltage should happen to be turned off for a brief interval and then turned on again. If this should happen the motor would slow down and perhaps stop: and if the contact arm of the rheostat remained in the running position, there would be an excessive flow of current through the armature when the line voltage is turned on. This is prevented by the action of the spring which pulls the contact arm to the off position as soon as it is released by the electromagnet, the strength of which falls quickly to zero when the line voltage is shut off. This arrangement is known as a "no-voltage release," and it is now the practice to place it on every starting rheostat, except the smallest sizes.

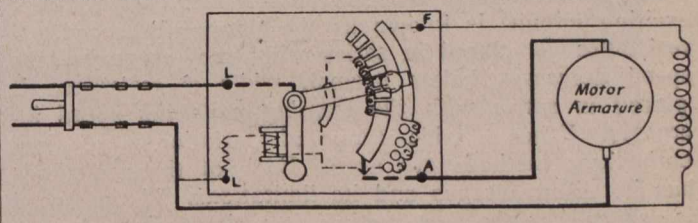


FIG. 40

This arrangement not only protects the motor in case the line voltage is shut off, but also in case the exciting circuit should be accidently broken, although in the latter case protection is usually afforded by a "circuit-breaker." This is a device which automatically opens the circuit when the current exceeds a predetermined value. Its action depends on a tripping device operated by a solenoid, which is excited by the current passing to the motor. This arrangement is often mounted on the starting rheostat, and is then known as an "overload release." It will break the circuit as soon as the current exceeds the fixed limit, due to overload or any other cause, and the breaking of the circuit will cause the contact arm to move to the off position. In Fig. 39 a

starting rheostat provided with no-voltage release and circuit-breaker is shown connected to a compound motor. The connections to a shunt or series motor would be the same as shown in the figure, except that in one case there would be no series exciting coils, and in the other case no shunt circuit.

The no-voltage release protects the rheostat as well as the motor, for with this device the contact arm will not remain anywhere between the off position and the running position (unless held there in some way). If held between these two positions, part of the resistance will be continuously in circuit, and, if the motor is loaded, the current will overheat this resistance and perhaps burn it. The resistance is designed to carry the current only for the short interval required for the motor to speed up. If it is desired to leave part of the resistance in circuit with the object of lowering the speed, a "speed-controller" must be used. (See following paragraph):—

Speed Control of Direct Current Motors.—When a motor is used to drive a group of machines, its speed must necessarily be constant (or approximately so), for it would obviously be impossible to vary the speed of the motor to suit one machine without interfering with the others. In this case the variations of speed which may be required for individual machines must be obtained by some speed-changing device connected to each machine. At present, however, the practice is to install a motor to drive each individual machine which requires any considerable amount of power and which operates at various speeds, while small machines are grouped together in convenient groups. In the case of the machine with the separate motor, the speed is always varied through the medium of the motor. If resistance is placed in series with the armature of a motor it will cause a loss of potential. If the voltage acting on the brushes is reduced on the armature. In this case the generated e.m.f. will automatically decrease to satisfy equation (16), and, since the flux remains constant, this reduction in e.m.f. must be effected by a reduction in speed. The speed of a motor may thus be varied by placing a resistance in series with the armature, or by varying the exciting current as previously noted. The speed at which a motor will run when no resistance is used (either with armature or exciting circuit) is known as the "normal" speed. **If resistance is placed in series with the armature, the speed decreases below normal, while if resistance is placed in series with the exciting coils the speed increases.** When a wide range of variation is required both these methods are used. Each of these methods has its disadvantages and its limitations. If the speed is reduced by the first method it will remain constant only while the load is constant. If the load is reduced, the motor at once speeds up. This is a serious disadvantage in the case of a machine with variable load. Another serious disadvantage is the loss of power in the rheostat, which is directly proportional to the loss of potential. If the voltage acting on the brushes is reduced to one-half by means of this resistance, the speed will be reduced to approximately one-half, and one-half of the total power used will be lost in the rheostat. On the other hand, when the speed is increased above normal by placing resistance in series with the exciting coils, the maximum driving torque will diminish directly with the flux, for the torque is proportional to current and flux, and the former is limited by the current-carrying capacity of the armature. **It thus follows that if the flux is reduced, the maximum torque of the motor must diminish in proportion.** A numerical example will illustrate these points:—

Example 13.—(a) A resistance of .4 ohm is placed in series with the armature of the motor specified in Example 12 to determine its speed at full load, and also at half load. (b) If the flux is reduced 10 per cent. to determine the speed with 200 amperes flowing in the armature; i.e., with maximum torque.

(a) Loss of potential in series resistance = 200 × .4 = 80 volts.
Loss of potential in armature resistance = 200 × .06 = 12 volts.
Generated e.m.f. = 200 — (80 + 12) = 108 volts.
Motor runs at 1,000 r.p.m. to generate 200 volts.
Speed to generate 108 volts = 1,000 × 108/200 = 540 r.p.m.
At half load the total loss of potential would be 46 volts.
Generated e.m.f. = 200 — 40 = 160 volts.
Speed to generate 160 volts = 1,000 × 160/200 = 800 r.p.m.

(b) With 90 per cent. flux motor would run at 1,111 to generate 200 volts.
Generated e.m.f. must be 200 — 200 × .06 = 188 volts.
Speed to generate 188 volts = 1,111 × 188/200 = 1,044 r.p.m.

A variable resistance or rheostat designed for use in series with the armature of a motor, whether alone or in conjunction with a resistance for inserting in the exciting circuit, is known as a "speed-controller" or "controlling rheostat," and a single variable resistance for use in the exciting circuit is known as a "field rheostat." The construction of either is similar to that of the starting rheostat. The principal difference between the latter and the speed-controller is that in the controller the resistance is designed to carry the full load current of the motor continuously without overheating, while in the starting rheostat the resistance is designed to carry this current only for the short period required for the motor to attain its normal speed. When field control is used in conjunction with armature resistance, both resistances are mounted in one box, and the whole range of speed is obtained by moving one contact arm. A controller combining both methods is shown connected to a shunt motor in Fig. 40. When a controller is equipped with a no-voltage release, there is a separate spring-actuated arm for this purpose, and when the voltage is cut off this arm carries the contact arm to the off position. This arrangement is shown in Fig. 40. Controllers serve the double purpose of starting and controlling.

On account of the loss of power occasioned by the use of resistance in series with the armature, a system of multiple voltages is sometimes used. This system involves the use of three or four transmission wires carrying different voltages. With this system as many different speeds may be obtained as there are different voltages without losing power. Intermediate speeds may be obtained by using a field rheostat or armature resistance.

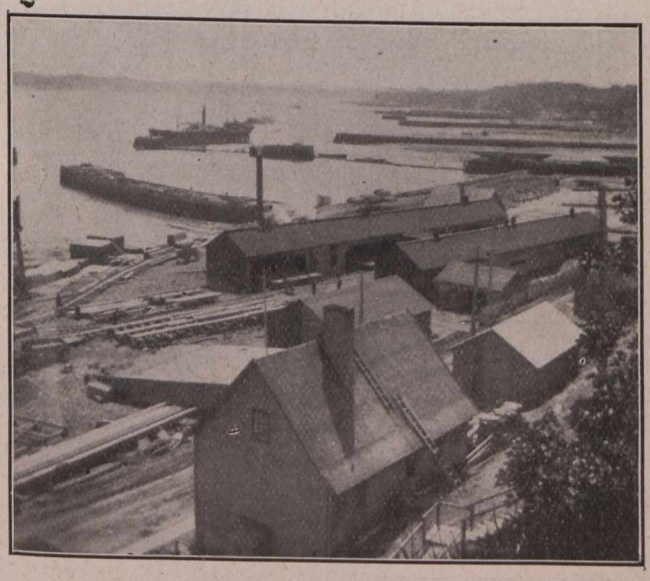
QUEBEC BRIDGE SUBSTRUCTURE.

When the Quebec Bridge crashed into the St. Lawrence River at twenty-three minutes to six o'clock on the afternoon of August 29th, 1907, it was noticed at once that the substructure remained absolutely intact. But the old piers are being torn down. New ones will be erected which will be

View of Plant at Sillery, Que., Three Miles From Bridge.

heavier in construction in order to carry a superstructure ninety-six feet wide, or thirty feet wider than was the superstructure of the bridge that fell.

There is a distance of 1,758 feet to be spanned between the two main piers, one on each side of the river. The distance between each main pier and its respective anchor pier

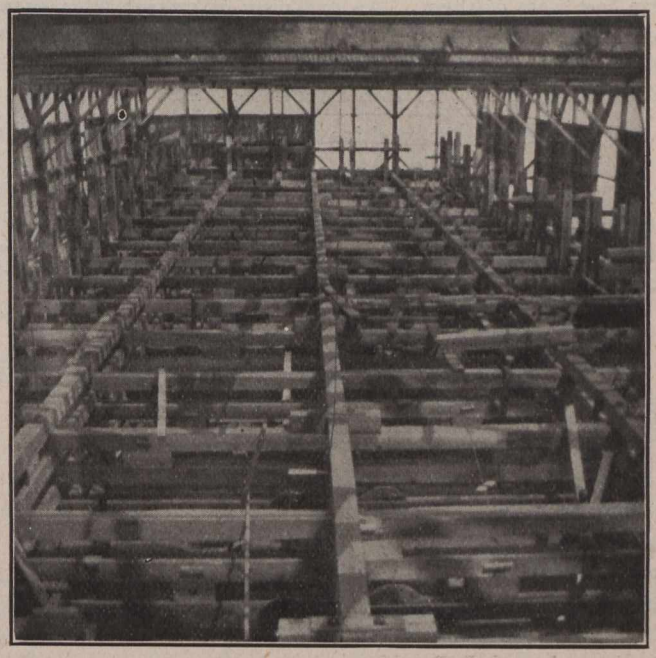


Shelter at Sillery in Which Caissons Were Built.

has not been finally determined. The plans at present give this distance as 500 feet, but it is thought likely that it may be shortened considerably, so as to reduce the length of the anchor arm.

The contract to build this new substructure was awarded to M. P. and J. T. Davis, of Ottawa, the contractors who built the substructure for the old bridge. G. A. d'Abbadie, Assoc. Mem. Can. Soc. C.E., is the engineer in charge of the work. M. P. Davis also takes a most active part in the construction work.

It is in the building of the new South Main Pier that the greatest difficulties will be met. It was on this side of the



Showing Top of Caissons After Top Was Taken Down.

river that the wreck occurred, and under water there is a considerable mass of iron that may hamper progress. Three caissons must be sunk for the construction of the South Main Pier; one alongside of the old caisson, one along the end of the old caisson, and a third covering these two, and also

View Showing Crib Work of Caissons, North Main Pier.

the old one. It is thought that this third caisson will be one of the largest ever built for this class of work. In the profiles of the piers the zero point is taken at 100 feet below average low-water, in order to avoid minus readings. Average high water on this datum is elevation 94.7 feet. Ordinary low water is elevation 82 feet. The lowest water on

record is elevation 79.8 feet. The total elevation of the South Main Pier will be 128; Fig. 1 shows an end elevation of the South Main Pier. The existing caisson (caisson X) is 49 feet wide. Five feet south of it will be sunk a new caisson (caisson A) 25 feet wide by 150 feet long, and a caisson (caisson B) 25 feet by 79 feet will be sunk across the ends of these two, and five feet west of them. An end view of caisson B is shown on the left of Fig. 2, which is the Side Elevation of the South Main Pier. From both Figs. 1 and 5, the position of the huge third caisson (caisson C) can be seen.

Fig. 2 shows the position of the new South Main Pier with respect to the old pier. The centre of the new pier is 15 feet nearer shore than the centre of the old pier. The centre line of the new bridge will be also 15 feet west of the centre line of the old bridge on account of the extra thirty feet in width of the superstructure. The east ends of the

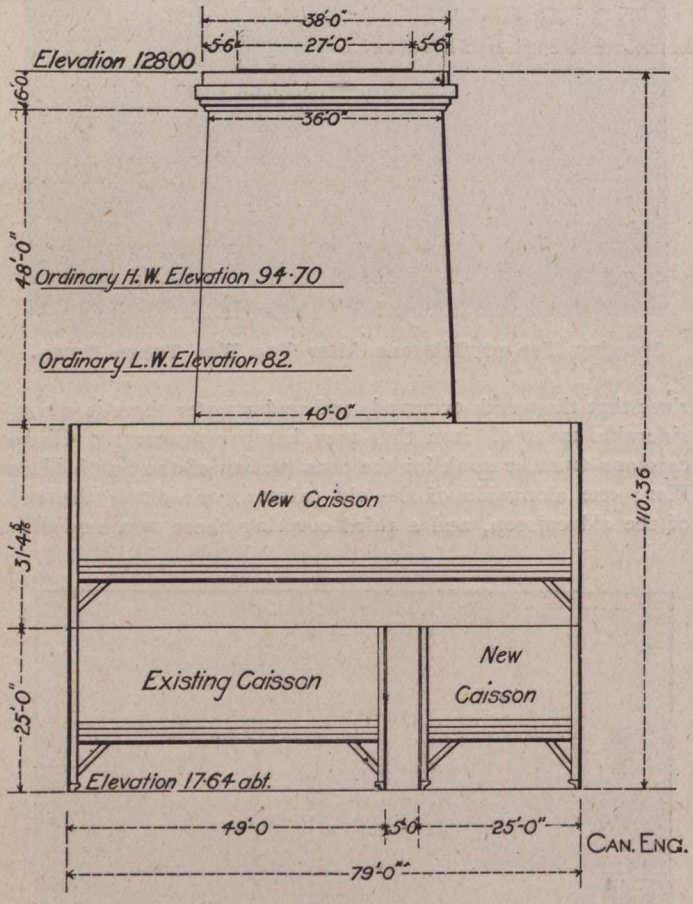


Fig. 1.

piers will be on the same line. The centres will be determined by W. D. Wilkins, D.L.S., acting on behalf of the Bridge Commission. As shown in Fig 2, when caisson C is sunk the part of the old pier under water will have to be taken out piece by piece through the air locks until caisson C is allowed to settle flatly upon caissons A, B, and X. Of course, the pier must be taken down to low water level before caisson C can be placed in position for sinking. There are, therefore, three caissons, of the following dimensions, which must be sunk for the new South Main Pier: Caisson A, 25′ x 150′; caisson B, 25′ x 79′; caisson C, 79′ x 180′. The existing caisson is 49′ x 150′. These over-all dimensions are shown by Fig. 4, which is a plan of the new South Main Pier, and which also shows the position and dimensions of the bed plates and of the pier itself.

As shown by Figs. 1 and 5, caissons A and B will be sunk

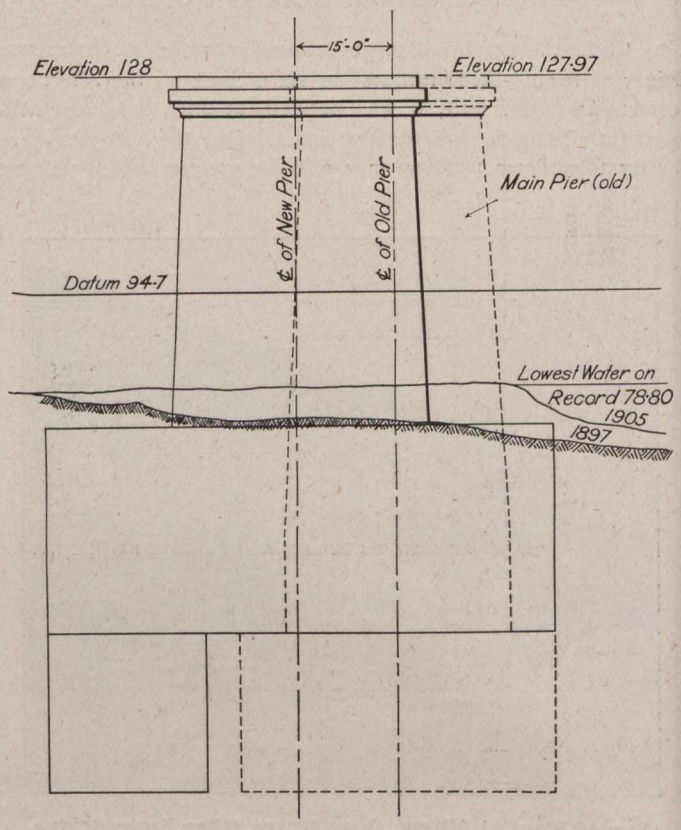


Fig. 3.

to elevation 17.6 feet approximately. Caissons A and B will be 25 feet in height. Caisson C will be 31 ft. 4 5/16-in. in height. Fig. 5 shows the slope of the nose of the pier, 1 in 24, and other structural dimensions. The pier will be concrete with granite facing and bocking.

While the centre line of the new South Main Pier will be 15 feet inshore from the centre line of the old pier, the centre line of the new North Main Pier will be 57 feet off-

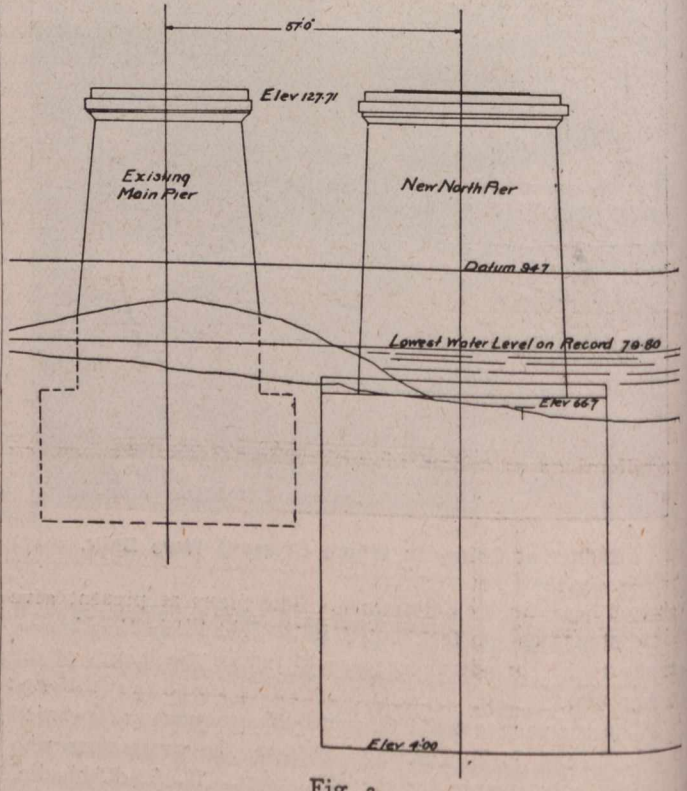


Fig. 3.

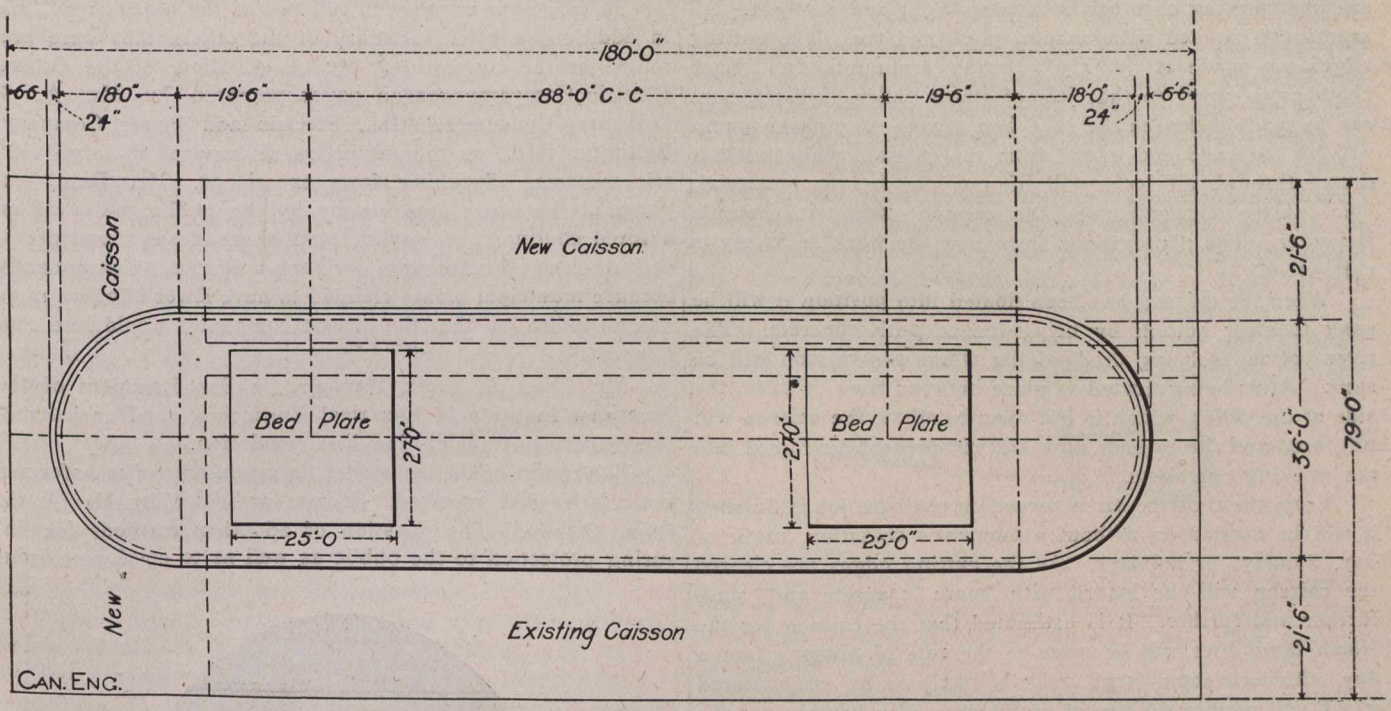


Fig. 4.

shore from the centre line of the old pier. The centre of the new North Main Pier will also be 15 feet west of the centre of the old North Pier, to accommodate the shift of the South Pier, and the centre of the abutments and anchor piers will be shifted 15 feet west also. The details of the abutments and anchor piers have not yet been decided upon.

The caisson for the new North Main Pier, shown in Fig. 3, will be sunk 5 feet south from the existing caisson, and down to elevation 4 feet, much lower than the caisson for the old pier was sunk. This caisson is 54' x 180'. It has already been constructed at Sillery, three miles east of the bridge site, and was launched on July 8th. The weight of this caisson is estimated at 1,700 tons. The deck of the working chambers, of which there are eight, is made of two layers of 12 x 12 timber, with two layers of 3-inch tongue and grooved planking between them. The body of the caisson must be water-tight,

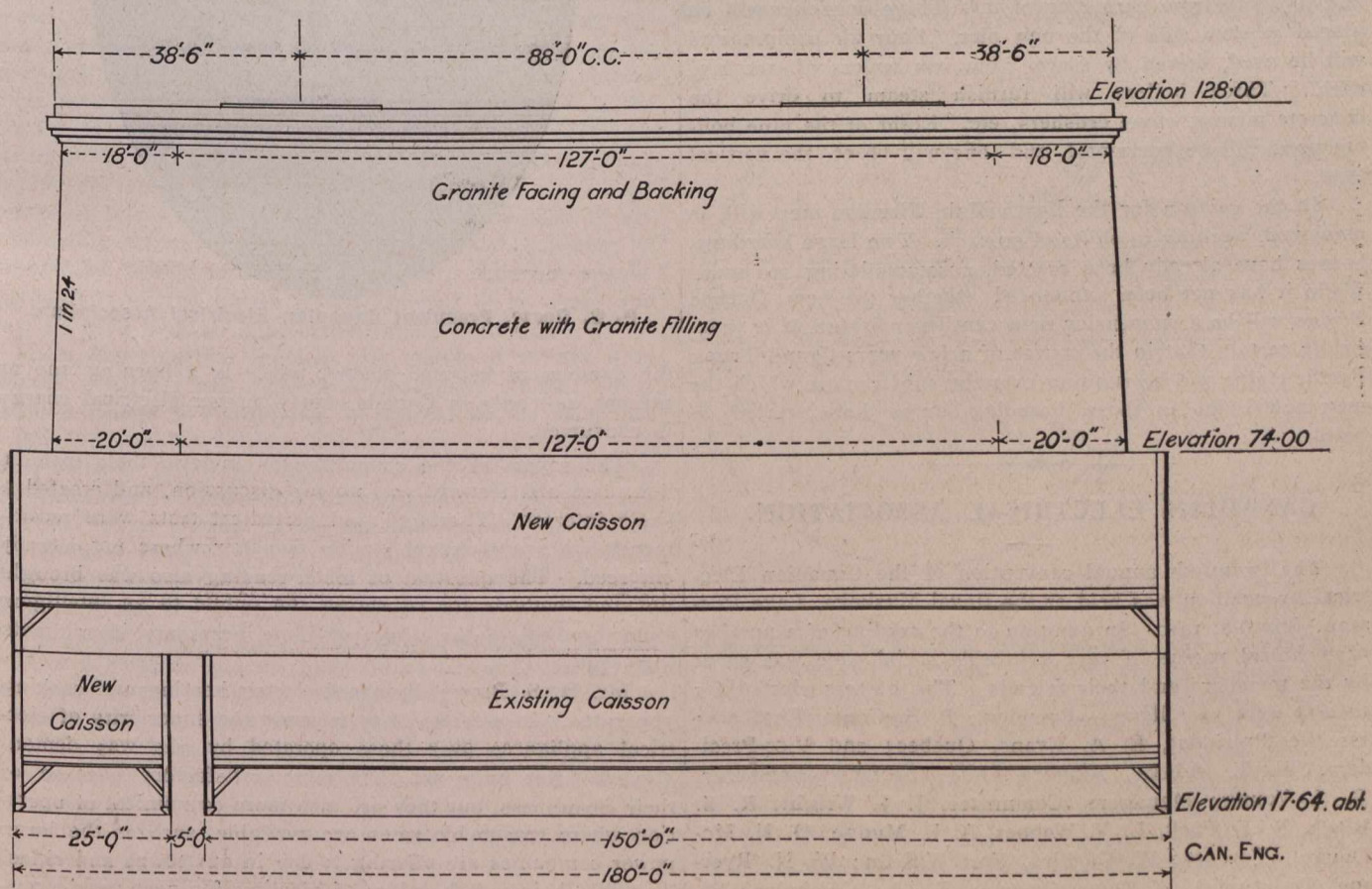


Fig. 5.

and the working chamber both water-tight and air-tight. All seams are caulked with oakum, pitch and tar. The cutting edges are made of 30″ x 30″ British Columbia fir. Each chamber is piped so that jets of water under high pressure can be made to loosen the sand and gravel. A sinking pump will lift the sand and gravel from the caisson, while buckets drawn through air locks will lift out the heavier material. The master carpenter on the caisson work, is Precule Belanger. The photographs show how the work at Sillery is carried on.

When the caisson has been floated into position it will be sunk to river bottom by being loaded with concrete. The river bottom is being dredged flat where the caisson will be sunk. After being floated in place between rows of piles, the side of the piling which is left open to admit the caisson will be closed and the caisson sunk and compressed air forced into the working chambers.

From the time the air is turned on until the job is finished it will be carried on without a moment's cessation, night or day, Sundays or holidays. As the cutting edges are cleared the caisson will be loaded with more concrete and sunk further and further. It is estimated that the caisson for the North Main Pier will be sunk at the rate of about a foot a day, although some large rock is likely to be encountered which will require the use of explosives. The borings for the new substructure were made for the Bridge Commission in 1909, by the McArthur Company, of Boston. When the cutting edges of the caisson for the North Main Pier rest at elevation 4 feet, the working chambers will be filled with concrete and the masonry work will be afterwards completed. Much of the granite that was used in the old piers can be recovered for use in the new piers. Piling is being driven in water 35 feet deep at the site of the caisson for the new North Main Pier. A platform will be built around the new caisson and to shore from each side of it. Three derricks will be placed at each side of the new pier. Four air compressors will be used, driven by steam from six boilers of 100 h.p. each. Three boilers will furnish steam to drive the concrete mixers, stone crushers, etc. Eight of the nine boilers used will be horizontal, and one will be of the vertical type.

In the caisson for the North Main Pier 270 men will be employed, working in shifts of 90 each. Two large boarding-houses have already been erected, accommodating 200 men. While it has not been announced whether the new Quebec Bridge will be a suspension or a cantilever bridge, it is practically certain that in the course of a few years Grand Trunk Pacific trains will be running over the substructure which the men now living in those boarding-houses have started to build.

CANADIAN ELECTRICAL ASSOCIATION.

The twentieth annual convention of the Canadian Electrical Association was held at the Royal Muskoka, Lake Rosseau, July 6-8, 1910. In addition to the reading of a number of technical papers, a very enjoyable social time was spent by the members and their friends. The officers elected for 1910-11 were as follows:—President, P. S. Coate, Chatham; 1st Vice-President, E. A. Evans, Quebec; 2nd Vice-President, W. L. Adams, Niagara Falls; Secretary-Treasurer, T. S. Young; Managers' Committee, J. J. Wright, R. S. Black, R. F. Pack, L. V. Webber, A. L. Mudge, D. H. McDougal, Toronto; W. C. Bird, Fort William; W. N. Ryerson, Duluth; A. A. Dion, Ottawa; F. A. Chisholm, St. John's, Que.

In this issue we give in full two of the papers read, and in addition, a brief summary of the others that were presented at the convention. Mr. A. A. Dion, of the Ottawa Electric Company, read a paper prepared by Mr. A. S. Loizeaux, Consumers' Gas, Electric and Power Company, Baltimore, Md., on the protection of services in large electric systems. Speaking from experience, Mr. Dion emphasized the great appreciation by the public to-day of an assured continuity of service, even where it was found necessary to charge higher rates for such a service. Consequently, because municipal plants claimed to have lower effective rates was no indication that the private companies would lose customers.

Mr. Chas. F. Scott, Pittsburg, a Past-President of the American Institute of Electrical Engineers, read an instructive paper on transmission line regulation.

The report of the committee on grounding of transformer secondaries was received. It was presented by Mr. A. A. Dion, Ottawa. The question of adopting methods for insuring protection to the public as well as to employees from

P. S. Coate, President Canadian Electrical Association.

the dangers of exposed electric wires is a burning one at present, not only in Canada, but wherever electrical energy is consumed.

The report of the committee on meters, their installation, care and testing, was up for discussion, and created a lively interest. Thorough and periodical tests were recommended to every central station manager where not already enforced. The question of meter-reading also was brought up, and methods for educating the public to an intelligent understanding of the usage of these necessary instruments were outlined.

Mr. H. S. Brown discussed electric heating and cooking apparatus. In a series of tests made the superiority of electrical appliances over those operated by gas was demonstrated. Not only are they more satisfactory because of their cleanliness, but they are also more economical of operation where reasonable rates are available, such as the large power companies are offering to-day in our towns and cities.

The choice of the place of meeting for next year's convention was left to the incoming executive. Ottawa, in all

likelihood, will be selected, although Fort William and Niagara Falls are also mentioned in this connection.

On the evening of the second day of the convention, a banquet was held which was largely attended by the members and their friends. The usual toasts were honored and in a stirring and patriotic speech Mr. Nicholls responded to the toast "Canada, Our Country." Although English-born, he said, this country appealed to him above all others. It was destined to become one of the greatest nations of the earth. "We have every right to look forward to a wonderful prosperity," said the speaker. "Even to-day we have in all walks of life comforts and luxuries unexcelled by any nation. Our railroads are as thoroughly equipped, our school system inimitable, and our electric light and telegraphs most modern. All this has been done by taxing ourselves, but to-day English capital is rapidly pouring into this country and finding profitable investment."

Mr. C. A. Littlefield, of New York, replying to the toast to the "Central Station," reviewed the wonderful progress since electrical energy was first generated.

Other speakers during the evening were Messrs. L. J. Belnap, Montreal; W. W. Freeman, President, and T. C. Martin, Secretary, of the National Electric Light Association; Chas. F. Scott, ex-President of the American Institute of Electrical Engineers; Major Hugh C. MacLean, and W. Bache, Toronto, and A. A. Dion, Ottawa.

NOTES ON TRANSMISSION LINE REGULATION.

By P. M. Lincoln.

The voltage drop between generating and receiving apparatus is usually of first importance to the operating engineer. In other words, the first thing the operating engineer wishes to know about his transmission line is its regulation. Usually he wishes to maintain constant voltage at his receiving station and what he wishes to know is the increase in voltage that must be supplied at his generating station as the load increases in order that the proper voltage may be delivered at his receiving station. It is one of the objects of this paper to describe a short-cut method of approximating transmission line regulation which has been of considerable benefit and use to the writer. The line regulation method offered herein is not claimed to be exact and must be used with an appreciation of its limitations.

In a direct current problem this matter of voltage drop between generator and receiver is extremely simple. It is merely a matter of multiplying the current by the resistance of the line and the voltage drop at once is obtained. In direct current problems, therefore, one only has to know two quantities to obtain this drop, namely: resistance and current. In an alternating current proposition, the equivalent problem requires for its complete solution four additional quantities, namely: leakage, capacity and reactance of the circuit, and the power factor of the load.

The first simplification which we may apply to the problem is to eliminate the question of leakage. In actual transmissions the leakage of current from the conductors is so slight that the most refined analysis does not require its treatment. If the case were one of telephone wires, where the amount of current transmitted is very small and leakage might amount to a measurable proportion of the total, the treatment of leakage might be necessary; but for transmission lines it is not.

The next simplification of the problem will be to eliminate questions of capacity, so far as line regulation or drop are concerned. In determining regulation, capacity has very little effect provided we define regulation to be the change in voltage at the generator in order to maintain constant voltage at the receiver with varying receiver loads and power factors, then a consideration of capacity effects would be current and generator power factor with the various receiver loads and power factors then a consideration of capacity effects would be very important, but if we consider only questions of line regulation, capacity effects may be neglected without serious error. This is not true if the lines are very long, for instance, 300 or 400 miles, and the frequency high, but for the ordinary problem which confronts the engineer this question of capacity may be neglected so far as line regulation is concerned. Later in this paper I am citing some examples which show the amount of error for certain specific cases when neglecting capacity effect.

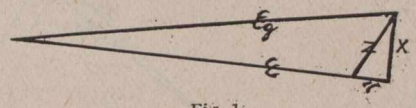


Fig. 1

The elimination of leakage and capacity leaves us four quantities that affect line regulation or drop, namely—current, resistance, reactance and load power factor. The effect of these various factors on the problem of line drop may be shown graphically and the fundamental ideas underlying the short-cut method may be explained by diagrams. In fig. I., let E represent the voltage at the load and let r be the ohmic drop which is caused by the receiver current flowing through the resistance of the transmission line, and let x be the reactive drop caused by the load current flowing through the line reactance inductance. The value of r in this diagram is assumed to be 10 per cent. of E, and that of x 20 per cent. of E. The directions of x and r are always at right angles to each other. Also r is always in phase with the current flowing and x is at right angles thereto. Fig. 1 shows graphically the generator voltage Eg when the load power factor is unity. When the power factor is unity it means simply that the voltage E at the terminals of the load is in phase with the current which flows through the load. As a consequence the voltage drop caused by the current flowing through the line resistance is directly in phase with both receiver voltage and current, and the voltage drop caused by the current flowing through the inductance x is at right angles thereto. The voltage of the generator Eg

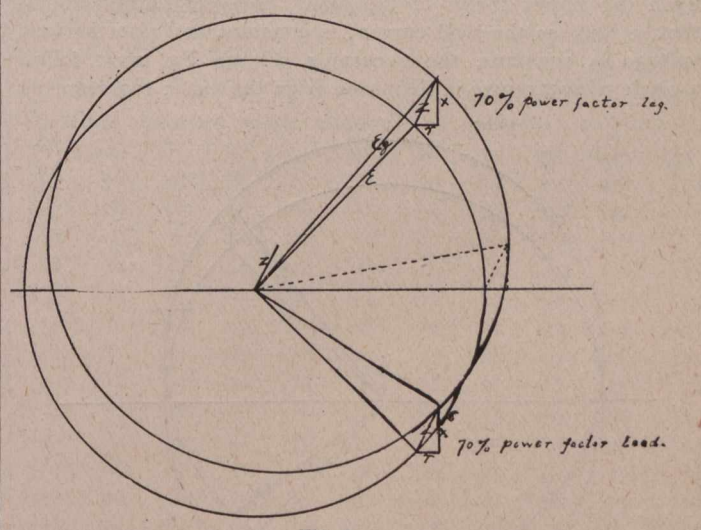


Fig. 2

is the resultant of the receiver voltage and the resistance and reactance drop as shown in fig. 1.

If now we assume a power factor of 70 per cent., a very different condition of affairs will obtain, as shown in fig. 2. Fig. 2 shows graphically relative values and angular positions of the generator voltage Eg and the receiver voltage E for 70 per cent. load power factor, both lagging and leading. In this diagram, the horizontal line still represents the phase direction of the load current and the angle that

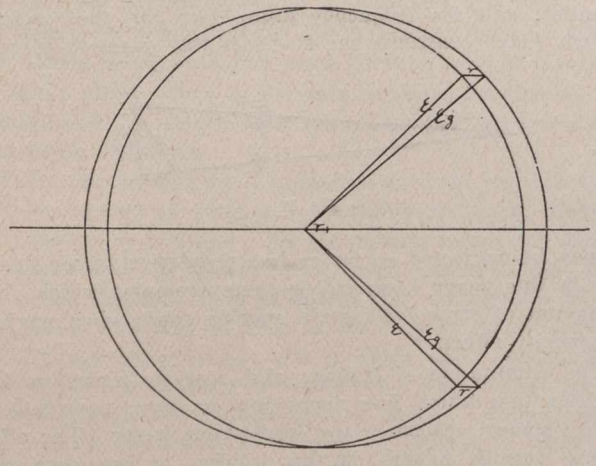


Fig. 3

E makes to the horizontal is the angle of lag or lead of the load current with respect to the load voltage. r and x, of course, remain horizontal and vertical respectively because they must be respectively in phase with and at right angles to the current which is assumed horizontal. It is evident, therefore, that the phase angle of the resultant voltage drop z of r and x with respect to the load voltage E depends upon the power factor of the load. It is therefore evident that so long as the load current is constant and also the load voltage is constant, the generator voltage Eg must follow a circle whose centre is displaced from the circle representing

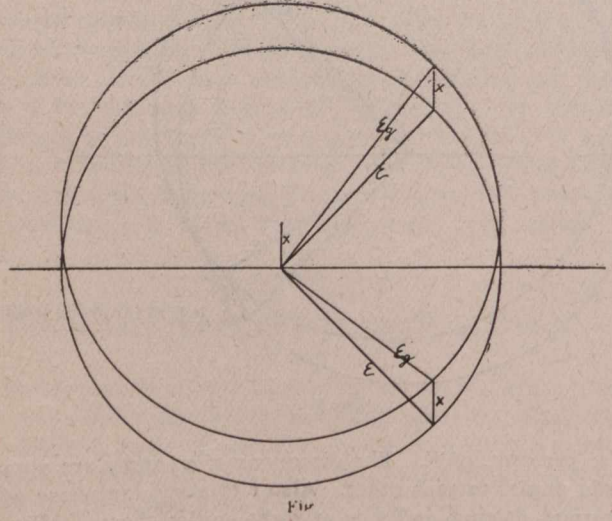


Fig.

E both in direction and distance by the resultant z. In fig. 2 the reactive volts x are still assumed to be 20 per cent. of E, and the resistance volts r 10 per cent.

A little study will show that the relation of these two circles is largely influenced by the ratio of x to r. Fig. 3 shows their relative locations when r is 10 per cent. of E and x is zero.

Fig. 4 shows their relative locations when x is 20 per cent. of E and r is zero.

It is evident from an inspection of figs. 2, 3 and 4 that if a transmission line contains resistance only the generator voltage is always necessarily higher than the receiver voltage; if inductance is present in the transmission line it is possible when the power factor of load is leading to obtain a condition where the generator voltage is lower than the receiver voltage or where, so to speak, the flow of energy is "uphill."

The generator voltage in figs. 2, 3 and 4 is drawn on the assumption that the current taken by the load is constant for all power factors. In actual practice, however, power factor variation of a load is secured by changing the field strength of synchronous motors so that power factor variation causes changes in the current in the transmission line although the true power transmitted remains unchanged. That is, when the true load in the receiver circuit is constant and the power factor changes, the current taken from the transmission line does not remain constant but varies inversely with the power factor.

Fig. 5 shows the shape of the curve taken by the genera-

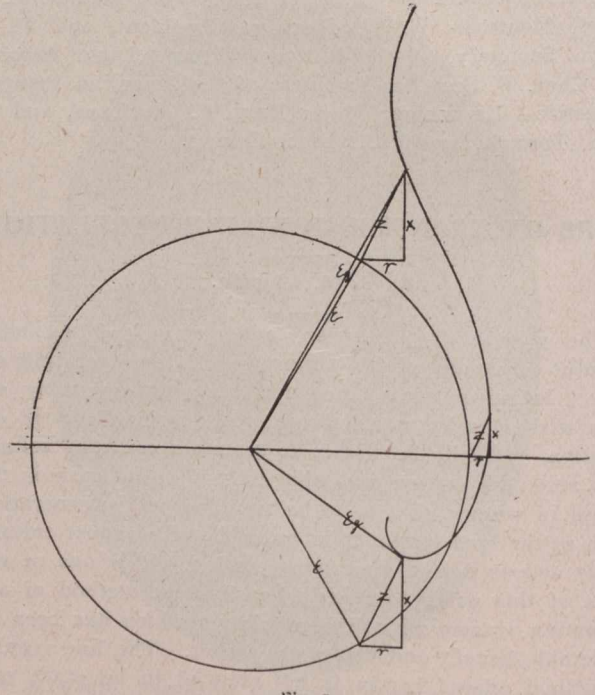


Fig. 5

tor voltage when the receiver voltage and load current are constant and when the power factor is varied by means mentioned above. It is evident, no matter how the power factor is varied, that the ratio of the resistance volts to the inductance volts will remain constant but that the size of the triangle will vary with the current which flows from generator to receiver and therefore with the power factor. The size of the triangle will therefore vary at the different power factors as is indicated by the drop triangles that have been shown in fig. 5.

Referring to all of the figures, it is evident that the transmission line regulation or the drop is equal to Eg—E. If O is the angle of lag of the receiver load and r and x are respectively the ohmic and reactive line drops, Eg is given by the following equation:

$$Eg = \sqrt{(E \cos O + r)^2 + (E \sin O + x)^2} \quad (1)$$

Where Eg = Generator Voltage
" E = Receiver Voltage
" r = Ohmic drop
" x = Inductive drop
" O = Angle of lag

From this equation the transmission line drop can easily be obtained.

Equation (1) gives true generator voltage Eg when we know the receiver voltage E, the resistance and reactance drops r and x and the angle of lag O. The only approximation so far is the neglect of leakage and capacity effects, which for all ordinary purposes may be safely neglected. In

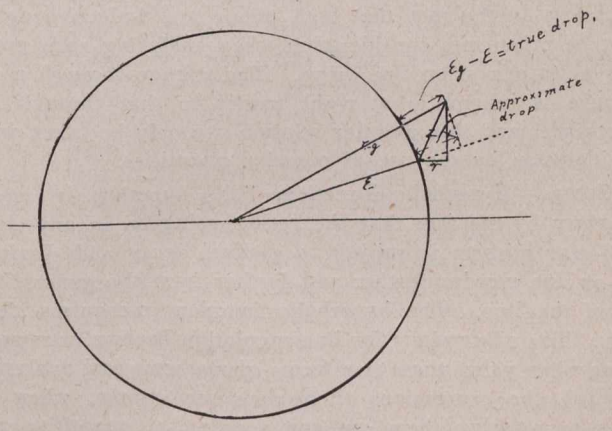


Fig. 6

order to apply the tables given later in this paper it becomes necessary to make one further approximation. The following tables assume that the voltage drop Eg—E is equal to the projection of z (the resultant of r plus x) on E (see fig. 6).

If the angle subtended by z is zero this assumption becomes absolutely correct. This condition is shown at A, fig. 7. When the power factor of the line and load are the same the drop becomes a maximum and the error in using the following tables becomes zero. It is also evident (figs. 6 and 7) that the larger the angle subtended by z, the greater will be the error of assuming that the drop Eg—E is equal to the projection of z on E. This error will reach a maximum (shown at B, fig. 7) at a point just 90 degrees from the point of zero error.

The maximum error on account of the assumption that the drop Eg—E is equal to the projection of z on E is given in the following table:—

$\frac{100z}{E}$ or per cent. of impedance volts	Maximum error in per cent. of z
5.	2.5.
10.	5.
15.	7.5.
20.	10.
25.	12.5.
30.	15.
40.	20.

In other words, the drop as obtained by the following tables should be increased as a maximum by the percentages given in the foregoing table. It should be noted that the maximum error occurs only with a leading load power factor, a condition seldom met with in practice.

To obtain exact drops the formula (1) may be used.

To obtain approximate drops proceed as follows:—

1.—Calculate the ohmic drop—that is, proceed just as if direct current were being dealt with.

2.—From either Table I. (25 cycles) or Table II. (60 cycles) find the ratio of reactive to ohmic drop.

3.—Follow down the first column of Table III. to the ratio thus found and on horizontal line under proper factor find a multiplying factor.

TABLE I.

Ratio $\frac{\text{reactive volts}}{\text{ohmic volts}}$ in a 3-phase line, triangular spacing, 25 cycles.

Size of wire B. & S.	Diameter in inches.	Resistance per mile of single conductor	Distance between wire centres in inches													
			2	6	12	18	24	30	36	42	48	60	72	96	120	144
10.....	.102	5.27	.04	.05	.05	.06	.06	.06	.06	.07	.07	.07	.07	.07	.08	.08
9.....	.114	4.18	.05	.06	.07	.07	.08	.08	.08	.08	.08	.09	.09	.09	.10	.10
8.....	.128	3.31	.06	.07	.08	.09	.09	.10	.10	.10	.10	.11	.11	.11	.12	.12
7.....	.144	2.63	.07	.09	.10	.11	.12	.12	.12	.13	.13	.13	.14	.14	.15	.15
6.....	.162	2.08	.08	.11	.13	.14	.14	.15	.15	.16	.16	.17	.17	.18	.18	.19
5.....	.182	1.65	.10	.13	.16	.17	.18	.18	.19	.20	.20	.21	.21	.22	.23	.23
4.....	.204	1.31	.12	.17	.19	.21	.22	.23	.24	.24	.25	.25	.26	.27	.28	.29
* 4.....	.232	1.31	.12	.16	.19	.20	.21	.22	.23	.24	.24	.25	.26	.27	.27	.28
3.....	.260	1.039	.14	.20	.23	.25	.27	.28	.29	.29	.30	.31	.32	.33	.34	.35
2.....	.292	.824	.18	.24	.29	.31	.33	.34	.35	.36	.37	.38	.39	.41	.43	.44
1.....	.328	.653	.21	.30	.36	.38	.40	.42	.44	.45	.46	.48	.49	.51	.53	.54
0.....	.373	.518	.25	.36	.43	.47	.50	.52	.54	.55	.57	.59	.61	.64	.65	.67
00.....	.418	.411	.31	.44	.53	.58	.61	.64	.66	.68	.70	.72	.75	.78	.81	.83
000.....	.470	.326	.37	.54	.65	.71	.76	.79	.82	.84	.86	.90	.92	.97	1.01	1.03
0,000.....	.528	.258	.45	.66	.80	.88	.93	.98	1.01	1.04	1.07	1.11	1.15	1.20	1.25	1.28
250,000.....	.596	.219	.50	.75	.91	1.00	1.07	1.12	1.16	1.20	1.23	1.28	1.32	1.39	1.44	1.48
300,000.....	.630	.182	.58	.89	1.08	1.19	1.27	1.33	1.38	1.43	1.47	1.53	1.58	1.65	1.72	1.77
400,000.....	.728	.137	.72	1.12	1.38	1.53	1.63	1.72	1.78	1.84	1.89	1.97	2.04	2.15	2.23	2.30
500,000.....	.815	.109	.85	1.36	1.68	1.87	2.01	2.11	2.19	2.26	2.32	2.43	2.51	2.64	2.74	2.83
600,000.....	.893	.091	.97	1.45	1.97	2.19	2.36	2.48	2.58	2.67	2.74	2.86	2.96	3.12	3.25	3.34
800,000.....	1.031	.0683	1.18	2.00	2.51	2.81	3.02	3.18	3.32	3.43	3.53	3.70	3.83	4.04	4.21	4.34
1,000,000.....	1.152	.0547	1.38	2.40	3.02	3.42	3.68	3.89	4.05	4.20	4.32	4.53	4.70	4.96	5.16	5.30
1,500,000.....	1.412	.0364	1.79	3.32	4.28	4.82	5.24	5.55	5.78	6.03	6.21	6.51	6.77	7.18	7.48	7.73
2,000,000.....	1.613	.0273	2.14	4.17	5.46	6.21	6.75	7.15	7.49	7.78	8.07	8.44	8.78	9.31	9.73	10.06

*This and all larger sizes stranded conductor.

4.—Multiply ohmic drop by this factor to obtain total drop.

To apply this same method to aluminum wires or wires of other (non-magnetic) material it is simply necessary to modify the values given in Tables I. and II. This modification consists simply in multiplying the values given in Tables I. and II. by the ratio of the conductivities of the material required compared to copper. For instance, for aluminum that has 65 per cent. of the conductivity of copper the values in Tables I. and II. should be multiplied by .65. The method then becomes applicable to such an aluminum line.

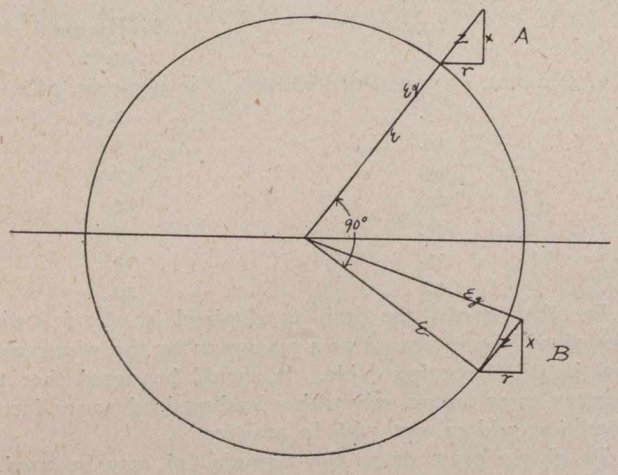


Fig. 7

The complete and accurate solution of the problem of line regulation requires the use of two forms of mathematical analysis that are unfamiliar to many engineers of the present generation. While this statement is true now, it probably will not apply to the succeeding generation of engineers, since the advantage of using these forms of analysis is bound to bring them in more and more general use.

The two forms of mathematical analysis to which I refer are:—

First—The use of the complex quantity. This is made necessary by the fact that both ohmic and inductive drops must be taken into consideration when analysing such problems as transmission line drops. The voltage through a resistance is inherently at right angles to that through an inductance, and this angular relation can only be taken into consideration by the use of complex quantities.

Second—Hyperbolic Function. This function is made necessary by the fact that the action going on in any electrical transmission is subject to gradual decay and elimination as one recedes further and further from the generating end of the line. The hyperbolic function recognizes this decay. The expressions for line regulation become extremely simple when using these two forms of mathematical analysis. Although the expressions themselves are simple, when it comes to working them out and arriving at quantitive results the process is somewhat tedious.

Although absolute accuracy demands the use of these two more or less unfamiliar methods of mathematical analysis, an accuracy sufficient for ordinary purposes may be obtained by the simple and easily applied process above described. There is, of course, a loss in accuracy in any simplification, and therefore one should work with short-cut methods only when he has a knowledge of their limitations. Usually, however, the data at hand for determining line re-

TABLE II.

Ratio $\frac{\text{reactive volts}}{\text{ohmic volts}}$ in a 3-phase line, triangular spacing, 60 cycles.

Size of wire B. & S.	Diameter in inches.	Resistance per mile of single conductor	Distance between wire centres in inches. 2	6	12	18	24	30	36	42	48	60	72	96	120	144
10.....	.102	5.27	.09	.12	.13	.14	.15	.15	.16	.16	.16	.17	.17	.18	.19	.19
9.....	.114	4.18	.11	.14	.16	.17	.18	.19	.19	.20	.20	.21	.21	.22	.23	.23
8.....	.128	3.31	.13	.18	.20	.22	.23	.23	.24	.25	.25	.26	.27	.27	.28	.29
7.....	.144	2.63	.17	.22	.25	.27	.28	.29	.30	.31	.31	.32	.33	.34	.35	.36
6.....	.162	2.08	.20	.27	.31	.33	.35	.36	.37	.38	.39	.40	.41	.43	.44	.45
5.....	.182	1.65	.25	.32	.38	.41	.43	.45	.46	.47	.48	.50	.51	.53	.55	.56
4.....	.204	1.31	.30	.40	.46	.50	.53	.55	.57	.56	.57	.61	.63	.66	.68	.70
* 4.....	.232	1.31	.29	.39	.45	.49	.52	.54	.56	.57	.58	.60	.62	.64	.67	.68
3.....	.260	1.039	.35	.48	.56	.61	.64	.66	.69	.71	.72	.75	.77	.80	.83	.85
2.....	.292	.824	.42	.58	.69	.75	.79	.82	.85	.87	.89	.92	.95	.99	1.02	1.05
1.....	.328	.653	.51	.72	.84	.92	.97	1.01	1.05	1.08	1.10	1.14	1.18	1.23	1.27	1.30
0.....	.373	.518	.61	.87	1.03	1.13	1.20	1.25	1.29	1.33	1.36	1.41	1.41	1.52	1.57	1.62
00.....	.418	.411	.70	1.06	1.26	1.39	1.47	1.54	1.59	1.64	1.68	1.74	1.79	1.88	1.94	2.00
000.....	.470	.326	.89	1.30	1.55	1.71	1.81	1.90	1.96	2.02	2.07	2.16	2.22	2.33	2.41	2.48
0,000.....	.528	.258	1.05	1.58	1.91	2.10	2.24	2.35	2.43	2.50	2.57	2.67	2.76	2.89	2.99	3.08
250,000.....	.590	.219	1.20	1.81	2.19	2.42	2.58	2.70	2.80	2.88	2.96	3.08	3.18	3.34	3.46	3.57
300,000.....	.630	.182	1.40	2.13	2.60	2.87	3.06	3.20	3.33	3.43	3.53	3.67	3.79	3.98	4.13	4.25
400,000.....	.728	.137	1.73	2.70	3.29	3.68	3.93	4.13	4.29	4.42	4.55	4.74	4.90	5.16	5.35	5.52
500,000.....	.815	.109	2.05	3.27	4.01	4.50	4.82	5.07	5.26	5.44	5.59	5.83	6.04	6.35	6.60	6.81
600,000.....	.893	.091	2.02	3.80	4.72	5.27	5.65	5.95	6.19	6.40	6.57	6.86	7.10	7.50	7.78	8.04
800,000.....	1.031	.0683	2.86	4.91	6.05	6.77	7.28	7.68	8.01	8.28	8.50	8.90	9.50	9.75	10.14	10.46
1,000,000.....	1.152	.0547	3.32	5.75	7.28	8.20	8.83	9.33	9.72	10.05	10.35	10.85	11.28	11.90	12.40	12.70
1,500,000.....	1.412	.0364	4.30	7.96	10.25	11.62	12.60	13.32	13.95	14.46	14.91	15.60	16.25	17.22	17.95	18.55
2,000,000.....	1.613	.0273	5.15	10.05	13.10	14.90	16.20	17.20	18.00	18.70	19.40	20.30	21.10	22.40	23.35	24.20

*This and all larger sizes stranded conductor.

TABLE III.

A.C. line drop—Multiplying factor. Total drop = ohmic drop × factor.

P.F. Ratio Inductive Ohmic	0	40	50	50	70	80	90	95	97	98	99	100	99	98	97	95	90	80	70	60
0	00	.40	.50	.60	.70	.80	.90	.95	.97	.98	.99	1.00	.99	.98	.97	.95	.90	.80	.70	.60
.2	.2	.58	.67	.76	.84	.92	.99	1.01	1.02	1.02	1.02		.96	.94	.92	.89	.81	.68	.56	.44
.4	.4	.77	.85	.92	.99	1.04	1.07	1.07	1.07	1.06	1.05		.93	.90	.87	.83	.73	.56	.41	.28
.6	.6	.95	1.02	1.08	1.13	1.16	1.16	1.14	1.12	1.10	1.07		.91	.86	.82	.76	.64	.44	.27	.12
.8	.8	1.13	1.19	1.24	1.27	1.28	1.25	1.20	1.16	1.14	1.10		.88	.82	.78	.70	.55	.32	.13	−.04
1.0	1.0	1.32	1.37	1.40	1.41	1.40	1.34	1.26	1.21	1.18	1.13		.85	.78	.73	.64	.46	.20	−.01	−.20
1.2	1.2	1.50	1.54	1.56	1.55	1.52	1.42	1.32	1.26	1.22	1.16		.82	.74	.68	.58	.38	.08	−.15	−.36
1.4	1.4	1.68	1.71	1.72	1.70	1.64	1.51	1.39	1.31	1.26	1.20		.79	.70	.63	.51	.29	−.04	−.30	−.52
1.6	1.6	1.87	1.88	1.88	1.84	1.76	1.60	1.45	1.36	1.30	1.22		.76	.66	.58	.45	.20	−.16	−.44	−.68
1.8	1.8	2.05	2.06	2.04	1.98	1.88	1.68	1.51	1.41	1.34	1.24		.74	.62	.53	.39	.12	−.28	−.58	−.84
2.0	2.0	2.23	2.23	2.20	2.13	2.00	1.77	1.57	1.46	1.38	1.27		.71	.58	.48	.33	.03	−.40	−.73	−1.00
2.2	2.2	2.42	2.40	2.36	2.27	2.12	1.86	1.64	1.50	1.42	1.30		.68	.54	.44	.26	−.06	−.52	−.87	−1.16
2.4	2.4	2.60	2.58	2.52	2.41	2.24	1.94	1.70	1.55	1.46	1.33		.65	.50	.39	.20	−.14	−.64	−1.01	−1.32
2.6	2.6	2.78	2.75	2.68	2.55	2.36	2.03	1.76	1.60	1.50	1.36		.63	.46	.34	.14	−.23	−.76	−1.15	−1.48
2.8	2.8	2.96	2.92	2.84	2.70	2.48	2.12	1.82	1.65	1.54	1.38		.60	.42	.29	.08	−.32	−.88	−1.30	−1.64
3.0	3.0	3.15	3.10	3.00	2.84	2.60	2.21	1.89	1.70	1.58	1.41		.57	.38	.24	.01	−.41	−1.00	−1.44	−1.80
3.5	3.5	3.61	3.53	3.40	3.20	2.90	2.42	2.04	1.82	1.68	1.48		.50	.28	.12	−.14	−.62	−1.30	−1.80	−2.20
4.0	4.0	4.06	3.96	3.80	3.55	3.20	2.64	2.20	1.94	1.78	1.55		.43	.18	0	−.30	−.84	−1.60	−2.15	−2.60
4.5	4.5	4.52	4.40	4.20	3.91	3.50	2.86	2.35	2.06	1.88	1.62		.36	.08	−.12	−.45	−1.06	−1.90	−2.51	−3.00
5.0	5.0	4.98	4.83	4.60	4.27	3.80	3.08	2.51	2.18	1.98	1.69		.29	−.02	−.24	−.61	−1.28	−2.20	−2.87	−3.40
6.	6.0	5.90	5.70	5.40	4.98	4.40	3.52	2.82	2.43	2.17	1.84		.14	−.21	−.49	−.92	−1.72	−2.80	−3.58	−4.20
7.	7.0	6.81	6.56	6.20	5.70	5.00	3.95	2.13	2.67	2.37	1.98		0	−.41	−.73	−1.23	−2.15	−3.40	−4.30	−5.00
8.	8.0	7.73	7.42	7.00	6.41	5.60	4.39	2.45	2.91	2.57	2.12		−.14	−.61	−.97	−1.55	−2.51	−4.00	−5.01	−5.80
9.	9.0	8.65	8.29	7.80	7.12	6.20	4.82	2.76	3.15	2.77	2.26		−.28	−.81	−1.21	−1.86	−3.09	−4.60	−5.72	−6.60
10.	10.0	9.56	9.16	8.60	7.84	6.80	5.26	3.07	3.40	2.97	2.40		−.42	−1.01	−1.46	−2.17	−3.46	−5.20	−6.44	−7.40
15.	15.0	14.10	13.49	12.60	11.41	9.80	7.44	5.63	4.61	3.77	3.10		−1.12	−2.01	−2.67	−3.73	−5.64	−8.20	−10.01	−11.40
20.	20.0	18.70	17.82	16.60	14.98	18.80	9.62	7.19	5.83	4.96	3.91		−1.83	−3.00	−3.89	−5.29	−7.82	−11.20	−13.58	−15.40

gulation has an accuracy which is no greater than the method above described for obtaining line regulation.

In order to indicate the limit of accuracy of the method herein described, I am assuming a certain hypothetical case and am giving the drop calculated by three different methods:

1st. By tabular method herein described.

2nd. By formula 1; this is correct for inductive effect but neglecting capacity.

3rd. Accurate method using complex quantities and hyperbolic functions.

Data of assumed line—

Length, 100 miles.

Voltage, 100,000 at receiving end, 3-phase.

Load, 12,000 k.w. at 75 per cent., power factor lagging.

Conductors, No. 00 stranded wire spaced 72 inches apart; triangular arrangement.

Frequency, 60 cycles.

Kva of load, 16,000.

Amperes of load, 92.4.

Resistance of a single conductor, 41.1 ohms.

Total ohmic drop equals 41.1 x 92.4 x 17.3 = 6570.

Ratio reactive to ohmic drop (Table II.) = 1.79.

Total drop (Table III.) = 1.93 x 6570 = 12690 = 12.69 per cent. for formula (1) the generator voltage.

$$Eg = \sqrt{(100000 \times 75 + 6570)^2 + (100000 \times .661 + 11750)^2} = 112{,}770.$$

Therefore drop = 12770.

Both the above methods assume that when the received current is zero the generator and line current is also zero. That is, line capacity is neglected. As a consequence of this assumption, at no received load the generator voltage becomes the same as the receiver voltage. When considering capacity effects, this does not follow, since the capacity of the line causes a current in the generator even with no load in the receiver. This capacity current also causes a modification of the generator voltage both at no load and full load. However, the difference between generator voltage at no receiver load and at full receiver load does not vary much from that obtained above. Assuming the same line constants as above and also the same received load and voltage, the generator voltage will be as follows:

Generator voltage, full load	110,900
Generator voltage, no load	98,000
Difference	12,900

Comparing the three methods of obtaining drop for this particular case, we have the following:

By method described in this paper, drop = 12,690 volts.

By method which neglects capacity but is accurate for resistance and reactance, drop = 12,770 volts.

By method that takes capacity into account, drop = 12,900 volts.

It is thus seen that for this particular case the accuracy of the method described in this case is within the usual error that must be made in obtaining resistance of line, distance apart, length of line, etc. In other words, the accuracy is amply sufficient.

COLLAPSE OF COAL TRESTLE AT EAST TORONTO YARDS, G.T.R.

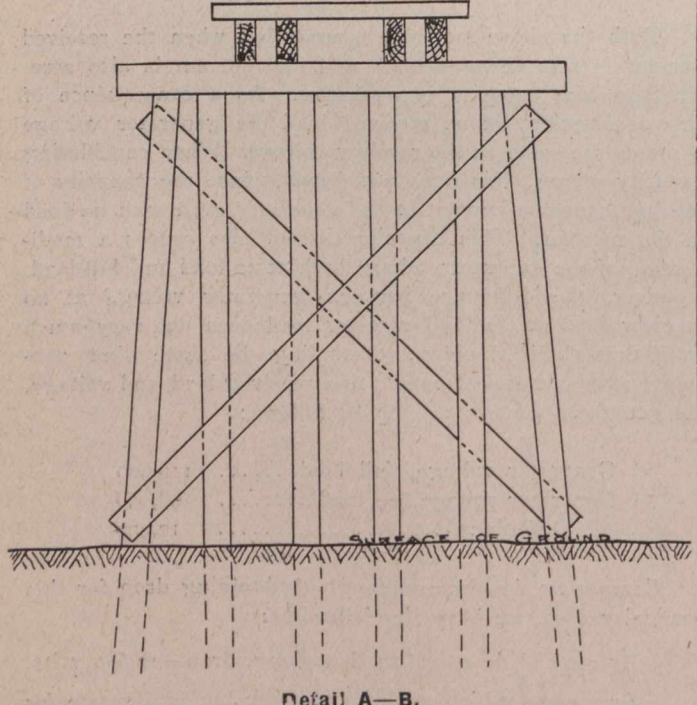
In The Canadian Engineer of July 7th, in the article referring to the collapse of the coal trestle at the G. T. R., East Toronto yards, there were three unfortunate mistakes.

We are glad to correct those misstatements in this issue, and are sorry that the article reflected in any way upon the design or construction or condition of the trestle.

The bents, as the accompanying diagrams will show, were placed 14 foot centres, and were made up of sound cedar piles, well braced. The tables given under each diagram would indicate that the factor of safety (considering the weight of the engine) in both stringers and piles was very large. An examination of the broken piles does not show that the body timber had decayed at all.

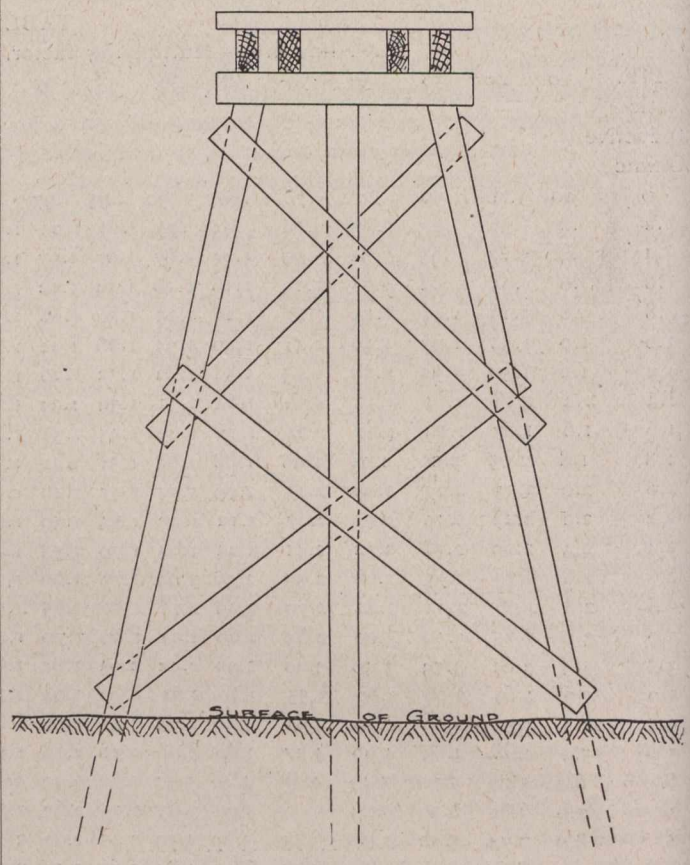
The profile of the trestle indicates the condition of the trestle after the collapse.

In the protograph published last week, the position of the engine is shown. The engine was lying on its side, almost at the centre line. There is nothing to indicate what may have caused the accident, and almost everyone who visits the scene has a theory of his own. The engine was not working nor yet had the air-brake been applied, when the trestle weakened. One theory advanced as to the cause of the collapse is that one or two of the piles may have settled on one side enough to cause the weight of the engine to push the trestle sideways.



Detail A—B.

Ties—Same as "B to C."
Stringers—Same as "B to D."
Caps—12 in. x 12 in. x length.
Length, 12 ft. to 16 ft.
Piles—Diameter at top, 12 in. to 14 in.
Diameter at ground, 9 in. to 12 in.
Length above ground, 10 ft. 5 in. to 14 ft.
Braces—3 in. x 12 in.
Two diagonal braces.

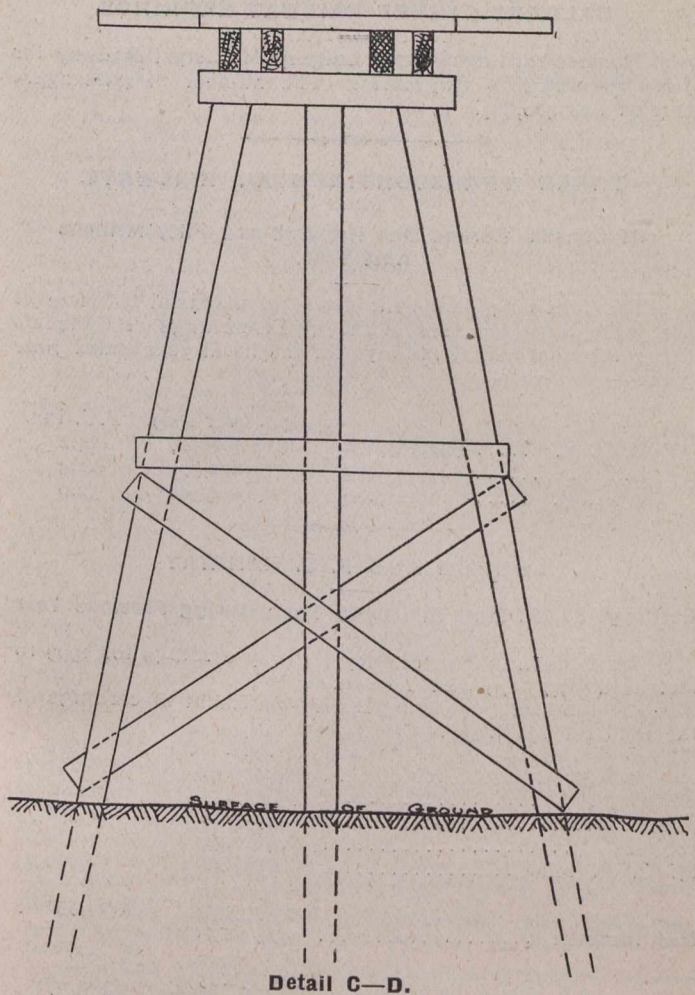


Detail B—C.

Ties—On Ramp—6 in. x 8 in. x 8 ft. track ties.
57 ties per hundred feet.
Spiked every 5 ft., 10 in. spikes.
Stringers—8 in. x 16 in. x 30 ft. Georgia pine.
2 under each rail—bolted together.
Joints alternating.
Caps—12 in. x 12 in. x 8 ft.
Drift-bolted to piles.
Drift-bolts ¾ in. x 24 in.
Piles—Cedar.
Diameter at top, 14 in. to 16 in.
Diameter at ground, 10 in. to 12 in.
Length above ground, 22 ft.-23 ft.
Braces—3 in. x 12 in. Georgia pine.
Longitudinal braces, 3 in. x 12 in.

"C" to "D."

Ties—6 in. x 8 in. x 8 ft.
Every third tie 6 in x 8 in. x 14 ft.
Long ties spiked to stringers, 10 in. spikes.
Stringers—8 in. x 16 in. x 30 ft.—Georgia pine.
Two under each rail—joints alternating.
Bolted together—¾ in. bolts.
Caps—12 in. x 12 in. x 8 ft.
Drift-bolted to piles.
Drift-bolts, ¾ in. x 24 in.
Piles—Cedar.
Diameter at top, 14 in. to 16 in.
Diameter at ground, 10 in. to 12 in.
Length above ground, 22 ft.-23 ft.
Braces—3 in. x 12 in.—Georgia pine.
Two diagonal and one horizontal.
Longitudinal brace between last two bents.
Horizontal brace about 11 ft. from ground.



Detail C—D.

The Government Peat Plant at Alfred—A. Anrep, Jr., of Department of Mines.

Afternoon.

Excursion to Government Peat Plant at Alfred. According to weather conditions this may be changed to one of the following days.

Night Session, 7.30 o'clock.

Address by the President, Dr. Eugene Haanel.

Draining of North Carolina Swamp Lands, and amount of peat found therein—Dr. Joseph Hyde Pratt, State Geologist, N. C.

Peat Power Generation—Dr. T. Arthur Mighill, Boston.

Work of the Peat Engineering Company—Francis J. Bulask, Toledo.

A New Portable Peat Machine–Ernest V. Moore, Peterborough, Ont.

Description of Colonel John Jacob Astor's Vibratory Disintegrator for Peat Gas Producers.

TUESDAY, JULY 26TH, 1910, 9 O'CLOCK.

Election of Officers.

(a) The Journal of the American Peat Society. (b) Peat Investigation of the U. S. Geological Survey. (c) The United States Bureau of Mines—Prof. Charles A. Davis, Peat Expert, U. S. Bureau of Mines.

Drying Peat–Dr. J. McWilliam, London, Ont.

A Well Equipped Peat Fuel Plant, and How to Operate It—Philip Heseltine, Detroit.

Afternoon.

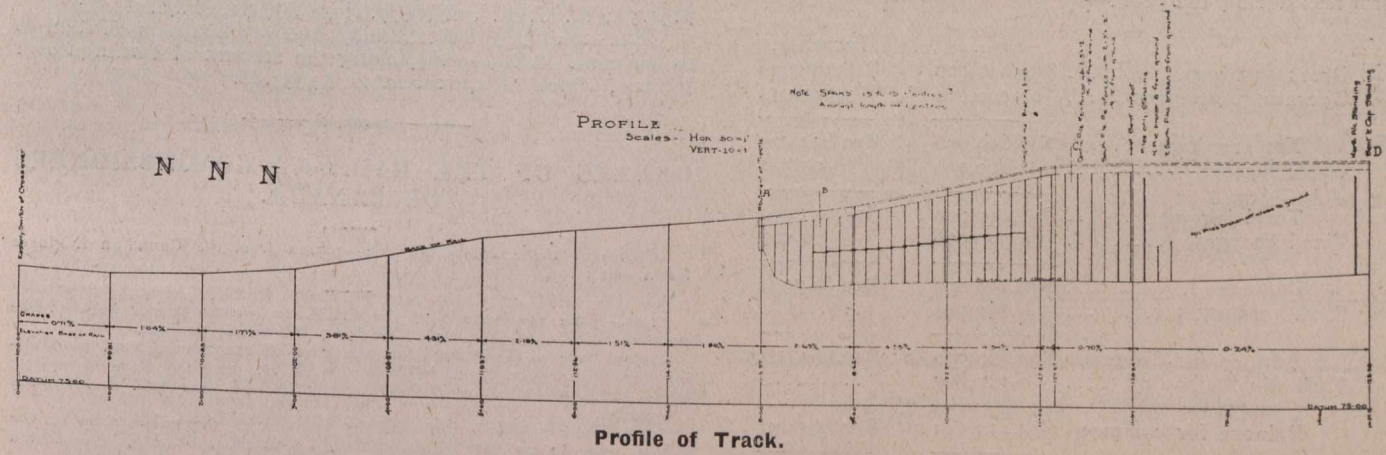
Visit to Government Fuel Testing Plant in Ottawa, and Automobile tour about the city.

Evening.

Banquet at Hotel Victoria, Aylmer.

WEDNESDAY, JULY 27TH, 1910, 9 O'CLOCK.

Prospect of the Peat Industry in the North-West—Max Toltz, St. Paul.



Profile of Track.

AMERICAN PEAT SOCIETY.

The fourth annual meeting of the American Peat Society will hold their fourth annual meeting at Ottawa, Can., July 25th, 26th, 27th, 1910. A very attractive programme has been arranged:

MONDAY, JULY 25TH, 1910, 9 O'CLOCK.

Opening Remarks by the President, Dr. Eugene Haanel.

Report of Officers.

Committees' Reports.

Propositions for the welfare of the Society.

Nominations of Officers.

A History of the Peat Industry of Canada—Alexander Dobson, Beaverton, Ont.

The Development of Gas Producers for Peat and Lignite—Prof. R. H. Fernald, Producer Gas Expert, U. S. Bureau of Mines.

Progress of Peat Briquetting—O. E. Moulton, Dover, N.H.

The Future of the American Peat Industry—William Eichhoff, Erie, Pa.

Afternoon Session, 2 O'Clock.

Some Problems of the Peat Filler Manufacturer—J. N. Hoff, New York.

Peat as a Fertilizer and Methods of Drying Same—Robert Ranson, St. Augustine, Fla.

The Latest Achievements of the Akerlund Gas Producer—Gibbs Gas Engine Co., Atlanta, Ga.

RAILWAY EARNINGS; STOCK QUOTATIONS.

The following table gives the latest traffic returns it is possible to obtain at the time of going to press:--

Road	Wk. Ended	1910	Previous Week	1909
C. P. R.	July 7	$2,022,000	$2,735,000	$1,611,000
G. T. R.	July 7	879,362	1,350,612	768,409
C. N. R.	July 7	294,800	372,400	179,200
Montreal St.	July 9	73,804	72,416	63,530
Halifax St.	July 7	4,882	5,464	4,267
T. & N. O.	July 7	23,143	35,465	29,072

Stock quotations on Toronto, Montreal and London exchanges, and other information relative to the companies listed in the above tables, are appended. The par value of all shares is $100.

Co.	Capital 000's omitted	Price June 30 1909.	Price June 23 1910.	Price June 29 1910.	Sales last week.
C. P. R.	$150,000	183	188¾	187¾ 187½	88
Mtl. St.	18,000	218 217	240 234½	236 235	2,143
Hal. El.	1,400	115 113½	123 121	122 ...	7
Tor. St.	8,000	124½	118½ ...	... 114½	1,028
G. T. R.	226,000	1st pfd. 108;	3rd pfd. 58¾;	com. 27¾	

OVER NINETY MILLIONS.

Gross Earnings of Canadian Pacific for Year Ended June 30th.

The end of the fiscal year for the Canadian Pacific Railway Company on June 30th showed that earnings available for dividends approximated $25,600,000, or 15½ per cent. on the common stock after the regular 4 per cent. payment on the preferred issue had been met. The following estimate of the operating results by the C.P.R. for the twelve months ended June 30th is unofficial, but gives an idea of the company's progress during the year:—

	1910.	Increase.
Gross earnings	$94,600,000	$18,286,679
Operating expenses	61,000,000	7,642,252
Net earnings	$33,600,000	$10,644,427
Other income	2,400,000	93,512
Total income	$36,000,000	$10,737,939
Fixed charges	9,500,000	72,967
Balance	$26,500,000	$10,664,972
S. S. replmt., etc.	880,000	.....
Balance for dividends	$25,620,000	$10,664,972
Pref. dividends (4%)	2,107,867	.....
Balance for common.	$23,512,133	$10,664,972

The foregoing balance available for the common stock is equal to 16.57 per cent. on the $150,000,000 outstanding, as compared with 8.56 per cent. in the year previous.

Only two lines, the Pennsylvania and the Southern Pacific, had during 1909 greater gross earnings than the C.P.R. has for the fiscal year of the company, which closed at the end of June. For the past six years the gross earnings, the working expenses and the net earnings are as follows:—

	Gross Earnings.	Working Expenses.	Net Earnings.
1905	$50,481,882	$35,006,794	$15,475,088
1906	61,669,758	38,696,445	22,973,313
1907	72,217,528	46,914,219	25,383,309
1908	71,384,174	49,591,808	21,792,366
1909	76,313,321	53,357,748	22,955,573
1910	94,585,000	61,063,000	33,522,000

CALGARY STREET RAILWAY EARNINGS.

The net earnings of the Calgary Municipal Railway for June amounted to $19,018.14. The number of passengers carried was 460,685.

THREE TRANSCONTINENTAL RAILWAYS.

Of Canada Earned One Hundred and Fifty Millions Last Year.

The following statement gives an unofficial estimate of the percentage increases in the gross earnings of Canada's three transcontinental railways for the fiscal year ended June 30th:—

		Inc. over 1909.	P.C. Inc.
C. P. R.	$94,585,673	$18,468,506	24.2
G.T.R.	43,943,377	4,861,771	12.4
C. N. R.	12,821,200	3,152,300	32.6

LONDON AND P. S. RAILWAY

Earnings $9,732 More in 1908-09 Than During Previous Year

The London & Port Stanley Railway earnings for 1909-10 increased $9,732.79 over 1908-09.

The following is a comparative statement of earnings of the road for 1908-1909:—

	1908.	1909.
Net freight	$65,816.85	$76,167.43
Passenger	33,355.53	33,012.01
Mail	1,557.68	1,552.72
Express	4,210.42	4,018.86
M. C. R. tolls	8,857.28	8,779.63
	$113,797.79	$123,530.65
Net increase	9,732.79	
	$123,530.65	

Increase—Net freight, $10,350.48—total, $10,350.48.

Decrease—Passenger, $343.52; mail, $4.96; express, $191.56; M. C. R. tolls, $77.65—total, $1,350.48.

The London & Port Stanley Railway board is entitled to 10 per cent. of $43,530.65, being the amount of earnings over $80,000, which is equivalent to $4,353.06.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

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

10989—June 25—Authorizing the C.P.R. to construct spur lines to the premises of the Quaker Oats Company, Peterboro, Ontario.

10990—June 24—Directing that the cost of constructing and maintaining the interchange track between the M.C.R. and the Pere Marquette Road at Leamington be divided equally between the said two railway companies.

10991—June 23—Declaring that the crossing of the public road by the P.M.R. immediately east of its station, Leamington, Ontario, is protected to the satisfaction of the Board.

10992—June 23—Directing that the date upon which the rates on petroleum and its products from Toronto, Petrolea, Sarnia, and Wallaceburg, shall become effective, as required by Order No. 10356, dated 25th April, 1910, be extended until the 10th day of July, 1910.

10993—June 25—Authorizing the Hydro-Electric Power Commission of Ontario to erect transmission line across the wires of the C.P.R. Company's Telegraph at Lot 55, Concession 1, Township of Ancaster, Ontario.

10994—June 24—Authorizing Laval Electric Company to erect its transmission line across the track of the C.P.R. near Mascouche Station.

10995—June 23—Authorizing the town of Fraserville, Que., to maintain a water pipe across the track of the Temiscouata Railway Company, at Riviere du Loup, Quebec.

10996—June 24—Authorizing the R. Forbes Company, Limited, to lay a one-inch water pipe under the track of the G.T.R. at what is known as Forbes Crossing, Hespeler, Ont.

10997—June 23—Authorizing Wm. J. Aikens, of Dunnville, Ont., to lay a gas pipe under the track of the Toronto, Hamilton and Buffalo Railway Company, at Gainsville.

10998—June 27—Authorizing the corporation of the city of Toronto, to lay a sewer under the tracks of the C.P.R., G.T.R., and the C.N.R., at Riverdale Park, Toronto, Ont.

(Continued on page 60).

ENGINEERING SOCIETIES.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—413 Dorchester Street West, Montreal. President, Col. H. N. Ruttan; Secretary, Professor C. H. McLeod.

Chairman, L. A. Vallee; Secretary, Hugh O'Donnell, P.O. Box 115, Quebec. Meetings held twice a month at Room 40, City Hall.

TORONTO BRANCH—
96 King Street West, Toronto. Chairman, A. W. Campbell; Secretary, P. Gillespie, Engineering Building, Toronto University, Toronto. Meets last Thursday of the month.

MANITOBA BRANCH—
Chairman, J. E. Schwitzer; Secretary, E. Brydone Jack. Meets first and third Fridays of each month, October to April, in University of Manitoba, Winnipeg.

VANCOUVER BRANCH—
Chairman, Geo. H. Webster; Secretary, H. K. Dutcher, 40-41 Flack Block, Vancouver. Meets in Engineering Department, University

OTTAWA BRANCH—
Chairman, W. J. Stewart, Ottawa; S. J. Chapleau, Resident Engineer's Office, Department of Public Works

MUNICIPAL ASSOCIATIONS.

ONTARIO MUNICIPAL ASSOCIATION.—President, Mr. George Geddes, Mayor, St. Thomas, Ont.; Secretary-Treasurer, Mr. K. W. McKay, County Clerk, St. Thomas, Ontario.

UNION OF ALBERTA MUNICIPALITIES.—President, H. H. Gaetz, Red Deer, Alta.; Secretary-Treasurer, John T. Hall, Medicine Hat, Alta.

THE UNION OF CANADIAN MUNICIPALITIES.—President, W. Sanford Evans, Mayor of Winnipeg; Hon. Secretary-Treasurer, W. D. Lighthall, K.C., ex-Mayor of Westmount.

THE UNION OF NEW BRUNSWICK MUNICIPALITIES.—President, Mayor Reilly, Moncton; Hon. Secretary-Treasurer, J. W. McCready, City Clerk, Fredericton.

UNION OF NOVA SCOTIA MUNICIPALITIES.—President, Mr. A. E. McMahon, Warden, King's Co., Kentville, N.S.; Secretary, A. Roberts, Bridgewater, N.S.

UNION OF SASKATCHEWAN MUNICIPALITIES.—President, Mayor Hopkins, Saskatoon; Secretary, Mr. J. Kelso Hunter, City Clerk, Regina, Sask.

CANADIAN TECHNICAL SOCIETIES.

ALBERTA ASSOCIATION OF ARCHITECTS.—President, E. C. Hopkins, Edmonton; Secretary, H. M. Widdington, Strathcona, Alberta.

ASSOCIATION OF SASKATCHEWAN LAND SURVEYORS.—President, J. L. R. Parsons, Regina; Secretary-Treasurer, M. B. Weeks, Regina

ASTRONOMICAL SOCIETY OF SASKATCHEWAN.—President, N. McMurchy; Secretary, Mr. McClung, Regina.

BRITISH COLUMBIA LAND SURVEYORS' ASSOCIATION.—President, W. S. Drewry, Nelson, B.C.; Secretary-Treasurer, S. A. Roberts, Victoria, B.C.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.—President, Charles Kelly, Chatham, Ont.; Secretary, W. A. Crockett, Mount Hamilton, Ont.

CANADIAN CEMENT AND CONCRETE ASSOCIATION.—President, Peter Gillespie, Toronto, Ont.; Vice-President, Gustave Kahn, Toronto; Secretary-Treasurer, R. E. W. Hagarty, 662 Euclid Ave., Toronto.

CANADIAN CLAY PRODUCTS' MANUFACTURERS' ASSOCIATION.—President, W. McCredie; Secretary-Treasurer, D. O. McKinnon, Toronto.

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

CANADIAN FORESTRY ASSOCIATION.—President, Thomas Southworth, Toronto; Secretary, James Lawler, 11 Queen's Park, Toronto.

CANADIAN GAS ASSOCIATION.—J. Keillor, Secretary-Treasurer, Hamilton, Ont.

CANADIAN INDEPENDENT TELEPHONE ASSOCIATION.—President, W. Doan, M.D., Harrietsville, Ont.; Secretary-Treasurer, Francis Dagger, 21 Richmond Street West, Toronto.

CANADIAN MINING INSTITUTE.—Windsor Hotel, Montreal. President, Dr. Frank D. Adams, McGill University, Montreal; Secretary, H. Mortimer-Lamb, Montreal

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

CANADIAN STREET RAILWAY ASSOCIATION.—President, D. McDonald, Manager, Montreal Street Railway; Secretary, Acton Burrows, 157 Bay Street, Toronto.

CANADIAN SOCIETY OF FOREST ENGINEERS.—President, Dr. Fernow, Toronto; Secretary, T. W. H. Jacombe, Ottawa.

CENTRAL RAILWAY AND ENGINEERING CLUB.—Toronto, President, J. Duguid; Secretary, C. L. Worth, 409 Union Station. Meets third Tuesday each month except June, July, August.

DOMINION LAND SURVEYORS.—President, Thos. Fawcett, Niagara Falls; Secretary-Treasurer, A. W. Ashton, Ottawa.

EDMONTON ENGINEERING SOCIETY.—President, Dr. Martin Murphy; Secretary, B. F. Mitchell, City Engineer's Office, Edmonton. Alberta.

ENGINEERING SOCIETY, TORONTO UNIVERSITY.—President, A. D. Campbell; Corresponding Secretary, A. H. Munroe.

ENGINEER'S CLUB OF TORONTO.—96 King Street West. President, C. M. Canniff; Secretary, R. B. Wolsey. Meeting every Thursday evening during the fall and winter months.

INSTITUTION OF ELECTRICAL ENGINEERS.—President, Dr. G. Kapp; Secretary, P. F. Rowell, Victoria Embankment, London, W.C.; Hon. Secretary-Treasurer for Canada, Lawford Grant, Power Building, Montreal, Que.

INSTITUTION OF MINING AND METALLURGY.—President, Edgar Taylor; Secretary, C. McDermid, London, England. Canadian Members of Council:—Prof. F. D. Adams, J. B. Porter, H. E. T. Haultain, and W. H. Miller, and Messrs. W. H. Trewartha-James and J. B. Tyrrell.

MANITOBA LAND SURVEYORS.—President, George McPhillips; Secretary-Treasurer, C. G. Chataway, Winnipeg, Man.

NOVA SCOTIA MINING SOCIETY.—President, T. J. Brown, Sydney Mines, C.B.; Secretary, A. A. Hayward.

NOVA SCOTIA SOCIETY OF ENGINEERS, HALIFAX.—President, S. Fenn; Secretary, J. Lorne Allan, 15 Victoria Road, Halifax, N.S.

ONTARIO PROVINCIAL GOOD ROADS ASSOCIATION.—President, W. H. Pugsley, Richmond Hill, Ont.; Secretary, J. E. Farewell, Whitby, Ont.

ONTARIO LAND SURVEYORS' ASSOCIATION.—President, H. W. Selby; Secretary, Killaly Gamble, 703 Temple Building, Toronto.

ROYAL ARCHITECTURAL INSTITUTE OF CANADA.—President, F. S. Baker, F.R.I.B.A., Toronto, Ont.; Hon. Secretary, Alcide Chausse, No. 5 Beaver Hall Square, Montreal, Que.

ROYAL ASTRONOMICAL SOCIETY.—President, Prof. Alfred T. de Lury, Toronto; Secretary, J. R. Collins, Toronto.

UNDERGRADUATE SOCIETY OF APPLIED SCIENCE, McGILL UNIVERSITY.—President, H. P. Ray; Secretary, J. P. McRae.

WESTERN CANADA RAILWAY CLUB.—President, Grant Hall; Secretary, W. H. Rosevear, 199 Chestnut Street, Winnipeg, Man. Second Monday, except June, July and August, at Winnipeg.

AMERICAN TECHNICAL SOCIETIES.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS (TORONTO BRANCH).—W. H. Eisenbeis, Secretary, 1207 Traders' Bank Building.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—President, John P. Canty, Fitchburg, Mass.; Secretary, T. F. Patterson, Boston & Maine Railway, Concord, N.H.

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION.—President, L. C. Fritch, Chief Engineer, Chicago G. W. Railway; Secretary, E. H. Fritch, 962-3 Monadnock Block, Chicago, Ill.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Secretary, C. W. Hunt, 220 West 57th Street, New York, N.Y. First and third Wednesday, except July and August, at New York.

AMERICAN SOCIETY OF ENGINEERING-CONTRACTORS.—President, George W. Jackson, contractor, Chicago; Secretary, Daniel J. Hauer, Park Row Building, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—29 West 39th Street, New York. President, Jesse M. Smith; Secretary, Calvin W. Rice.

WESTERN SOCIETY OF ENGINEERS.—1735 Monadnock Block, Chicago, Ill. J. W. Alvord, President; J. H. Warder, Secretary.

COMING MEETINGS.

CANADIAN ELECTRICAL ASSOCIATION.—July 6-7-8. Annual convention at Royal Muskoka Hotel, Muskoka Lakes, Ont. Secretary, T. S. Young, Confederation Life Building, Toronto, Ont.

AMERICAN SOCIETY FOR TESTING MATERIALS.—June 28-July 2. Annual meeting at Atlantic City, N.J. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

THE ROYAL ARCHITECTURAL INSTITUTE OF CANADA.—August 24-27. Annual meeting at Winnipeg, Man. Alcide Chausse, Hon. Secretary, 5 Beaver Hall Square, Montreal, Que.

UNITED STATES GOOD ROADS' ASSOCIATION.—July 28-29-30-31, 1910, Niagara Falls, N.Y. President, Arthur C. Jackson.

THE AMERICAN PEAT SOCIETY will meet at Ottawa, Ont., July 25-26-27, 1910. Secretary and Treasurer, Julius Boodollo, Kingsbridge, New York City.

NEW ENGLAND WATER WORKS ASSOCIATION.—September 21-23. Annual meeting, Rochester, N.Y. Willard Kent, Secretary, Narragansett Pier, R.I.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.—October 11-16. Seventeenth annual convention, Erie, Pa. Prescott Folwell, Secretary, 239 W. 39th Street, New York, N.Y.

NATIONAL MUNICIPAL LEAGUE.—November 14-18. Annual meeting, Buffalo, N.Y. Clinton Rogers Woodruff, Secretary, North American Building, Philadelphia, Pa.

UNION OF CANADIAN MUNICIPALITIES.—August 31st to September 2nd. Tenth annual convention, Toronto, Ont. Secretary, W. D. Lighthall, K.C., Westmount, Que.; Assistant Secretary, G. S. Wilson, 107 St. James Street, Montreal, Que.

INTERNATIONAL MUNICIPAL CONGRESS AND EXPOSITION.—September 18-30, 1911, at Chicago, Ill. Curt. M. Treat, Secretary, 1107-8 Great Northern Building, Chicago.

AMERICAN PEAT SOCIETY.—July 25, 26, 27, 1910, at Ottawa, Can. Secretary Julius Bardollo, Kingsbridge, New York City, New York; Assistant Secretary, A. J. Forward, B.A., Ottawa, Can.

WESTERN CANADA IRRIGATION ASSOCIATION.—August 3, 4, and 5, 1910, at Kamloops, B.C.

TORONTO, CANADA, JULY 14, 1910.

CONTENTS OF THIS ISSUE.

CONSTRUCTION NEWS SECTION

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

TENDERS PENDING.

In addition to those in this issue.

Further information may be had from the issues of The Canadian Engineer referred to.

Place of Work.	Tenders Close.	Issue of.	Page.
Moose Jaw, Sask., drainage works	July 18.	June 23.	56
Sorel, Que., breakwater	July 18.	June 23.	658
Quebec, Que., bridge	Sept. 1.	June 30.	56
New Hamburg, Ont., electrical apparatus	July 18.	June 30.	54
Toronto, Ont., sewer	July 26.	June 30.	53
Natashquan, Que., wharf	July 19.	June 30.	690
Brockville, Ont., bridge	July 25.	July 7.	53
Saskatoon, Sask., boiler	July 25.	July 7.	53
Toronto, Ont., bridge abutments.	July 19.	July 7.	53
Sault Ste. Marie, Ont., railway	July 23.	July 7.	53
Ottawa, Ont., steam fitting, railway shops	July 26.	July 7.	22

TENDERS.

Truro, N.S.—Tenders will be received until July 19th for the erection of an academy building. John H. Murphy, Sec. School Board, Port Hood.

Fredericton, N.B.—Tenders will be received until July 13th for all trades in the erection of additions and improvements to the Masonic Temple. Wm. E. Minue, Architect, 220 Aberdeen St.

New Waterford, C.B.—Tenders will be received until July 15th for the erection of a lock-up. D. M. Curry, Municipal Clerk.

Granby, Que.—Tenders will be received until July 15th for the plumbing and installation of the heating and ventilating systems at the convent and at the college. Dr. L. A. Lessard, Chairman, School Board.

Montreal, Que.—Tenders will be received until July 27th for timber and railway ties. David Seath, Sec.-Treasurer, Harbor Commissioners.

Montreal West, Que.—Tenders will shortly be invited for the construction of a new town hall.

Outremont, Que.—Tenders will be received until July 20th for sewer construction; also 80 man-hole covers. J. Kruse, secretary-treasurer.

Quebec, Que.—Tenders will be received until July 13th for the construction of waiting rooms, offices, etc., for Quebec and Levis Ferry. W. D. Baillarge,

Quebec, Que.—Tenders will be received until July 13th for street paving. W. D. Baillarge, City Engineer.

Westmount, Que.—Tenders will be received until July 16th for the supply of coal. A. D. Shibley, City Clerk.

Brantford, Ont.—Tenders will be received until July 13th for building brick porch, cementing floor of basement, ceiling inside of schoolroom with metallic sheeting, painting schoolhouse inside and out, and putting in furnace. J. Ryder, Sec.-Treas., School Board, Harley P.O.

Collingwood, Ont.—Tenders will be received until July 30th for approximately 3636 sq. yds. of street paving. K. S. Macdonell, Town Engineer. (Advt. in the Canadian Engineer.)

Colchester, Ont.—Tenders will be received until August 9th for the construction of an extension to the pier. R. C. Desrochers, Asst. Secretary, Dept. of Public Works, Ottawa. (Adv. in The Canadian Engineer.)

Fort William, Ont.—Tenders will be received until July 15th for the construction of piers, abutments, and pedestals for a bridge over the Kaministiquia River. Frank Lee, Division Engineer, C. P. Ry., Winnipeg, Man.

London, Ont.—Tenders will be received until July 14th for resurfacing asphalt pavement. A. O. Graydon, City Engineer.

London, Ont.—Tenders will be received until July 29th for waterworks and electrical equipment. O. Ellwood, Secretary, Board of Water Commissioners. (Adv. in The Canadian Engineer.)

Ottawa, Ont.—Tenders will be received until August 16th for the supply of coal for the public buildings throughout the Dominion. R. C. Desrochers, Asst. Secretary, Dept. of Public Works.

Port Arthur, Ont.—Tenders will be received until July 18th for the construction of a reinforced concrete bridge over Current River. J. McTeigue, City Clerk.

Peterboro', Ont.—Tenders will be received until July 16th for the building of a manse for St. Paul's Presbyterian Church. W. F. Nelson, Sec.

Toronto, Ont.—Tenders will be received until July 19th for laying a 6-foot steel conduit, a distance of 500 feet. G. R. Geary (Mayor), Chairman, Board of Control, City Hall. (Adv. in The Canadian Engineer.)

Brandon, Man.—Tenders for the erection of the Canadian Northern Railway hotel will be invited within the next two weeks.

Elkhorn, Man.—Tenders will be received until July 18th for the erection of a six-roomed school building. Chas. R. Duxbury, Sec.-Treas., School Board.

Gretna, Man.—Tenders will be received until July 14th for the erection of a new four-room brick schoolhouse. Garry F. Stirk, Sec.-Treas., School Board.

Winnipeg, Man.—Tenders are invited for the supply of five hundred tons of Pocohuntus coal, also for one thousand cords of green-cut, seasoned tamarac, to be delivered at any point, and in such quantities as may be required from time to time. Oldfield, Kerby & Gardner, 234 Portage Ave.

Winnipeg, Man.—Tenders will be received until July 26th for the construction of a sewer, extending from the pump house and terminal yard to the Seine River. P. E. Ryan, Secretary, National Transcontinental Railway, Ottawa, Ontario.

Winnipeg, Man.—Tenders will be received until July 21st for 2,000 half inch water meters. M. Peterson, secretary, Board of Control.

Winnipeg, Man.—Tenders will be received until July 16th for the erection of a warehouse, for the Gordon Mitchell Drug Co. Ltd., Jordan & Over, Architects, 47 Canada Life Building.

Winnipeg. Man.—Tenders will be received until July 16th for a brick and reinforced concrete bakery building. John Woodman, Architect, Free Press Bldg.

Winnipeg, Man.—Tenders will be received until July 15th for supply of labor and materials necessary for painting required at the waterworks pumping station. M. Peterson, Secretary, Board of Control.

Winnipeg, Man.—Tenders will be received until July 25th for the substructure of Le Pas Bridge, on Hudson Bay Ry. L. K. Jones, Secretary, Dept. of Railways and Canals, Ottawa. (Adv. in The Canadian Engineer.)

Calgary, Alta.—Tenders will be called for within a few days for lining the new city reservoir with cement. J. T. Child, City Engineer.

Calgary, Alta.—Tenders will be received until July 21st for the erection of a six-storey brick and reinforced concrete hotel. Burroughs & Richards, Architects, Crown Bldg.

Wainwright, Alta.—Tenders will be received until July 15th for the installation of a heating plant. H. V. Fieldhouse, Sec.-Treas., Wainwright, S.D.

Vancouver, B.C.—Tenders will be received for installing electric ornamental street lighting, and for the erection of twelve royal standards in each block from Cordova Street to the bridge. A. J. Paterson, 570 Granville St.

CONTRACTS AWARDED.

Sydney, N.S.—For 1910 sewer work, the following tenders were received, and that of Ww. Cooke was recommended for acceptance by the Works board:

Wm. Cooke, $22,661.50.
J. H. Treen, $24,436.70.
Sutherland & Redding, $25,552.90.
McDonald & McLeod, $27,055.50.

Fredericton, N.B.—Powers & Brewer, contractors, who have been employed for the past two and a half years on the Transcontinental, have been awarded the contract for installing a complete water system for the town of Grand Falls. The work consists of reservoir, pumping station and pump, and the furnishing and laying of 20,000 feet of cast-iron pipe.

Brantford, Ont.—The Warren Bituminous Paving Co., got the contract for the top surface paving of Darling street, at $1.63 a square yard, while a similar contract for Lorne Crescent was given to the Westrumite Co., at $1.29.

Collingwood, Ont.—Wm. Simpson, a local contractor, secured the sewer construction contract at $1,600.

Fort William, Ont.—The Grand Trunk Pacific Railway have awarded to Carter-Halls Aldinger Co. of Winnipeg, the contract for their roundhouse and machine shops on the Mission. The buildings will cost about $100,000.

Guelph, Ont.—The Westrumite Co. was given the contract for paving Norfolk Street, about 6,000 feet. The contract price is approximately $12,000.

Guelph, Ont.—McCormick & Robinson were given a contract for ventilation, at $22,470 and Stevenson & Malcolm a contract for heating the Central School at $1,900.

Kingston, Ont.—The Ontario Bridge Co. submitted the lowest tender for rebuilding the Cataraqui Creek bridge, and were given the contract. The structure will be of concrete, 110 feet in length.

Ottawa, Ont.—The Canada Foundry Co. were given the contract for the Hudson Bay Railway bridge at the Pas. The structure will have four spans of 117 feet.

Ottawa, Ont.—The following contracts have been awarded by the Department of Public Works: Extension to Kingsport, N.S., pier, H. MacAloney, Parrsboro, N.S.; wharf extension at Sault Ste. Marie, Ont, J. F. Boyd, Sault Ste. Marie, Ont.; Wharf construction at Angers, Que., J. H. and R. H. Murphy; and wharf extension at Maria, Que., Peter Nadeau & Sons, Grand Caspedia, Que.

Ottawa, Ont.—J. W. Russell, of Toronto, has been awarded the contract for widening the Welland Canal at Welland. The contract price is $12,000.

Peterboro, Ont.—The Township of Monoghan has awarded to H. Thurter, a contract for concrete walk construction at 12 cents a foot.

Morden, Man.—Herman Campbell was given the contract for constructing 1,500 sq. yards of cement sidewalks at $1.30, and $2.50 for crossings.. Other bids were: A. G. Selley, Morden, $1.40; Main & West, Winnipeg, $1.83; Geo. Gordon, Morden, $1.62.

Winnipeg, Man.—The Board of Control awarded to T. D. Robinson & Sons, of Winnipeg, a contract for one million feet of B. M. lumber, at $25.143.75.

Winnipeg, Man.—Wm. Newman & Co. have the contract for the piers of the Brown & Brant street overhead bridge. The contract price is $54,720. As recorded last week, the superstructure contract was secured by the Cleveland Bridge and Engineering Co., at $205,160.

Edmonton, Alta.—Phalen & Shiley, contractors on the Grand Trunk Pacific main line, will build the branch line that is to tap the Brazeau coal fields south of the main line. The contract was sublet from Foley, Welsh & Stewart. The branch will run south from Edson and will tap the coal areas controlled by the Yellowhead Coal Company and the Pacific Pass Coal Company. The line is to be completed by the fall.

Vancouver, B.C.—Macdonell, Gzowski & Co. secured the contract for the construction of the first section of the Kettle Valley Railway, which will connect Vancouver with the Kootenays.

Vancouver, B.C.—For lining the Little Mountain reservoir, the Wells Construction Company received a contract at the following prices:

Reinforced Concrete Lining	$1.88	per sq. ft.
Plain " "	1.42	"
Rock surface " "	1.20	"
Inlet and outlet, etc.....	500.00	"

RAILWAYS—STEAM AND ELECTRIC.

Montreal, Que.—The Canadian Pacific Railway Telegraph Department will this summer string 2,400 miles of copper wires in the West. It will mean a copper wire from Montreal to Vancouver. It is also the intention to equip the entire Lake Superior section with telephones.

Guelph, Ont.—The first sod of the People's Railway was turned on Monday afternoon, July 4th, 5½ miles from Berlin. The heaviest grade is 1.47 per cent, near Berlin, and the only bridge is on the Grand River at Berlin. A. N. Warfield, C.E., is the vice-president and general manager, and B. J. Forrest is the chief engineer.

Toronto, Ont.—Arrangements are now in progress for the depression of the tracks on the G.T.R. from Bathurst street to Sunnyside crossing. The work, which will entail an expenditure of something like $500,000, will be commenced almost immediately. The proposal means that there will now be four tracks between Bathurst street and the freight yard at New Toronto.

Calgary, Alta.—Plans have been completed for the construction of a combined depot and hotel here for the Canadian Northern Railway.

Calgary, Alta.—The Street Railway Commissioners have passed estimates for a new branch that is expected to cost over half a million dollars. The extensions proposed include several large concrete and steel bridges.

Nanaimo, B.C.—Council is considering the proposition of the Dominion Stock & Bond Corporation in reference to the construction of a street railway here.

Point Grey, B.C.—The proposed forty-year contract between this municipality and the B.C. Electric Railway was read for the first and second time at the council meeting on July 2nd.

Vancouver, B.C.—Plans of the B. C. Electric Railway Company for new lines on Granville and Cambie streets have been passed by the Board of Works.

Vancouver, B.C.—Taylor & Harvey, of Vancouver, will apply to the legislature at the next session for a charter to build and operate an electric railway from Nanaimo to Wellington and Ladysmith.

Vancouver, B.C.—Plans have been completed for the new terminal building of the British Columbia Electric Railway Company. The structure, completed without furnishings, will represent an investment of about a quarter of a million. There will be ample room for the entrance of three tracks at the Hastings street front. The building on the west will parallel the C.P.R. tracks, and on the east will run along Carrall street. The building will have a steel frame and the bulk of the other material used will be reinforced concrete, faced with stone.

Vancouver, B.C.—A contract for the construction of the first section of the Kettle River Valley Railway, the road which will link Vancouver with the Kootenays, was awarded to the engineering and contracting firm of Macdonell Gzowski & Company of Vancouver. The work awarded covers that portion of the line lying between Merritt, a station on the Spences Bridge-Nicola Railway, and the headwaters of the Coldwater River, a distance of thirty miles. The Kettle River Valley Railway, which is in receipt of a subsidy from the Province of British Columbia of $5,000 a mile for 150 miles of its route, is under agreement to start construction on or before July 10. With the completion of the railway from Merritt to the headwaters of the Coldwater River the line will be practically on the divide between that stream and the Coquhalla River, which flows into the Fraser. From the headwaters of the Coldwater the railway route will swing eastward in the direction of Penticton and either the main line or a branch will reach the town of Princeton. From Penticton the railway will run to Midway. Ten miles northeast of the latter point the route will converge with that of the old Midway & Vernon Railway project and the Kettle Valley road will utilize the grade which the Midway & Vernon company built between Rock Creek and Midway.

Victoria, B.C.—Detailed plans of the line of the Canadian Northern Pacific Railway through the mainland of British Columbia from the lower Fraser terminals at Port Mann to a midway point on Moose Lake (beyond and eastward of Tete Jaune Cache) have been filed with the chief commissioner of lands, and formally accepted. The line is now authoritatively delineated insofar as the mainland sections are concerned with the exception of one short section

lying between the headwaters of the North Thompson and the McLennan River and such minor deviations as may hereafter be made will not vary from these filed plans by more than a mile at the maximum. The first section plan covers the location decided upon from mile o to mile 37, otherwise from Yale, south along the Fraser River to Chilliwack. The second section extends from Chilliwack to New Westminster bridge. From Kamloops the line follows the North Thompson 156 miles to its headwaters. The easterly section (yet to be connected by the awaited plan for the line from the North Thompson to McLennan River) extends from the headwaters of Canoe River northerly to about ten miles south of Tete Jaune Cache, at the junction of the McLennan with the Fraser, and there makes a sharp bend, following easterly. This section is 33.6 miles in length. In their entirety the plans filed cover upwards of 400 miles of construction, and only omit about thirty miles of the complete mainland line. On Vancouver Island two reconnaissance parties are now in the field, one on the northern shore of Cowichan Lake, and the other more southerly. It is expected that their reports will be made, and the route decided before mid-July. The letting of contracts will follow immediately.

LIGHT, HEAT AND POWER.

London, Ont.—According to a despatch from St. Thomas, a contract was let on Saturday for the laying of a twelve-inch gas main ninety miles long, from the wells in Raleigh Township to London and St. Thomas.

London, Ont.—Engineer Roberts estimates the construction of a transmission line to Springbank at $9,982.

Kingston, Ont.—The light and power committee of the council is considering an offer from the Seymour Power and Electric Company, Limited, of Campbellford, to supply the city with power at $25 per horse power. The company also asked permission to build and maintain a distributing system here.

Winnipeg, Man.—The Board of Control decided on Thursday to advertise for a business man to manage the sale of power. The new official will commence work on October 1st. Magnus Peterson, secretary, Board of Control

BY-LAWS AND FINANCE.

The following bonds were sold last week:

Outremont, Que.—$200,000.
Pelham Township, Ont.—$9.000.
Claresholm, Alta.—$15,000.
Indian Head, Sask.—$2,827.
Virden, Man.—$25,000, schools.
Thorah Township, Ont.—$5,000.

Sydney, N.S.—On July 20th the ratepayers will vote on a proposal to grant a bonus of $350,000, and a free site to a British firm that proposes the establishment of a shipbuilding yard here.

North Bay, Ont.—On July 25th, tenders will be opened by M. W. Flannery, treasurer of the town of North Bay, for $65,835 local improvement debentures

Ottawa, Ont.—Until September 2nd, debentures amounting to $257,707 are offered for sale by this municipality.

St. Catharines, Ont.—On July 29th, the ratepayers will vote on a by-law to authorize the Buffalo, Niagara and Toronto Railway Company to build new lines.

Brandon, Man.—A $25,000 fire hall by-law was passed, while the city hall by-law was defeated.

Shellmouth Municipality, Man.—On July 12th the ratepayers will vote on a by-law to raise $10,000 for roads and bridges. F. G. Richardson, secretary-treasurer, Asessippi.

Souris, Man.—A $200,000 by-law for the installation of waterworks and sewers was passed by the ratepayers.

Calgary, Alta.—On July 28th the ratepayers will vote on a by-law to raise $125,000 for the purpose of constructing, erecting and equipping a municipal electric power plant, and another of $61,000 for buildings on the exhibition grounds.

Cumberland, B.C.—The ratepayers defeated a $20,000 sewerage works by-law.

Point Grey, B.C.—Council passed by-laws to borrow $500,000 to install a waterworks system, $250,000 to construct a main sewer, $100,000 for parks, and $100,000 for the improvement of streets.

Revelstoke, B.C.—The $27,000 waterworks extension by-law was carried.

SEWERS, SEWAGE AND WATERWORKS.

Halifax, N.S.—At a cost of $5,687 the board of works will lay a new 12-inch water main on Oxford street.

Grand Falls, N.B.— A complete waterworks system will be installed here by Powers & Brewer, who have just been given the contract.

Berlin, Ont.—A centrifugal or turbine pump, a storage tank of 70,000 gallons capacity and 3,600 feet of 8-inch cast iron pipe are included in the engineer's estimate of new equipment required in connection with the sewage disposal scheme outlined for the northern portion of the town.

North Bay, Ont.—A special committee is considering a report on the question of water supply, prepared by the John Galt Engineering Company. Some new machinery is recommended.

Souris, Man.—The ratepayers carried a by-law to expend $200,000 on the construction of waterworks and a sewerage system.

Revelstoke, B.C.—Ratepayers have sanctioned the expenditure of $27,000 on waterworks extensions

Marysville N.B.—The town council is considering the installation of modern sewage disposal works. A. D. McPherson, town clerk.

MISCELLANEOUS.

St. John, N.B.—The International Waterways Commission will traverse the western tributaries of the St. John River between Fredericton and Van Buren, Maine, to study the question of storage dams.

Lachine, Que.—The Canadian Railway Signal Company, Limited, is erecting an extensive factory at the corner of Broadway and 20th Avenue. A substantial building of reinforced concrete will be put up, and with the plant it is expected over $100,000 will be invested.

Chatham, Ont.—The Knights of Columbus Hall County, will erect a $25,000 building here.

Collingwood, Ont.—Tenders recently received for paving were returned unopened, and the town engineer writes that new tenders will be invited shortly.

London, Ont.—The following figures relate to building operations in London during June, and the first six months of 1910 and 1909:—

June 1910—Number Permits issued 66; Value $38,586.00
June 1909—Number Permits issued 117; Value ..127,639.00
6 months, 1910—Total value of Permits, 457 ....452,466.50
6 months, 1909—Total value of Permits, 410 ....557,789.00

Niagara Falls, Ont.—Council decided to purchase a street sweeper.

Ottawa, Ont.—The Grand Trunk Pacific Railway has fyled plans and made application for a dry dock subsidy. The company proposes to put in an immense floating dock at Prince Rupert. It will cost a million and a half and have a lifting capacity of 20,000 tons. It will be a commercial dock of the second-class and be entitled to a subsidy of 3½ per cent. for twenty-five years.

The Marine department has made arrangements to immediately establish a marine depot at Prince Rupert at an initial expenditure of a hundred thousand dollars for ship repairs and a depot for light and buoy service.

St. Thomas, Ont.—Engineer Bell was instructed to prepare plans and specifications for a pure water reservoir with a capacity of 800,000 gallons, to be completed and in use before the end of the year.

Portage la Prairie, Man.—The rural council, at a recent meeting, set aside $17,000 for roads and bridges.

Winnipeg, Man.—Building figures for the first six months of this year show a return of $9,825,500, or an increase of $2,777,250 over the highest previous record for the same period of any year. The former record was established dur-

ing 1906, and while this year eclipses it in total valuation, 1906 still holds first place in the number of permits issued and in the number of buildings erected.

A detailed comparative statement of building operations for several years is appended and substantiates the belief that the permits for the year will total more than fifteen millions.

Comparative Figures

Period.	Permits.	Buildings.	Cost.
June, 1906	416	501	$1,436,450
June, 1907	337	412	1,110,600
June, 1908	196	229	802,200
June, 1909	418	490	2,042,850
June, 1910	373	461	2,406,600
Six months—			
1906	1,835	2,251	$7,058,150
1907	1,606	2,251	4,443,850
1908	714	807	2,238,250
1909	1,305	1,545	5,468,850
1910	1,789	2,201	9,835,500

Saskatoon, Sask.—Plans are being prepared for a $70,000 addition to the store of J. F. Cairns. Brown & Brown, of Montreal, are the architects.

Vancouver, B.C.—The Waterworks department will purchase an auto truck to cost $1,000.

Victoria, B.C.—The streets committee of the city council has decided to purchase fifteen one-inch and five hundred five-eighths-inch Trident meters at a cost of $2,390 for the waterworks department.

St. Thomas, Ont.—N. R. Darrach has completed plans for the extension to the Norsworthy Company's foundry. The addition will be 104 feet by 57 feet.

Victoria, B.C.—All records for building activity were eclipsed during the first half of 1910 in Victoria. The figures compare as follows:—

Month.	1910.	1909.	1908.
January	$128,985	$ 78,080	$ 54,275
February	151,760	122,630	72,325
March	244,760	121,640	110,800
April	192,440	188,060	129,625
May	257,290	188,620	79,295
June	312,600	90,120	74,010
*Total	$1,287,835	$789,200	$520,780

*Six months' total.

CURRENT NEWS.

Montreal, Que.—A report of the Building Inspector for the past six months, shows the amount expended on new structures is as follows: January, $136,560; February, $235,800; March, $587,239; April, $1,647,205; May, $1,580,615; June, $143,902. The total amount invested was almost half a million dollars above the amount invested for the corresponding half of last year, when a marked increase in this investment was noted.

Montreal, Que.—The Phoenix Bridge Company has appealed to the Court of King's Bench from the verdict recently rendered by a jury by which they were condemned to pay a victim of the Quebec Bridge accident named Haley $20,000.

Ottawa, Ont.—Plans for two large drydocks have been approved by the Government. One is to be built at Sault Ste. Marie, and the other at Vancouver. The Sault dock is to be seven hundred feet long and cost nine hundred thousand dollars. It will accommodate the largest craft on the great lakes, a number of which are over six hundred feet long.

The Vancouver dock is to be one of the second-class, floating dock, with a lifting capacity of fifteen thousand tons, and is, therefore, capable of handling the largest craft sailing to Canada at the present time. The company contemplate the operation of a car construction plant in conjunction with its drydock and shipbuilding and repairing industry. The car works will involve an additional outlay of half a million dollars. There will be no subsidy on this.

PERSONAL.

Readers are invited to forward notes of staff changes and new appointments for publication in this column.

Mr. Herbert Johnston, A. M. Can. Soc. C. E., has been appointed engineer of Berlin, Ontario. Mr. Johnston is a graduate of the Faculty of Applied Science of Toronto University.

Dr. Charles Sheard has been re-appointed Medical Health Officer of Toronto and has decided to continue in office.

Mr. W. Chase Thomson, M. Can. Soc. C. E., assistant engineer of the Dominion Bridge Company, Montreal, resigned his position at the end of June and has assumed charge of the Canadian office of the Cleveland Bridge and Engineering Company, Limited, of Darlington, England. His office is in the Canadian Express Building, Montreal.

Mr. K. A. Mackenzie, B.A.Sc., formerly managing editor of "Applied Science" left this week for Great Britain. Mr. Mackenzie will spend several weeks in the industrial centres in the interest of The Canadian Engineer.

Mr. W. R. Reynolds, of St. Marys, for upwards of three years manager of the electric plant and waterworks of that town, has been appointed manager of Ingersoll's municipal electric plant.

Mr. R. C. Desrochers, who has been assistant secretary in the Department of Public Works at Ottawa, will most probably succeed the late Mr. Napoleon Tessier as secretary.

Mr. Robt. E. Carter informs us that he has disposed of his interest in the Hamilton Brick Company, and has resigned the office of president.

The Keuffel & Esser Company, of Hoboken, N.J., have opened a repair department in connection with their office at 252 Notre Dame Street West, Montreal, Que.

Mr. A. J. McPherson, B.A. Sc., who has lately been appointed city commissioner for Regina, Sask., graduated with honors in the faculty of Applied Science, University of Toronto, in 1894. From 1894 to 1899 he was superintendent of waterworks and town engineer of Galt, Ont., later he was in partnership with Mr. Willis Chipman, as consulting engineer, having a branch office at Brockville, Ont., and from 1901 to 1904 was territorial engineer for the Yukon District.

In 1905 he was locating and constructing engineer on the Klondyke Mines Railway, and from 1905 to 1910 was assistant chief engineer and superintendent of highways, Department of Public Works, Government of Saskatchewan.

Early in 1910 he was appointed consulting engineer for the city of Regina, and in June last, was appointed city commissioner. Mr. McPherson is an associate member of the Canadian Society of Civil Engineers and took an active part in the organization of the Saskatchewan Land Surveyors' Association.

The council of the University of Manitoba has made the following appointments:—

Baldur Olson, B.A., to be demonstrator in chemistry.

Rober C. Wallace, M.A. (Edin.), B.Sc. (Edin.), Ph.D. (Gottingen), to be lecturer in geology.

Lloyd A. H. Warren, M.A. (Queen's), to be lecturer in mathematics.

Lesli I. Johnstone (University of Maine), to be lecturer in surveying and geodesy.

Leslie R. Thomson, B.A. Sc. (Toronto), to be lecturer in drawing.

Geo. Halstead, B.Sc. (Manchester), to be lecturer in materials and hydraulics.

John W. Dorsey, R.E. (Lehigh), to be lecturer in electrical engineering.

OBITUARY.

Mr. Cecil Goddard, chief engineer of the Alberta and Great Waterways Railway, died recently in Winnipeg.

Select List of Engineering Books

SANITARY SCIENCE.

Principles of Sewage Treatment.—By Prof. Dr. Dunbar, Director of the Hamburg State Hygienic Institute. Translated by H. T. Calvert, M.Sc., Ph.D., F.I.C. 271 pages, 147 illustrations, 6 x 9, cloth, $4.50.

Moore's Standard Treatise on Sanitary Engineering.—Revised by E. J. Silcock, M. Inst. C.E. 950 pages, 160 tables, 920 illustrations, $12.00.

Sewerage.—By A. Prescott Folwell, editor "Municipal Journal and Engineer." Deals with design, construction and maintenance of sewerage systems. Fifth edition, revised and enlarged, 6 x 9, 469 pages, illustrated, cloth, $3.00.

Sewage Disposal in the United States.—By Geo. W. Rafter, M. Am. Soc. C.E., and M. N. Baker. Third edition, 625 pages, 4to., illustrated, $6.00.

The Filtration of Public Water Supplies.—By Allen Hazen. Third edition, revised and enlarged, 8vo., xii. + 321 pages, fully illustrated with line and half-tone cuts, cloth, $3.00.

Disposal of Municipal Refuse.—By H. de B. Parsons. 8vo., x. + 186 pages, 73 figures, mostly half-tones, cloth, $2.00.

Sewer Design.—By H. N. Ogden, C.E., Assistant Professor of Civil Engineering, Cornell University. 12mo., xi. + 234 pages, 54 figures, five plates, cloth, $2.00.

British Sewage Works.—By M. N. Baker. Cloth, 6 x 9, 150 pages, $2.00.

Sewage Disposal Works.—By H. P. Raikes. Cloth, 6 x 9, 414 + xv. pages, 72 illustrations, $4.00.

Water Supply Engineering.—The Design, Construction, and Maintenance of Water-supply Systems, both City and Irrigation. By A. Prescott Folwell, Second edition, revised and enlarged, 8vo., xiv. + 570 pages, illustrated with 95 figures and 19 full-page plates, cloth, $4.00.

Waterworks for Small Cities and Towns.—By John Goodell, 281 pages, 6 x 9, 53 illustrations, $2.00

Some Details of Waterworks Construction.— By W. R. Billings, 96 pages, 6 x 9, 28 illustrations, $2.00.

RAILWAY ENGINEERING.

Manual for Resident Engineers Containing General Information on Construction.—By F. A. Molitor and E. J. Beard. 16mo., iv. + 118 pages, cloth, $1.00.

Surveying Manual.—By Profs. W. D. Pence and Milo S. Ketchum. Flexible leather, 4½ x 6½, 252 pages, illustrated, $2.00.

Surveyor's Handbook.—By T. U. Taylor, Professor of Civil Engineering, University of Texas. An invaluable pocketbook for the field or office. Flexible leather, gilt edges, 4½ x 7, illustrated, 328 pages, $2.00.

Economics of Railway Operation.—By M. L. Byers. Buckram, 6 x 9, 672 pages, many illustrations. Diagrams and forms showing standard and most recent practice, $5.00.

Field Practice of Railway Location.—By Willard Beahan. Cloth, 6 x 9, 260 pages, 43 illustrations and 7 folding plates, $3.00.

Railway Track and Track Work.—By E. E. R. Tratman. Cloth, 6 x 9, 520 pages, 232 illustrations, 44 tables and an Appendix of Statistics of Standard Track Construction on American Railways. Third edition, revised and enlarged, $3.50.

Railway Transition Spiral.—By Prof. A. N. Talbot. Flexible leather, 4 x 6¾, 110 pages; fifth edition, revised, $1.50.

Railroad Curve Tables.—By R. S. Henderson. Cloth, 5 x 7, 69 pages, 10 diagrams, $1.00.

Earthwork and Its Cost.—By H. P. Gillette. Cloth, 5 x 7½, 256 pages, illustrated, $2.00.

Earthwork Tables.—By R. S. Henderson. Heavy paper, oblong, 32 pages, $1.00.

Field Manual for Railroad Engineers.—By Prof. J. C. Nagle. 2nd edition. 403 pages, 99 figures, Morocco, $3.00.

Railroad Structures and Estimates.—By J. W. Orrock. 270 pages, 93 figures, cloth, $3.00.

Field Engineering.—By Wm. H. Searles, 503 pages, Morocco, $3.00.

STRUCTURAL ENGINEERING.

Types and Details of Bridge Construction.—By Frank W. Skinner, C.E. A manual of bridge design in three volumes. Vol. I.—Arch spans, 301 pages, 6 x 9, 300 diagrams and illustrations. Vol. II.—Plate Girders. 424 pages, 6 x 9, over 300 diagrams and illustrations, $4.00. Vol. III.—Specifications and Standards for Short Railroad Spans. 307 pages, 6 x 9, 142 illustrations, 42 tables, $3.00.

Godfrey's Tables for Structural Engineers.—Flexible leather, 4 x 6½, 218 pages, $2.50.

Corrosion of Iron and Steel.—A brief treatise on the decay of iron and steel. By Alfred Sang. 130 pages, 5 x 8, $1.00.

Corrosion and Preservation of Iron and Steel.—By Allerton S. Cushman, A.M., Ph.D., Assistant Director and Chemist in Charge of Physical and Chemical Investigation, Office of Public Roads, United States Department of Agriculture, and Henry A. Gardner, Director, Scientific Section, Paint Manufacturers' Association of the United States. 375 pages, 6 x 9, illustrated, $4.00 (17s.) net, postpaid. This publication was reviewed in The Canadian Engineer for May 20th, 1910, on page 510. It is the first authoritative treatise on a most serious problem in all branches of engineering. The causes and theories of corrosion are fully covered, and special emphasis is laid on protective coatings, inhibitive pigments, etc., for all classes of iron and steel work. The authors are respectively the leading authorities in their special fields. The main chapter headings are: I.—The Corrosion and Preservation of Iron and Steel. II.—Theory of Solution. III.—The Theory of Corrosion. IV.—Application of Electrolytic Theory. V.—The Inhibition and Stimulation of Corrosion. VI.—The Technical Protection of Iron and Steel. VII.—Relation of Pigments to the Corrosion of Iron. VIII.—Recent Field Tests on Protective Coatings for Iron and Steel. IX.—Paints for Various Purposes. X.—The Testing and Design of Protective Paints. XI.—Properties of Pigments. XII.—The Properties of Paint Vehicles.

De Pontibus.—By J. A. L. Waddell. A pocket-book for bridge engineers. 403 pages, Morocco, $2.00.

ROADS AND PAVEMENTS.

Economics of Road Construction.—By H. P. Gillette. Cloth, 6 x 9, 40 pages, illustrated, second edition, enlarged, $1.00.

City Roads and Pavements.—By Wm. Pierson Judson. Cloth, 6 x 9, 197 pages, 69 illustrations, fourth edition, revised (1909), $2.00.

Highway Construction.—A treatise on Highway Construction. By A. T. Byrne, C.E. Fifth revised and enlarged edition, 8vo., xliii. + 1,040 pages, upwards of 300 illustrations, cloth, $5.00.

A Treatise on Roads and Pavements.—By Ira Osborn Baker, C.E., 8vo., viii. + 655 pages, 171 figures, 68 tables, cloth, $5.00.

Text-Book on Roads and Pavements.—By Frederick B. Spaulding. 3rd edition, 340 pages, cloth $2.00.

MISCELLANEOUS.

Treatise on Masonry Construction.—By Ira Osborn Baker, B.S., C.E., D. Eng., Prof. of Civ. Eng., University of Illinois. 10th edition, re-written and enlarged. 746 pages, over 100 tables and 244 illustrations, Cloth, $5.00.

Book Dept., Canadian Engineer, Toronto, Ont.

RAILWAY ORDERS.

(Continued from page 52).

10999—June 27—Amending Order No. 9977, dated March 23rd, 1910, made upon the application of the Alberta Central Railway Company, approving of the location of its railway from the town of Red Deer, Alta., by cancelling the approval of the line of railway of the said Railway Company from Red Deer to the west side of Section 8, Township 28, Range 27, west 4th Meridian.

11000—June 27—Approving location of the Alberta Central Railway Company's line of railway from mile 2, on the northern boundary of Section 3, Township 38, Range 27, west 4th Meridian, to mile 20.

11001—June 27—Authorizing the C.P.R. to construct an additional track across the road allowance at the east boundary of Section 33, Township 9, Range 25, west Principal Meridian, at Routledge, Man.

11002 to 11013 Inc.—June 25—Authorizing the Atlantic, Quebec & Western Railway Company to construct its railway across the Concession Road at mile 45¾, crossing No. 8; across the King's high road at mile 44⅛, crossing No. 6; across the King's high road at mile 46½, crossing No. 9; across the Concession Road at mile 44½, crossing No 7; across the Concession Road at mile 48¼, crossing No. 12; across the road at the east end of the Grand Pabos Bar, crossing No. 1, across the King's high road at mile 47¾, crossing No. 11; across the side road at mile 47½, crossing No. 10; across the branch road to the sea-shore at mile 43½, crossing No. 5; across road at east end of the Grand Pabos Bar, crossing No. 4; across road at east end of the Grand Pabos Bar, crossing No. 3; across the road at the east end of the Grand Pabos Bar, crossing No. 2, in the municipality of Pabos, County Gaspe, Quebec.

11014—June 27—Approving a certain Form of Permit allowing the use on the Michigan Central of a railway bicycle.

11015—June 28—Granting leave to Commissioners of the Transcontinental Railway to cross the railway line and tracks of the C.P.R. (Emerson Branch), by an overhead crossing of the main line of the National Transcontinental Railway at St. Boniface, Man.

11016—June 27—11017—June 28—11018—June 28—Temporarily approving, pending the final determination of the Board of the tariffs of tolls which the Bell Telephone Company shall be authorized to charge, and the form of agreement with other companies to be approved by the Board, the agreement of the C.N.Q.R. dated the 13th June, 1910; the People's Telegraph and Telephone Company, dated 8th June, 1910, and the Wolford Rural Telephone Company, dated the 17th May, 1910, entered into with the Bell Telephone Company; providing that these Orders be not taken to authorize the Bell Telephone Company to charge any higher toll or tolls than it was immediately previous to the 13th May, 1906, authorized by law to charge.

11019—June 27—Relieving the C.P.R. from providing further protection at the crossing of the highway between Lots 19 and 20, Township of Brandford, County Oxford, Ont.

11020—June 28—Approving location of the C.N.R. Company's line of railway through Townships 26-23, Range 24, west 4th Meridian, west 5th Meridian, Alberta, mile 212.83 to 257.32, reckoned from junction line at Vegreville.

11021—June 28—Approving location of the James Bay and Eastern Railway Company's line of railway northwards from Roberval, through Townships of Roberval, Ouiatchouan, Ashuapmouchouan, Demeules, and Dufferin, County Lake St. John.

11022—June 29—Extending, for a period of two months from the date of this Order, the time within which the gates at the crossing of Louis Street, Farnham, by the C.P.R., were required by Order No. 10450, dated April 28th, 1910, to be erected.

11023—June 28—Authorizing the C.N.O.R. to construct a siding across the Concession Road at Sudbury Junction, between Concessions 4 and 5, Township Neelon, District of Nipissing, Ont.

11024—June 28—Authorizing the C.N.O.R. to construct a bridge over Goforth's Creek, and to construct its lines and tracks across the public road, mile 214.28, from Ottawa.

11025—June 28—Authorizing the corporation of the city of Toronto to lay a water pipe at Davenport Road, West Toronto, under the track of the Northern Division of the G.T.R.

11026—June 20—Directing that the M.C.R. divert Medora and Thomas Streets, and combine the two crossings in one, west of Essex Station.

11027—June 29—Approving plans showing proposed interlocking signals and switches to be installed by the G.T.R. at Alford Junction, Ontario.

11028—June 29—Approving plans of the C.P.R. Bridge over Kaministiquia River, Fort William.

11029—June 29—Rescinding Order No. 8110, dated September 14th, 1909,—authorizing the Vancouver Power Company to cross with its tracks the tracks of the New Westminster & Southern Railway Company, and providing for the installation of a full interlocking plant at said crossing, by directing that the said crossing be protected by a double-armed semaphore operated by the trainmen making the crossing.

11030—June 29—Authorizing the C.P.R. to operate a branch line of railway across the road allowance, and on the premises of Joel Bardsley, north-east quarter of Section 4, Township 2, Range 7, west 2nd Meridian, at Shand.

11031-33—June 29—Authorizing the Saskatchewan Government Telephones to erect wires across the C.P.R. tracks at three different points in Saskatchewan.

11034—June 29—Authorizing the Hydro-Electric Power Commission of Ontario to erect transmission line across the wires of the G.N.W. Telegraph Company at Lot 120, Township Thorold, County Welland, Ont.

11035—June 28—Authorizing the corporation of the city of Lachine to lay a 12-inch cast-iron pipe under the tracks and lands of the G.T.R., Lachine Wharf Branch, where the same crosses Notre Dame Street, Lachine.

11036—June 29—Authorizing the city of Toronto to lay a water pipe under the track of the G.T.R. at St. Clair Avenue, West Toronto, Ontario.

11037—June 30—Granting leave to the Montreal Rolling Mills Company to erect an automatic coal handling railway over the Lachine Canal Bank Branch of the G.T.R., on St. Ambroise Street, St. Henri, Quebec.

11038—June 2—Authorizing the Lincoln Paper Mills Company to lay a 12-inch water main under the track of the Niagara, St. Catharines and Toronto Railway Company in Merritton, County of Lincoln, being part of Lot No. 11, 10th Concession, Township of Grantham.

11039—June 21—Rescinding Order No. 10798, dated June 7th, 1910, which authorizes a diversion of the crossing by the tracks of the M.C.R. at Fletcher Station.

11040—June 29—Authorizing the C.P.R. to construct a subway under its line of railway where the same crosses Cornelia Street, Smith's Falls; and an overhead bridge over its line of railway where the same crosses George Street, Smith's Falls.

11041—June 27—Directing that all railway companies subject to the legislative authority of the Parliament of Canada file with the Board not later than August 15th, 1910, supplements to their Official Distance Tables, issued in compliance with Order No. 5954, of December 21st, 1908, showing:—(A) The names of the points at which freight traffic may be interchanged with the lines of connecting railway companies. (B) The names of the companies with which freight may be interchanged at such points. (C) Whether the freight traffic which may be so interchanged consists of C. L., or L. C. L., or both. (D) Whether the interchange is by switch connection or by cartage.

11042—June 23—Authorizing the Lachine, Jacques Cartier and Maisonneuve Railway to cross with its tracks the tracks of the Montreal Park & Island Railway Company at Bagg Avenue, Parish of Sault aux Recollets.

11043—June 24—Authorizing the municipality of Matsqui, to construct the highway known as the Aish and Creamer Road across the Mission Branch of the C.P.R. at Matsqui, B.C.

11044—July 2—Authorizing the C.P.R. to construct an industrial spur for the Nichols Chemical Company, Limited, Lot 23, Concession 11, Township of Hungerford, County Hastings, Ont.

11045—July 5—Relieving the G.N.R. from providing further protection at the crossing of Government Avenue at Weston, B.C.

11046—June 30—Authorizing the C.N.R. to construct its line of railway across the public road between the Townships of Hope and Hamilton.

11047—June 30—Authorizing the C.N.R. to close and divert the public road running through Lot 20, Concession B, Township Murray, County of Northumberland, Ontario.

11048—July 5—Authorizing the C.P.R. to use and operate 21 bridges on its line of railway.

11049—June 24—Dismissing application of the municipal corporation of the village of Montmorency, County Quebec, Quebec, for an Order directing the Q. R. L. & Power Company to provide and construct public highway crossings across its railway in the village of Montmorency.

11050—June 23—Dismissing application of the Board of Trade of Three Rivers, Quebec, alleging excessive freight rates and defective service of the G.T.R. between Three Rivers and St. Colestin.

11051—June 23—Dismissing application of the municipality of the Parish of St. Valere de Bulstrode, County Arthabasca, Quebec, for an Order directing the G.T.R. to reconstruct and maintain its part of the bridge over the River Noir (Black River), at St. Valere de Bulstrode, Quebec.

11052—June 5—Approving the plans and specifications showing the Appleford Drain as proposed to be constructed under the railway of the Pere Marquette Road Co., Township of Harwich.

11053-54—June 30—Approving the location of the C.P.R. Company's station buildings at Ruskin and Chase, B.C.

11053—June 30—Authorizing the C.P.R. to construct an additional track across the road allowance on the east boundary of the south-east quarter of Section 8, Township 8, Range 4, west 5th Meridian, at Coleman, Alta.

11056-59 Inc.—June 30—Authorizing the C.P.R. to construct an additional siding across the road allowance between Sections 3 and 4, Township 10, Range 22, west of Principal Meridian; an additional track across the road allowance between Sections 17 and 18, Township 10, Range 21, west of Principal Meridian, and also across Dundee Street, Alexander; an additional siding across road allowance between Sections 14 and 15, Township 11, Range 27, near Hargrave Station; and an additional siding across the road allowance between Sections 31 and 32, Township 15, Range 1, west 2nd Meridian, near Burrows Station, Manitoba.

11060—July 5—Authorizing the C.P.R. to construct an industrial spur to the premises of the Woodhall Metal Company, Limited, Calgary.

11061—July 5—Authorizing the C.P.R. to construct an industrial spur to the premises of the McClary Manufacturing Company, Calgary.

11062-3—July 5—Authorizing the G.T.R. to construct a branch line of railway to the premises of the Ontario Asphalt Company, Walkerville, and also to the premises of Mr. Charles Kreutziger, Waterloo, Ontario.

11064—July 5—Authorizing the G.T.R. to construct a branch line of railway from Toronto to North Bay, 820 feet distant from mile-post 37 to a point on the canal lands north of the side road running west from the public road between Concessions 1 and 2, of the Township of East Gwillimburg.

11065—June 29—Authorizing the Hydro-Electric Power Commission of Ontario to erect transmission line across the wires of the G. N. W. Telegraph Company at Lot 55, Concession 1, Township of Ancaster.

11066-7—July 5—Authorizing the Queen City Oil Company to lay a two-inch wrought iron pipe for the conveyance of gas, etc., across the right-of-way lands and track of the G.T.R. a short distance north-east of North Street, Kingston; and across the right of land and under the track of the Kingston and Pembroke Railway Company, Kingston.

11068—July 5—Recommending to the Governor-General-in-Council for sanction an agreement of sale entered into between the Royal Trust Company and the Quebec Oriental Railway Company, dated the 19th May, 1910.

11069—June 24—Dismissing application of the city of Quebec, for an Order directing the Q. R. L. and P. Company to cross the main line of the C.P.R. at Lesage Avenue.

11070—June 23—Dismissing application of the city of Three Rivers, Quebec, regarding condition of Plaisance Street Crossing, over the C.P.R., in Three Rivers, Que.

11071—June 24—Adding the Bell Telephone Company as a party to the St. Maurice & Champlain Telephone Company for an Order directing the Portneuf Telephone Company to comply with the terms of an agreement entered into between the two companies.

11072—July 5—Extending, until the 15th of September, 1910, the time within which the C.P.R. was required by Order No. 8992, dated December 7th, 1909, to complete certain work at the crossings of the highways by its railway in the Township of Artemesia, County Grey, Ont.

11073—July 5—Approving By-law No. 102, of the W. E. & L. S. R. R. Company, authorizing Albert Eastman, general manager of the said company, to prepare and issue tariffs of tolls to be charged by the applicant company for all traffic carried by the company upon its railway.

11074—July 5—Approving location of the G.T.P. Railway Company's Melville-Regina Branch from Section 5, Township 18, Range 19, west 2nd Meridian, District of Assiniboia, Sask., mile 33 to mile 91.24.

11075—July 5—Approving location of the C.P.R. Company's station building from Lanoraie to Joliette Junction, on the Quebec Section of said railway, County Joliette, Quebec.

11076—July 5—Authorizing the C.P.R. to construct its railway under the wires of the Bell Telephone Company where the railway crosses the road allowance between Concessions 2 and 3, Lots 6 and 7, Township Etobicoke, County York, Ontario.

11077-8—July 5—Authorizing the Hydro-Electric Power Commission of Ontario to erect its transmission line across the wires of the Bell Telephone Company at two different points in Ontario.

11079—July 6—Authorizing the city of Winnipeg to erect a conduit under the track of the C.P.R. Company on King Street, Winnipeg.

11080—July 8—Authorizing the corporation of the city of Ottawa to lay a 12-inch tile pipe sewer under the track of the C.P.R. Company on Beech Street, between Preston Street and Champagne Avenue, Ottawa.

11081—July 5—Authorizing the C.P.R. to construct an industrial spur to the premises of the Calgary Paving Company, Limited, Calgary, Alberta.

11082—July 6—Directing the M.C.R. to divert the crossing between Concession 6 and 7, along the north side of the railroad to the Town Line Road between Townships Tilbury East and Raleigh.

11083—July 6—Amending Order No. 10819, dated June 6th, 1910, by substituting for the words "Village of Mornington, in the Township of Perth," in the third and fourth lines of the recital of the said Order, the words "Village of Millbank, in the County of Perth."

11084—July 5—Relieving the Toronto, Hamilton and Buffalo Railway Company from providing further protection at the crossing of the Canboro Road,—2nd highway west of Fenwick Station, Ont.

11085—July 4—Requiring the C.N.R. to carry out the terms of Order No. 9293, dated January 17th, 1910, made upon the complaint of the rural municipality of Stuartburn, Man., within two months from the date of this Order, and in the event of its failure to do so, it shall be liable to a penalty of $25 per day for every day after the said two months have expired that the work remains uncompleted.

11086—June 23—Directing that the G.T.R., upon the complaint of the Board of Trade of Three Rivers, Quebec, provide a suitable and proper station for freight and passenger traffic, with an agent at Three Rivers, Quebec, and furnish an improved train service between Doucet's Landing and Victoriaville.

11087—July 6—Authorizing the Atlantic, Quebec and Western Railway Company to open for the carriage of traffic that portion of its railway between mileage 20¼ and 35, between Port Daniel and Grand Pabos.

11088—June 30—Authorizing the C.N.O.R. to cross by means of an overhead structure the public road between Lots 20 and 21, Concession 1, Township of Cramahe, County of Northumberland, at Station 935.13.

THE TECHNICAL EDUCATION COMMISSION.

The itinerary of the Technical Education Commission has been completed. The first sitting will be held at Halifax on July 18, 19 and 20, and others as follows:—Lunenburg, July 22; Liverpool and Yarmouth, 23; Digby, 25; Middleton, 26; Kentville and Wolfville, 27; Windsor, 28; Truro, 29; Sydney and district, August 1, 2 and 3; New Glasgow, 5; Pictou, 6; Charlottetown, 7 and 8; Summerside, 10; Amherst, 12; Shediac, 14; Moncton, 15 and 16; Sussex and Hampton, 17; St. John, 18 and 19; Fredericton, 22; and Woodstock, 24.

The commission then will go to the Toronto exhibition.

The Quebec and Ontario dates are: Quebec, September 13th to 15th; Three Rivers, 16th; Sorel, 17th; St. Hyacinthe, 18th; Sherbrooke, 20th; Montreal and Valleyfield, September 21st to 28th; Ottawa and Hull, September 29th to October 3rd; Lachute, October 4th; Smith's Falls, October 5th; Cornwall, October 6th; Brockville, October 7th; Kingston, October 11th; Belleville, October 12th; Peterborough, October 13th and 14th; Toronto, 17th to 20th; Barrie and Orillia, 21st; Hamilton, 24th to 26th; St. Catharines, 27th; Niagara Falls, 28th; Brantford and Paris, October 31st to November 1st; Galt, November 2nd; Berlin and Waterloo, 3rd and 4th; Guelph, 5th and 7th; Stratford, 8th; Woodstock, 9th; London, 10th and 11th; St. Thomas, 14th; Chatham, 15th; Windsor and Wakerville, 16th.

The commission will then go west and stay there till the end of January. On the way back St. Louis, Chicago and Milwaukee will be visited. The commission early in February will go to the Eastern States and then sail for Europe.

MARKET CONDITIONS.

Montreal, July 13th.

Dullness is still the predominating feature of the pig-iron markets in the United States. The northern producers, however, are showing a disposition to resist further declines in price, and are refusing orders because of a difference of 15c. per ton. Just the same it would seem that most orders have been placed at minimum prices. In the south, a slightly easier tone was noticed, although for late deliveries producers are still holding out for a minimum of $11.50 for No. 2 Birmingham. At water points, iron is available at the lowest prices yet reached, although sellers do not seem to be quite so anxious, having no doubt disposed of most of the supplies which they were prepared to dispose of at a sacrifice. Since the first of July there has been further blowing out of blast furnaces, especially of steel companies, and it is thought that the total production is now at a rate of 29,000,000 tons annually. A further curtailment of merchant furnaces seems highly probable, as stocks on furnace banks have increased slightly, although the rate of production has been cut down between four million and five million tons per year from the high point.

While consumption of steel remains about steady, production has gone ahead very rapidly, so that there has been competition between mills. Blowing out of blast furnaces is accordingly the order of the day, and the cutting down of output of both semi-finished and finished material is in progress. It looks as though this condition of affairs would continue until the fall when the demand will again overtake the production. There is competition for orders, and finished material is being shaded $1 to $4 per ton. The output of crude steel as well as pig-iron has been cut down recently at the rate of over 3,600 tons per day. It may be curtailed still further. Reports as to the production of pig-iron during June in the United States shows a falling off.

In Great Britain, there has been practically no change during the past two or three months. The past week has witnessed nothing new; very little export demand is being experienced, although a fair quantity is going out. Home consumption is moderate.

Trade in Canada is quiet, although dealers are not complaining. Canadian furnaces seem to be operating steadily on contracts, and prices show very little alteration. The situation here is just about as it has been for some time past. There is no real activity in buying at the moment, and the trade is waiting more or less upon the conditions on the other side of the border.

The market holds steady at recent prices:—

Antimony.—The market is steady at 8c. to 8¼c.

Bar Iron and Steel.—The market holds dull and steady. Bar iron, $1.90 per 100 pounds; best refined horseshoe, $2.15; forged iron, $2.05; mild steel, $1.90; sleigh shoe steel, $1.90 for 1 x ⅜-base; tire steel, $2.00 for 1 x ⅜-base; toe calk steel, $2.40; machine steel, iron finish, $1.95; imported, $2.20

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 year will be the largest in the history of the country. Prices on foreign fibre, 55c. per roll; dry fibre, 45c. (See Roofing; also Tar and Pitch). (164).

Cement.—Canadian cement is quotable, as follows, in car lots, f.o.b.,

Montreal:—$1.30 to $1.40 per 350-lb. bbl., in 4 cotton bags, adding 10c. for each bag. Good bags re-purchased at 10c. each. Paper bags cost 2½ cents extra, or 10c. per bbl. weight.

Chain.—The market is unchanged, being now per 100 lbs., as follows:—¼-in., $5.30; 5-16-in., $4.70; ⅜-in., $3.90; 7-16-in., $3.65; ½-in., $3.55; 9-16-in., $3.45; ⅝-in., $3.40; ¾-in., $3.35; ⅞-in., $3.35; 1-in., $3.35.

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 13¾ to 14c.

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

Galvanized Iron.—The market is steady. Prices, basis, 28-gauge, are:—Queen's Head, $4.10; Colborne Crown, $3.85; Apollo, 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.

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

Iron.—The market is steady and prices unchanged. Following are the prices, on cars, ex-wharf, Montreal:—No. 1 Summerlee, $20.50 to $20.75 per ton; selected Summerlee, $20 to $20.25; soft Summerlee, $19.50 to $19.75; Carron, special, $20 to $20.50; soft, $19.50 to $20; Clarence, $17.25 to $17.50; Cleveland, $17.25 to $17.50 per ton.

Laths.—See Lumber, etc.

Lead.—Prices are easier, at $3.35 to $3.45.

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 1c. 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.

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

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

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

Pipe.—Wrought and Galvanized.—Demand is about the same, and the tone is firm, though prices are steady, moderate-sized lots being: ¼-inch, $5.50 with 63 per cent. off for black, and 48 per cent. off for galvanized; ⅜-inch, $5.50, with 50 per cent. off for black and 44 per cent. off for galvanized; ½-inch, $8.50, with 60 per cent. off for black, and 50 per cent. off for galvanized. The discount on the following is 71½ per cent. off for black, and 61¼ 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 ¼, and $2.10 for ¼ and thicker; 12-gauge being $2.30; 14-gauge, $2.15; and 16-gauge, $2.10.

Rails.—Quotations on steel rails are necessarily only approximate and depend upon specification, quantity and delivery required. A range of rails, per gross ton of 2,240 lbs., f.o.b. mill. Re-laying rails are quoted at $27 to $29 per ton, according to condition of rail and location.

Railway Ties.—See lumber, etc.

Roofing.—Ready roofing, two-ply, 70c. per roll; three-ply, 05c. per roll of 100 square feet. Roofing tin caps, 6c. lb.; wire roofing nails, 5c. lb (See Building Paper; Tar and Pitch; Nails, Roofing)

Rope.—Prices are steady, at 9c. per lb. for sisal, and 10¼c. for Manila. Wire rope, crucible steel, six-strands, nineteen wires: ¼-in., $2.75; 5-16 $3.75; ⅜, $4.75; ½, $5.25; ⅝, $6.25; ¾, $8; ⅞, $10; 1-in., $12 per 100 feet

Spikes.—Railway spikes are steady, at $2.45 per 100 pounds, base of 5⅝ x 9-16. Ship spikes are steady at $2.85 per 100 pounds, base of ⅝ x 10 inch, and ⅝ x 12-inch.

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

Telegraph Poles.—See lumber, etc.

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

Tin.—Prices are firm, at $34 to $34.50.

Zinc.—The tone is easy, at 5¾ to 6c.

CAMP SUPPLIES.

Beans.—Prime pea beans, $2 to $2.25 per bushel.

Butter.—Fresh made creamery, 23 to 23½c.

Canned Goods.—Per Dozen.—Corn, 80 to 85; peas, $1.05 to $1.15; beans, 85c.; tomatoes, 85 to 90c.; peaches, 2s, $1.65, and 3s, $2.65; pears, 2s, $1.60, and 3s, $2.30; salmon, best brands, 1-lb. talls, $1.87½, and flats, $2.02½; cheaper grades, 95c. to $1.65.

Cheese.—The market ranges from 11c. to 11½c., covering all Canadian makes.

Coffee.—Mocha, 20 to 25c.; Santos, 15 to 18c.; Rio, 10 to 12c.

Dried Fruits.—Currants, Filiatras, 5¾ to 6¼c.; choice, 8 to 9c.; dates, 4 to 5c.; raisins, Valentias. 5 to 6¼c.; California, seeded, 7½ to 9c.; Evaporated apples, prime, 8 to 8½c.

Eggs.—No. 1 eggs are 20 to 21c.; selects, 22 to 25c.

Flour.—Manitoba, 1st patents, $5.90 per barrel; 2nd patents, $5.40; strong bakers', $5.20.

Molasses and Syrup.—Molasses, New Orleans, 27 to 28c.; Barbadoes, 40 to 45c.; Porto Rico, 40 to 43c.; syrup, barrels, 3½c.; 2-lb. tins, 2 dozen to case, $2.50 per case.

Potatoes.—Per 90 lbs., good quality, 60 to 70c.

Rice and Tapioca.—Rice, grade B., in 100-lb. bags, $2.75 to $2.80; C.C., $2.65. Tapioca, medium pearl, 5½ to 6c.

Rolled Oats.—Oatmeal, $2.20 per bag; rolled oats, $2, bags.

Sugar.—Granulated, bags, $5.05; yellow, $4.65 to $5. Barrels 5c. above bag prices.

Tea.—Japans, 20 to 38c.; Ceylons, 20 to 40c.; Ceylon, greens, 19 to 25c.; China, green, 20 to 50c.; low-grades, down to 15c.

Fish.—Salted.—Medium cod, $7 per bbl.; herring, $5.25 per bbl.; salmon, $15.50 per bbl., for red, and $14 for pink. Smoked fish.—Bloaters, $1.10 per large box; haddies, 7½c. per lb.; kippered herring, per box, $1.20 to 1.25.

Provisions.—Salt Pork.—$27 to $34 per bbl.; beef, $18 per bbl.; smoked hams, 16 to 20c. per lb.; lard, 16½ to 17½c. for pure, and 12½ to 14c. per lb. for compound.

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Toronto, July 14th, 1910.

The market is still strong, building material and supplies not being available to meet the demand.

Advances in coal and iron are expected.

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

Antimony.—Trade is quiet, market easier at $8.50.

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

Bar Iron.—$2.05 to $2.15, base, per 100 lbs., from stock to wholesale dealer. Free movement

Bar Mild Steel.—Per 100 lbs., $2.15 to $2.25. Sleigh shoe and other take same relative advance.

Boiler Plates.—¼-inch and heavier, $2.20. Boiler heads 25c. per 100 pounds advance on plate. Tank plate, 3-16-inch, $2.40 per 100 pounds.

Boiler Tubes.—Orders continue active. Lap-welded, steel, 1¼-inch, 10c.; 1½-inch, 9c. per 10 foot; 2-inch, $8.50; 2¼-inch, $10; 2½-inch, $10.60; 3-inch, $11 to $11.50; 3½-inch, $18 to $18.50; 4-inch, $19 to $20 per 100 feet.