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The Canadian Engineer

ESTABLISHED 1893.

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

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TORONTO, CANADA, NOVEMBER 5, 1909.

CONTENTS OF THIS ISSUE.

WIDE TIRES AND THE HIGHWAYS.

Some years ago we heard a great deal about the advantage of using wide tires for wagons carrying heavy loads. Some municipalities introduced by-laws calling for four and five-inch tires, but usually the by-law did not get past the second reading. Ratepayers could not see the advantage of sustaining immediate loss that good roads might result in future years.

Experiments that have been made go to show great saving in traction effort where wide tires have been used on earth, gravel or macadam roads, and with this saving in traction effort there is a marked improvement in the condition of the road, rolling it smooth, even and making it almost impervious to the rain.

The Missouri Experimental Station gives as a result of a number of experiments the following:—

Three earth roads gave:—		
	1½-inch tire pull	86 lbs.
	6-inch tire pull	61 lbs.
		25 lbs.
Three macadam roads gave:—		
	1½-inch tire pull	71 lbs.
	6-inch tire pull	55 lbs.
		16 lbs.
1½-inch tires gave:—		
	On three earth roads	86 lbs.
	Or three macadam roads	71 lbs.
		15 lbs.

These results go to show that, although there is a large saving on improved roads, yet wide tires show a saving greater than that made by improvements.

In this country we make great talk about highway improvement. We are spending large sums on grading, gravel, and crushed stone. All of which is good. But more attention should be given to the question of width of tires.

If the user can be shown the advantage, the manufacturer will not be long in filling the want.

A NEW PUMP.

There has been installed at Dudley Port a pump novel in design and economical in operation. This pump depends for its lifting power upon the direct action of a gas explosion, and is the invention of H. A. Humphrey.

The pump, which comprises an iron U tube, is simple, and with few moving parts. The short leg of the U connects with the water supply and the long leg with the delivery tank, or pipe. In the open end of the short leg there is a conical-shaped combustion chamber, which is fitted with valves for supplying gas, air and an exhaust valve. The control of the valves is automatic and interlocking.

The cycle of operation is as follows: The charge of mixed gas and air is ignited by a sparker, and exploding drives the water forward, and water flows in from the suction-tank, and, a slight vacuum being created, more air enters. The water begins to surge back under the static head and compresses the air in the combustion chamber, and the elasticity of the air causes the water to again reverse.

Under test a 16 horse-power plant required 1,063 pounds of coal for every horse-power represented by the water raised, which compares very favorably with the 1.7 pounds required by first-class triple expansion steam pumping machinery.

EDITORIAL NOTES.

Japan has appropriated $20,000,000 for the building of a Government railway. Canadian contractors and manufacturers of Canadian steel rails should find an interesting field here. Business cannot be done by Canadians in Japan unless they send a representative to that country.

* * * *

Graphical methods of solving engineering problems are being much employed. Diagrams and curves to aid in estimating are in constant use. Once a month we expect to insert diagrams that will be of interest to engineers and contractors. The insert in this issue is not just as perfect as we could wish, but we hope to improve the inserts both in regard to the value of information they contain and also in respect to press work.

* * * *

McGill University has opened a new department in the Faculty of Applied Science—that of Harbor Engineering. Harbor engineering works in Canada are now requiring the services of many men, and McGill is to be congratulated in that she is the first university to take up the work, and because she has been so fortunate to secure an engineer as lecturer in the course so familiar with this class of work and a man standing so high in the profession as Mr. F. W. Cowie, of the Montreal Harbor Commission.

* * * *

BRITISH COLUMBIA'S RAILWAYS.

(Fred. W. Field in the Monetary Times.)

British Columbia is in need of railways. They are the life of a mountainous country, which has also large and fertile valleys. But mountainous countries do not make easy railroad building. The Canadian Northern has been nursing a transportation proposition in British Columbia for some time past. It hatched the other day, and with it came a brood of trouble. Premier McBride, on behalf of the provincial government, said the road would be guaranteed by them to the extent of $35,000 per mile. Railways have been talked indefinitely on Canada's Pacific coast, so Premier McBride's definite statement was something new. Two of his ministers, Hon. R. G. Tatlow and Hon. F. J. Fulton, who manage between them finance, agriculture and lands, have handed in their resignations, evidently thinking that the day of railroad bonuses has passed. The province needs more transportation facilities than it now possesses, and the final result will probably be a dissolution, the return of the McBride government—for British Columbia prefers railroads to politics—and a guarantee of the Canadian Northern bonds.

COMING MEETINGS.

Canadian Society of Civil Engineers (Toronto Branch). Special meeting, Monday, November 15th at 8 p.m. Address by Mr. Allen Hazen on "Water Filtration."

American Society of Engineering Contractors.—Feb. 24-26, 1910. Annual convention at Chicago, Ill. Secretary, Daniel J. Hauer, Park Row Building, New York, N.Y.

American Society of Mechanical Engineers.—December 7-10, 1909. Annual meeting New York City. Secretary, Calvin W. Rice, 29 W. 39th Street, New York, N.Y.

American Street and Interurban Railway Association.—October 4-8, 1909. Annual convention at Denver, Colo. Secretary, Bernard V. Swenson, 29 W. 39th Street, New York, N.Y.

National Municipal League.—November 15-19, 1909. Annual meeting Cincinnati, O. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

The Engineers' Club of Toronto

96 KING STREET WEST TELEPHONE MAIN 4977

Programme for November, 1909

THURSDAY, NOVEMBER 4th.

General Business Meeting.

Consideration of proposed amendments to the Constitution, of which notice was given by Mr. A. F. MACALLUM on October 7th, as follows:

*"Clause 3. MEMBERS. The Club shall consist of members, honorary members, and associates. * **

"An associate shall be one who is not an Engineer by profession, but whose pursuits, scientific acquirements or practical experiences qualify him to co-operate with engineers in the advancement of professional knowledge; and he shall possess all the rights and privileges of members, except the right to vote or to hold office."

By MR. T. AIRD MURRAY:

Clause 8. After the word "members," in the first line, add "and associates."

Clause 8. To increase the annual dues for resident members from $5.00 to $7.50 from 1st January next.

THURSDAY, NOVEMBER 11th.

"Some points in the Construction of the Simplon Tunnel." Illustrated by lantern slides.
Paper by Mr. Chas. B. Fox, M.A.

THURSDAY, NOVEMBER 18th.

"Facts and Figures relating to Producer Plant Practice."
Paper by Mr. M. Chapman.

THURSDAY, NOVEMBER 25th.

Meeting of the Toronto Branch of the Canadian Society of Civil Engineers.

THE EXECUTIVE MEETS EVERY THURSDAY AT 7.30 P.M.

A. B. BARRY, President, City Hall.
L. J. STREET, Treasurer, 37 Melinda St.
R. B. WOLSEY, Secretary, 25 Lowther Ave.

There are twenty-six Dominion Forest Reserves and National Parks set aside in the public-land area of the Canadian West. Their total area is 10,441,120 acres, distributted as follows:—

Manitoba—six reserves	2,288,160	acres.
Saskatchewan—four reserves	473,600	"
Alberta—six reserves	6,209,280	"
British Columbia—ten reserves	1,470,080	"

HIGHWAY BRIDGE OVER THE MIAMI RIVER AT ELIZABETHTOWN, OHIO.

The Longest Simple Truss Span Bridge in Existence.

H. C. Tyrrell.*

This bridge is remarkable in being the longest simple-truss bridge span in existence, and was designed by the writer. It has a span of 586 feet between centres of end pins and surpasses in length by 36 feet the longest other span, which is one in the bridge crossing the Ohio River at Cincinnati, known as the Cincinnati and Covington Railway and Highway bridge.

The width of roadway is 30 feet, and as the end posts are 30 inches wide, the distance between centres of trusses is 32 feet 6 inches, which is one-eighteenth of the span. The trusses are divided into 18 panels, 32 feet 6 inches long each, making square panels for the lateral system. The type of truss is the subdivided Pratt, with main panels 65 feet long. The truss depth varies from 80 feet at the centre to 40 feet at the first panel point. The curve of the top chord is a parabola, in straight sections of two panel lengths. Stiff laterals and sway bracing are used throughout. This is an essential feature of the design, and one upon which much of the stiffness of the bridge depends. Lateral and other light struts are built in box form, latticed on four sides. The first panels of the diagonals in the top lateral system are built in the same way. Each of the 33 feet 6 inch panels of the floor system are again subdivided by carrying an intermediate floor beam on two longitudinal beams, one at each side of the bridge. In addition to the benefit of economy in floor framing, the two side beams serve also as chords for the lower lateral system. The longitudinal and cross floor beams are of the same size, and the diagonal laterals are rigidly connected by plates, which fasten to the bottom flanges of both cross and longitudinal beams. The floor joists consist of 6-inch steel beams spaced 2 feet 6 inches apart, elevated on 9-inch corbels. On the steel joist is laid the 2½-inch oak flooring, spiked to six lines of 3-inch by 7-inch oak spiking pieces, with 60 d nails. The wheel guards are 6 by 6 inch oak, bevelled on the inner edge and elevated on 4-inch blocks spaced 2 feet apart for drainage. The bridge was given an initial camber of 3 feet at the centre. On each side of the roadway is a neat railing, made of four angles, latticed in box form. This railing lines up with the inner face of the web posts and fastens to them. The portal as shown on the writer's design is a heavy lattice framework, but it was changed in the shop to one plate construction, as shown in photograph, which does not harmonze with the other light framing. The two lines of heavy floor stringers, which act as wind truss chords, are rigidly attached by bottom bracket angles to the main truss posts. Such portions of the wind chord stresses as are not resisted by these longitudinal side beams, are transferred to the bottom chord eyebars, through these rigid connections.

The Elizabethtown Bridge, H. C. Tyrrell, Engineer.

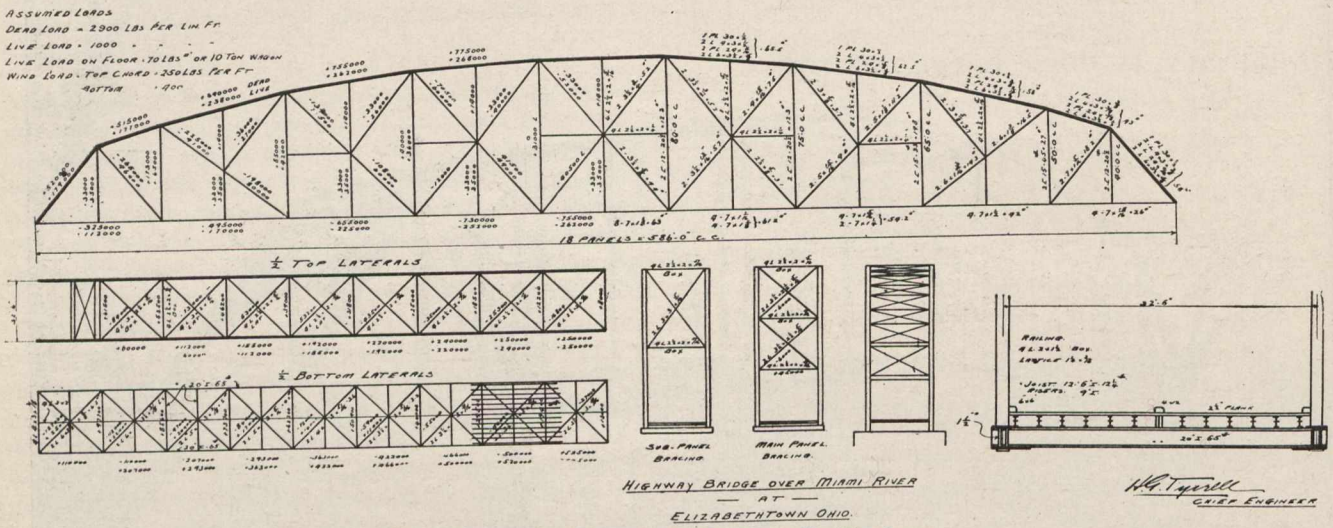
The cross beams at the panel points are suspended by two rod hangers 1½ inches in diameter each, from the bottom chord pins, and at the same time are riveted to the bottom angles on the web posts. This gives a rigid floor beam connection and at the same time reduces the cost of erection. At one end of the bridge are sets of turned rollers and at both ends, the heavy side beams are connected to the shoe boxes, thereby transferring the wind stresses as directly as possible to the masonry. The vertical posts are spliced at the joints of the lateral struts. The minimum thickness of metal used is one quarter inch. The metal throughout is medium steel, conforming to the Manufacturers' standard specifications.

For the purpose of comparison, a table of other long span bridges is given, arranged in the order of their length:

* Bridge Engineer, 1847 Asburg Avenue, Chicago, and author of "Concrete Bridges and Structures," "The Elizabethtown Bridge," etc.

Table of Long Span Bridges.

Date.	Location	River Crossed.	Kind of Bridge Railway or Highway	Span ft.	Engineer.
1904	Elizabethtown	Miami	Highway	586	H. C. Tyrrell.
1888	Cincinnati	Ohio	Railway and highway	550	Wm. H. Burr.
1894	Louisville	Ohio	Railway	546	Phoenix Bridge Co.
1889	Cincinnati	Ohio	Railway and Highway	542	
1896	Philadelphia	Delaware	Railway	533	
1890	Pittsburg	Ohio	Railway	523	
	St. Louis	Mississippi	Railway	524	
1885	Henderson	Ohio	Railway	522	Keystone Bridge Co.
1889	Ceredo	Ohio	Railway	521	T. K. Thomson
	Cairo	Ohio	Railway	520	Union Bridge Co.
	Havre de Grace	Susquehanna	Railway	515	
1877	Cincinnati	Ohio	Railway	515	J. H. Linville
1870	Kuilenburg	Leck River		515	G. Van Diesen.
1902	New Baltimore	Miami	Highway	465	J. H. Hilton
1859	Saltash	Taular	Railway	456	Brunel
1889	Hawksbury		Railway	416	Union Bridge Co.
1901	Hamilton	Miami	Highway	406	



The Elizabeth Bridge, H. C. Tyrrell, Engineer.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

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

8384—October 19—Granting leave to the Manitoba Government Telephone System to erect, place and maintain its wires across the track of the C.P.R. at Brandon, Man., at Hanbury Siding.

8385—October 15—Granting leave to the Rural Municipality of Miniota, Man., to erect, place and maintain its wires across the track of the C.N.R. at P.C. between sections 10 and 11, Tp. 15, R. 25, Man.

8386 to 8391—October 19.—Granting leave to the C.N.Q.R. to erect, place and maintain its telephone wires under wires of the Portneuf Telephone Company, the Bell Telephone Company, G.N.W. Company, and St. Maurice & Champlain Telephone Company at several points in the Province of Quebec.

8392—October 7—Setting forth conditions for the carrying of wires and cables across the tracks of railways under the jurisdiction and subject to the control of the Board.

8393 to 8395—October 5—Directing the V.V. & E. Ry. & Nav. Co. to pay forthwith to Knut Larsen, James Plester, and Jens Gunderson, the sum of $3,875 respectively to the first two and $3,566.25 to the last named on account of land affected by diversion of said railway.

8396—October 19—Authorizing the C.P.R. to open for the carriage of traffic that portion of the double track of the Ontario & Quebec Railway from Finch to Avonmore.

8397—October 15—Refusing application of the C.P.R. for an Order directing that detail plans referred to in Order No. 6968 dated April 27th, 1909, re crossing of Weston Road, town of West Toronto, Ont., by the G.T.R. be amended to show the tower midway between the G.T.R. and C.P.R.

8398—October 19—Granting leave to the Bell Telephone Company to erect, place and maintain its aerial wires across the track of the Michigan Central Railroad on Muir Street, just west of Welland Station. Ont.

8399 to 8401—October 19—Granting leave to the C.N.Q.R. to place its telegraph wires under the wires of the G.N.W. Tel. Company, Bell Tel. Company, Portneuf Tel. Company, and the St. Maurice & Champlain Co. Tel. Company at three points in Province of Quebec, viz., near Portneuf, near St. Severin and near Lachevrotiere, P.Q.

8402 and 8403—October 19—Granting leave to the Saskatchewan Government Telephone System to erect, place and maintain its wires across the track of the C.P.R. near Bienfait, Sask., and at Saskatoon, Sask.

(Continued on page 513.)

THE

Sanitary Review

SEWERAGE, SEWAGE DISPOSAL, WATER SUPPLY AND WATER PURIFICATION

THE STATE BOARD OF HEALTH IN ITS OFFICIAL RELATIONS TO SANITARY ENGINEERS.

The above forms the title of a contribution by Dr. C. O. Probst to the Quarterly Bulletin, Ohio State Board of Health. Matter is dealt with which should be of great value to those who wish to see the Canadian Provincial Boards of Health become more effective machines in advising and controlling matters of water supply, sewerage, sewage disposal and water purification.

Not until the year 1892 did the Ohio State Board of Health add an engineering department to its constitution; since that date the department has passed upon 655 plans, providing for the construction of sewers, waterworks, sewage and water purification plants.

It is interesting to note that the engineering department was the practical result of the cholera epidemic in Hamburg in 1892, the epidemic being transmitted to the port of New York, causing alarm throughout the whole country. In a revised public health Act the following paragraph at the suggestion of Dr. Probst was adopted:—

"No city, village, corporation or person shall introduce a public water supply or system of sewerage, or change or extend any public water supply or outlet of any system of sewerage now in use unless the proposed source of such water supply or outlet for such sewerage system shall have been submitted to and received the approval of the State Board of Health.

Before this date the Board had often found itself in the position of a consultant; the adoption of the above paragraph, however, made it absolutely imperative that an engineering staff be established to advise the Board with reference to any plans submitted in order to make its administration effective.

The first engineer secured was the late Mr. Flynn, and gradually the work of the Board has extended to a present engineering staff of seven men, all specially trained as sanitary engineers, who may properly be classified as experts.

With the building up of the engineering department and its daily consideration of plans there has been accumulated information and experience of very great value to the designing or constructing engineer. This information finds annual publication in the State Board of Health reports.

The system adopted in passing upon plans for engineering work is as follows:—

Application is made for approval of plans for water or sewerage, or for the purification of one or the other. An engineering blank is usually sent for further information. An engineer then visits the locality and looks over the ground. Plans are finally submitted, which are referred to the engineering department. These come back to the secretary's office with recommendations, which are then discussed. They are then transmitted to the members of the Board, with recommendations approved by the secretary and chief engineer. After consideration by the Board they are adopted, by a majority vote, either as recommended or with such modifications as the majority agree upon.

This final disposition of the plans is not usually reached without correspondence or consultation with the engineer who made the plans.

The engineering department in reviewing the plans frequently find changes or additions desirable. What are deemed essentials are held to, and made a condition of approval.

At times the Board of Health is consulted by municipal authorities before they engage an engineer. It may send an engineer in such cases to look over the ground and give general advice. It insists, however, that an engineer must be finally engaged to prepare definite plans.

From the above it will be at once seen that the State stands in the position of consulting and advising engineer to the many municipalities under its jurisdiction.

Dr. Probst claims that municipalities have been saved great cost by the avoidance of errors, while the system has worked without friction and, in fact, in perfect harmony with the engineering profession.

We must ask the question, Has the time not come when our Provincial Boards of Health must adopt some such sanitary engineering department, which can give useful advice in the first instance to municipalities and form a check upon work, designed perhaps by engineers who may never have seen a sewerage and water supply scheme before.

This class of work is coming more and more into prominence in Canada, and it is somewhat remarkable that the Western Provinces are ahead of the Eastern in recognizing the necessity of governmental engineering advice.

For some time back Dr. Seymour, the Chief Medical Officer of Health for Saskatchewan, has been anxious to put in force the example of the American State Boards of Health, and recently, backed by a strong and progressive Government, with the Hon. W. Scott as Premier, an engineering department on sanitary matters has been formed. Municipalities in Saskatchewan are now in the position to obtain general expert advice from the Government. It is further anticipated that the Government are about to legislate on advanced lines on the whole question of stream pollution and pure water supply in a revised public health Act.

Why an engineering department should not be added, say, to the Provincial Board of Health of Ontario, it is difficult to say. This Board, composed solely of medical men from different parts of the Province, meet regularly to adjudicate and pass upon engineering plans for sewerage and water supply, and are totally

unassisted by any engineering advice. We understand that the permanent secretary, Dr. Hodgetts, recognizes the necessity of such a department. Why it is that the Ministers are so blind to the importance of a progressive and useful movement by which every municipality would benefit in Ontario, we must confess we are at an entire loss to know. General poverty of the Province cannot be made an excuse, and surely there are plenty of examples of the soundness of the policy to warrant its adoption.

Can. Eng., Vol. 17, Page 261.

The last paragraph but one in the first column should have read:—

"Professor Dunbar's experiments and conclusions, published since the Commission's report, leave little doubt that Dibden's theory on which he based the contact bed has no scientific basis."

"Professor Dibden" should read "Professor Dunbar." The reference in the first instance is to Dunbar's "Modern Treatment of Sewage Disposal," in which he freely explains by the result of experiments the working of contact beds. The reference in the second instance is to the first conception of contact beds as illustrated by the experimental tanks for the London County Council by Santo Crimp and Dibden.—Ed. San. Rev.

OZONE TREATMENT.

Report by Toronto City Engineer to the Corporation.

Referring to the City Clerk's letter of the 18th instant, forwarding a copy of series of enquiries by Alderman R. H. Graham, as follows:—

1. "What experts and other officials recommended to the Board of Control the system of sand filtration for the water supply of Toronto?

2. "Was the question of electric filtration considered? If so, why was it not recommended?

3. "What part of the plant now being constructed would be available in the event of electrical filtration being found suitable and more economical?

4. "In case a change should be adopted from sand filtration to electric filtration after the completion of the present works, what would be the estimated cost of such change?

5. "If the work was suspended and the change made in the near future, what would be the estimated cost?"

I beg to report as follows:—

In answer to the first question, this is fully set out in the report of the Board of Control, No. 15, of May 26th, 1908, and it will also be seen that the report recommending the present system is signed by Charles Sheard, Medical Health Officer; C. L. Fellowes, Deputy City Engineer, and W. M. Harrison, M.D., representative of Board of Control

In reply to the second question, this can be better answered by the gentlemen who presented the report.

In answer to the third query, I understand the term "electrical filtration" to refer probably to the ozone treatment of water. It is difficult for me to state just what part of the present plant would be available for the ozone process, because I have never had an opportunity of seeing a plant of this description in successful operation, and I do not know precisely of what it would consist. The only ozone plant for treating a municipal supply which I have ever heard of upon the American continent is one at Lindsay, Ont., very recently completed, or perhaps not yet entirely completed. So far as I have heard, ozone treatment has usually been considered and recommended for use on the effluent from filters of the ordinary type. If such should prove to be the case, the whole of the plant now being completed would be available in connection with ozone.

The following statement in the Canadian Engineer of September 10th, 1909, page 288, bears directly upon this point:—

"Disinfection or sterilization may be feasible as an adjunct or accessory to filtration, but as a method of purifying water by itself it is absolutely useless. For instance, if we could obtain a water entirely free from all suspended matter, and containing only organic matter in solution along with the presence of bacteria, then sterilization might be effective. But no such water is ever placed before us to deal with, unless it has been first treated by efficient filtration. We, therefore, find that in all cases of so-called sterilization processes filtration of the water is insisted upon as a primary necessity. We have a case illustrative of this point in Canada at the present time at Lindsay, Ont. At Lindsay there has been recently installed an ozone sterilizing plant. The water is first treated by filtration and then charged with the ozone gas. The filtration is only of a rough-and-ready character, as it is expected that the ozone will do the real work. According to a recent analysis of the treated water, however, we find that the filters remove 67 per cent of the bacteria, and that the ozone only removes a further 57 per cent. of the bacteria from this partially clarified water, the total percentage removal of bacteria from the original water by the combined processes being only 87 per cent., or 8 per cent. below the standard required for mechanical filters.

"In the above case, if the filtration had been of an efficient character to remove the whole of, or practically the whole of the suspended matter, the result might have been satisfactory. Too much was asked of ozone and too little of filtration.

"The fact of the matter is that, up to the present, no data exist which will allow of a pronouncement in favor of sterilization as opposed to filtration. On the other hand, sterilization may be a useful and efficient addition to filtration in certain cases where the original organic impurities are so high as to leave an undrinkable water with a bacterial removal of even over 99 per cent, etc."

In reply to the fourth enquiry, the whole subject of ozone treatment is too indefinite to allow me to make any sort of an estimate of the cost of applying it effectively to the effluent from the plant now under construction.

The fifth question is, perhaps, sufficiently covered by the above.

In connection with the above replies I had the opportunity of consulting Mr. Allen Hazen in regard to same, and he fully concurs in the above report.

THE NEW FILTRATION PLANT FOR WILKINSBURG.*

F. B. Leopold, Pittsburg.

The Pennsylvania Water Company, which supplies water to the town of Wilkinsburg and a number of adjacent towns, secures its water from the Allegheny River by means of a series of galleries located in the river bed. As it comes from the galleries it is practically clear and of a rather unusual purity for a supply of this kind. After considerable litiga tion, however, on the part of the town of Wilkinsburg, in which it was claimed by the municipality that the water was not of the degree of purity that the company should furnish

*A paper read before the Central States Waterworks Association.

under its charter, and could furnish with the proper equipment, it was decided that the company should install a mechanical filtration plant. Owing to the arrangement of the water system and the limited space available at the pumping station, some rather unusual conditions had to be met. The contract was made in May with the Pittsburg Filter Manufacturing Company, of Pittsburg, and the plant was designed by it, in conjunction with the engineers of the water company, and is now under construction. The plant is designed for an ultimate capacity of 20,000,000 gallons per day. The filter beds at present being installed, when fully equipped, will give a capacity of 12,500,000 gallons; only a 10,000,000 gallon equipment is being placed, however, at the present time.

The company has a reservoir at present holding about 16,000,000 gallons, from which the distribution to the system is made. This reservoir is some 450 feet above the pumping station. Owing to the fact that it is undesired to lose any of the available head, it became necessary to design the plant so as to utilize the present reservoir as a clear-water receiving basin; this necessitated the building of the filter plant practically all above ground. In general, the plant consists of two reinforced concrete sedimentation basins, each 150 feet long, 65 feet in width and 22½ feet in depth, each holding something in excess of 1,500,000 gallons. These reservoirs are uncovered and surrounded by vertical walls of heavily reinforced concrete 15 inches in width at the top and 30 inches at the bottom and 17 feet in width of base. As it is necessary for the flow of water to be at a sufficient elevation above the flow line of the present reservoir to provide for the filter operating head, the question of foundation would ordinarily have been one of considerable expense; fortunately, however, the top of the hill on which it is located is composed of shale, and after the surface removal of two or three feet of earth there was formed a most excellent and solid foundation.

The water is pumped direct from the pumping station into the end of each basin, being controlled by a valve to each, and a connection is made to the inlet to the present reservoir, so that the raw water from the pumping station may be supplied to either or both of the sedimentation basins or by-passed through the reservoir, and may also be by-passed directly to the system. Water is distributed across the end of the basin through vertical risers, and will flow horizontally to the opposite end of the basin, passing under a baffle located about in the centre of the basin, and being gathered at the opposite end into a concrete overflow conduit which discharges into a central chamber, from which point it is carried through a 36-inch cast-iron conduit into the filter house and distributed to the filters. The basins are provided with an open overflow 12 inches below the top of the wall, the bottom being sloped with about an 8 per cent. slope to a central sump, from which a valve discharges into a 20-inch washout pipe in the bottom of each basin. The floors of the basins are covered with 10 inches of concrete reinforced with triangular mesh reinforcement, and the walls on the outside are banked up to within three feet of the top all around.

The main filter building consists of a T-shape brick structure 140 feet long and 40 feet wide for the length covering the filters, which are partially covered with flat concrete covers, and 66 feet long over the portion covering the operating-room, machinery and laboratory. This building is one storey in height over the filters; the T-head is two stories above the filter, and has a basement floor on the level of the pipe gallery floor. The building is of buff-colored brick, covered with a Spanish tile roof, the interior finish being of natural wood. The office and laboratory will have metal ceiling and be lined with white glazed tile. The basement floor and all other floors are of concrete, and in this basement is installed the pumping machinery, heating plant and light apparatus. The first floor contains the concrete solution tanks, with concrete orifice tanks for operating them, the office, general reception-room and laboratory. The third floor is to be used as a storage-room for the coagulants, and dissolving tanks are also located here. Communication is had between the three floors by a circular iron stairway. The lower gallery floor is on the level of the ground on the outside of the building, a double door on one end, and the arrangement of the piping in the gallery gives a clear passage from this doorway through the gallery into the basement. The arrangement of the gallery is such that there is a clear space three or four feet wide and high enough for a man to walk through it without meeting obstructions.

The filter equipment is of the contractor's usual general standard type, using a separate water and air manifold system. The water manifold is entirely of cast-iron, with cast-iron laterals and bronze screens; the air manifold is of perforated brass tubing, above which are 8 inches of gravel and 36 inches of sand. The troughs are cast-iron, diamond-shape troughs, so arranged that the flow of water to them does not exceed a travel of 3½ feet, and are designed to carry away not less than ten gallons of water per square foot of area from the bed. The controllers are the closed type, arranged so that the rate of flow can be adjusted from the operating floor, similar to those in use at Lorain, Ohio, and McKeesport, Pa. The valves are all hydraulically operated, and furnished by the Rennselaer Manufacturing Company, and are controlled from marble operating tables, with polished brass trimmings. On the operating table will be located the loss of head gauges. The type of gauge used at this plant will be entirely new in design. It will be of the recording type, with a rectangular chart of convenient form for binding; it will be arranged with double recording pens, one of which will record the actual water level on the filters, the other one recording the loss of head in the effluent, thus giving at a glance the absolute loss of head in each filter, irrespective of any variation in the water level of the filter itself. The purified water is discharged through the controllers into a concrete conduit below the gallery floor, from which it flows to the present reservoir by gravity.

On account of the isolated position of the plant the power conditions were a matter of considerable study. It was not desired to build an independent power station at this point, as it would necessitate hauling all fuel for three miles up a very steep hill, and in winter time over exceedingly bad roads. The conditions at the filter plant require a maximum of power in use a few minutes at a time periodically. After considerable study, it was determined to place a generating plant in the pumping station, about a mile distant, and deliver current over a transmission line to the filters to operate the wash pump, blowers and other power requirements; and in order to secure the most economical electrical installation it was determined to distribute the use of power over a considerable period of time. To do this necessitated the storage of both water and air, and to do this economically required the storage to be at a pressure or elevation practically the same as that of the larger machinery used in direct application. It was finally determined to employ a storage tank of considerable area for water, so that the pumping head would be very little, if any, above that required in washing the filters by direct pumping.

Previous methods of air storage have been the use of pressure tanks, compressing the air in them under high pressure, and then reducing it to that required for use in the filters. This involves an enormous waste of energy, and in studying this question it was ascertained that a method had been devised and a patent application made for a scheme that would accomplish that process. Arrangements were, therefore, made for the use of this arrangement, which consists of an inverted tank on the order of a gasometer, weighted sufficiently to produce the pressure required in the filter beds, then building the tank of such volume as to give the required amount of air. A further study of this revealed the convenience of utilizing the water tank as a seal tank for the air tank. A combination was, therefore, designed, using an inverted air tank on top of the water storage tank.

A small generating plant is to be installed in duplicate at the pumping station, which will be sufficient to furnish power to operate all the motors at one time. This plant will be required to be only about one-third the size of a plant which would be required to operate wash pumps and blowers sufficient to apply water and air directly, the result of this being a very uniform draft on the power station, a more economical use of power, and some economy in the cost of installation. The small pumps for supplying the wash water to the wash-water tank and the air to the air tank will be designed to operate about 50 to 75 per cent. of the time, and will be arranged to operate automatically, so that during the washing of a filter when the water level falls a few inches in the storage tank the motors supplying the wash water, if they are not running, will be automatically started, and will continue to operate until the level is brough up to its normal, when the automatic switch will cut them out. The same arrangement will be applied to the air storage tank, which is designed for volume and not pressure. The motors, therefore, require no care except to see that they are kept in proper shape.

As the plant is located above the point from which water pressure is secured and hydraulic valves are in use, it, of course, becomes necessary to provide pressure for the hydraulic valves; this is done by a small automatic control pressure pump and a surge tank which automatically controls the pressure of the operating cylinders of the valves. These features, as far as the writer's experience or knowledge goes, are unique, and it is believed that it is their first application.

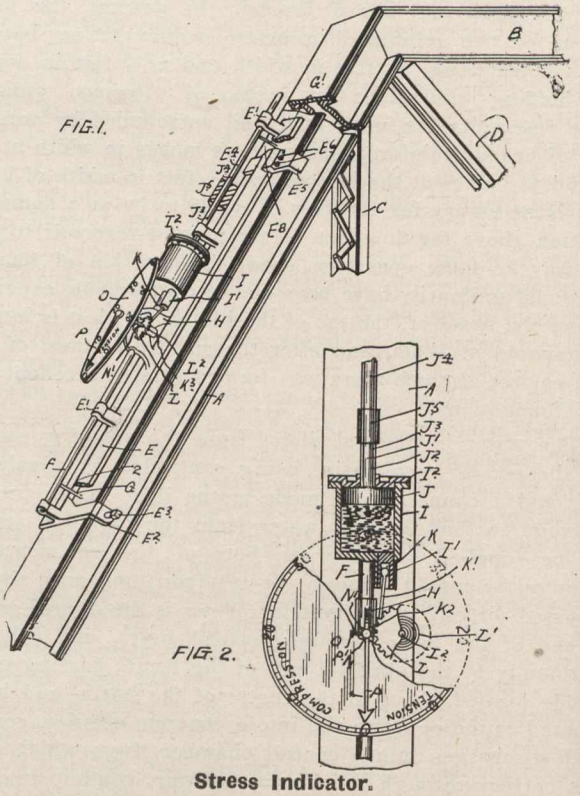
The reagents or chemicals will be stored in the second floor of the building above the office; this storage room will be equipped with an electric hoist for unloading from the wagons and conveying to the storage room. Inside the storage room there will be baskets and a track for delivering the chemicals from the storage space to the dissolving boxes above the solution boxes, which are also located in this room, so that the labor of handling is reduced to a minimum.

The building will be lighted by both gas and electricity. For heating there will be used a low-pressure cast-iron heating boiler in the basement, arranged to use natural gas as fuel.

Immediately beyond the plant there will be a round reinforced concrete basin, into which the water from the washing of the filters will be drained. This basin will provide several hours' sedimentation, so that after washing the filters the wash water carried into it will have an opportunity to settle, the heavy accumulations going to the bottom. The bottom of this tank slopes to the centre, and an outlet standpipe is placed near the centre, so arranged as to drain down to within 4 feet of the bottom; to this will be connected an electrically driven pump, which will take the settled water and pump it back into the sedimentation basin. In this manner it is expected to give the highest economy in the use of the wash water. The location, of course, of this plant and the high head against which all the water is pumped form the only condition which would make for economy in an arrangement of this character, but it is believed that the saving that will be accomplished in this manner will more than justify the expense of the necessary structures for accomplishing it.

IMPROVEMENTS IN STRESS INDICATORS.

What appears to be a valuable invention has just been patented by Mr. Walter P. Chapman, M. Can. Soc. C.E., resident engineer of the Canadian Northern Railway at Toronto. The device is applicable to both compressive or tensile stresses, and is particularly adaptable for testing the strength of steel construction, bridges and buildings, whereby the amount of tension or compression in pounds to the square inch, under any load, stationary or movable,



Stress Indicator.

may be ascertained quickly and closely, so as to obviate to the greatest extent possible the structure in any of its parts or members exceeding the limit of safety.

The invention consists of an instrument comprising a suitable base, a stationary rod at one end in suitable supports on the base, and a longitudinal adjustable rod held in suitable supports on the base at the opposite end, provided with a pin extending into a hole in the plate of the end post and connected to a hydraulic cylinder, a supplemental cylinder extending from one end of the main cylinder, a minor piston located therein, a gear-wheel mounted on a suitable arbor and having a spring attached thereto to counterbalance the pressure on the minor piston, an arbor mounted in suitable bearings and provided with a pinion meshing with the gear-wheel, a dial suitably supported and indexed at the outer edge, and a hand adjustably supported on the end of the arbor.

Fig. 1 is a perspective view, showing the portion of a bridge and the application of the instrument to measure the compression stresses, while Fig. 2 is a plan view, partially broken away.

In the drawings like letters of reference indicate corresponding parts in each figure.

A is the end post of a bridge or other truss, B is the top chord, C the vertical member, and D the diagonal member. The instrument is shown applied to the end post and the top plate. E is the base of the instrument, having the supports E^1 extending out at right angles thereto and projecting bent lugs E^2 at one end by which it is held on the post by set screws E^3 extending through the same. The opposite end of the base E is provided with an end projection E^4, held in place by a suitable set screw. E^5 is a clip which fits over the edge of the plate and the base E, such clip being held in position by suitable screws E^6 so that it may be readily removed.

F is a stationary rod which is held in the supports E^1. G is a pin projecting inwardly from the rod F into a hole in the plate A, the hole being, of course, drilled previously to the instrument being set in place. The pin G extends through a slot 2 in the base E. H is a support intermediate of the length of the base E, and through this the rod F extends. On the end of the rod F is a cylinder 1, to which is attached a supplemental cylinder I^1 as indicated. The cylinder is partially filled with oil and other fluid, and is provided with a piston J, having the piston rod J^1, which extends through the head I^2. On the rod J is an index mark J^2.

The rod J^1 is made in two parts—J^3 and J^4, which are connected by a coupling J^5, provided with a right and left-hand internal thread to fit into the corresponding threads of the portions J^3 and J^4. The rod J^1 is also held in supports E^1, and is provided with a pin G^1, which extends through a slot E^8 in the base plate E into a hole in the top plate of the end post.

K is a piston fitting into the minor piston I^1 and connected by a rod K^1 to a crank pin K^2 on the gear-wheel L, which is held on a suitable anchor L^2, journalled in suitable bearings K^3. L^1 is a helical spring attached at one end to the gear-wheel L and at the other end to the arbor, the normal tendency of such spring being to force the gear-wheel in a direction contrary to what the liquid in the piston I will force the piston K, or, in other words, to compensate the pressure of the liquid on the piston.

N is an arbor journalled in the support H, and having a pinion N^1 secured thereto, which meshes with the gear-wheel L. O is a dial plate in which the arbor N is centrally disposed, such dial plate being suitably held in position on the top of the support H. P is a hand secured on the top of the arbor by means of a set screw P^1, whereby the position of the hand may be altered as hereinafter explained.

Each half of the dial plate is divided from zero to forty, thus indicating thousands of pounds to the square inch. It will be noticed that the index numbers ten, twenty and thirty when the dial is in the normal position are located on each side of the centre line of the rods F and J^1, and that the cypher o and number 40 are arranged diametrically opposite each other on a line with the rods F and J^1.

The instrument is placed in position as indicated in the drawing on the end post of the structure. As soon as the load is transmitted to the end post the indicator will show the additional stress upon the same, and the percentage of recovery from such loading after the load is removed.

If the instrument is placed on a lower member of a bridge or structure in which it is desired to ascertain the tensile strength of the member, the hand will move in an opposite direction.

The advantage of this invention will be that the stresses in bridges or structures may be ascertained as erection work progresses. If affixed to a member of an incompleted building, the stresses due to an imposed, stationary or moving load would be registered.

RAILWAY ORDERS.

(Continued from page 508).

8404 to 8406—October 19—Authorizing the United Fuel Company, Ltd., to lay and thereafter maintain gas pipe under the track of the P.M.R.R. and M.C.R.R. in the Tp. of E. Tilbury, Tp. of Raleigh, and Tp. of Moore, Ont.

8407—October 20—Authorizing the C.P.R. to construct, maintain, and operate branch line of railway, or spur, in the city of Fort William, Ont., on Hardisty Street.

8408—October 20—Approving by-law of the C.P.R. authorizing Jas. Kent the manager of telegraphs of the company to prepare and issue tariffs of telegraph tolls.

8409—October 13—Dismissing complaint of Houghton Lennox, M.P., that the G.T.R. has closed up its freight shed at Allandale, Ont., and that the freight formerly received and delivered at that point has to be received and delivered at Barrie, Ont.

8410—October 12—Granting leave to the C.P.R. to construct its railway across the highways on its main line grade revision, on the Medicine Hat section of its railway, in Province Saskatchewan, from mileage 49.34 to 57.29.

8411—October 13—Dismissing complaint of Township of Seneca, re working of the electric bells installed by the Grand Trunk Railway Company where its line of railway crosses the Port Dover and Hamilton Road, town of Caledonia, Ont.

8412—October 13—Dismissing complaint of J. W. Freeman, of Burlington, Ont., alleging that the watercourse on his property has been blocked by the building by the G.T.R. of a new siding.

8413—October 12—Dismissing complaint of the Municipal Council of the Townhip of Esquesing, Ont., against dangerous condition of the crossing of the G.T.R. on the 7th line in said township.

8414—October 12—Directing that the Michigan Central Rail Road and the P.M.R.R. install each upon its own railway, within 45 days from date of Order, electric bell, at point to be approved by Chief Engineer of the Board, on town-line between Townships Southwold and Dunwich, Ont.

8415—October 15—Directing that the G.T.R. install, within 60 days from date of Order, single arm gate on each side of crossing on Church Street, Police Village of Mimico, Ont.

8416—October 19—Authorizing the C.P.R. to construct, maintain, and operate an industrial spur for Messrs. P. Burns & Company, Dist. Lot 182 C New Westminster District now in the city of Vancouver, B.C.

8417—October 19—Approving proposed change of location of station and the re-arrangement o ftracks of the G.T.R. at Jeannetts's Creek, Ont.

8418—October 14—Directing that the trains and cars of the G.T.R. Company be brought to a full stop before reaching crossing over the track of the Windsor & Tecumseh Electric Railway in Township of Sandwich East; and be flagged across; and that the cars of the Windsor & Tecumseh Electric Railway be operated across diamond at a rate of speed not exceeding four miles per hour, Township Sandwich East, Ont.

(Continued on page 517).

PROBLEMS IN APPLIED STATICS.

T. R. Loudon, B.A.Sc.

This series of problems began in the issue for the week, October 22nd, 1909. It is assumed that the reader either has an elementary knowledge of the subject of Statics, or is in a position to read some text on such theory.

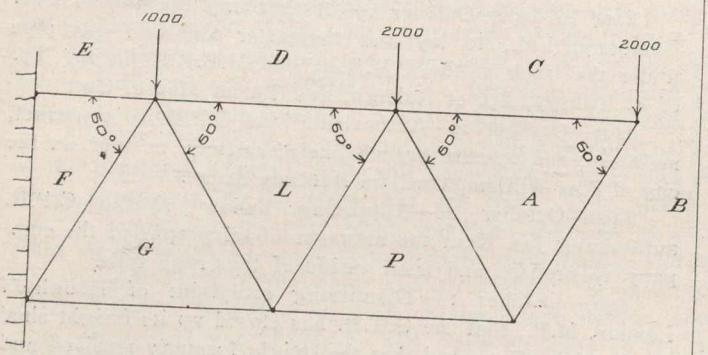


Fig. 67.

Find the stress in the members of a cantilever such as indicated in Fig. 67, the panels of which are equilateral triangles.

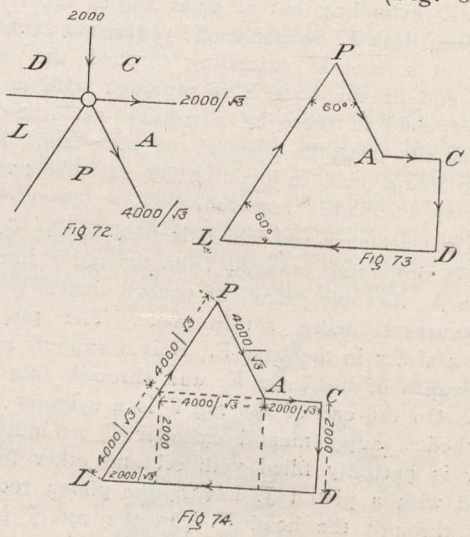
In all the following problems on the determination of the stress in the members of a framed structure, **the joints of the truss must be considered as frictionless circular pin joints, perfectly fitted so as to allow of no slack motion,** these being the assumptions upon which the theory is based. So, then, whenever the reader encounters the statement to consider the forces acting at a point in a truss, he must bear in mind that he is really considering **the forces which act on the pin of the joint,** for in any statical problem, when a set of forces are being considered, there must always be some body acted upon. In these cases the pin is that body, and the members are the bodies acting on it. It may be pointed out, however, **that because of this construction,** the lines of action of the forces acting on the pin intersect at the centre of the pin, and it is this fact that is referred to in the statement: "To consider the forces acting at a point." With the exception of the case of three forces in equilibrium, which, of course, **must** have directions intersecting at a common point, it must not be thought that the forces acting at a joint in a truss must act through the centre of the pin in order to be in equilibrium. **They merely do so,** as pointed out before, **because of the construction of the joint.**

Consider the point BCA. The forces acting at this point are in equilibrium, the conditions being such as indicated in the Statical Diagram (Fig. 68). If the Vector Polygon for this set of forces be constructed, it must close.

The reader must bear in mind the **important** fact that these Statical Diagrams merely represent the conditions **at the point being considered.** The lines indicating the directions of the known and unknown forces are **the lines of action of forces acting on the pin.**

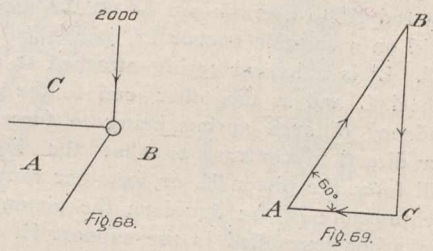
In the following discussion it will be assumed that the relative lines of action of the forces being considered are accurately represented in the Statical Diagram; so that in constructing the Vector Polygon for a set of forces, all that will be necessary, in order to represent the direction of any force, will be to draw a line parallel to the line representing the force in the Statical Diagram.

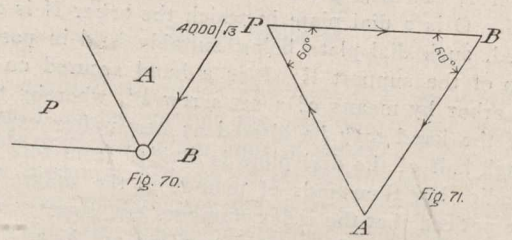
Construct BC (Fig. 69) to represent the known vertical force. From C and B draw lines parallel to CA and AB (Fig. 68), respectively, to represent the directions of the unknown forces CA and AB. These lines intersect at A. Evidently CA and AB (Fig. 69) repre-



sent the unknown forces CA and AB, their magnitudes being 2,000/√3 pounds and 4,000/√3 pounds, respectively.

If the sense marks of CA and AB found in Fig. 69 be placed on the Statical Diagram (Fig. 68), it is seen that the member CA exerts, at the point being considered, a tensile force, and the member AB a compressive force. The member CA is, therefore, in tension,





and the member AB in compression, to the extent of 2,000/√3 pounds and 4,000/√3 pounds, respectively.

Consider the point BAP. Since the member BA is in compression, it must exert a compressive force at the point BAP. This, together with the other conditions at the point, is represented in the Statical Diagram (Fig. 70).

BA (Fig. 71) represents the known force BA. From A and B draw lines parallel to the directions of AP and PB (Fig. 70), respectively. These lines intersect at P. Then AP and PB (Fig. 71), with sense marks running

continuously as indicated, must represent the hitherto unknown forces AP and PB.

If the sense marks of AP and PB as found in Fig. 71 be placed on the corresponding lines of action of AP and PB in Fig. 70, it is seen that AP acts away from the point and PB against it. The member AP, therefore, exerts a tensile force and the member PB a compressive force at the point, both being forces of $4,000/\sqrt{3}$ pounds, since the triangle BAP (Fig. 71) is equilateral.

The member AP is, therefore, in tension $4,000/\sqrt{3}$ pounds, and the member PB in compression $4,000/\sqrt{3}$ pounds.

Consider the point PACDL. Acting at this point are three known forces (the load and two tensile forces exerted by the tension members PA and AC) and two unknown forces as indicated in the Statical Diagram (Fig. 72).

PA, AC, and CD (Fig. 73) represent the known forces PA, AC, and CD. From D and P, respectively, draw lines parallel to the directions of DL and LP (Fig. 72), intersecting at L. DL and LP (Fig. 73) represent, respectively, the unknown forces DL and LP, acting as indicated by the continuously pointed sense marks. In order to avoid confusion, another diagram (Fig. 74) has been constructed, showing how to arrive at the magnitudes of DL and LP. From this diagram it is seen that DL and LP are forces of $8,000/\sqrt{3}$ pounds each.

The force DL evidently acts away from the point (tensile force) and LP against the point (compressive force). The member DL is, therefore, in tension $8,000 \div \sqrt{3}$ pounds, and the member LP in compression $8,000 \div \sqrt{3}$ pounds.

Find the stress in the remaining members LG, GB, EF, and FG.

These stresses may be found by first considering the point BPLG, and then the point GLDEF.

(The correct diagrams for these points will be shown next week.)

THE ROAD SURFACE.*

By W. A. McLean, Engineer of Highways, Toronto.

Country highways of Ontario are every year increasing in importance. Without good roads, efforts to improve homes and farms, and commercial and social conditions, throughout the Province, will be largely nullified. As feeders of, and distributors from, the railways, country roads are of great importance to towns and cities. Important as country roads were before the advent of the steam railway, the extension of steam railways has greatly increased their value, for steam railways mean development; and that development, if it means anything, implies the necessity of good country roads.

The road and the vehicle are part of one machine, just as the efficiency of the steam engine is dependent upon steel rails and the roadbed. With the coming of motor vehicles a new era in the use of roads is dawning, and to reap the benefit, country roads must be equal to their new counterpart—the horseless vehicle. Ontario roads are not yet in keeping with the horse-drawn vehicle. While it may seem impracticable to aim at serving a higher class of traffic, it can only be neglected to our own loss.

Problems of road construction involve a considerable degree of skill in dealing with drainage, grades and contours, sub-soils and earthwork, road metal, road location, bridges, road machinery, etc. In addition we have systems of road management and the supervision of labour.

Treating of one department—the road surface—it is impossible to ignore various other features. Mud underneath the road is more destructive than mud on the surface, so that without a well-drained and firm sub-soil, the best road surface must prove a failure. The science of road construction is broad, and to discuss briefly a few details, it is necessary that we assume a suitable foundation, that the road is well located, that drainage is ample, and that the turnpiking is sufficient.

Road metal is placed on a road to make, so far as possible, a waterproof covering for the soil; to make a surface that will resist wear; to distribute the concentrated wheel load over a greater area of sub-soil, and to overcome the surface tendency to mud and dust.

The sub-soil should be crowned, and should be even, without depressions. This is particularly necessary in the case of clay. If there are depressions in a clay surface below the stone, water will find its way into them, will lie there, soften the soil, and weak spots will develop in the road surface through a condition of mud below it.

Before putting stone on an earth roadbed, the sub-soil should be solidified with a roller. This is too commonly evaded in an effort to keep down the cost. It is necessary that the metal form a distinct crust, if its full degree of usefulness is to be obtained. Stone forced down into a soft sub-soil is largely wasted. However firmly a surface layer of road metal may itself be rolled, it will display weakness if the sub-soil has not been consolidated. Earth in its natural state, however solid it may appear, is not as compact as rolling can make it. The cost of roads is not so much in the earthwork as in the cost of treating and hauling surface material. In the amount of metal saved from sinking into a loose sub-soil, and in the greater strength of the road, the cost of rolling the sub-soil is more than repaid.

The road metal, gravel or stone, is intended to form a separate crust over the natural soil, and should be so treated by rolling that it will be a distinct and firmly compacted covering. The benefits of rolling are numerous and difficult to sum up briefly. Rolling is an absolute necessity for the most economical, as well as most durable and satisfactory type of road. Without rolling, a large proportion of the road metal is forced into the sub-soil and wasted before it is bonded into a distinct crust. The road cannot be well formed when it is left for traffic to consolidate. The citzens who are compelled to drive through a mound of loose road metal will never give praise to the man who constructs such a road. By building a finished road on which it is a delight to drive, a little extra cost is quickly forgotten. A more durable road is obtained and the additional expense is further offset by the considerable saving of road metal.

A road surface may be constructed in various ways. The road may be surfaced wholly with crushed stone, using "crusher run"; that is, a mixture of fine and coarse, just as it comes from the crusher, without screening. This makes a surface of uneven quality and strength, and hollows and holes appear quickly under heavy traffic.

Screened stone may be used, placing the coarsest in the bottom and the finer on top. This makes a much smoother surface, of more uniform strength, than does "crusher run." It pays to screen.

Instead of making the road wholly of crushed stone, large flat stones, of sizes up to a foot or eighteen inches square may be laid on the earth sub-grade, and crushed stone spread over this. This, as a rule, is cheaper than all crushed

* Read before the Ontario Land Surveyors.

stone, as a thinner covering of fine (and more expensive) material is required. Where flake stones are used in this way, perfect under-drainage is desirable; otherwise the larger material is heaved by frost, and the finer metal gradually works downward, the large stones coming to the surface. Instead of laying the stone flat, they may be placed on edge, the largest at the centre of the road, the top angles being chipped off and wedged into the voids between the stone. This last method is known as a " Telford " foundation, and is to be recommended for weak sub-soils, or where drainage is difficult.

Instead of a base of large stone, there may be spread a foundation layer of gravel, on which to spread the broken stone. This method is useful where gravel of an inferior quality is plentiful. The gravel makes a stronger foundation than does the natural earth, while the crushed stone makes a more durable wearing surface.

Good results may be had in some cases by using large flake stone for a base and placing gravel on top. This process is useful principally where the earth foundation is very weak, and a gravel of first-class quality can be obtained within reasonable haul.

A common method consists of using pit-gravel in the ordinary manner, without stone. Unless of very exceptional quality, gravel roads are not so lasting as broken stone, particularly for heavy or constant traffic—but it is a question of traffic as well as metal. As a rule, broken stone should be used near large towns. This provides for heavy traffic, with a short wagon-haul if the stone has to be brought in by rail.

A profitable method of using gravel is to pass it through a crusher and screen out the excess of sand and earthy material. Use the screenings as a base, and place the stone on top for a wearing surface. By using a well-equipped plant, and loading wagons from a bin, the saving in cost of loading may be made to pay the cost of crushing and screening, particularly for short hauls from the pit.

In the choice of stone there is room for much variation in the quality of the road. After gravel, the most commonly used material in Ontario is limestone. In this there. is much difference in quality, even in the same quarry. Limestone while softer than most other rocks, gets it value largely by the power of its dust and screenings to cement and re-cement, making an exceptionally waterproof covering, and so bonding as to distribute the concentrated wheel load. The most durable class of road metal is trap rock, but unfortunately there is little available. Granite and gneiss are used with considerable success. Sandstone is very inferior, as it grinds readily into dust, and has little cementing value. Granite and gneiss have not good cementing value, but are harder and more resistant to wear.

The strength and durability of a road is dependent largely upon the binding material used, as developed by thorough sprinkling, and the use of a steam roller. When rolling a road the roller should be preceded by a sprinkler, and the stone kept well saturated. Limestone screenings are most valuable as a binding material, but some limestones have a much stronger cementing value than others. Crystalline limestones are in some cases of little more value in this respect than sandstones. Sand is a very inferior binder. Road metal should be clean, for clay and loam are weak binders. Crushed gravel, bonded with limestone screenings, makes a surface much superior to gravel only.

The width of roads is an important detail in surface treatment. Throughout Ontario all varieties of ideas prevail in this regard. We find the roads graded almost from fence to fence, the full width of the road allowance. In other cases the opposite degree is sought. From study of road conditions in Ontario I am convinced that the width of a road from ditch to ditch should be no greater than traffic demands. The width of road metal should be such that there will not be an earth track at the side. Wide grades are very desirable when kept in good repair, nor are they much more expensive to construct than narrow roads. But they are vastly more difficult and expensive to keep in repair. The choice, except under special conditions, will be between a narrow road that is good and a wide road that is bad. Few municipalities in Ontario, or indeed in any part of the world, will be found so wealthy that they can afford to maintain an unnecessary width of road. When a strip of macadam is flanked by wide, flat clay shoulders, the early destruction of the macadam is certain. Standard European practice is 18 or 20 feet between gutters, and while many roads are wider, others are narrower. This is a point of economy which, for the sake of good roads at least, municipalities in Ontario could well copy. As traffic increases, widen the metal rather than the grade.

The camber or crown of a road gives much play for difference of opinion. A high crown is not desirable so far as traffic is concerned. A new road, however, should first be turnpiked and crowned too high, otherwise it will soon get too flat. A road just right when first constructed will be water-logged at the end of a couple of years. All forces of gravity and traffic are at work to bear down on the camber and grade, the flattening tendency is constant. Under ordinary circumstances in Ontario a crown of one inch to the foot for the stone covering, and two inches to the foot for earth shoulders, is not too great. In the case of town streets, if constant attention is given to repair and the roads are macadamized from curb to curb, this can be reduced; but in the country, narrow roads, sharply crowned, are the roads which return most for the expenditure on them.

The coming of the automobile has drawn attention to the exceedingly dusty condition of roads in summer. The extended use of these machines requires that there be some palliative, both for the property owners along the roads and for the maintenance of the roads themselves. While light motor vehicles travelling at a moderate speed will not seriously injure the roads, the dust removed by heavy touring cars travelling at a high speed removes the binding material, and the stone unravels. A large amount of experiment has been carried on with a view to finding a remedy. Many materials, patented and otherwise, have been brought to public notice. Their careers are usually ephemeral. Tar and tar products are the only materials that have been used with marked success in England, France or the United States. A thoroughly servicable and cheap system has not been developed. The majority of methods are either too expensive for the ordinary use in Ontario, or they are unsuited to our conditions of climate.

This is one of the fields in which there is room for invention in road construction. At the International Road Convention in Paris during October of last year, all departments of road construction received careful and scientific attention. In the conclusions of that convention, however, it has not been shown that any marked advance has in recent years been made in methods of construction. The field is still an open one, and there is much to be hoped for in achieving a type of construction that is at once serviceable, durable and economical.

QUEBEC.—Survey parties have been organized by Mr. A. R. Decary, district engineer of the Department of Public Works, in connection with the preparation of a report on the possibilities of improving the harbour facilities at Quebec.

RAILWAY ORDERS.

(Continued from page 513).

8419—October 13—Directing that the C.P.R. and C.N.O.R. construct at their own expense, the portion of highway within their limits of their respective right of way on Lot 6, Township of Foley, Ont.

8420—October 19—Authorizing the C.P.R. to construct, maintain, and operate industrial spur for Hill Manufacturing Company in Block 11, Plan F. V., in city of Saskatoon, Sask.

8421—October 19—Approving proposed new bridge across Preston Street in the city of Ottawa, Ont., to be erected by the G.T.R.

8422—October 12—Requiring the G.T.R. to install at the crossing of Park and Duke Streets, Chatham, Ont., within 45 days from date of Order, an electric bell to be located and bonded to the satisfaction of the Chief Engineer of the Board.

8423—October 20—Granting leave to the C.N.Q.R. to construct its line and tracks, by means of a subway, across public road on Lot 27, Parish of St. Stanislas, County Champlain, P.Q.

8424—October 15—Amending Order of Board No. 5681, dated November 12th, 1908; directing that the G.T.R. erect and maintain gates and watchmen at Windermere and Ellis Avenues, Township York, Ont., by directing that the two-twelfths directed under the said Order to be paid by the County of York, be distributed equally between the city of Toronto, Township of York, and the G.T.R. Company.

8425—October 13—Directing that the Hamilton Radial Railway construct a suitable farm crossing in the Township of Nelson, County of Halton, Ontario.

8426—October 14—Amending Order of the Board No. 6677, dated March 26th, 1909, made upon the application of the corporation of the Township of Tilbury East, approving the plans and specifications of the "King and Whittle Drain," in the Township of Tilbury East, in so far as they affect the property of C.P.R. by striking out the whole of the last five lines of the said Order after the word "approved" in the third line thereof.

8427—October 19—Granting leave to the Manitoba Government Telephone to erect place, and maintain its wires across the track of the C.P.R. near Teulon Station, Manitoba.

8428—October 19—Ordering that the M.C.R.R. widen the bed of the stream across its right of way under the bridge at Bear Creek, one mile east of the town of Petrolea, Ont.

8429—October 22—Authorizing the Ontario and West Shore Railway Company, at its own expense, to make a temporary connection of its tracks with the tracks of the Guelph and Goderich Railway at Menesetung Station, Ont.

8430 and 8431—October 22—Granting leave to the Saskatchewan Government Telephones to erect, place, and maintain its wires across the track of the C.N.R., N.W. ¼ of Sec. 10, Tp. 37, R. 5, west 3rd Meridian and near Warman, Sask.

8432 and 8433—October 22—Approving and sanctioning location of the C.N.O. Railway through County Leeds, Ont., and through Townships 44-50, Ranges 16-20, west 3rd Meridian, Province Saskatchewan.

8434—October 22—Granting leave to the C.P.R. to construct an extra track of its railway across Osler Street, Cayley, Alta.

8435—October 22—Granting leave to the C.P.R. to construct, maintain, and operate industrial spur for Mr. Phillips Saumure, town of St. Louis, Parish of Montreal, P.Q.

8436—October 20—Authorizing the C. N. Railway to cross the lines and tracks of the C.P.R. Company's Arcola branch, at Carlyle, Sask.

8437—October 22—Authorizing the Atlantic, Quebec and Western Railway to construct twelve pine trestles on Sections 5 to 10 of its line of railway.

8438—October 21—Authorizing the G.T.R. to reconstruct overhead bridge which carries the highway over its tracks between lots 16 and 17 in 8th concession, Township of Grantham, between St. Catharines and Merritton, Ont.

8439—October 14—Ordering that C.P.R. extend its platform at Creelman, Sask., to a length of 240 feet on or before 1st of May, 1910.

8440—October 14—Dismissing application of the residents of Keeler, Sask., for Order that the C.P.R. erect a suitable freight and passenger station and appoint a permanent agent at Keeler, Sask.

8441—October 15—Dismissing application of the city of Saskatoon, Sask., for an Order that the C.N.R. widen the approaches of 11th Street in said city.

8442—October 15—Dismissing petition of the residents of the district near Saskatoon, for an Order directing the C.N.R. to construct siding on N.E. ¼ of Sec. 26, Tp. 35, R. 7, Sask.

8443—October 15—Dismissing complaint of the Board of Trade of Battleford, Sask., that the C.N.R. has not made proper provision for the loading and shipping of traffic.

8444—October 13—Ordering that the C.N.R. construct, prior to the first of December, 1909, crossing where its railway across the highway between Sections 28 and 29, Tp. 13, R. 14, Manitoba.

8445—October 13—Ordering the C.N.R. to convey to the Municipality of Strathclair, Man., prior to December 1st, 1909, strip of land for a highway in lieu of land taken by the railway company.

8446—October 13—Dismissing application of the municipality of Miniota, Man., for Order that the C.P.R. construct a transfer track of the G.T.P. Railway at Quadra Siding, Man.

8447—October 13—Ordering the C.N.R. to construct, before the 1st of December, 1909, where its railway crosses five highways in the municipality of McCreary, Man.

8448—October 13—Dismissing complaint of R. A. Knight, of Hargrave, Man., alleging discrimination in freight rates of the C.P.R. from Lethbridge to C.N.R. points.

8449—October 13—Dismissing complaint of B. Maxfield, of Souris, Man., alleging dangerous condition of highway crossing over the C.P.R. at First Street, Souris, Man.

8450—October 13—Ordering the C.N.R. to construct, before December 1st, 1909, highway crossings where its railway crosses the highway between Sections 24 and 25, Tp. 13, R. 15, in municipality of Langford, Man.

8451—October 14—Ordering the municipality of Midale to open a highway, from Railway Avenue in north-east direction, across tracks of the C.P.R. at Midale, Sask.

8452—October 14—Authorizing the village of Brownlee, Sask., to construct a highway across the tracks and property of the C.P.R.

8453—October 14—Ordering the C.P.R. to construct, maintain, and operate for a period of three years branch line to Parliament Buildings, Regina, Sask.

8454—October 18—Directing that the C.N.R. establish a flag station and suitable loading platform at Fenton, Sask.

8455—October 18—Dismissing complaint of the Board of Trade, Prince Albert, Sask., alleging unsatisfactory train connection between the C.P.R. and C.N.R. at Regina, Sask.

8456—October 18—Dismissing complaint of Board of Trade of Prince Albert alleging defective and unsafe condition of roadbed of Prince Albert section of north line of C.N.R.

(Continued on Page 523.)

RAILWAY EARNINGS AND STOCK QUOTATIONS

NAME OF COMPANY	Mileage Operated	Capital in Thousands	Par Value	EARNINGS Week of Oct. 31		STOCK QUOTATIONS TORONTO				MONTREAL			
				1909	1908	Price Oct. 28 '08	Price Oct. 21 '09	Price Oct. 28 '09	Sales Week End'd Oct. 28	Price Oct. 28 08	Price Oct. 21 09	Price Oct. 28 '09	Sale Week End'd Oct. 28
Canadian Pacific Railway	8,920.6	$150,000	$100	$3,224,000	2.446,000	175 174	183½	184½ 183¾	541	175 174	183½ 183⅝	183¾ 183½	1010
Canadian Northern Railway	2,986.9	.....	.....	457 300	385,200	.....	.....	.....	.....	.....	.....	.....	.....
*Grand Trunk Railway	3,536	226,000	100	.....	.....	.....	.....	*1st. pref. 108½, 3rd pref. 57½, ordinary 23¾	.....	.....	.....	.....	.....
T. & N. O.	334	(Gov. Road)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Montreal Street Railway	138.3	18,000	100	74,463	68.954	.....	.....	.....	.....	192 191¾	211½ 210½	207½ 202	1181
Toronto Street Railway	114	8,000	100	75,218	69,724	.....	124	123 122¾	180	104⅝ 103½	125 123½	123½ 122⅞	1026
Winnipeg Electric	70	6,000	100	.....	.....	168	185	183	.....	167	.....	.....	.....

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

RAILWAY ACCIDENTS FOR OCTOBER.

Thirty-Nine Killed and Forty Injured.

Character of Accident	Passengers K.	Passengers I.	Employees K.	Employees I.	Others K.	Others I.	Total K.	Total I.
Derailment	..	4	2	15	..	..	2	19
Head-on Collision	..	..	7	3	..	..	7	3
While shunting	..	..	4	3	..	..	4	3
Highway crossing	..	..	..	..	3	2	3	2
Trespassing	..	..	..	..	8	4	8	4
Fell off freight cars	..	..	3	1	..	..	3	1
Pitch-in with hand car	..	..	1	..	..	..	1	..
Adjusting couplings	..	..	1	..	..	..	1	..
Passengers falling off	2	..	..	..	..	..	2	..
Working on track	..	..	2	1	..	..	2	1
Attempt to board moving train	..	..	1	..	..	..	1	..
Unclassified	..	..	1	..	..	..	1	..
Working on cars	..	..	2	..	..	..	2	..
Collision (rear-end)	..	..	..	1	..	..	..	1
Jumping off moving train	1	..	..	3	..	..	1	3
Struck by water tank	..	..	1	..	..	..	1	..
Working on cars and engines	..	..	..	2	..	..	..	2
Couplings broke	..	..	..	1	..	..	..	1
Totals	3	4	25	30	11	6	39	40

From the above table it will be observed that men engaged in actual operation of trains figured largely among the victims of the accidents which occurred on the steam railways of Canada during October. Derailments and collisions were responsible for the majority of fatalities relating to employees, while twelve of the accidents, eight proving fatal, were due to trespassing. During the month, thirty-nine persons were killed and forty were injured. Figures relating to the past three months are appended:

1909	Passengers K.	Passengers I.	Employees K.	Employees I.	Others K.	Others I.	Total K.	Total I.
October	3	4	25	30	11	6	39	40
September	0	5	18	15	15	7	33	27
August	4	5	6	8	22	2	32	15

In the United States.

In this connection some figures regarding the accidents on railways in the United States will be interesting. A report, just issued by the Interstate Commerce Commission, for the year ended June 30, 1909, shows a decrease in the number of casualties. During the year 2,791 persons were killed and 63,920 were injured, as against 3,764 killed and 68,869 injured during the previous year. The total number of collisions and derailments during the second quarter of 1909 was 2,100, and the damage to cars, engines and roadways was $1,703,642.

In Great Britain.

It is interesting to note that not a single passenger was killed last year in a train accident in Great Britain. So far as these records go back, there has only been one other year (1901) when this was the case. The average for the past ten years is twenty-one passengers killed and 626 injured. Last year only 283 passengers were injured. Six railway servants were killed, however, and 164 injured in train accidents, and a number were killed and injured in performing their work. The fact that no passengers were killed and that so few were injured shows how safe railway travelling has become.

On the Electric Roads.

A slight improvement will be noticed in the October returns of accidents on the electric railways, the record for September being especially unenviable. Here are the figures:

October 1909	Killed.	Injured.
Run over	1	1
Fell off	..	1
Struck	1	10
Derailment	..	1
Alighting	..	1
Collisions	..	14
October 1909 totals	2	28
September 1909 "	7	32
August 1909 "	3	27

Notes of Wrecks.

At London, Ont., a freight train conductor's lamp was extinguished and he was unable to stop a fast eastbound Sarnia freight which collided with his train, wrecking the engine and many cars.

Traffic was delayed twelve hours by washouts on the I.C.R.

Part of a C.N.R. freight train was derailed at Pratt, near Brandon, Man., causing some delay to other trains and wrecking several cars.

A defective rail caused a freight train wreck near Port Hope, Ont. Nine loaded cars in addition to the engine were derailed.

Accidents causing neither loss of life nor injury but resulting in more or less damage to rolling stock and the right-of-way occurred in the neighbourhood of the following stations: Vancouver, B.C.; Orangeville, Ont.; Port Hope, Ont.; North Bay, Ont.; Ellershouse, N.S.; Fernie, B.C.; London, Ont.; Coatsworth, Ont.; White River, Ont.; Saskatoon, Sask.; Halifax, N.S.; Ramsay, Ont.; Grand Falls, N.B.; Edwards, Ont.; Cartier, Ont., and Brandon, Man.

I. C. R. EARNINGS.

For the first six months of the fiscal year an increase of $100,000 is reported in the gross earnings of the Intercolonial Railway.

CAPE BRETON ELECTRIC RAILWAY

Gross Earnings.

Gross earnings August, 1909	$ 22,005
" " " 1908	22,958
Operating expenses, August, 1908	11,504
" " " 1908	11,886
Gross earnings for 8 months, 1909	148,388
" " " 1908	159,817

GUELPH RADIAL RAILWAY

The annual report of the Guelph Radial Railway Board as presented to the City Council on November 1st, shows a net profit for the year of $6,523.35. The sum of $6,000 was laid aside for maintenance of plant. Before the city took over the road, under private ownership it was a losing proposition.

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.

Quebec.

ARTHABASKA.—The secretary-treasurer of the council of the County of Arthabaska will receive up to Thursday, December 9th, tenders for the construction of a steel bridge on the Becancour River, between the municipalities of St. Louis of Blandford and the township of Stanfold. Louis Lavergne, secretary-treasurer.

MONTREAL.—Tenders will be received up to Wednesday, December 1st, on 1,000 h.p. water tube boilers, 200 lbs. pressure for The Saraguay Electric & Water Co. Mr. Chas. Brandeis, C.E., Montreal.

MONTREAL.—Bids will be received up to Wednesday, 10th November, for about 100,000 feet B.M. Sawn Hemlock Lumber, and about 75,000 feet B.M. Sawn Pine Lumber, all one inch thick. Permits to inspect the lumber may be obtained upon application to Mr. F. W. Cowie, Chief Engineer. David Seath, Secretary, Montreal Harbor Commission, 57 Common Street.

MONTREAL.—Tenders will be received until Monday, the 15th November, for the construction of a 5-foot circular sewer in the under-mentioned section of street, with the necessary connections according to the sections and specifications on view in my office, viz.:—Sherbrooke Street, 5th Section—From Victoria Street to Drummond Street. John R. Barlow, City Surveyor.

QUEBEC.—Tenders will be received until Tuesday, the 30th November, for the building of the substructure of the Quebec Bridge. The general specification and form of tender will be ready about November 20th; but in the meantime contractors are invited to visit the office of the Quebec Bridge Board of Engineers, Canadian Express Building, Montreal, for the purpose of securing preliminary information to enable them to submit tenders for this work. L. K. Jones, secretary, Department of Railways, and Canals, Ottawa.

QUEBEC.—Tenders will be received until Monday, the 15th November, for the removal of the wreckage of the Quebec Bridge on the Anchor Arm, and on that portion of the Cantilever Arm, down to low water. Full information can be obtained at the Department of Railways and Canals, Ottawa. Parties tendering are to quote a price for the purchase of the material as it stands, which they may remove and dispose of as they wish. L. K. Jones, secretary, Department of Railways and Canals, Ottawa.

Ontario.

BURLEIGH FALLS.—Tenders will be received up to Tuesday, 16th November, for the works connected with the construction of a concrete dam at Burleigh Falls, on the Trent Canal. L. K. Jones, secretary, Department of Railways and Canals, Ottawa.

BERLIN.—The time for receiving tenders for King Street pavement is extended to Thursday, November 11th. Tenders received on October 28th will be returned unopened. Amended specification and plan may be obtained from Mr. W. M. Davis, town engineer, on application. A. H. Millar, town clerk.

DUNNVILLE.—Tenders will be received until Thursday, November 18th, for constructing a system of sanitary sewers comprising about 18,000 lineal feet of tile sewers. the contractor to furnish all materials therefore. The entire work is to be completed on or before August 31st, 1910. Robert Bennett, Mayor; J. W. Holmes, town clerk; Willis Chipman, chief engineer, 103 Bay Street, Toronto.

LONDON.—Tenders will be received until Wednesday, November 10th, for underground conduit and cable system for electric light and power supply. Tenders are also invited until November 22nd on the transformers, motor generator set, voltage regulators, switchboards, lightning protectors, instruments, arc and incandescent street lighting systems, and other electrical apparatus. Address, Mr. E. I. Sifton, Electrical Engineer, City Hall.

OTTAWA.—Tenders will be received until Thursday, November 25th, for the packing of material and supplies for points along the Yukon Telegraph line between Quesnelle and Atlin, in the course of the season of 1910, 1911, and 1912. Forms of tender and specification may be obtained and form of contract seen on application to Mr. J. T. Phelan, Superintendent of Government Telegraphs, Vancouver, B.C.; Mr. William Henderson, District Superintendent Government Telegraphs, Victoria, B.C.; and from the Government Telegraph Agents at Ashcroft, B.C.; Quesnelle, B.C.; Hazelton, B.C.; and Telegraph Creek, B.C. Napoleon Tessier, secretary, Department of Public Works, Ottawa.

TORONTO.—Tenders will be received until Monday, November 22, for additions and alterations to the Toronto General Post Office. Plans may be seen at the office of Mr. Thomas Hastings, clerk of works, Customs Buildings, Toronto; N. Tessier, secretary, Department of Public Works, Ottawa. (Advertised in the Canadian Engineer.)

TORONTO.—Tenders will be received until Wednesday, 10th November, for all the cherry, birch, maple, spruce, hemlock and other classes of timber, estimated to contain over fifty million feet of hardwood, and over fifty million feet of soft wood, on a tract situated on the Georgian Bay at Beaverstone River. McCarthy, Osler, Hoskins & Harcourt, Toronto, Solicitors.

CONTRACTS AWARDED.

New Brunswick.

ST. JOHN.—The city of St. John recently invited tenders for the excavation, backfill and carriage for a main sewer to be laid in Harding street. Mr. Peter Arsenault received the contract at: Earth, 80 cents; rock, $2.75 per lineal foot. Average depth, 7¾ feet. The pipe will be provided and laid by the city. Mr. Wm. Murdock, City Engineer.

Quebec

QUEBEC.—The Levis Ferry Company have awarded to Messrs. Davie a contract for the construction of the pontoons required for the ferry service between Quebec and Levis.

Ontario.

TORONTO.—Sixteen tenders were received for the electrical pumps to be used in connection with the city's waterworks system. The contract for the machinery, which will probably cost about $150,000, has not yet been awarded.

TORONTO.—The Board of Control recently awarded contracts, as follows:—Canada Foundry Company, check valves, $148.54; Matthew Warnock, 16-inch stop valves, $1,496; Jenks-Dresser Company, Sarnia, Ont., steel gates and railing for Broadview Avenue lavatory; excavation, drainage, masonry, William Forbes & Sons, $5,590; joiner work, painting and glazing, William Forbes & Sons, $540; plumbing, heating and ventilation, John Ritchie Co., $3,700.

The day following the awarding of contract for the steel work, local contractors complained that they were not aware that tenders had been invited and the controllers decided to cancel the contract and advertise again.

TORONTO.—The Board of Control have authorized City Engineer Rust to transfer his contract at $14,168 for the asphalt pavement on Shaw Street, from College to Bloor, to the Constructing and Paving Company, and his contract at $6,507 for a bitulithic pavement on Russell Hill road, from Clarendon to St. Clair, to the Warren Bituminous Pav-

ing Co. John F. Connolly was granted a contract to put in a sewer on Lonsdale avenue at a cost of $482. The next tenderer's figure was $483, and the city engineer's figure was $538.

BRANTFORD.—The board of works have recommended that the tender of the Westrumite Company for the brick pavement on Brant Avenue, between Church Street and St. Paul's Avenue at $2.29 per square yard be accepted.

BRANTFORD.—The contract for installing the heating and plumbing systems in the new Collegiate Institute have been awarded to Howie & Feely. The cost is in the neighborhood of $13,000.

WESTON.—Contracts for the new plant, in connection with the waterworks scheme, were awarded as follows:—Contract "A," labor in laying out pipes and furnishing certain materials, J. F. Connolly, Toronto. Contract "C 1," steel water tower, Toronto Iron Works, $5,040. Contract "C 2," concrete foundation for water tower, G. B. Moork, Berlin, $1,350. Contract "D," all cast iron water pipes and special castings, Canada Foundry Co. Contract "E," fire hydrants, sprinkling cranes, gate valves and valve boxes, The London Foundry Co. The approximate cost of the work is $55,000.

Manitoba.

WINNIPEG.—The tender of McDougall & Orton for 300 cords of green cut dry tamarac at $5.20 per cord was accepted by the Board of Control who considered the tender as particularly satisfactory, it being stated that the retail price of tamarac to consumers was $6.50 per cord.

RAILWAYS—STEAM AND ELECTRIC.

Ontario.

WELLAND.—The N. St. C. & T. Railway is understood to be planning extensions from Fort Erie to Port Colborne.

TORONTO.—The contract for the building of the spur line on the T. & N. O. Railway, connecting with the main line at New Liskeard and continuing about a mile to serve several mining industries, has been awarded by the Commissioners to the Canadian Contracts, Ltd., the new Toronto firm. The work will be proceeded with at once.

Manitoba

WINNIPEG.—Only fifteen miles of track on the C.N.R. remain to be laid with heavy steel between here and Port Arthur, and as soon as this work is completed running time between the two terminals will be greatly reduced.

Saskatchewan.

GRENFELL.—The Grand Trunk Pacific survey parties are now engaged on the final survey of the section between Qu'Appelle and Regina, of the Yorkton branch of that railway.

British Columbia

CHILLIWACK.—A survey party running a line for the Canadian Northern Railway recently entered the extreme east end of the Chilliwack Valley at Popcum, coming down from Hope, and are now working in the vicinity. Indications are that they will run a direct line across the eastern side of the valley to Vedder crossing, and from there parallel the British Columbia Electric Railway to Abbotsford.

VANCOUVER.—Contractors are commencing operations on the second 140-mile contract on the G.T.P. from Kitsilas Canyon to Aldermere, says Mr. G. A. McNicholl, purchasing agent for the G.T.P., who returned from Prince Rupert a few days ago, and he expects to call for tenders for half a million ties for this section shortly.

VANCOUVER.—Under the terms of the agreement between the Provincial Government and the Kettle Valley Railway, providing for the payment of a subsidy of $5,000 per mile for 150 miles, construction work will be started next spring at four different points. The line will link the boundary district with the Fraser Valley as well as tap the Okanagan and Similkameen districts. When completed, it will reduce the time between Vancouver and Penticton to eight hours, Midway twelve hours, Grand Forks thirteen hours and Nelson eighteen hours. The system will have a total mileage of 350. The maximum gradient will be one and one-half per cent. in crossing the summit between West Fork and the Okanagan Valley. For the remainder of the distance to Nicola the grade will be less than one-half of one per cent.

SEWERAGE AND WATERWORKS.

Ontario.

BOWMANVILLE.—Mr. T. Aird Murray, consulting sanitary engineer, of Toronto, has been engaged by the town of Bowmanville to prepare plans for a water supply.

NORTH BAY.—The Nipissing Power Company offers to pump the water for the town on a ten-year contract, at two cents per 1,000 gallons, or two cents for stated amount, and 1¾ cents for additional 1,000. This will be considered by a committee of whole council at a secial meeting.

Ontario.

COLDWATER.—The plebiscite vote on waterworks resulted as follows: For complete waterworks, 53; for fire protection only, 10; against both, 2.

British Columbia.

PRINCE RUPERT.—Work at the waterworks intake has been progressing rapidly. A temporary intake has been arranged and the 10-inch main was connected a few days ago with the G.T.P. 10-inch main at the foot of the mountain. There was not a leak in the line when the water was turned on. The new dam is built of heavy cribwork across a pocket in the mountain stream. It will have a face of timber set in concrete. An automatic valve will regulate the supply of water and allow none to run to waste during the season of low water.

LIGHT, HEAT, AND POWER.

Ontario.

OTTAWA.—American and Canadian capitalists interested in the development of the water power of the Long Sault Rapids on the St. Lawrence River, near Cornwall, have submitted to the Government, revised plans which eliminate the objection on the ground that navigation would be interfered with.

TORONTO.—Mr. Justice Riddell on Monday morning dismissed the action of the Ontario Government against the Canadian & Niagara Power Company for $15,217, as representing power in excess of the 10,000 horse-power according to the company's charter as the minimum above which anything would be charged. The Government wished to charge any higher reading till the end of the year or until it was exceeded, but His Lordship held that the company was liable only for the power actually developed, as indicated by the average daily reading.

CEMENT—CONCRETE.

Ontario.

TORONTO.—A handsome trussed concrete bridge, across the Etobicoke River, connecting the Counties of York and Peel, and designed by Mr. Frank Barber, York County Engineer, and Mr. C. R. Young, B.A.Sc., was formally opened and tested on Tuesday, October 26th. The structure has a span of eighty feet and cost less than four thousand dollars. Mr. O. L. Hicks, of Humber Bay, was the contractor.

GUELPH.—Contractor Conery is getting along well with the new cement bridge at Presant's mill. The three cement arches are all but completed, and with good weather the entire structure will be finished within a week.

FINANCING PUBLIC WORKS.

Quebec

MONTREAL.—Tenders for a loan of $800,000 will shortly be invited by the Ville St. Louis Council.

Ontario

EXETER.—The village of Exeter in Huron County, offers $22,000 debentures, issued for waterworks purposes. J. Senior, clerk.

ORILLIA.—Tenders will be received up to Monday, November 15th, for the following issue of debentures:—$55,000 sewerage, $15,000 cement walks, $20,000 public school, $3,000 park purposes, $50,000 loan to Tudhope Company. C. E. Grant, Treasurer.

Alberta

CALGARY.—The by-law to provide funds for extensions to the street railway was carried last Wednesday by a majority of 4.

RAILWAY ORDERS.

(Continued from Page 517.)

8457—October 15—Directing the C.N.R. to remove its fences on the west side of its station yard at Bladmore, Sask., prior to December 1st, 1909.

8458—October 20—Directing the G.T.P. Railway to erect fences at each side of its right of way through the district of East Clover Bar, Alta.

8459—October 20—Directing the G.T.P. Railway to erect fences at each side of its right of way in the district of Clover Bar, Alta.

8460—October 20—Dismissing application of the residents of Round Hill, District Alberta, for Order requiring the C.N.R. Company to locate a station at Round Hill, Alta.

8461—October 20—Dismissing complaint of the Clover Bar Coal Company, Limited, of Edmonton, Alta., alleging discrimination of C.N.R. under tariff C.R.C. 304, effective May 25th, 1909.

8462—October 20—Directing that the G.T.P. Railway construct prior to first day of July, 1910, a subway with an opening 66 feet wide and 14 feet high, over the passage of Fort Saskatchewan trail, Edmonton, Alta.

8463—October 22—Authorizing the G.T.R. to construct, maintain, and operate branch line to and into the premises of the Golden Lake Lumber Company, Township of South Algoma, County Renfrew, Ont.

8464—October 22—Authorizing the C.P.R. to construct, maintain, and operate industrial spur for Jas. McCreary, in Lot 12, Concession 1, Township of Hess, District of Algoma, Ont.

8465—October 22—Authorizing G. A. Farrill, of Kenilworth, Ont., to lay and thereafter maintain water pipe under the track of the C.P.R. at Kenilworth, Ont.

8466—October 22—Authorizing the corporation of the town of Drummondville, P.Q., to lay and thereafter maintain drain pipes under track of the C.P.R. at Convent St., in said town.

8467 and 8468—October 22—Granting leave to the Saskatchewan Government to erect, place and maintain its wires across the track of the C.N.R. west of Warman, Sask., and between Sections 2 and 3, Township 38, R. 5, west 3rd, Sask.

8469—October 22—Granting leave to the Bell Telephone Company to erect, place, and maintain its underground wires across the tracks of the N. St. C. & Toronto Railway at public crossing corner Court Street and Welland Avenue, St. Catharines, Ont.

8470—October 27.—Authorizing the G.T.R. to reconstruct bridge at mileage 29.62, on 16th Dist. between Rifle Range and Long Branch, on Toronto-Hamilton line.

8471—October 22—Authorizing the Hartland Village Water and Fire Commissioners to lay and thereafter maintain pipe under track of the C.P.R. at Bradley Street, Hartland, N.B.

8472 and 8473—October 27—Granting leave to the Volcanic Oil and Gas Company to place, erect, and maintain its wires across the track of the P.M.R.R. at Tecumseh Road, Township Sandwich East, Ont., and at town-line between Township Sandwich East and Sandwich South, County Essex, Ont.

8474 and 8475—October 27—Granting leave to the Government of the Province of Alberta to erect, place and maintain its wires across the track of the C.P.R., Sedgewick, Alta., and Aix, Alta.

SOCIETY NOTES.

Engineering Society, University of Toronto.—On Wednesday afternoon, Mr. T. Kennard Thomson, C.E. (Tor. Univ.), consulting engineer, of New York, addressed the Engineering Society of Toronto University on "Foundations for High Buildings." In the evening, the S.P.S. Alumni held their first dinner of the season, at the St. Charles Hotel. Among the guests of the evening were President Falconer, Dean Galbraith and Mr. T. Kennard Thomson. Mr. C. M. Caniff, as "E. C. Easy," gave his humorous address

McGill Science Undergraduates' Society.—The postponed meeting of the McGill Science Undergraduates' Society was held in the large theatre of the Chemistry Building. The speaker of the evening was Mr. H. H. Vaughan, assistant to the vice-president of the C.P.R., who delivered an address on machine designing. These meetings are always well attended by the Science men, and an interesting programme enlivened by songs and music, followed by refreshments is always prepared. The officers of the society for 1909-10 were elected recently as follows: President, O. N. Brown, '10; vice-president, J. N. Timberlake, '10; secretary, P. H. Skelton, '11; treasurer, G. H. Walker, '11; reporter to Martlet, A. W. Clark, '10.

Railway Engineman's Educational Club.—With a view to increasing their technical knowledge there has been organized in Winnipeg what is known as the Railway Engineman's Educational Club. It has a membership of 250 and a branch at Kenora numbering 50 members. The employees of all railroads are eligible. The headquarters of the organization are in the Empress Block, Winnipeg. The president is C. A. Boyd; vice-president, J. McLachlan; secretary, G. F. Collins, and treasurer, W. S. Metcalf.

MISCELLANEOUS.

Quebec.

MONTREAL.—Messrs. Coste, Desbarats, Holgate, Kennedy, Cowie, and St. Laurent, the members of the Board of Engineers who are considering plans for the improvement of the Port of Montreal, will meet this week to draft a report which will deal with the enlargement of docking facilities, increase in elevator capacity and deepening of the harbour channel so as to accommodate heavy draft steamers.

MONTREAL.—The Mayor of Ville St. Louis has been authorized to sign a contract whereby the C.P.R. and Montreal Street Railway will agree to subscribe $50,000 each for the construction of a tunnel under the C.P.R. tracks on St. Lawrence Boulevard, near Mile End.

ST. FELICIEN.—The new Carbonneau Bridge, situate at St. Felicien, eighteen miles from Roberval, was opened a few days ago. It is of the familiar closed-in type, something like the old Victoria Bridge, but is built entirely of wood. The bridge is 1,364 feet long, comprising ten spans, built ten feet above extreme high water. It was started eight months ago by the Provincial Government, from plans prepared by Mr. J. N. Castonguay, provincial engineer, who estimates that unless the bridge should be destroyed by fire it will be good for a century to come.

Ontario

BERLIN.—New tenders for paving King Street have been invited by this municipality. Mr. W. M. Davis is the city engineer.

OTTAWA.—The engineers in charge of the plans for the reconstruction of the Quebec Bridge have reported to the Minister of Railways that the question as to whether or not the new bridge shall be of suspension or cantilever design is simply a matter of cost. Both plans are feasible, and a decision as to which plan will be adopted will be reached within a fortnight. In the meantime it has been decided to remove one of the piers on the north side of the river and to enlarge the pier on the Levis side. The pier on the north

side will be replaced by one which goes down to the solid rock, twenty-five feet below the gravel bed, on which the present pier rests.

PORT ARTHUR.—Good progress is being made with the construction of the Western Drydock and Shipbuilding Company's plant. In order to make the excavation necessary outside the shore line a coffer dam is being built necessitating 700 feet of crib work. Five hundred feet of this has been completed and now the work of putting it in position has been started.

Manitoba.

WINNIPEG.—With the completion at Point Roberts, last week, of the work of a party of government engineers, there is in existence for the first time a complete and accurate survey of the boundary line between the Dominion of Canada and the United States from Eastport, Me., on the Atlantic to Cape Flattery on the Pacific coast. The boundary survey has been carried on under the direction of a committee authorized by the United States Government three years ago, and working in conjunction with a like committee named by the Canadian government.

Alberta

FRANK.—At Bellevue, the West Canadian Collieries is putting in a new steel plant with air haulage and new railroad yards involving an expenditure of $250,000. The Canadian American company at Frank also is planning for big future operations and will, in the spring, begin the construction of a new plant and the building of coke ovens on which the outlay will run to between $300,000 and $400,000. These plans include the building of a new sanitarium building at the Frank sulphur springs to cost $60,000.

British Columbia.

NORTH VANCOUVER.—Detailed estimates of the cost of making improvements in the West Capilano district include the following items: Clearing, $4,100; grubbing, grading, etc., $40,000; rock-cutting, $72,500; bridging, $47,520; general improvement of Keith Road from western city boundary to Eagle harbour, $16,060; contingencies, $18,000. Total, $198,180. Tenders are invited for road improvements which will be done on the local improvement plan.

NEW WESTMINSTER.—Work has commenced on the setting of the massive centre casting for the swing pier of the new Lulu Island bridge. The south span has been rivetted in position and part of the draw span has been rivetted. The work can now proceed until it comes to the laying of the flooring, which cannot be done on the steel portion until the arrival of the sidewalk brackets. The International Contract Company is also laying the track for the British Columbia Electric Railway line across the bridge. Work on the draw protection has been suspended until such time as the old bridge is removed. It is expected that in about two weeks from now it will be necessary to close the North Arm to navigation.

Yukon.

DAWSON.—The last of the government road construction crews in the territory will have finished its work for the season, and will reach Dawson in a few days from the Black Hills. Fifty thousand dollars have been spent on construction of new roads in the territory recently.

PERSONAL NOTES.

MR. G. H. HERRIOT, B.Sc., of Souris, Man., has been appointed to be a lecturer in Mathematics by the School of Mining, Kingston.

MESSRS. WATSON, JACK & COMPANY, 709 Power Building, Montreal, have been appointed agents for the Province of Quebec for the Polson Iron Works, Ltd., Toronto.

MR. B. J. HARPELL, 24 Aikins Building, Winnipeg, has been appointed Western Canadian agent of Glaholm & Robson, Ltd., Sunderland, England, manufacturers of wire rope of every description. Mr. Harpell has also secured the agency in Western Canada of the Richmond Safety Gate Company, Richmond, Ind., manufacturers of automatic and semi-automatic elevator gates, and all kinds of fire doors.

MR. J. NIBLOCK of the C.P.R., superintendent of the Calgary division, retired from the service November 1, after 35 years of railroading, 30 years of which he has spent in the West. He has been the Calgary superintendent since 1896, having gone there when headquarters were removed from Medicine Hat. Mr. C. S. Maharg, now superintendent at Medicine Hat, will fill the vacancy, while Mr. J. G. Taylor, at present superintendent at Moose Jaw, will take Mr. Maharg's place at Medicine Hat, and Mr. W. J. Urn, superintendent at Brandon, will be moved to Moose Jaw.

THE DUCKWORTH-BOYER ENGINEERING AND INSPECTION COMPANY, LTD., of Montreal, have taken over the business of Mr. Walter R. Duckworth, C.E., Inspecting Engineer, and have arranged with him to act as president and manager of the company. Mr. Duckworth is a graduate of McGill and an Associate Member of the Canadian Society of Civil Engineers. His past record of twelve consecutive years as chief inspector for the Dominion Bridge Company ranks him as an expert in this line of engineering. Mr. Aurelien Boyer, a graduate, with honours, of L'Ecole Polytechnique and an Associate Member of the Canadian Society of Civil Engineers, will act as vice-president. Mr. Boyer some years ago left the civil service in Ottawa, where he was occupying one of the best positions as engineer of the Department of Public Works, to extend his field of knowledge and acquire more experience. Before joining this company he was acting as Chemical Engineer and Superintendent of the works of Montreal industries. The company will give special attention to the inspection of bridges and structural work, tests of materials of construction; and reinforced concrete work, also expert examination and reports.

MR. F. W. COWIE, M. Can. Soc. C.E., of Montreal, will probably deliver a course of lectures on Harbour Engineering, before the fourth year students in the Faculty of Applied Science at McGill University. Mr. Cowie has had experience, which marks him as by far the man best fitted to deliver such a course of lectures. On his graduation from McGill in 1886, he at once entered the engineering offices of the Montreal Harbour Commission, transferring after some years to Ottawa. Later he had experience about the ports of the Great Lakes and also made a study of inland navigation. Some thirteen years ago he was appointed ship channel engineer for the St. Lawrence, where he had charge of much of the great improvement work which has been accomplished; and in 1907, resigned that position to become chief engineer for the Harbour Commission, Montreal. He accompanied Major Stephens on an extensive trip to study the chief ports of Europe and the work which these two gentlemen prepared on their return, is recognized as one of the most valuable on the subject ever published. More recently, Mr. Cowie drew up one of the two great plans for the improvement of the harbour of Montreal, which are now under consideration of a board of expert engineers.

MARKET CONDITIONS.

Montreal, November 3rd, 1009.

The United States is again going through the excitement experienced in 1903 at the beginning of the prolonged boom in iron and steel material. Notwithstanding the fact that there is in the neighborhood of one million tons of pig-iron held in store by various interests, coupled with the circumstance that output is to-day greater than at any other time in history, such is the confidence of consumers that prices are going up by leaps and bounds under the demand which is coming along from all parts of the country for all grades of metal. Standard Bessemer iron could be purchased in June at $14.50 per gross ton, Valley furnace; it is now selling readily at $19 per ton, for prompt delivery, with an advance of 50c. to $1 per ton asked for delivery during next year. Foundry and basic grades have advanced in proportion and the tendency is still upward. The reasons for this advance are several, among which is the increased cost of raw material, such as ore and coke. Prices of Lake Superior ore have not yet been fixed for next year, but it is fully expected that it will be advanced at least 50c. per ton. Practically two tons of ore are used to make one ton of pig iron, thus adding $1 to the cost; coke prices are fully $1 per ton higher than they were two months ago and, approximately one ton of coke is used to make one ton of pig, another dollar is added to the cost of pig. Thus ore and coke will alone account for fully $2 of the advance, the balance being made up of increasing demand made on available supplies of metal. The railway companies, which have been the most backward interests during the year, are again coming into the market liberally for locomotives and cars, and large quantities of rails, this circumstance alone accounting largely for the improved condition. But there seems to be no feature of the trade which is lacking in confidence and enthusiasm.

The English and Scotch markets, while not so excited as those of the United States, are showing a decided improvement. Scotch producers of pig-iron have recently got together, but have not been able to advance prices materially, although it is impossible to secure concessions on any tonnage for prompt shipment. Some are declining to make contracts for large deliveries during 1910. The English market is now at a higher point than at any time during the past two years, and as numerous enquiries are

now before English makers and merchants, for shipment to United States Atlantic ports, it is believed that a further upward movement will be experienced almost immediately. Already several cargoes have been arranged for delivery at Philadelphia, and negotiations are under way for shipments to New York and Boston.

From the Continent come reports, for the first time in many months, indicating an optimistic tone in Germany and Belgium. While not materially higher, prices are certainly on the up-turn, and, with prospects for a firm business ahead, the indications point to higher prices all round. General market conditions in these countries are also showing signs of improvement, which would have the tendency of creating a demand for iron and steel materials and thus warrant better prices for manufacturers.

Locally, everything points to a decided improvement, not alone in prices but in the volume of business. From all points of the country, good enquiries are being received, and as the market is almost bare of pig-iron, consumers are being compelled to pay advanced prices for prompt delivery. They will, however, without doubt, be called upon to pay considerably higher prices for tonnage which they may need to contract for later on for 1910 delivery. Canadian furnaces are pretty well occupied and for the most part cannot take on additional orders for delivery during the present year. Telegraph and telephone orders are being received by merchants, urging them to make immediate delivery of orders which purchasers were of the opinion they would not require for a considerable time to come.

Notwithstanding the strength of the situation in pig-iron, merchants handling finished and semi-finished iron and steel products fail to find the strength uniform in their markets. For instance, steel plates have been almost easy in tone and it is quite possible that figures quoted some months since might be shaded, even, at the present moment. In bar iron and steel, however, the situation is otherwise, and the mills report that advances are now not far away. This will mean much to the general hardware market which has shown few alterations for some time past. During the past week, there have been advances in nails and spikes, and galvanized iron is a shade higher, chain, also, being quite a little dearer. The market generally is stronger:—

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

Bar Iron and Steel.—The market promises to advance shortly. Bar iron, $1.85 per 100 pounds; best refined horseshoe, $2.10; forged iron, $2; mild steel, $1.85; sleigh shoe steel, $1.85 for 1 x ⅜-base; tire steel, $1.00 for 1 x ⅜-base; toe calk steel, $2.35; machine steel, iron finish, $1.90; imported, $2.20.

Boiler Tubes.—The market is steady, quotations being as follows:—1½ and 2-inch tubes, 8¼c.; 2½-inch, 10c.; 3-inch, 11¼c.; 3½-inch, 14 1-2c.; 4-inch, 18 1-2c.

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

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

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

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

Explosives and Accessories.—Dynamite, 50-lb. cases, 40 per cent. proof, 15c. in single case lots, Montreal. Blasting powder, 25-lb. kegs, $2.25 per keg. Special quotations on large lots of dynamite and powder. Detonator caps, case lots, containing 10,000, 75c. per 100; broken lots, $1; electric blasting apparatus:—Batteries, 1 to 10 holes, $15; 1 to 20 holes, $25; 1 to 30 holes, $35; 1 to 40 holes, $50. Wire, leading, 1c. per foot; connecting, 50c. per lb. Fuses, platinum, single strength, per 100 fuses:—4-ft. wires, $3; 6-ft. wires, $3.54; 8-ft. wires, $4.08; 10-ft. wires, $5. Double strength fuses, 4-ft., $3.75; 6-ft., $4.29; 8-ft., $4.83; 10-ft., $5.37. Fuses, time, double-tape, $6 per 1,000 feet; explohmeters, fuse and circuit, $7.50 each.

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 outlook is strong. The following prices are for carload quantities and over, free on dock, Montreal, prompt delivery; No. 1 Summerlee, $20.50 to $21; selected Summerlee, $20 to $20.50; soft Summerlee, $19.50 to $20; Clarence, $18.25 to $18.50; Midland or Hamilton pig is quoted at $20 to $20.50 per ton for No. 1 f.o.b., cars at point of production, No. 2 being $19.50 to $20, and No. 3 $19 to $19.50 for delivery during the next six months. It is said Dominion and Scotia companies are not quoting prompt delivery. Carron No. 1, $20.50 to $21; Carron special, $20 to $20.50.

Laths.—See Lumber, etc.

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

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

Lumber, Etc.—Prices on lumber are for car lots, to contractors, at mill points, carrying a freight of $1.50. Red pine, mill culls out, $18 to $22 per 1,000 feet; white pine, mill culls, $16 to $17. Spruce, 1-in. by 4-in. and up, $15 to $17 per 1,000 ft.; mill culls, $12 to $14. Hemlock, log run, culls out, $13 to $15. Railway Ties; Standard Railway Ties, hemlock or cedar, 35 to 45c. each, on a 5c. rate to Montreal. Telegraph Poles: Seven-inch top, cedar poles, 25-ft. poles, $1.35 to $1.50 each; 30-ft., $1.75 to $2; 35-ft., $2.75 to $3.25 each, at manufacturers' points, with 5c. freight rate to Montreal. Laths: Quotations per 1,000 laths, at points carring $1.50 freight rate to Montreal, $2 to $3. Shingles: Cedar shingles, same conditions as laths, X, $1.50; XX, $2.50; XXX, $3.

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

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

Pipe.—Cast Iron.—The market is unsettled and uncertain, as dealers are compelled to meet competition from all sources. Prices are easy and approximately as follows:—$31 for 6 and 8-inch pipe and larger; $32 for 5-inch and 4-inch at the foundry. Pipe, specials, $3 per 100 pounds. Gas pipe is quoted at about $1 more than the above.

Pipe.—Wrought and Galvanized.—Demand is much better and the tone is firm, though prices are steady, moderate-sized lots being: ¼-inch, $5.50 with 63 per cent. off for black, and 48 per cent. off for galvanized; ⅜-inch, $5.50, with 59 per cent. off for black and 44 per cent. off for galvanized; ½-inch, $8.50, with 69 per cent. off for black, and 59 per cent. off for galvanized. The discount on the following is 72½ per cent. off for black, and 62½ per cent. off for galvanized; ¾-inch, $11.50; 1-inch, $16.50; 1¼-inch, $22.50; 1½-inch, $27; 2-inch, $36; 2½-inch, $57.50; 3-inch, $75.50; 3½-inch, $95; 4-inch, $108.

Plates and Sheets.—Steel.—The market is steady. Quotations are: $2.20 for 3-16; $2.30 for ⅛, and $2.10 for ¼ and thicker; 12-gauge being $2.30; 4-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 $30.50 to $31 is given for 60-lb. and 70-lb.; 80-lb. and heavier, being $30; rails, per gross ton of 2,240 lbs., f.o.b. mill. Re-laying rails are quoted at $27 to $29 per ton, according to condition of rail and location.

Railway Ties.—See lumber, etc.

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

Rope.—Prices are steady, at 9c. per lb. for sisal, and 10½c. for Manila. Wire rope, crucible steel, six-strands, nineteen wires; ¼-in., $2.75; 5-16, $3.75; ⅜, $4.75; ½, $5.25; ⅝, $6.25; ¾, $8; ⅞, $10; 1-in., $12 per 100 feet.

Spikes.—Railway spikes are firmer at $2.45 per 100 pounds, base of 5½ x 9-16. Ship spikes are steady at $2.85 per 100 pounds, base of 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 pounds. (See building paper; also roofing).

Tin.—Prices are unchanged, at 32½ to 33c.

Zinc.—The tone is steady, at 6 to 6¼c.

* * * *

Toronto, November 4th, 1909.

An increased activity is observable in many departments of business, and as a rule the trend of prices is upward. In iron and steel goods, since the recent difference between producers of these in Britain and the States, the market is on the rise, and from reliable information the price at point of production has already advanced. Higher prices may be looked for here in sheets, and it might be well to book requirements now.

In building materials, lumber is steady, brick firm and active, cement unchanged from former quotations. Roofing felt is active, building paper quiet, pitch and tar normal, all without change of quotation. The Manitoba and Western demand for these goods is much brisker than that in Ontario.

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

Antimony.—Demand active and price higher at $9.25 per 100 lbs.

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

Bar Iron.—$1.95 to $2, base, per 100 lbs., from stock to wholesale dealer. Market well supplied.

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

Boiler Tubes.—Orders continue active. Lap-welded, steel, 1¼-inch, 10c.; 1½-inch, 9c. per foot; 2-inch, $8.50; 2¼-inch, $10; 2½-inch, $10.60; 3-inch, $12.10; 3½-inch, $15; 4-inch, $18.50 to $19 per 100 feet.

Building Paper.—Plain, 30c. per roll; tarred, 40c. per roll. Demand is only moderate.

Bricks.—Business is very active, price at some yards $9 to $9.50, at others, $9.50 to $10 for common. Don Valley pressed brick move also freely. Red and buff pressed are worth $18 delivered and $17 at works per 1,000.

Broken Stone.—Lime stone, good hard, for roadways or concrete, f.o.b., Schaw station, C.P.R., 60c. per ton of 2,000 lbs., 1-inch, 2-inch, or larger, price all the same. The supply is excessive; hence the lowered price. Broken granite is selling at $3 per ton for good Oshawa.

Cement.—Manufacturers' prices for Portland cement are $1.35 without bags, or $1.65 including cotton bags for car lots on board car, Fort William or Port Arthur; the price at Toronto is $1.30 without bags, or $1.70 with bags. Smaller dealers get $1.35 to $1.40 per barrel without bags, in load lots, delivered in town. Demand is fairly steady.

Coal.—Retail price for Pennsylvania hard, $6.75 net, steady. This price applies to grate, egg, stove, and chestnut; only pea coal is cheaper, namely, $5.75. These are all cash, and the quantity purchased does not affect the price. Soft coal is in good supply, American brokers have been covering the ground very fully. In the United States there is an open market for bituminous coal and a great number of qualities exist. We quote. Youghiogheny lump coal on cars here, $3.70 to $3.80; mine run, $3.60 to $3.75; slack, $2.65 to $2.85; lump coal from other districts, $3.40 to $3.70; mine run 10c. less; slack, $2.50 to $2.70; cannel coal plentiful at $7.50 per ton; coke, Solvey foundry, which is largely used here, quotes at from $5.25 to $5.50; Reynoldsville, $4.50 to $4.75; Connellsville, 72-hour coke $5.25 to $5.50.

Copper Ingot.—The market continues as before stated, price being $13.85 to $14.05, and the demand normal.

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

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

Roofing Felt.—An improvement in demand of late, no change in price, which is $1.80 per 100 lbs. Much is being now used for lumber camps.

Fire Bricks.—English and Scotch, $30 to $35; American, $25 to $35 per 1,000. The demand is steadv.

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

Iron Chain.—¼-inch, $5.75; 5-16-inch, $5.15; ¾-inch, $4.15; 7-16-inch, $3.95; ½-inch, $3.75; 9-16-inch, $3.70; ⅝-inch, $3.55; ¾-inch, $3.45; ⅞-inch, $3.40; 1-inch, $3.40, per 100 lbs.

Iron Pipe.—Repeat quotations of last week, as follows:—Black, ¼-inch, $2.03; ⅜-inch, $2.25; ¾-inch, $2.63; ¾-inch, $3.28; 1-inch, $4.70; 1¼-inch, $6.41; 1½-inch, $7.70; 2-inch, $10.26; 2½-inch, $16.39; 3-inch, $21.52; 3½-inch, $27.08; 4-inch, $30.76, 4½-inch, $38; 5-inch, $43.50; 6-inch, $56 Galvanized, ¼-inch, $2.86; ⅜-inch, $3.08; ½-inch, $3.48; ¾-inch, $4.43; 1-inch, $6.35; 1¼-inch, $8.66; 1½-inch, $10.40; 2-inch, $13.86, per 100 feet.

Lead.—Prices steady outside. This market is steadier, and demand quiet, at $3.75 to $3.85 per 100 lbs.

Lime.—Retail price in city 35c. per 100 lbs. f.o.b., car; in large lots at kilns outside city 22c. per 100 lbs. f.o.b. car. Demand is good.

Lumber.—Prices continue steady, and city demand still active. We quote dressing pine $32.00 to $35.00 per M; common stock boards, $26 to $30; cull stocks, $20; cull sidings, $17.50; Southern pine dimension timber from $30 to 45, according to size and grade; finished Southern pine according to thickness and width, $30 to $40. Hemlock in car lots, $16.50 to $17; spruce flooring in car lots, $22 to $24; shingles, British Columbia, $3 to $3.10; lath, No. 1, $4.25; No. 2, $3.75; for white pine, 48-inch; for 32-inch, $1.60.

Nails.—Wire, $2.35 base; cut, $2.60; spikes, $2.85 per keg of 100 lbs.

Pitch and Tar.—Pitch, demand moderate, price so far unchanged at 70c. per 100 lbs. Coal tar fairly active at $3.50 per barrel.

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

Plaster of Paris.—Calcined, New Brunswick, hammer brand, car lots, $2; retail, $2.15 per barrel of 300 lbs.

Putty.—In bladders, strictly pure, per 100 lbs., $2.25; in barrel lots, $2.05. Plasterer's, $2.15 per barrel of three bushels.

Ready Roofing.—Dealers report a large demand, the prices being as before, per catalogue

Roofing Slate.—Most of the slate used in Canada comes now from Pennsylvania or Maine, the Canadian supply being slender and mostly from the Rockland quarries of the Eastern Townships in Quebec. There is a great variety of sizes and qualities, so that it is difficult to indicate prices. But No. 1 Pennsylvania slate 10x16 may be quoted at $7.25 per square of 100 square feet, f.o.b., cars, Toronto; seconds, 50c. less. The demand continues active; competent roofers are scarce.

Rope.—Sisal, 9½c. per lb.; pure Manila, 12½c. per lb., Base.

Sewer Pipe.—

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

Business steady; price, 73 per cent. off list at factory for car-load lots; 65 per cent. off list retail. Small lots subject to advance.

Steel Beams and Channels.—Quiet.—We quote:—$2.50 to $2.75 per 100 lbs., according to size and quantity; if cut, $2.75 to $3 per 100 lbs.; angles, 1¼ by 3-16 and larger, $2.50; tees, $2.80 to $3 per 100 pounds. Extra for smaller sizes of angles and tees.

Steel Rails.—80-lb., $35 to $38 per ton. The following are prices per gross ton, for 500 tons or over; Montreal, 12-lb. $45, 16-lb. $44, 25 and 30-lb. $43.

Sheet Steel.—We do not alter prices as yet; 10-gauge, $2.50; 12-gauge, $2.55; American Bessemer, 14-gauge, $2.35; 17, 18, and 20-gauge, $2.45; 22 and 24-gauge, $2.50; 26-gauge, $2.65; 28-gauge, $2.85. Quite a good demand exists, and there is prospect of higher prices.

Sheets Galvanized.—Apollo Brand.—Sheets 6 or 8 feet long, 30 or 36 inches wide; 10-gauge, $2.90; 12-14-gauge, $3.00; 16, 18, 20, $3.10; 22-24, $3.25; 26, $3.40; 28, 3.85; 29, $4.15; 10¾, $4.15 per 100 lbs. Fleur de Lis—28-gauge, $4; 26, $3.80 per 100 lbs. Demand very active.

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

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

Tin.—The feeling in tin is firm, and the price 32 to 33c. per lb.

Wheelbarrows.—Navvy, steel wheel, Jewel pattern, knocked down, $21.60 per dozen; set up, $22.60. Pan Canadian, navvy, steel tray, steel wheel, $3.30 each; Pan American, steel tray, steel wheel, $4.25 each.

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

CAMP SUPPLIES.

Beans.—Hand picked, $2; prime, $1.85; Rangoon, $1.80.

Butter.—Dairy prints, 21 to 22c.; creamery rolls, 25 to 26c.

Canned Goods.—Peas, $1.00 to $1.50; tomatoes, 3s, 85c. to 95c.; pumpkins, 3s, 80 to 85c.; corn, 75 to 85c.; peaches, 2s, white, $1.50 to $1.60; yellow, $1.90 to $1.95; strawberries, 2s, heavy syrup, $1.90 to $1.95; raspberries, 2s, $1.90 to $1.95.

Cheese.—No old cheese on hand; new cheese, large, 12¾c.; twins, 13c.

Coffee.—Rio, green, 10 to 12½c.; Mocha, 21 to 23c.; Java, 20 to 31c.; Santos, 11 to 15c.

Dried Fruits.—Raisins, Valencia, 5½ to 6c.; seeded, 1-lb. packets, fancy, 7½ to 8c.; 16-oz. packets, choice, 7 to 7½c.; 12-oz. packets, choice, 7c.; Sultanas, good, 5 to 6c.; fine, 6 to 7c.; choice, 7 to 8c.; fancy, 8 to 9c.; Filiatras currants, 6½ to 7c.; Vostizzas, 8½ to 9c.; uncleaned currants, ¼c. lower than cleaned. California Dried Fruits,—Evaporated apricots, 14 to 15c. per lb.; prunes, 60s to 70s, 7 to 7½c.; 90s to 100s, 6½c.; evaporated apples, 9½c.

Eggs.—New laid, 25 to 26c. per dozen, in case lots.

Lard.—Scarce and higher. Tierces, 16c.; tub, 16¼c.; pails, 16½c. per lb.

Molasses.—Barbadoes, barrels, 37 to 45c.; Porto Rico, 45 to 60c.; New Orleans, 30 to 33c. for medium.

Onions.—$1.25 a bag.

Potatoes.—Best, 75c. a bag.

Pork.—Market uncertain. Short cut, $27.50 per barrel; mess, $26, nominal; no stock here.

Rice.—B grade, 3½c. per lb.; Patna, 5½ to 5¾c.; Japan, 5¼ to 6c.

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

Smoked and Dry Salt Meats.—Long clear bacon, 15c.; firm, tons and cases; hams, large, 14 to 14½c.; small, 15½ to 16c.; rolls, 14½ to 14¾c.; breakfast bacon, 17c.; backs (plain), 18 to 19c.; backs (peameal), 18c. to 18½c.; shoulder hams, 12c.; green meats out of pickle, 1c. less than smoked. Market very firm.

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

Sugar.—Granulated, $4.75 per 100 lbs. in barrels; Acadia, $4.65; yellow, $4.35; bags, 5c. lower; bright coffee, $4.55; bags, 5c. less.

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

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

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Winnipeg, November 2nd, 1909.

Conditions in the West remain very satisfactory as far as building operations are concerned; and all trades connected with it are working up to full capacity. Carpenters are in demand, and there is, if anything, a shortage in the labor market. Orders are coming to hand from country merchants for shelf and heavy hardware, and in Winnipeg there is reported to be a shortage of small, iron pipe caused by the large amount of this material being used for the installation of May-Oatway Fire Alarm Systems. There seems to be no let up in the number of propositions being considered, and there is no shortage of capital in the West this year for this purpose. Coal dealers are very busy; but the price of coal is unchanged, and there is scarcely any change in quotations of the different lines of coal on this market. Cement is quiet, with prices remaining steady. The iron working factories are still busy, and taking the season just closed which has been the best in their history for the amounts of contracts completed.

Winnipeg quotations are as follows:—

Anvils.—Per pound, 10 to 12½c.; Buckworth anvils, 80 lbs., and up, 10¾c.; anvil and vice combined, each, $5.50.

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

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

Bar Iron.—$2.50 to $2.60.

Bars.—Crow, $4 per 100 pounds.

Beams and Channels.—$3 to $3.10 per 100 up to 15-inch.

Boards.—No. 1 Common Pine, 8 in. to 12 in., $38 to $45; siding, No. 2 White Pine, 6 in., $55; cull red or white pine or spruce, $24; No. 1 Clear Cedar, 6 in., 8 to 16 ft., $60; Nos. 1 and 2 British Columbia spruce, 4 to 6 in., $55; No. 3, $45.

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

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

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

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

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

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

Chain.—Coil, proof, ¼-inch, $7; 5-16-inch, $5.50; ⅜-inch, $4.90; 7-16-inch, $4.75; ½-inch, $4.40; ⅝-inch, $4.20; ¾-inch, $4.05; logging chain, 5-16-inch, $6.50; ⅜-inch, $6; ¼-inch, $8.50; jack iron, single, per dozen yards, 15c. to 75c.; double, 25c. to $1; trace-chains, per dozen, $5.25 to $6.

Dynamite.—$11 to $13 per case.

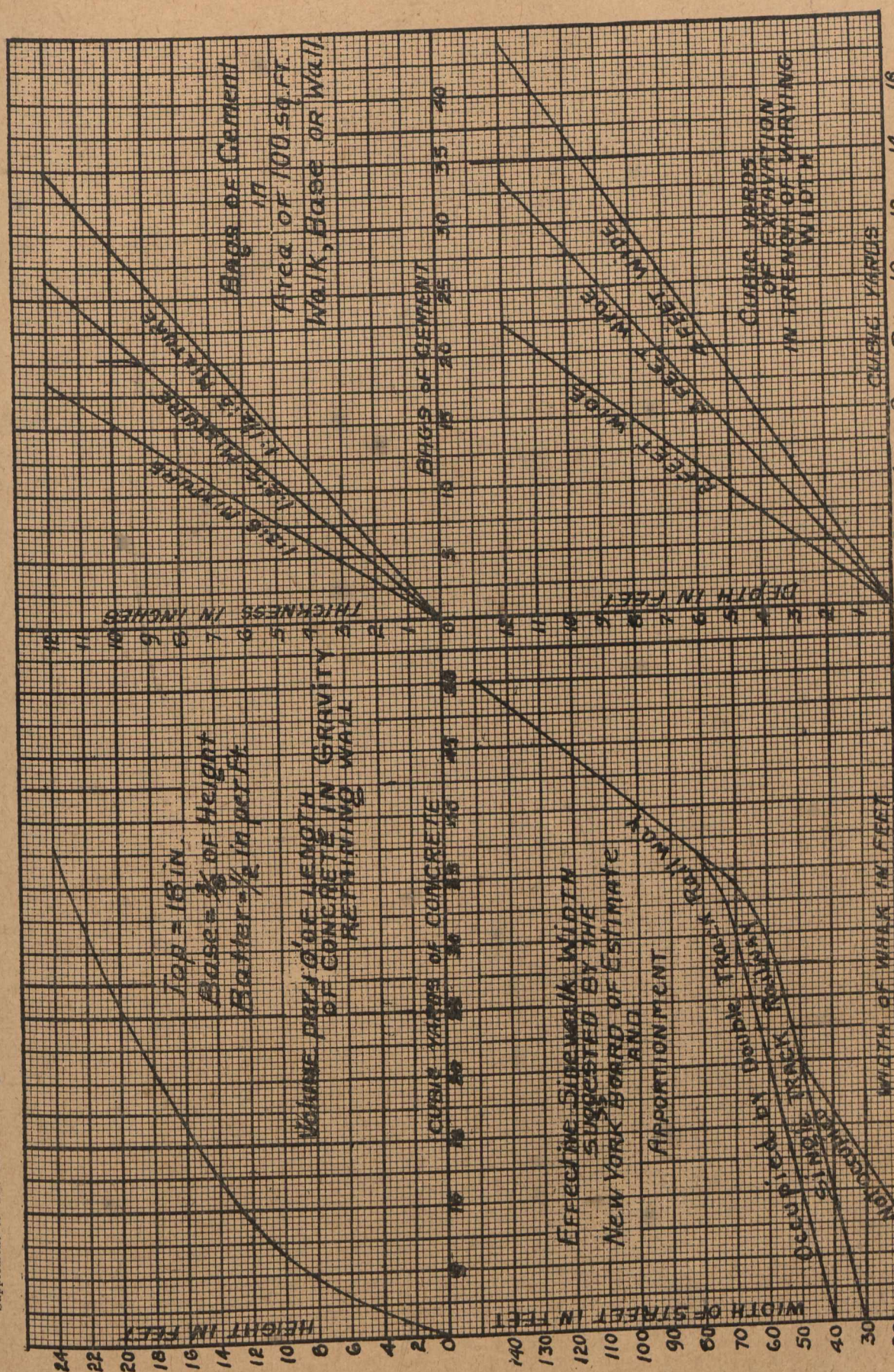
Hair.—Plasterers', 80 to 90c. per bale.

Hinges.—Heavy T and strap, per 100 lbs., $6 to $7.50; light, do., 65 per cent.; screw hook and hinge, 6 to 10 inches, 5¼c. per lb.; 12 inches up, per lb., 4¼c.

Galvanized Iron.—Apollo, 10¾, $4.90; 28, $4.70; 26, $4.30; 22, $4.10; 24, $4.10; 20, $4; 18, $3.95; 16, $3.90; Queen's Head, 28, $4.90; 26, $4.70; 24, $4.30; 22, $4.30; 20, $4.10 per cwt.

Iron.—Swedish iron, 100 lbs., $4.75 base; sheet, black, 14 to 22 gauge, $3.75; 24-gauge, $3.90; 26-gauge, $4; 28-gauge, $4.10. Galvanized—American, 18 to 20-gauge, $4.40; 22 to 24-gauge, $4.65; 26-gauge, $4.65; 28-gauge, $4.90; 30-gauge, $5.15 per 100 lbs. Queen's Head, 22 to 24-gauge, $4.65; 26-gauge English, or 30-gauge American, $4.90; 30-gauge American, $5.15; Fleur de Lis, 22 to 24-gauge, $4.50; 28-gauge American, $4.75; 30-gauge American, $5.

(Continued on Page 40.)



CURVES FOR RAPID ESTIMATING OF QUANTITIES.

Supplement to The Canadian Engineer, November 5th, 1909.