PAGES

MISSING

The Canadian Engineer

WEEKLY

ESTABLISHED 1893

VOL. 15. TORONTO, CANADA, NOVEMBER 13th, 1908. No. 46

The Canadian Engineer

ESTABLISHED 1893

Issued Weekly in the Interests of the

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

Editor—E. A. JAMES, B.A. Sc.

Business Manager—JAMES J. SALMOND.

Present Terms of Subscription, payable in advance:

Canada and Great Britain:		United States and other Countries:	
One Year - -	$2 00	One Year - -	$2.50
Six Months - -	1.25	Six Months - -	1.50
Three Months -	0.75	Three Months	1.00

ADVERTISEMENT RATES ON APPLICATION.

HEAD OFFICE: 62 Church Street, and Court Street, Toronto TELEPHONE MAIN 7404.

Montreal Office: B 32 Board of Trade Building. T. C. Allum, Editorial Representative. Phone M 2797.

Winnipeg Office: Room 315, Nanton Building. Phone 8142. G. W. Goodall, Business and Editorial Representative.

Address all communications to the Company and not to individuals.

Everything affecting the editorial department should be directed to the Editor

NOTICE TO ADVERTISERS:

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

Printed at the office of THE MONETARY TIMES PRINTING CO., Limited, TORONTO, CANADA.

TORONTO, CANADA, NOVEMBER 13, 1908.

CONTENTS OF THIS ISSUE.

THE CITY ENGINEER AND THE CITY COUNCIL.

The reorganization and new appointments suggested by the Board of Control in connection with the Toronto City Engineer's Department recalls a somewhat similar movement that has taken place in Edmonton, Calgary, Hamilton, and half a dozen other Canadian cities.

In each community there were local conditions which influenced the city council in their actions, but through them all there appears to be a feeling that unless the city engineer is an expert in sewage disposal, electric equipment, highway pavement, and water supply, and also an able administrator, he falls short of being an efficient city engineer, and to the man supposed to possess all these qualifications they propose paying the princely (?) salary of $5,000 per annum.

A man expert in any one of the departments named is worth twice that money, and the man does not live who is an expert, up-to-date and familiar with the best methods in all the branches of engineering. Why, then, are the members of Council unreasonable in their requests for expert advice from their City Engineer?

The Council have a right to expect their City Engineer to be a good administrator, a man capable of organizing and directing the departments of his service, and familiar, in a general way, with the problems of each department, but to expect him to be an expert is the worst kind of folly. Some municipalities recognize that their engineer must keep posted as to what is being done elsewhere, and send him on trips of inspection. This is very good, but to expect a man in a six weeks' trip to return with clear ideas as to the best method of sewage disposal is asking him to do that which a Royal Commission of Engineers could not decide in three years.

In every department of engineering changes come quickly. Each year new ideas are being developed, methods of a year ago are old, and a city council must not expect a man, tied down half the time to office routine, preparing useless reports and doing administrative duty to be an expert in all lines of work. For each new large work they should be prepared to engage a man specially qualified, and let him design and construct, and be responsible to the City Engineer for a completed scheme.

JOHN GALBRAITH, LL.D.

The thirty years of patient service rendered by John Galbraith to Canadian academic circles and to the cause of technical education have received graceful recognition. The presentation to the university last week of a life-sized portrait is a tangible expression of appreciation, long felt and widely distributed. It was, too, a tribute to his professional fidelity, a faithfulness to a conception of the proper college training of a prospective engineer.

The organization of a new department of a growing university is no small task. To plan and build along new lines, to play the pioneer requires patience, courage and vision. To have found that after thirty years of quiet, unostentatious service that the conceptions of three decades ago are still the expression of student

requirements in engineering must have been the pleasing gratification of a life wish.

In 1877 John Galbraith and William Hodgson Ellis were the teaching staff of what is now the Faculty of Applied Science, and their students did not number half a dozen. To-day the teaching staff numbers over thirty and the student body over seven hundred. Through these years of stress and growth Dean Galbraith has been the guilding hand as well as the official head, and a week ago the graduate body presented to the Board of Governors of Toronto University an oil painting of their former teacher as a token of their appreciation of him as an educationalist, an administrator, a man and a friend.

As a teacher Dean Galbraith was not a high-pressure educationalist. His students were constantly encouraged to inquire. To educate with him was to bring out far more than to pour in; to promote reflection and stimulate thought was the object of his teaching. No one was ever snubbed for ignorance or silenced for presumption, nor was a sneer ever used by him in the class-room. In his journeys back to "first principles" he sometimes sorely tried the patience of a restive class, but those who came in closest touch with him realized the soundness of his arguments and were stimulated in thought.

As an administrator he stands out, in the life of Toronto University, a leader. About the man there is such a fine spirit of inflexibility towards his notion of duty that those working with him catch the inspiration of the place, and his wishes are anticipated. Cautious in the extreme and thorough, he masters the question himself and then carefully and fully presents it in detail, keeping hid his own bias until he is sure the listeners' views are his views. He always restrained, and never at first encouraged new ventures or radical measures, but when the enthusiasm of the moment had subsided and the work of completing the details of some dreamer's scheme, he was ever ready with sympathetic council and patience for the slow working out.

Of Dean Galbraith as a man we will say but little. We leave that to those who were more intimately acquainted with him. This we do know, kinder man never trod God's earth, nor a more generous soul.

EDITORIAL NOTES.

The Dominion Railway Board are sending out a circular in which they intimate that railway companies need not expect the Board to confirm what has been done unless they have sanctioned that particular work before it was undertaken. The old plea that the money has been spent and the railways will suffer great hardship if the law is enforced will no longer avail.

* * * *

Advices from New York and Chicago show much negotiation in structural steel proposals during the week. Probably 100,000 tons is expected to be contracted for in various large buildings on Wall Street, and in the city hall and the Marx Building in Chicago. But it is significant to find a despatch of November 9th saying: "Contracts verbally awarded last week were between 25,000 and 30,000 tons, but the business actually closed was less than 15,000 tons."

* * * *

Elections are now well over, and for another four or five years business will continue uninterrupted by the excitement and prejudices of party politics. If the Government closes contracts for the many public works they have been advertising work should been plentiful. The prices submitted will likely be lower than they have been able to secure heretofore, and it is in quiet times like these that necessary public works should be undertaken.

While a better feeling has existed throughout the American steel industry since the election of November 3rd, the tendency is everywhere to magnify the improvement that has taken place in trade. The election of Taft was largely discounted during the second half of October by heavy transactions, and the first half of November will be greatly less. The railways are not sufficiently in funds to buy all they need, but they have been giving small orders to rail mills. The Pennsylvania, the New York Central, and the Elevated has each given out a number of bridge and crossing contracts, but the aggregate is small.

PRECIPITATION FOR OCTOBER, 1908.

The table shows for fifteen stations included in the report of the Meteorological Office, Toronto, the total precipitation at these stations for the month. Ten inches of snow is calculated as being the equivalent of one inch of rain:—

Station.	Depth in inches.	Departure from the average of twenty years.
Calgary, Alta.	1.60	+ 1.12
Edmonton, Alta.	1.50	+ 0.79
Swift Current, Sask.	2.60	+ 1.95
Winnipeg, Man.	2.20	+ 0.59
Port Stanley, Ont.	1.50	— 1.38
Toronto, Ont.	1.01	— 1.42
Parry Sound, Ont.	0.50	— 3.38
Ottawa, Ont.	2.40	— 0.27
Kingston, Ont.	2.20	— 0.54
Montreal, Que.	1.50	— 1.66
Quebec, Que.	2.20	— 0.98
Chatham, N.B.	....	....
Halifax, N.S.	3.70	— 1.81
Victoria, B.C.	2.30	— 0.05
Kamloops, B.C.	0.60	+ 0.15

MECHANICAL STRAINS IN POLE LINE.

In our issue of October 23rd, 1908, in Mr. F. A. Bowman's paper on page 756 two typographical errors occurred. The formulæ for side strain should read as follows:—

For single trolley, horizontal strain $= -\frac{L}{2X}\left(\frac{LW}{4} + \frac{TW'}{2} + \frac{Z}{2}\right)$

For double trolley horizontal strain $= \frac{L-A}{2X}\left(\frac{AW}{2} + [L'-A]\frac{W}{4} + TW' + \frac{Z}{2}\right)$

THE DESIGN OF CANAL DIVERSION WEIRS ON A SAND FOUNDATION.

W. C. Bligh, M. Inst. C.E.

(Continued from last week.)

Fig. 18 is the section of the Jamrao weir built across a branch of the Indus River. The value of the coefficient c will thus be 15, which is common to all Himalayan rivers.

The head, or difference of level between the crest of the weir shutters and LWL is 8 ft. The correct contour base length should therefore be 8 × 15 = 125 ft. As will be seen from Fig. 18a, the actual contour, including the tail curtain,

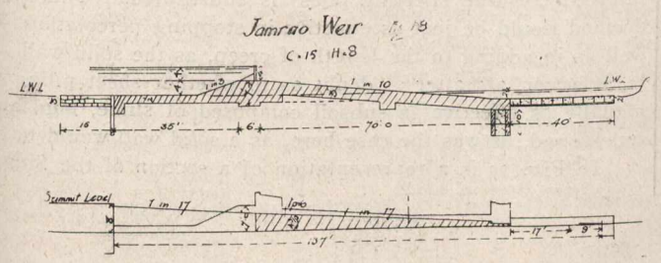


Fig 18.

is 137 ft. long, which quantity when divided by the head 8 ft., the quotient or the coefficient c will be 17

The outline of tp in Fig. 18a shows that the effective depth of the floor or tp is just sufficient. The design must be pronounced to be good and economical. The height of the weir being so low, (only 4 ft. above LWL), renders the construction of a solid apron a necessity, in order that the necessary weight be afforded without having to greatly increase the depth below LWL. Material for loose stone filling was also not available near the site of the work.

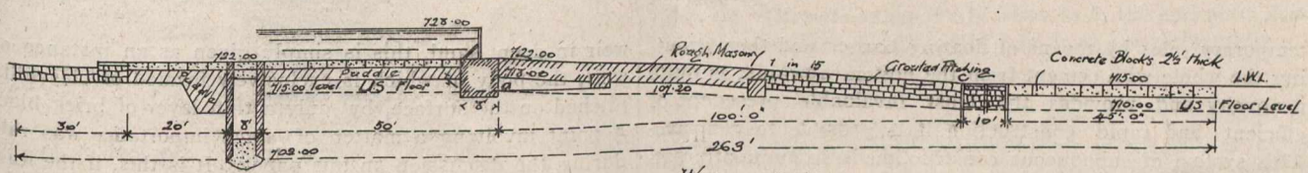
The diagram of pressure in Fig. 19a shows the hydraulic gradient of the work as originally built and as restored. In the latter case the addition of the rear apron and rear curtain reduced the hydraulic slope from 1 in 8.3 to 1 in 16.

The pressure at a, the commencement of the sloping apron is only 3 feet, the base line of the trapezium of pressure being raised in part above LWL. This reduction in pressure is due to the head of water being diminished owing to the base of the floor being raised above LWL, as explained previously. The value of t p is everywhere considerably in excess of requirements, being 4×2=8 feet at the point a, and continuing at that value up to b, where the floor base intersects the LWL. From b onwards the value decreases owing to partial submergence up to the termination of the impervious floor at c, where it is 4×1=4 feet.

From the above it is evident that the profile would be much improved, without increasing cost, by lowering the floor below LWL, thus converting the section from one of type A_2 to B_2. This has been done in Fig. 4 in which the quantities of material are less than in Fig. 19, while the waterway at the weir wall is increased in depth by 7 feet. This increase will effect a material diminution of the velocity of the current and thus enable the length of the talus to be diminished, and in addition effect a substantial reduction in the annual cost of renewal and repairs during the first few years of the weir's existence.

In Fig. 4 the fore-apron is designed of concrete slabs laid at an angle similar to the construction adopted in the Colombo breakwater, the joints will subsequently be grouted with cement mortar, the whole operation being effected in water. The profile of the fore and rear apron will be dredged out of the sand and in the pool, thus formed, the material will be deposited.

Fig. 4a is the pressure diagram, which requires no comment.



Chenab Weir. Fig 19.

The section of the Chenab weir is given in Fig. 19. Having originally hardly any rear apron whatever, the effective length of base up to the end of the grouted pitching was but about 108 or 116 feet. As the head is 13 feet this would give a hydraulic gradient of 1 in 108÷13 or 116÷13, i.e., 1 in 8 or 9. This proved insufficient and the floor, as already mentioned, failed by piping, except beneath the partition walls or groins

A further example of Type A_2 is given in Fig. 20 of the Jhelum weir over the river of that name. The class of sand is the same as in the last example with coefficient 15. The head being 10 feet, a base length of 15×10=150 feet is all that is required. The actual horizontal base length is 133 feet, to which, if the vertical depression be included, a further length of 87 has to be added, making a total value of 220 feet.

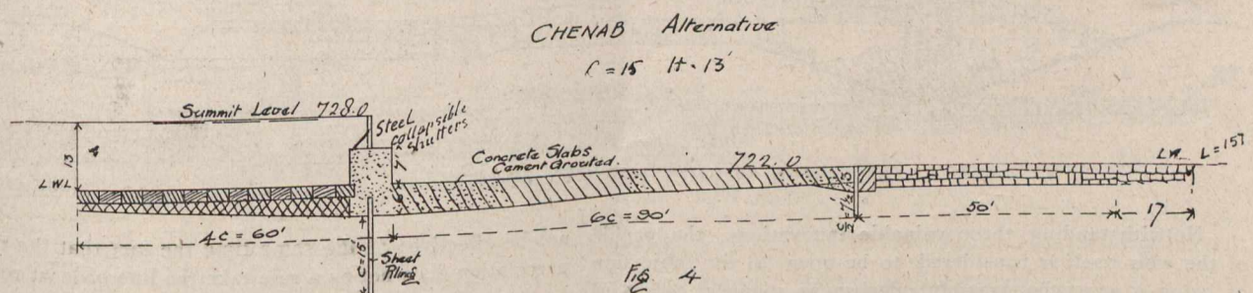


Fig 4

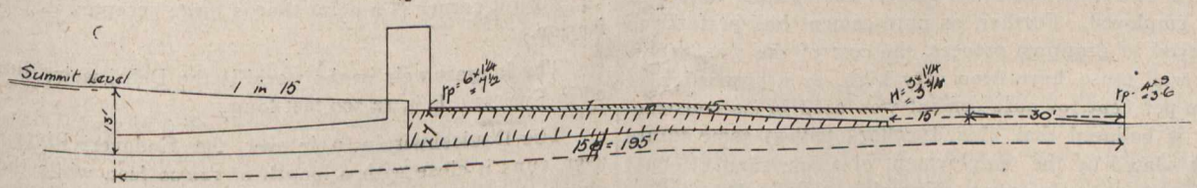


Fig 4A

500 feet apart with which this weir was provided. The extra weight of these walls prevented disintegration of the sand in their immediate vicinity. The extensive horizontal rear apron shown in the figure was constructed subsequently.

N.B.—The letter p is used for the Greek letter roe in formulae.

The hydraulic gradient will then be 220÷10=1 in 22. This is clearly excessive. If all the lines of curtain walls were abolished and one line of rear sheet piling 15 feet deep substituted, the gradient would be reduced to the more reasonable ratio of 1 in 16. At the same time it is considered that if the apron were depressed to form a horizontal floor at

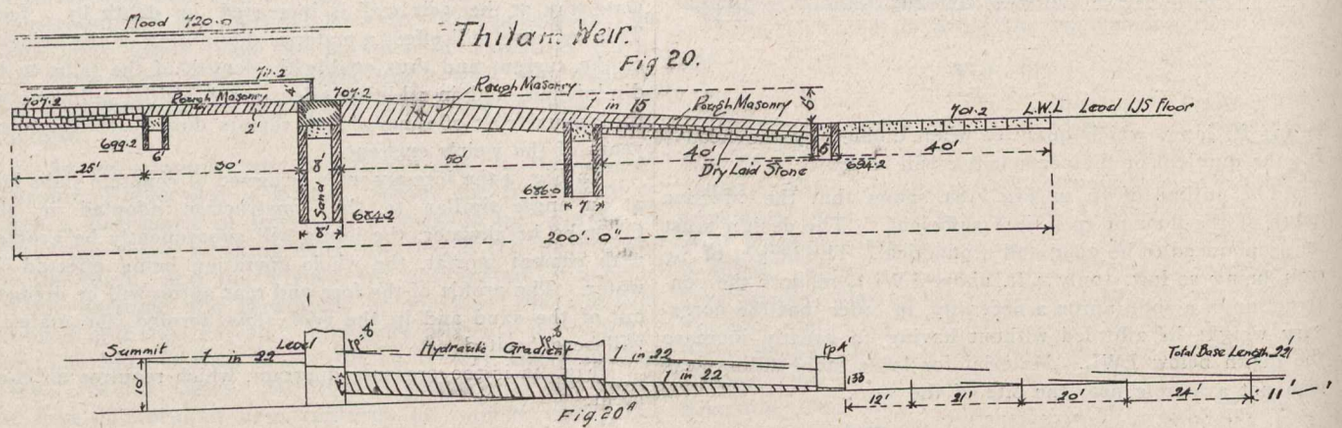
LWL, giving a direct overfall of 6 feet, as was done in the last example, the section would be still further improved.

In the plan "rough" masonry should read "rubble" masonry.

Fig. 21 is a section of the recently constructed Damietta and Rosetta subsidiary weirs across the Nile, below the Grand Barrage. The work is of Type A, with this difference, that the foundations are dredged out below LWL, as in Type B_2. The breast or core wall is carried down to a great depth in order to prevent leakage below the foundation of the old Barrage.

The system of dredging out the sand foundations and depositing material in the pond so formed, without pumping out the water, a peculiarity of Type B_2 entirely obviates the great delay and immense expense which are inevitable in the old system of dry construction.

The method of building the core wall by depositing loose stone filling in a wooden box, contained between a few



temporary piles by means of floating barges and then grouting the whole with cement from the bottom upwards, is quite a novelty and provides the most invaluable precedent of efficient and rapid construction it is possible to conceive. This system of subaqueous construction is so eminently satisfactory that it is bound to supersede the old methods. The disposition of clay beneath a part of the fore-apron is also the only actual example of this kind and is a sound and economical construction. For details of this construction the reader is referred to "Irrigation," by Sir Hanbury Brown (Constable, London), a quite recent and most excellent publication.

Notwithstanding these valuable innovations, the profile of the weir itself is considered to be open to the objection of being a somewhat wasteful design as regards excess of material employed. Further, as pure cement had perforce to be employed in grouting process, the cost of the masonry in the core wall must have been very high, as a proportion of nearly 40 per cent. of pure cement was used in its construction. It is believed that this drawback will at some future day be obviated by the employment of a fine sand of equal specific gravity, as admixture. Experiment showed that when ordinary sand was mixed with the cement, the grouting was not satisfactory, the materials forming separate layers owing to the varying degree of fineness and specific gravity of the ingredients of the mortar.

The main objection to be found in the profile rests in the slope given to the fore and the rear aprons. If the whole of the filling lying above RL 9.50 were bodily removed and the dredged surface line lowered from 8.00 metres to 7.50 in the middle and raised from 7.50 to 8.00 at the end, thus involving no increase of material, the section with much less superficial area would be in reality stronger than before. The objectionable fore slope of Type A, by contracting the waterway of the flood area, maintains the high velocity of passage long past the crest of the weir and thus the erosive force on the floor and talus is greater than would be the case if a direct overfall were adopted.

In Fig. 22 an alternative section is provided in Type B_2, in which, for the expensive masonry breast wall, a row of reinforced concrete sheeting piles is substituted. This it is deemed would be just as effective in stopping percolation, as well as in adding to the length of creep, as the solid wall; it is, however, a matter of doubt as to whether sheet piling is actually as effective in subsoil composed of slime, mud and quick sand, as was the case here, as a solid wall would be.

In Fig. 23 is a representation of a section of the Sidnai weir in deep sand, this is simply given as an instance of a weir, the body of which is exclusively formed of clay filling, pitched on the surface, by only a thin layer of brick blocks. A point involving a matter of some importance was raised during the discussion on this paper. It is this, if the line of creep follows the contour of the vertical depressions, such as solid masonry curtain walls or sheet piling, how near can these vertical depressions be spaced? In reply, it is considered that the spacing of such curtains should be not closer than their combined depth, thus one row of sheet piling 15 feet should be 15+10=25 feet distant from another row 10 feet deep. It is clear that several rows placed in quite close proximity could not be effective; at the same time the fact that the course of percolation does not as a rule take the line of least resistance, i.e., cut off corner is a point that is quite accepted in the profession.

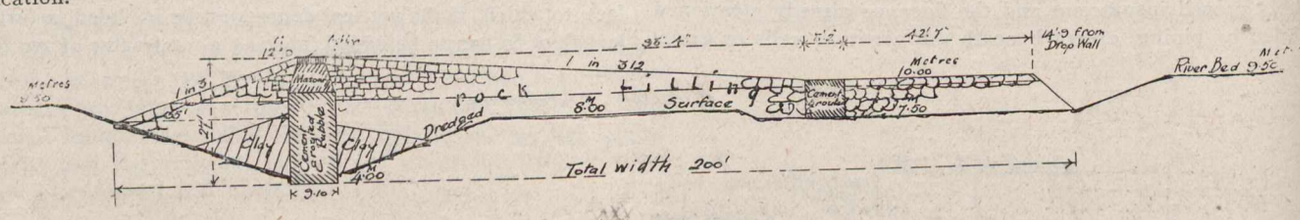


Fig. 21. Damietta Weir Nile River.

The longest weir in the world is the Dehri weir, illustrated in Fig. 12. It is 12,500 feet long.

The Dauleshwirain weir over the Godaveri River, however, runs it close with a length of 12,000 feet, while the discharge is no less than 1,210,000 second feet.

The Jobra weir over the Mahanadi, of very similar section to the Dehri weir, but 10 feet high and longer, and with 3 party walls, carries a flood discharge of 900,000 second feet with a length of 6,400 feet. The Kistna River anicut passes 736,000 second feet.

From the following table the proper safe values of the coefficients relating to l, i.e., cH can be obtained at a glance.

Table of Values of the Coefficient c in Formula l cH Deducted from Actual Practice.

Values of c adopted: Class I., 15; Class II., 12; Class IA., 18. Boulder vs. gravel from 6 to 9.

No.	Class	Rivers Name	Work	Weir Type	H	l	$\frac{l}{c=h}$	Remarks
1	1	Ganges	Narora	B	13	145	11	At time of failure without rear apron.
		"	"	"	"	170	13	As originally constructed.
		"	"	"	"	200	15.4	As restored.
2		Jumna	Okhla	A	13	200	15.4	l=base of fore apron only
3		Chenab		A2	13	125	9.6	Previous to failure.
					"	200	15.4	l=contour less projection of rear curtain below puddle.
4		Jhilam	?	A2	10	160	16	Exclusive of deep rear curtain.
		"			"	223	22.3	Inclusive of deep rear curtain.
5	"	Indus	Jamrao	A2	8	123	15.2	Rear wooden piling included.
6	11	Sôn	Dehri	A	10	123	12.3	Contour of fore apron base without curtains.
7	'	Penner	Sangam	A2	10	110	11	Excluding wells } av. 13.3
					"	156	15.6	Including wells }
8	"	"	Adima-poli	A2	8.5	100	11.7	Excluding wells } av. 13
					"	122	14.3	Inclusive wells }
9	111	Nile	Assiut	Regulator	2 55	60.5	23	Including iron sheet piling. " "
10		"	Ibramiya	"	3 25	65.5	20	" " "
11		"	Zifta	"	13	200	15.4	

(1) When failure took place, that portion of the rear apron which was puddled was carried away by cross currents. The weight is very deficient.

(2) The Okhla anicut has a horizontal base, without any

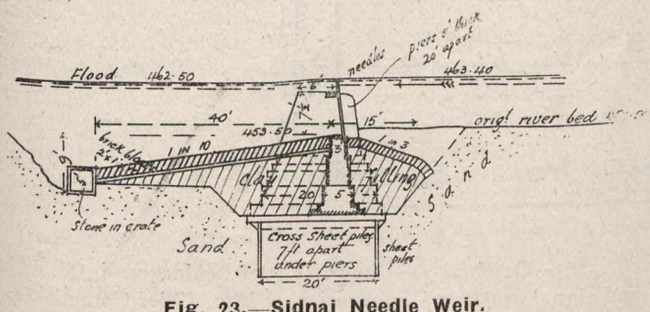


Fig. 23.—Sidnai Needle Weir.

vertical curtain projection whatever; rear apron not being stanch is omitted from count.

(3) This weir stood many years before actual failure took place.

(4) The very deep rear curtain is excluded as clearly superfluous.

(7 and 8) The circular wells used in the Madras Presidency are not strictly water tight curtains, and so a mean between the value obtained by their inclusion with that by their exclusion would fairly represent their actual value.

(9) There is a doubt whether 2.55 metres represents the maximum possible head to which this work is subjected.

Deductions made from the above table are as follows:

For sands of Class I., c=15.4 (taken as 15), there being remarkable unanimity in this figure, and C the multiplicand of CH for AP works out as 100, as shown in paragraph 8.

For sands of Class II., c is a few points over 12, which latter value will be taken as the safe coefficient. The corresponding value of C in this case will be by deduction 75.

For the Nile Class I., c will be taken as 18, and for boulders and gravel c=from 6 to 9.

It will be seen that in cases 1 and 3, failure took place when l was reduced to about 10 H. The factor of safety in adopting 15, is, therefore, 1½.

An example of the design of a 20 foot high overfall weir on boulders and gravel formation was given in Engineering News, of October 1st. It is of the "Granite Reef" diversion weir. "Salt River" project, of which the Roosevelt dam is the main feature. This design, which has stood the test of actual trial, is extremely valuable as an object lesson, from which a reliable value for the coefficient c, for river beds formed of boulders and gravel can be deduced. The estimated length of creep amount to 84 feet, which divided by the head 20 feet gives a coefficient c=4.2. The peculiarity of the section consists in the floor being almost entirely relieved of hydrostatic pressure by spaces 3 inches wide, being purposely left between the 10 foot square concrete blocks which form the surfacing of the floor. This arrangement, by shortening the base length, effects considerable reduction in the pressure area on the drop wall. Such a device, however, would not be practicable when pure sand form the foundation, as it would inevitably be blown up through the interstices and washe l away, causing the floor to collapse. The fore-curtain wall is likewise pierced by openings, with the alleged object of reducing the hydrostatic pressure below the weir by allowing the water a free passage. This idea is purely chimerical, the only possible effect of the openings will be simply to completely nullify the utility of the fore-curtain, as providing an additional length of creep. In the diagram of area pressure, the outlet not being quite free a reduced pressure of 1½ feet is allowed at the rear end of the floor, tapering to nil at the extremity.

In Fig. 25, while retaining the general characteristics of the original profile, the following modifications have been introduced:

1st. The safe value of c is taken as 6, the hydraulic grade is, therefore, 1 in 6, instead of 1 in 4, or 4.2 as formerly.

2nd. A rear apron 50 feet in length is provided.

This inexpensive increase in base length enables the section of the drop wall to be reduced, as not only is the upward hydrostatic pressure considerably lessened, but the horizontal water pressure is likewise reduced, the depth of water against the wall being 15 instead of 20 feet. In addition to this the base length of the solid part of the weir can now be lengthened from 32 to 40 feet, affording a much needed increase in this direction.

The thickness of the loose concrete slabs in the talus is increased from 1½ to 2½ feet for the first 30 feet of length

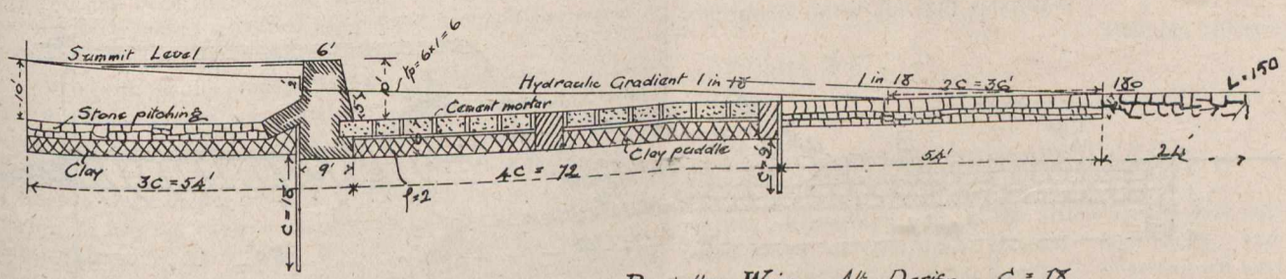


Fig. 22. Damietta Weir, All. Design C = 18.

C-18 H=10

as the thickness of 18 inches given in the original is deemed decidedly insufficient for security.

The value of C of 4 .2 or 4 is taken as a bais equilbrium value, for safety it should be increased to 6, as has been done in Fig. 25. We shall, therefore be justified in adopting this as a safe value for a boulder and gravel river bed, this practical example affording the necessary datum from which a reliable value for c can be deducted.

The alternative sections will cost less than the original and be much more stable.

(To be continued.)

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

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

5449—October 20—Authorizing the C.P.R. to construct bridge No. 36.4 on Boundary Section, B.C., of its line.

5450—October 20—Authorizing the Minto Rural Telephone Company to erect, place, and maintain its wires across track of Grand Trunk at road allowance between Concession C and D, Township Minto, Ont.

5451—October 20—Authorizing the C.P.R. to open for carriage of traffic seven portions of its Medicine Hat section.

5452—October

5453—October 16—Dismissing application Winnipeg Board of Trade and others, for order disallowing tariffs of freight rates issued by C.P.R. and C.N.R.

5460—October 20—Authorizing Bell Telephone Company to carry its wires across the tracks of the Niagara, St. Catharines, and Toronto Railway.

5461—October 9—Authorizing the Chatham Gas Company to lay gas pipe under track of G.T.R. west of Queen Street, Chatham, Ont.

5462—October 22—Granting leave to Charles Gould, Uxbridge, Ont., to erect, place, and maintain electric light wires and steel cable across lands and tracks of G.T.R., Uxbridge, Ontario.

5463—October 22—Authorizing the C.P.R. to construct nine bridges on the New Brunswick Southern Railway.

5464—October 22—Granting leave to the South Wellington Coal Mines, Limited, to construct two tunnels under right of way of the Esquimalt and Nanaimo Railway, Cranberry District, Vancouver Island, B.C.

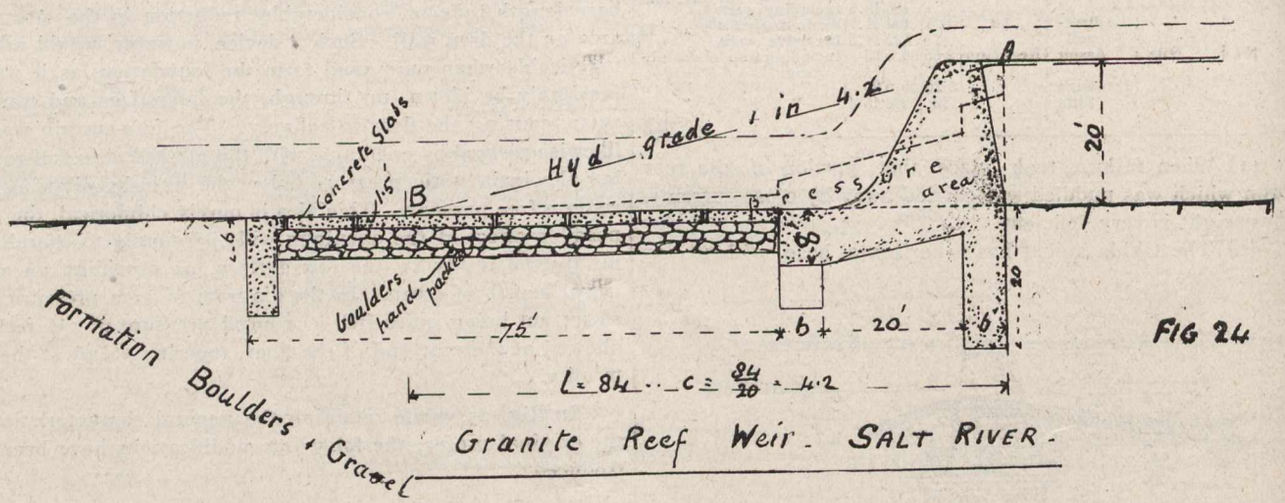


FIG 24

5454—October 6—Granting leave to the B. & H. Railway Company to construct its railway across Alfred and Murray Streets, Brantford, Ont.

5455—September 14—Authorizing the city of Winnipeg to construct at its own expense, highway crossing over spur of C.P.R. known as Brown and Rutherford's spur.

5456—August 1—Authorizing the James Bay Railway Company to place its line of track across line of track of the C.P.R. near Wahnapitae, Township Neelon, District Nipissing, Ont.

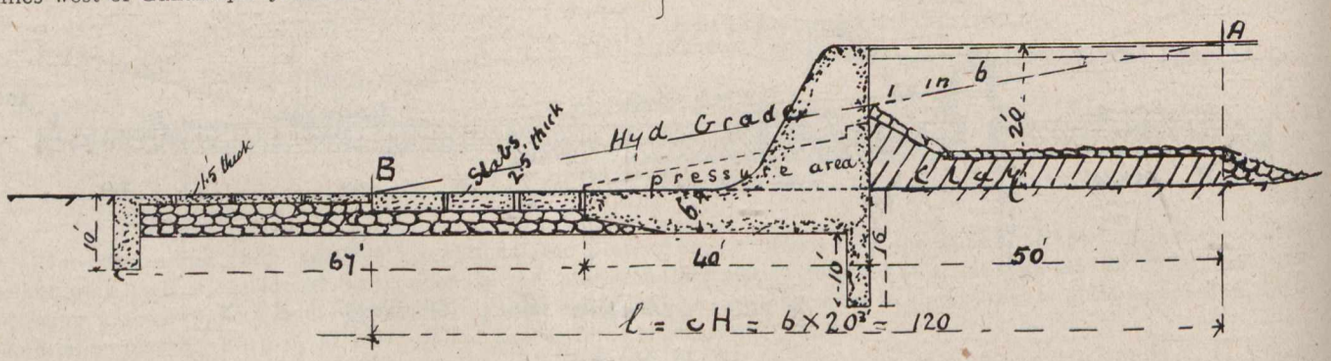
5457—October 20—Granting leave to the South Leeds and Pittsburg Telephone Company to erect, place, and maintain its wires across track of the G.T.R. at public crossing 2½ miles west of Gananoque Junction, Ont.

5465—October 21—Approving of enlarged interlocking and signal apparatus application of Hon. Chief Commissioner of Lands and Works of British Columbia for use on bridge over Fraser River, New Westminster, B.C.

5466—October 21—Authorizing the C.P.R. to construct bridge No. 8.05 over Quaker Brook, Tobique branch of its line of railway.

5467—October 21—Authorizing the C.P.R. to construct, maintain and operate branch line of railway to and into the premises of Rat Portage Lumber Company, New Westminster District, B.C.

5468—October 21—Authorizing the C.P.R. to construct, and operate branch line of railway to and into the premises of



Alternative Design FIG 25

5458—October 20—Granting leave to the South Leeds and Pittsburg Telephone Company to erect, place, and maintain its wires across the track of the G.T.R. at public crossing ¾ mile east of Findlay Station.

5459—October 20—Granting leave to the South Leeds and Pittsburg Telephone Company to erect, place, and maintain its wires across track of G.T.R. at a point one-half mile east of Findlay, Ont.

the Consolidated Mining and Smelting Company, Kootenay District, B.C.

5469—October 22—Granting leave to the Bell Telephone Company to erect, place, and maintain its underground wires across track of N. St. C. and T. Ry. at Stanley Street, Niagara Falls, Ont.

5470 and 5471—October 27—Authorizing the Bell Telephone Company to erect, place, and maintain its wires across the tracks of the C.P.R. at two different places.

CORRESPONDENCE

[This department is a meeting-place for ideas. If you have any suggestions as to new methods or successful methods, let us hear from you. You may not be accustomed to write for publication, but do not hesitate. It is ideas we want. Your suggestion will help another. Ed.]

THE AURORA BOREALIS.

Sir,—Some time ago, in an editorial comment on an exhibition of the aurora borealis, which was visible in Victoria a night or two before, you said something about some persons having heard the northern lights crackle, but you were unable to corroborate the fact.

In Nova Scotia, when a boy and young man, I can recollect some very vivid displays of the aurora, and can remember very vividly occasionally hearing the crackling sound made by them. So far as I recollect, it resembled the crackling or crinkling of a good linen writing paper. The last time I can recollect its occurrence was in the fall of either 1879 or 1880. I was then working at Torbay, the Nova Scotian landing place of one of the Atlantic cables. The working of the cable to Ireland was much interfered with for several days by this severe electrical storm, as the electrical commotion is known in telegraph circles. Sometimes it was so severe that for a whole day only a few messages could be gotten through the cable, fifty or a hundred, while the regular traffic totalled some twelve hundred. The Atlantic cables at that time were worked by what was known as the "mirror system," as delicate an instrument as could well be imagined. It was simply a swell mirror (about half-inch in diameter) suspended by a single fibre of silk between the poles of a magnet. A lamp with a tin chimney cast a beam of light, say, an inch long by quarter inch wide, on to the mirror, which reflected it to a piece of paper stuck up in a rack in front of it. If a very light positive current was sent from Ireland through the cable and through the coils of electric magnet, the mirror, which had three small pieces of steel on its back, would be attracted, say, to the right, moving the spot of light to the right, which would indicate a dash (—). If now a negative current were sent across it would attract the mirror to the left and sign a dot (.). A dot and a dash indicate the letter "n." This system has been superseded by the "recorder," an instrument which makes a record by a small crooked line upon a paper tape which is constantly running.

You will readily understand that an instrument so sensitive as the mirror was quick to respond to outside influences, such as thunderstorms and electrical storms, such as the aurora. Day and night, we could feel it for some days—I think a week or ten days. It got so bad that one day while trying to use the cable it became so heavily charged that it burned it somewhere. The trouble remained for years, so that whereas before the event it was possible to duplex it (that is, send a message simultaneously from each end) it could afterwards only be worked simplex (single). This was caused by currents set up apparently in the sea by the aurora borealis.

It affected the land wires in a similar manner, heavily charging them one minute, so that the operator could not break circuit, the current arching across the points of the key (sending instruments), the next moment leaving the wire dead through reversal of one regular battery. During that display I worked with St. John, N.B., with both Torbay and St. John batteries cut off, purely from the electricity picked up from the aurora. We worked so for hours, and it created a good deal of comment at the time, though it has probably been frequently done since. I think the aurora must be, if I may so term it, more powerful in the eastern portion of the Dominion. It seems rather rare out here, whereas it used to be quite common in the east.

I was reading in the October "Metropolitan Magazine" a whaling story of Hudson's Bay, from which I take the liberty of quoting the writer's description of the aurora and its "crackling."

"Well, the winter wore away, somehow. Once in a while he'd fumble 'round there in the dark—seal-oil was too precious to use much for light, you know—and get to the plank door and open it when his watch said noon, and slip outside and close the door behind him to keep the cold from getting in. Outside he'd stand there in a place that sometimes he kept shovelled, and contemplate the borealis. That, alone, from sheer magnificence and awe-inspiring majesty, was enough to drive a solitary man insane, at close range, like he was. I've seen it from within the circle!

"Wonderful, it is, man, wonderful! All the colors in ten thousand rainbows; all the fire effects of every Independence Day in history, and Peelee added; a million times the majesty of any sunrise; magnificence incredible, impossible to tell! Think of this reflected on a thousand steeples of the towering ice, which rise there high enough to dwarf the tallest man-built spire in Christendom, and which have been fretted by the King of Cold as no hammer and no chisel ever dreamed of carving stone; think of it reflected on the rounded bosoms of the white snow-mountains; think of it aplay on boundless plains of pure, unbroken, crystal crust! First, the weird, blue, frozen, corpse-light of the North, and then, suddenly this brilliance, as if a million prisms had been broken by the hammers of the gods to dazzling fragments, and were falling in wild riots of mad color, indescribable, right at his feet! And he, you must remember, was quite near enough to hear the lights as well as to see them. There's many that don't know the northern lights are audible, but multiply the musketry of Gettysburg by that of Waterloo, and add the uproar of the Japs and Russians at the Yellow River, and you may have, if your imagination is a giant's, a baby's guess at what the crackling of electricity sounds like up there when the aurora's at its height. You may throw in thundrous crashing of ten thousand tons of ice, cracked, now and then, from brittle bergs a-shrink beneath the pressure of a cold which makes zero feel warm, for the artillery. All this has baffled scientists since science first came from an egg; it makes description falter and fall fainting.

William Christie.

Victoria, B.C.

SAFE SUPERIMPOSED LOADS.

Sir,—Referring again to the article on the safe superimposed loads on reinforced concrete floor slabs, and Mr. Oxley's letter in the October number,—whenever we have had occasion to submit plans to the City Building Department for permit, we have found that in order to satisfy the authorities we have had to base our calculations for strength of beams on the assumption, that the neutral axis in a concrete beam is always the centre between the centre of tension and the centre of compression, this being the interpretation given the written law by the City Building Department. It is, therefore, readily seen, that plans prepared and based on the formula $w = \frac{619h^2}{L^2}$ will not satisfy the conditions.

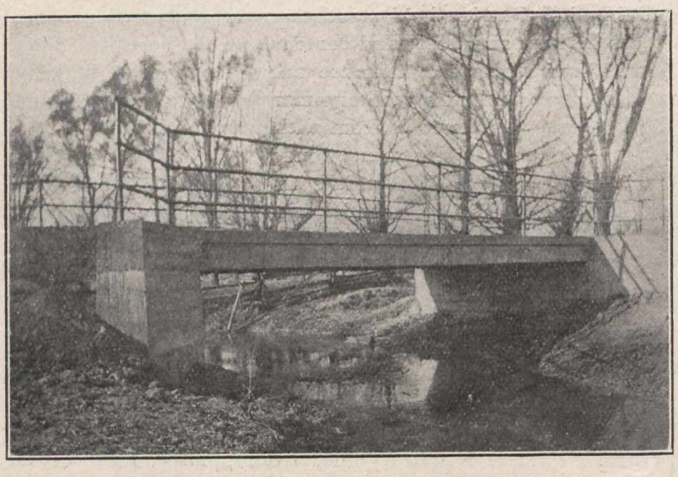
Yours very truly,
Trussed Concrete Steel Co.,
Per, Gustave Kahn.

A PAGE OF COSTS

ACTUAL, ESTIMATED and CONTRACTED

A NEW SYSTEM OF CONCRETE CONSTRUCTION.

Some months ago Mr. S. B. Birds conceived the idea of a new sytsem of concrete bridge construction. In August he built on the Sixth Concession of Trafalgar, near the village of Hornby, a bridge according to this new design. After nearly three months use, during which the bridge was put to the severest test by heavy traction engines, it has every appearance of being a substantial structure. Together, with a short description of the bridge we give a summary of costs. Many of these items are high and could be reduced. Especially is this true of cement, gravel and reinforcement.



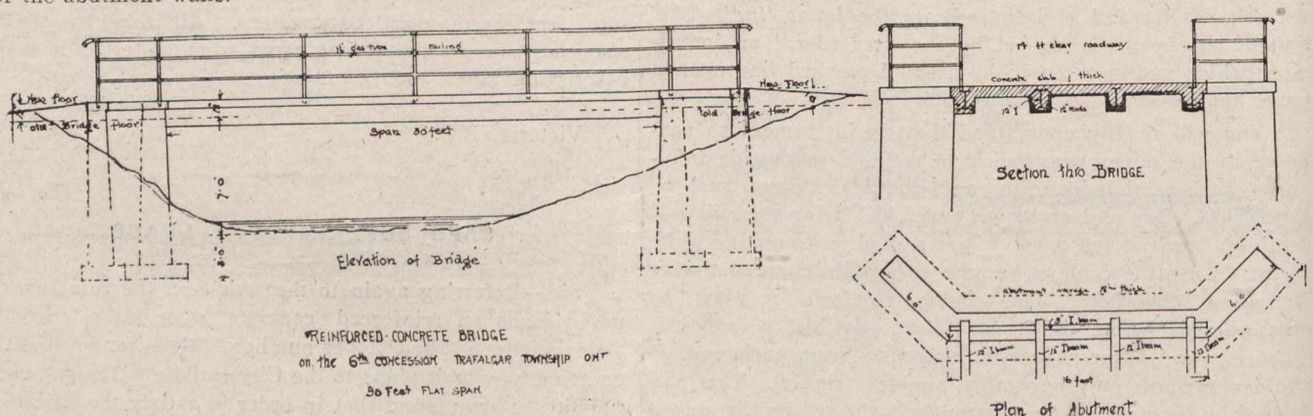
View Looking up Stream.

Altogether it gives a fair estimate of cost for this particular span.

The abutment and wing walls are built of solid concrete plumb on face and splayed behind from 3 feet thick at bottom to 18 inches thick at top.

They rest upon a solid concrete foundation slab 4 feet wide and 1 foot thick put upon the hard pan at a depth of 3 feet below the bed of the creek.

The reinforcement of the bridge floor consists of four 12-inch I-beams of light section 32 feet long, resting at their ends upon a 5-inch I-beam 15 feet long, laid along the centre of the abutment walls.

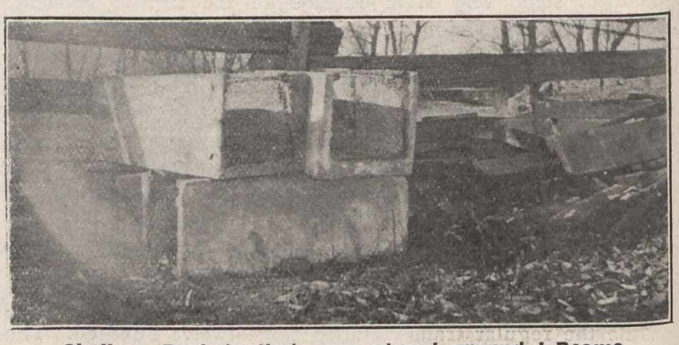


REINFORCED CONCRETE BRIDGE
on the 6th CONCESSION TRAFALGAR TOWNSHIP ONT
30 Feet FLAT SPAN

This 5-inch beam forms a bearing plate for the floor beams and transmits the bridge load equally over the whole length of the abutment walls. Two 1½ inch round steel rods are placed on each side of the two inner I-beams, and one similar rod on each side of the outer I-beams, these rods being placed and wired in position before the hollow beam shells are fixed.

The V shaped beams shells are of concrete 1 inch thick, 12 inches wide and 12 inches deep, and are cast in 3 feet lengths upon a frame of expanded metal lath wired to V shaped beam steel stirrups. The beam shells were suspended from the I-beams by steel hangers bent to shape and then poured full of liquid concrete composed of fine gravel and sand, thus forming a reinforced concrete beam 12 x 12 inches having a steel I-beam core in addition to the 1½-inch tension rods.

After the beams were poured thin slabs of concrete 1 inch thick, 4 feet by 2 feet, which had been cast upon a foundation of expanded metal were placed across the bridge floor openings between the beams and bedded and jointed with cement mortar. On top of these covering slabs and across the beams were placed ½-inch round steel rods at 6 feet centres the whole width of the bridge floor and the whole area of the bridge covered with a slab of concrete 6 inches thick which was made to fall away to the sides to drain off storm water into the creek.



Shell or Baskets that were placed around I-Beams.

It is proposed to keep the concrete floor slab covered with a road cushion of gravel 6 inches thick.

The handrail consists of 1½ inch gas tubing tapped and screwed and set into the concrete and follows the line of the wing walls at an angle of 45° at each approach.

The detailed cost of the work is as follows:—

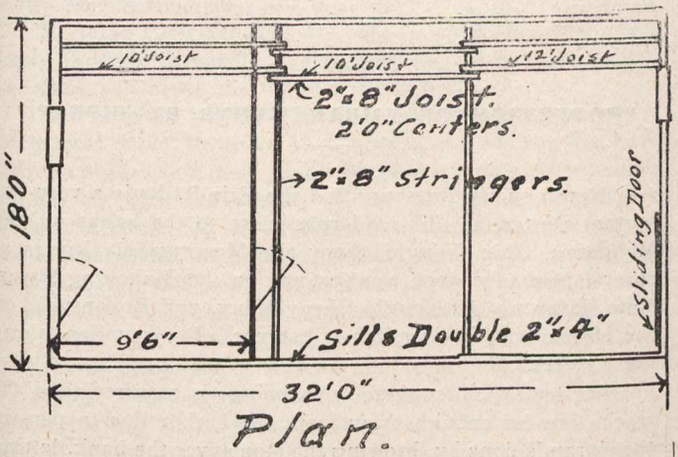
Excavating	$ 18
50 yards gravel at $2	100
60 barrels of cement at $2	120
Labor at 20 cents per hour	240
Steel reinforcing, including galvanized steel mould for beam shells	300
Handrail	50
Lumber for abutment forms	25
Contractor's outfit	25
Freight and hauling	22
Contract price	$900

The actual net cost of the work would be less than $900, as this includes contractors outfit, lumber and galvanized steel moulds which will be used on future work.

COST OF SUPPLY STORE.

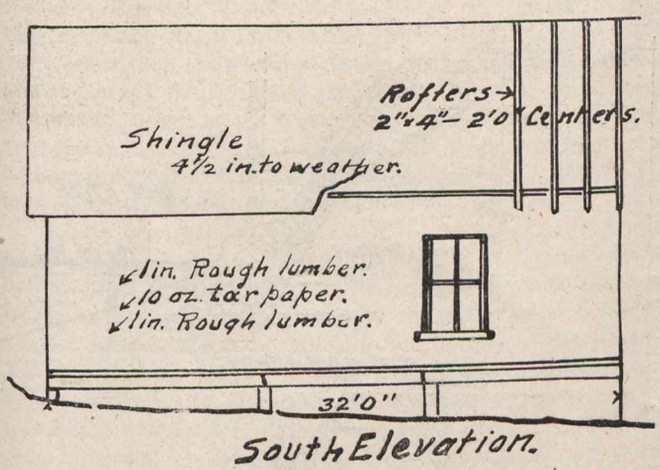
One of the heavy items of cost in connection with works in out of way places is the erection of temporary camps and stores. This frequently means an outlay of $5,000, and at the end of a couple of years these stores are almost valueless.

We give herewith the cost of a camp store which was erected on a piece of work which was expected to take three



Plan.

years. Considerable heavy freight was to be handled, and because of the nature of the ground and to assist in loading the building was set on posts. Shingles were used in place of the usual tar paper. Detailed costs are give as well as nails used per square or thousand:—



South Elevation.

MATERIAL.

Tar Paper.

Three rolls, 10 oz. at 50c	$ 1.50

Nails.

30 lbs. 1¼ inch, 3⅓ cents	$ 1.00
60 lbs. 2½ inch, 3⅓ cents	2.00
45 lbs. 4 inch, 3⅓ cents	1.50

Doors.

Roller door track and hangers	$ 1.44
Two pair with hinges	.20
One lock	.40
Two stock doors, $2	4.00

Windows.

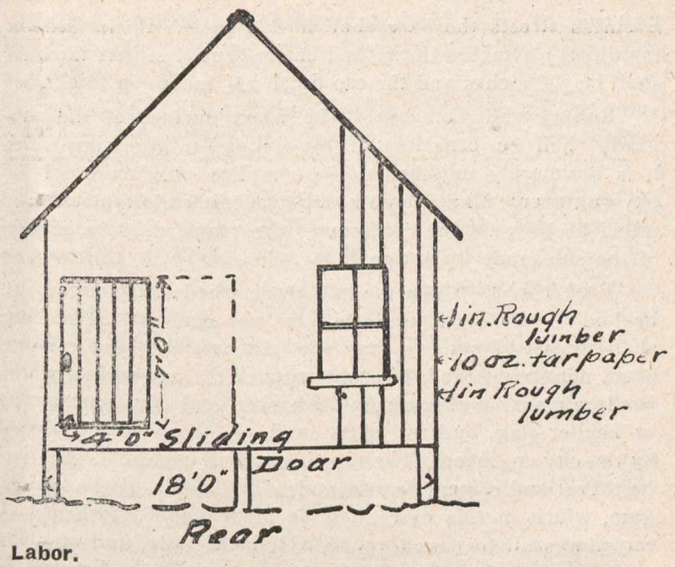
Six sash, 60 cents each	$ 3.60
Thirty-six lights, 10 by 14 inches, 6 cents each	2.16
Putty, 5 lbs., at 4 cents	20

Shingles.

Eight M New Brunswick shingles at $3	24.00

Lumber

3,500 F.B.M. 1 inch hemlock, $17 per M	$59.50
1150 F.B.M. 2 inch hemlock, $22 per M	23.00
120 F.B.M. 2 by 8 inch—18 feet, $22 per M	2.64
700 F.B.M. 2 by 4 inch—14 feet, $22 per M	15.40
6 Cedar posts at 25 cents	1.50
	$144.04



Rear

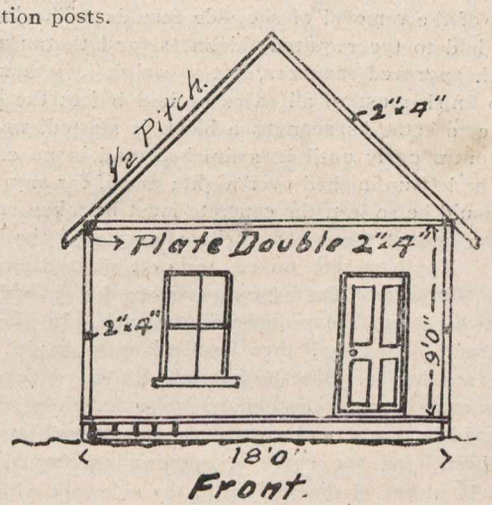
Labor.

Laying 8½ square shingle, 22 hours at 30c... $ 6.60
or 77½ cents per square

Building Shed.

123 hours at 30 cents $36.90
or almost $6.70 per M.

This of course includes fitting door and windows, placing foundation posts.



Front.

It is worth noting that 8½ squares only took 8 M shingles, and that 8½ square required 30 lbs. of nails, or better than 3½ lbs. per square.

For the inch lumber it took approximately 12 lbs of nails per M.

COST OF WATER MAINS.

Sydney, C.B., laid during 1907 3,420 feet of six-inch water mains at the following cost:—

Length in Feet.	Size.	Cost. Labor.	Material.	Total.	Cost per Lineal Foot. Labor.	Mat'l.	Total.
(a) 523	6 in.	137.87	452.44	590.31	.263	.865	1.13
(a) 84	"	31.99	58.71	90.70	.381	.699	1.08
(b) 606	"	234.61	512.04	746.65	.387	.845	1.23
(b) 2087	"	878.32	1760.64	2638.96	.421	.844	1.26
(a) 120	"	38.37	82.90	121.27	.319	.691	1.01

(a)—Clay
(b)—20 per cent. Rock.

Laborers were paid 17½ cents per hour. Foremen were paid 40 cents per hour.

We are indebted to Mr. D. McD. Campbell, city engineer, for our information.

COST OF CEMENT SIDEWALKS.

The City of Nelson, B.C., completed in September 1908 about a thou and lineal feet of cement sidewalks. The plans and specifications were prepared by J. C. Dufresne, City Engineer. Sections of the specifications are given here:—

Thickness.—On the business streets the sidewalk shall be six inches, and on the residential streets five inches in thickness. This shall consist of a base and top finish. On

business streets the base shall be 4½ inches thick, and the top finish 1½ inches thick; and on residential streets the base shall be 3¾ inches and the top finish 1¼ inches in thickness.

Rolling and Tamping.—The whole surface of the sub-grade shall be consolidated by rolling or ramming until it is thoroughly solidified to the complete satisfaction of the city engineer. The sidewalk sub-grade when completed and rolled as above, must conform to the required cross section of the sub-grade formation.

Proportions.—Upon the sub-grade a bed of concrete shall be laid to the depth and width as per contract. The base shall consist of not less than one part best Portland cement, of an approved brand, to eight parts of the aggregate, which shall be made up of five parts of broken rock, one part gravel or smelter slag, and two parts sand, or otherwise as directed by the city engineer. The top finish shall consist of one part best Portland cement to two and a half parts of the aggregate, which in this case shall be made up of crushed rock screenings all to pass through a ¾-inch circle, and or clean sharp sand, and or smelter slag, in proportion as directed by the city engineer. The method of measuring the cement, sand, gravel, etc., shall be to the approval of the city engineer.

Laying and Ramming.—The concrete shall be laid in strips or blocks five feet in width, every alternate block being left out until the block on either side shall be sufficiently set to allow of the removal of the side moulds. The base shall be first laid to the required thickness, and thoroughly rammed with approved rammers, not to weigh less than 20 lbs. The top finish must in all cases be laid before the base has had time to set. As soon as a block is started, work must go on continuously until it is finished, and in no case must a block be left unfinished over night; and if for any reason a block should be so left, the concrete must be taken out by the contractor and at the contractor's expense, and the block re-started. Any concrete mixed and left unused over night must be discarded. On business streets the sidewalbs shall have a two per cent. slope towards the curb. In like manner the alternate strips shall then be filled up to grade. A strip of half inch lumber must be left between the blocks to prevent adhesion. After the concrete is sufficiently set (to be determined by the city engineer) these half inch strips shall be removed, and the crack or opening so formed filled to within 1½ inches of the surface of the sidewalk with coal tar or paving pitch, and the concrete edges neatly rounded off and jointed with a proper bronze jointer tool, made for the purpose. Only one of the above joints will be necessary to each 75 feet length of sidewalk; the balance may be made by leaving a strip of tar paper between the blocks, and finishing with jointer tool.

Finishing.—Each concrete block or strip of sidewalk shall be divided off into three sections by lines made by pressing a half inch board down through the top finish before it is thoroughly set. Each section so formed shall be neatly floated and trowelled, and rolled with a dot roller to within two inches of its edges, which must be properly rounded off, and jointed with a special jointer tool for that purpose. All lines must be straight and square, and all finishing work must be done neatly, and to the complete satisfaction of the city engineer.

	Wages	Cement	Team hire	Sundries	Total
Block No. 5...	543.70	458.50	95.50	65.30	1160.00
Block No. 6...	645.70	500.00	152.00	41.80	1340.00
Block No. 1...	617.50	477.75	155.00	57.75	1308.00
	1806.90	1436.75	402.50	161.85	3808.00

These sidewalks were all 330 feet by 15 feet, having a six inch granite curb stone on the outer edge, and a concrete area of 4,770 square feet.

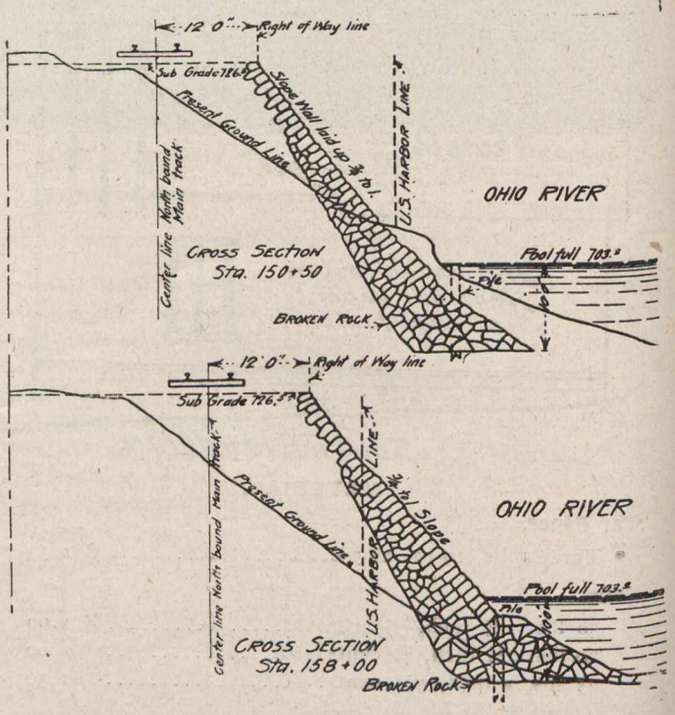
The above costs include the filling material for bringing the sidewalks up to grade. There was about 590 cubic yards required for this purpose, which was procured at a cost of about 80 cents per cubic yard, or a total of $472; leaving the sum of $3,336 for the actual cost of preparing the sub-grade, setting and leveling 990 linear feet of curb stone, and laying 990 lineal feet of cement sidewalk—14½ feet in width, having an area of 14,310 square feet, or 1,590 square yards at a cost of $3.37 per linear foot, or 23⅓ cents per square foot.

Prices.—Labor—foreman, $6; finisher, $4; and all the balance $3 per day of nine hours. Team hire, $7 per day, including two horse team, feed, wagon, and teamster; extra wagons, 50 cents per day. Cement, $3.50 per barrel ex-warehouse Nelson. The work was commenced on August 3rd and completed September 5th.

PROTECTION OF EMBANKMENTS BY RIPRAP.*

Riprap on the Pittsburg & Lake Erie R. R. is a very important matter, as this road runs close to the banks of the Mahoning, Ohio, Youghiogheny and Monongahela Rivers at several points between Youngstown on the Mahoning River, New Haven on the Youghiogheny River, and Brownsville on the Monongahela River, for a distance of 165 miles along these rivers.

At some points where riprapping is required and the tracks are far enough away from the harbor line to permit, the riprap is done by throwing the stone over the bank, letting them rol lor slide down, making a slope about 1½ to 1, the slope varying in thickness from 2 to 4 feet. We use for this quarry spalls or small stone such as can be handled by one man, and in some cases we use furnace slag, which becomes hard from the effects of the weather and makes very good rip-



rapping, which costs from one to two dollars per square yard.

At points where we are close to the harbor line we use stone such as can be handled by one man and laid in place by track laborers on a slope of 1 to 1, varying in thickness from 2 to 3 feet, costing about $3 per square yard. Please see illustration of riprapping where stones are laid in place along the banks of the Ohio and Monongahela Rivers at Pittsburg.

In riprapping piers and abutments of bridges we use in some cases, where the current is not very rapid, small stone such as can be handled by one man, and where the current is very rapid we use large breakwater stones, usually dropping them around the piers or abutments, allowing them to find their own bearing.

In all cases I would prefer the large breakwater stones filled in with small stones to fill up the crevices between the large stones and make the riprapping as compact as possible to prevent any washing.

* Report of a Committee to the Association of Railway Superintendents of Bridges and Buildings at Washington, D.C., October 20th, 1908.

F. Ingalls, Supt. B. & B., Northern Pacific Railway Co., Jamestown, North Dakota.—On most waterways of the Northern Pacific Railway, through the prairie country of North Dakota, we use boulders which can be picked up on the prairie and loaded on cars for $1 per cubic yard and placed for 75 cents per yard. We also use stone for protection of banks from wave wash, where permanent protection is required. For temporary protection on times of occasional high water we use sand bags and fascines.

Portable snow fence is also used in emergencies. This fence is made in panels 16 feet long and when placed along the bank will break the force of the waves.

At one place where we have a mile or track exposed to occasional wave wash we have sodded the banks, but have had no high water there since the banks were sodded, so we cannot say what the benefit will be, but believe it will give good protection. At the crossing over the Missouri River we have experienced all kinds of trouble from bank cutting for approximately two miles above the bridge. The bridge itself is protected by dykes built of piles, fascines and rocks. For the protection of banks above the bridge, dykes were built of mattresses composed of willows and stone and held in place by piling. Most of this work was done by the government, as the cutting of the banks endangered Mandan on the west side of the river and would also have destroyed the harbor for boats at Bismarck on the east side of the river.

J. S. Berry, Supt. of B. and B., St. Louis South-western Railway Co., Tyler, Texas.—One of my first methods is to first slope the embankment to a pitch of 3 to 1 and drive piling at the toe of the slope about 50 feet apart; then weave a mattress of willow of sufficient length so that it will lie from the toe of the slope out into the river about 50 feet. The mattress is then sunk with rock and placed in proper position and the entire bank is then riprapped with rock all the way and about 10 feet at the top of the bank, so that high water cannot cut in behind it. I consider this method of bank protection practical and it has proven satisfactory. It will cost approximately $8 per running foot of embankment.

I have been using another method which has proven very effective, this being to drive deflecting dykes, piles being driven about every 8 feet apart, dykes spaced about every 30 feet; 2 x 6 planks are spiked onto the piles about 6 inches apart from the top of the piling to the bottom of the stream. These deflecting dykes will collect the debris and the chembers will gradually fill in and form a bar. I also consider this method effective in case of very rapid currents and it will cost approximately $6 per lineal foot all complete.

There are other methods used, some of them being quite effective. There is what is known as the system of mud-rafts and hollow fascines. These are generally constructed out of willows and poles, then put into proper position and anchored. They will gradually fill in with sand and silt from high water and sink in place, and the embankment usually fills in behind it. It also has a tendency to check the current. However, this is expensive work, costing $9 per lineal foot. The mud-rafts cost about $6.

Committee—G. H. Soles (chairman), J. C. Beye, R. C. Sattley, J. S. Berry, W. B. Rogers and F. Ingalls.

ORDER OF THE RAILWAY COMMISSIONERS OF CANADA.

(Continued from Page 812.)

5472—October 26—Authorizing the C.P.R. to construct, maintain, and operate branch line to and into the Standard Lumber Company and the Cranbrook Estate, Kootenay District, B.C.

5473—October 26—Authorizing the C.P.R. to construct, maintain, and operate branch line to and into the premises of Messrs. McClure & Scott, Balmoral, Man.

5474—October 22—Authorizing the C.P.R to divert public road between Lots 5 and 6, Concession 9, Township Tecumseth, County Simcoe, Ontario.

5475—October 22—Authorizing the C.P.R. to construct, maintain, and operate branch line to and into the premises of the Canadian-America Oil Company, Frank, Alta.

5476—October 22—Authorizing the C.P.R. to use and operate bridges on the Atlantic Division of its line of railway, at various points.

5477—June 2—Granting leave to the C.N.O.R. to erect telegraph wires across the track of the G.T.R. near Gamebridge, Ont.

5478—October 13—Directing the T.H. & B. Railway to supply adequate and suitable accommodation for receiving and loading of bricks, etc., at Hamilton, Ont.

5479—October 6—Dismissing complaint of residents of Barrington, P.Q., against closing and removing of G.T.R. offices at that village to junction of G.T.R. with C.A.R.

5480—October 22—Approving New Miller Frost Proof Fire Extinguisher No. 8 for use in passenger coaches of the G.T.P.R.

5481—October 6—Granting leave to B.T.C. to cross with its wire tracks of Schomberg, and Aurora Railway Company at Schomberg, Ont.

5482—October 27—Authorizing the C.P.R. to open for carriage of traffic four portions of its Medicine Hat Section; rescinding Order of the Board No. 5451, 20th October, 1908.

5483—October 28—Approving C.N.O.R. line between Counties of Carleton and Russell, mileage 48.3 to the north line of Lot 23, Concession 2, Township Gloucester, County Carleton, Ont.

5484—October 28—Authorizing the C.P.R. to reconstruct bridge No. 67.31 over the Wanapitei River, Cartier Section.

5485—October 28—Granting leave to the C.P.R. to construct two branch lines of railway or spurs across P.H. at Cardigan, N.B.

5486—October 22—Authorizing the Corporation City of Ottawa to lay sewer pipe under track of the G.T.R. at Bayswater Avenue, Ottawa, Ont.

5487—October 28—Authorizing the C.P.R. to open for carriage of traffic portion of its Pheasant Hills Br. from Asquith to Wilkie, Sask.

5488—October 22—Temporarily approving tariff of telegraph tolls filed by G.T.P. Telephone Company in Provinces of Man., Sask., and Alberta.

5489—October 28—Requiring the C.P.R. to stop its trains opposite the C.N.R. platform at St. Jerome, P.Q.

5490—October 28—Directing the C.N.Q.R. to remove from service baggage car No. 154 in use on its Shawbridge Branch.

5491—October 20—Directing the P.M.R.R. to interchange traffic with the W.E. and Lk. S.R.R. at Kingsville, Ont.

5492—October 28—Granting leave to the G.T.P.R. to do on any Sunday work incidental to the continuance of its destination of freight in transit at the beginning of sush Sunday, notwithstanding that the cars containing such freight and forming part of any train so in transit.

FAIR WAGE SCHEDULE.

On September 15th, 1908, Thomas A. Nicholson, St. Catharines, secured a contract for repairing the Cornwall Canal. The following wage schedule was attached by the Government to the contract:—

Trade or Class of Labor	Rate of wages not less than
Foreman carpenter	$3.00 per day of 10 hours
Foreman laborers	2.50 per day of 10 hours
Carpenters	2.25 per day of 10 hours
Laborers	1.50 per day of 10 hours
Team and driver	3.00 per day of 10 hours
Horse, cart and driver	2.25 per day of 10 hours
Stationary engineer	2.00 per day of 10 hours
Fireman	1.75 per day of 10 hours
Steam shovel runner	$100 per month and board 12 hours per day.
Steam shovel craneman	75 12 hours per day
Steam shovel fireman	40 12 hours per day
Locomotive runner	65 12 hours per day
Locomotive fireman	40 12 hours per day

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.

New Brunswick.

DOUGLAS.—Tenders for Cardigan Bridge will be received at the Department of Public Works, Fredericton, until Monday, 16th day of November, 1908, at noon, for rebuilding Cardigan Bridge, over Keswick River, parish of Douglas, York county, according to plans and specifications to be seen at the Public Works Department, Fredericton, N.B., and at the residence of Dr. O. E. Morehouse, Smith's Corner, York county, N.B. John Morrissy, Chief Commissioner, Department of Public Works.

Ontario.

BARRIE.—Tenders will be received until November 24th, 1908, for the construction of a steel bridge over the Nottawasaga River by J. T. Simpson, chairman Bridge Committee, Barrie, Ont. C. H. Mitchell, C.E., Traders Bank Building, Toronto, engineer in charge. (Advertised in The Canadian Engineer.)

OTTAWA.—Tenders for a new hydrographic steamer will be received up to noon of the 10th day of December, 1908, for the construction of a twin screw steel steamer for the hydrographic service on the Atlantic coast, of the following leading dimensions, namely: Length over all, 173½ feet; breadth of beam, moulded, 29 feet; depth, 15½ feet; to be delivered at Sorel, in the Province of Quebec. G. J. Desbarats, Acting Deputy Minister of Marine and Fisheries.

Manitoba.

WINNIPEG.—Sealed tenders, addressed to the chairman of the Board of Control, will be received at the office of the undersigned up to 11 a.m. on Monday, November 16th, 1908, for supply and erection of air compressor and motor for Well No. 7. M. Peterson, Secretary. Board of Control office, Winnipeg, November 3rd, 1908.

Alberta.

EDMONTON.—Tenders will be received until Dec. 1st, 1908, for the granite for Parliament Building, Edmonton. J. Stocks, Deputy Minister of Public Works. (Advertised in The Canadian Engineer.)

CONTRACTS AWARDED.

Nova Scotia.

HALIFAX.—The Dominion Iron & Steel Company has just received a large order from the Government of New South Wales, Australia, of about 18,000 tons of steel rails to be delivered as early as possible next year.

Quebec.

MONTREAL.—The William G. Hartrauft Cement Company, Montreal, have secured from the Department of Railways and Canals two contracts for work on the Lachine Canal, one for ten thousand barrels and one for twenty thousand barrels of Vulcan cement.

Ontario.

SIMCOE.—The fire, water and light committee have sold the fire engines to Hug Cameron and Company, Canadian agents of the Waterous Engine Company, Brantford, receiving in exchange an up-to-date No. 1 hose wagon and a cheque for $200.

Foreign.

LONDON, ENG.—Two important contracts for railway construction on behalf of the Chilean Government are now being advertised in this country. One of the railway projects is the long-standing scheme for the Arica to La Paz Railway, for the building of which tenders are invited up to December 1, by the Assistant Secretary of the Department of Public Works at Santiago. The time in which the contractor undertakes to do the work will be taken into consideration in the award of the contract. Bids for the other contract for a line from Ligua to Copiapo and a branch line from Papudo to Copiapo may be submitted up to February 1, 1909, to the Department of Public Works. The plans of these works and other information may be obtained from the Chilean Legation in London. The Chilean Government Estimates for 1909 include a big sum for new rolling stock.

RAILWAYS—STEAM AND ELECTRIC.

New Brunswick.

MONCTON.—The International Brotherhood of Railway Employees on the I.C.R. is no more, but the Canadian Brotherhood of Railway employees has taken its place, and although the members of the former order are now members of the latter, it is practically a new organization. A. R. Mosher, of Halifax, is now grand president, and M. M. McLean, of Halifax, grand secretary-treasurer.

Quebec.

MONTREAL.—The Post Office Department is negotiating with the Montreal Street Railway, and may enter into contract for the carrying of mails on closed cars, not only to the head office, but to all the branches.

Ontario.

SARNIA.—It is again rumored that the Canadian Pacific Railroad is about ready to extend its line from Komoka to Sarnia. This line is already surveyed by way of Petrolea. It practically parallels the Grand Trunk main line, but would dip down into new territory now indifferently served. The prime purpose in building this extension is probably to add to the lake ports which the railroads already touches, and which form so important a part of the Canadian Pacific Railway system.

WALLACEBURG.—It has been definitely announced that the Chatham and Wallaceburg Electric Railway will be extended from Wallaceburg to Dresden and on to Thamesville next summer.

Manitoba.

WINNIPEG.—The Winnipeg Electric Street Railway Company will shortly complete the construction of its new Fort Rouge belt line which is to connect with the line running south and east from Maryland Bridge. The heavy rails are laid in concrete from Pembina to Lilac Street along Corydon Avenue.

WINNIPEG.—S. R. Poulin, engineer in charge of district F. of the National Transcontinental has returned from one of his periodical trips down the line. The rails, he states, are now laid for about twelve miles beyond Rennie. Work, however, is at present concentrated on ballasting the track east of the present steel terminus. In a short time steel-laying will be resumed, and it is expected that rails will be laid from St. Boniface to the Winnipeg river by Christmas.

Saskatchewan.

MOOSE JAW.—The first train running to Conan from Moose Jaw was operated by the Canadian Pacific on November 2nd, the train making the return trip.

SASKATOON.—The first train on the Wilkie service pulled out of the C.P.R. station on November 2nd, bearing as its freight an army of commercial men who are out after the business of the promised intervening and newly-opened country.

YORKTON.—The first train of the Canadian Pacific operating between Sheho and Leslie was sent out from Yorkton on November 2nd. This branch is expected to be in the future a part of the main line between Winnipeg and Edmonton. The service between Yorkton and Leslie will be given for the present twice a week. The line is sixty miles long.

British Columbia.

FRASER LAKE.—The final tie was made yesterday, completing the G.T.P. location survey, when the party in charge of K. W. Chudleigh, working north, connected with the party in charge of W. F. Graham, working south, and met at a point near Bulkley Summit, about 70 miles north of Fraser Lake. These parties are now on their way to Ashcroft, B.C.

VANCOUVER.—The C.P.R. has just completed a preliminary survey of the route which the extension of the Spence's Bridge-Nicola line may take from Nicola to Penticton. Ultimately the line will be continued from Penticton to Midway, where it will link up with the Columbia and Western Railways, finally furnishing the C.P.R. a line from Vancouver to the Boundary country. Whether the C.P.R. or Great Northern Railway will be the first to connect the Kootenay country with the coast is a matter of considerable speculation. The roads have started construction from opposite ends, the C.P.R. from Spence's Bridge and the Great Northern from Midway, and both are surveying and building a little more road all the time.

Foreign.

PITTSBURG.—It is reported that the railways have placed heavy orders for steel rails at $24 per ton. The old price was $28. It was given out that the life of a steel rail is seven years, thus one-seventh of the entire rail base of a railroad should be replaced yearly. This has not been done for two years throughout the country, it is claimed, which leaves the demand for almost two years rail to be filled now. Steel rails are the only thing in a finished condition on which prices have not been reduced the past year.

LIGHT, HEAT, AND POWER.

Ontario.

GANANOQUE.—The council are endeavoring to ake a new lighting contract with the Electric Light Company. They are offering $40 per annum for an all-night arc service, and $8 for incandescents and discounts allowed of 10, 20 and 30 per cent. for large users. Contract for five years.

British Columbia.

NELSON.—The city council passed a new lighting by-law fixing rates as follows:—Porch lights up to four candle power free. Cooking appliances.

	Cap. in W.	Pr. M.
Irons for domestic purposes	500	25
Irons for commercial purposes	...	$2.50
Disc stoves	350	25
Water heaters (1 pint)	300	25
Water heaters (1 quart)	500	50
Toasters for domestic purposes	350	25
Coffee percolators for domestic purposes	350	25
Tea kettles—for domestic purposes	500	50
Chafing dishes	500	25
Warming pad	60	25
Coffe urn	1400	2.50
Domestic purposes	1500	75
Broiler for commercial purposes	...	10.00
Electric ovens for domestic purposes	1200	2.00

Meter Rates.

1st 50 killiwatts	12	cents per killiwatt
2nd 50 killiwatts	11	"
Next 100 killiwatts	10	"
Next 200 killiwatts	9	"
Next 300 killiwatts	8	"
Next 300 killiwatts	7	"
Next 500 killiwatts	6	"
Next 500 killiwatts	5	"
All over 2,000 killiwatts	4	"

A discount of 10 per cent. shall be allowed on all the above rates if paid on or before the 15th of the month for the previous month.

The following rates are for the supply of power to consumers using 50 horse-power and under, and all other rates heretofore in force are hereby cancelled: On the first killiwatt hours, 5 cents per killiwatt hour; on the second killiwatt hours, 4 cents per killiwatt hour; on the next 50 killiwatt hours, 3 cents per killiwatt hour; all in excess of 250 killiwat hours, 2 cents per killiwatt hour.

Manitoba.

WINNIPEG.—On November 6th the first sod in the excavation of the canal and power-house site at Point du Bois was turned. It is expected that Winnipeg will realize benefits of the scheme by 1910.

MISCELLANEOUS

Quebec.

MONTREAL.—A terrific explosion took place in the harbor of Montreal, about one o'clock Sunday afternoon, shattering the glass of many of the large office buildings in the business district near the harbor front, and causing people for miles distant to rush to their doors to ascertain what had happened. The detonation by the explosion of a quarter of a ton of dynamite being held for the purposes of the Harbor Commissioners in the harbor of Montreal. The boat or barge upon which the dynamite was stored was anchored off the end of the Guard Pier, some distance out from the centre of the harbor. A fire was being maintained within it for the purpose of keeping the dynamite from freezing, though, as a matter of fact, the day was reasonably mild, and there was no possibility of the dynamite freezing at that particular time. The watchman was barely able to escape in time after noticing that the boat was afire. As he rowed away for dear life the explosion took place, and he was in the midst of falling timbers, none of which touched him. No one was injured, largely owing to the cessation of activities, owing to the day being Sunday. The damage will amount to many thousand dollars. The Commissioners began an investigation at once.

Ontario.

COBOURG.—On November 2nd the first sod for the construction of the big steel and rolling mill plant was turned. The establishment of this plant is looked upon as the dawning of a new era of industrial activity for the town, which has already been chosen as the Canadian terminus of the G.T.R. Company's big car ferry. About fifty men are now actively engaged in the construction of the buildings. M. Jek & Co., of Cobourg, have the contract.

DESERONTO.—The smelting works owned by the Deseronto Iron Company, which were struck by lightning and burned down last September, are being built up again. The company expect to have the works in full operation by April next.

WELLAND.—The Ontario Iron and Steel Company at Welland has added a new branch to its already large industry. It will manufacture rail joints. This will necessitate the employment of about thirty additional skilled workmen. A building 120 by 90 feet will be erected, and the first work will be turned out in about one month.

WINDSOR.—City Solicitor Ellis is taking action on behalf of the city of Windsor against the American Bonding and Surety Co. to collect a guarantee of $6,000 that the company placed on asphalt block pavement laid by a Toledo firm about six years ago. The city claims that the pavement was not in specified condition, and is trying to collect from the bonding company, the paving company having been dissolved.

TELEPHONY.

Ontario.

BROCKVILLE.—The private telephone system extending to North Augusta, Bellamy and Algonquin has been

connected with the lines of the Bell Telephone Company at Brockville and Prescott. It is interesting to note that these points can now be reached by long distance telephone.

NEWMARKET.—The central telephone station has been transferred from Starr's store one door further north. The change involved nearly a week's work by a gang of seventeen men. In the new switchboard accommodation is provided for 250 subscribers.

ST. CATHARINES.—The new circuit lately added to the lines of the Bell Telephone Company between St. Catharines and Welland has greatly aided telephone communication between these two points, as well as with intermediate towns.

Manitoba.

WINNIPEG.—The Telephone Commission, Manitoba, is now discussing with the American telephone companies adjoining the Province a revision of rates for long distance messages across the line.

PERSONAL.

MR. JOHN OSMOND has been appointed mechanical superintendent of the Smart Manufacturing Co., Brockville, Ont.

MR. THOMAS HEWITT, superintendent of the Kingston Waterworks, has resigned, the resignation to take effect January 1st, 1909.

MR. KEMPER J. KNOTT, of Chicago, has been elected a director of the Allis-Chalmers Company, to succeed Jos. S. Measle, of Cincinnati, Ohio.

MR. E. W. McClennan, former manager of the Bell telephone exchange at Orillia, Ont., and section manager of the surrounding towns, has been appointed traffic manager of the Manitoba Government system in Winnipeg. He will take over his new duties immediately.

MR. HENRY N. NOLD has severed his connection with the Berlin Machine Works, of Beloit, Wis., and Hamilton, Ont., as electrical engineer, and has opened an office at Room 2, Hamilton Provident and Loan Chambers, Hamilton, Ont., as a consulting electrical and mechanical engineer. Mr. Nold's work will embrace the preparation of estimates, plans, specifications, and the supervision of installation of railway, lighting, power and industrial enterprises.

MARKET CONDITIONS.

Toronto, 12th November, 1908.

In building materials there is nothing novel to chronicle. Lumber is moving slowly, cement decidedly dull at the factories, but fairly active among the small dealers, bricks still in demand. Structural steel hardly in the running until next spring, American advices indicate a distinctly better feeling. Foundry and forge iron are also moving with more freedom, 30,000 tons having been sold since Election Day.

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

Antimony.—Price unchanged at 8¾c., with more enquiry.

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

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

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

Boiler Tubes.—Demand limited. Lap-welded, steel, 1¼-inch, 10c.; 1½-inch, 9c. per foot; 2-inch, $8.50; 2¼-inch, $10; 2¾-inch, $10.60; 3-inch, $12.10; 3½-inch, $15.30; 4-inch, $19.45 per 100 feet.

Building Paper.—Plain, 30c per roll; tarred, 40c. per roll. Business brisk.

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

Cement.— Market still weak; cement can be had in 1,000 barrel lots at $1.70 per barrel, including the bags, which is equal to $1.50 without bags. At this time of year building operations are closing down, demand is therefore naturally limited. The smaller dealers, however, are busy selling small quantities.

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

Copper Ingot.—There is more activity in the States, and if anything a steadier feeling; prices are firm at 14 1-2 to 14 3-4c. here.

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

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

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

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

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

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

Iron Chain.—¼-inch, $5.75; 5-16-inch, $5.15; ⅜-inch, $4.15; 7-16-inch, $3.95; ½-inch, $3.75; 9-16-inch, $3.70; ⅝-inch, $3.55; ¾-inch, $3.45; ⅞-inch, $3.40; 1-inch, $3.40.

Iron Pipe.—Black, ¼-inch, $2.03; ⅜-inch, $2.25; ½-inch, $2.63; ¾-inch $3.56; 1-inch, $5.11; 1¼-inch, $6.97; 1½-inch, $8.37; 2-inch, $11.16; 2½-inch, $17.82; 3-inch, $23.40; 3½-inch, $29.45; 4-inch, $33.48; 4½-inch, $38, 5-inch, $43.50; 6-inch, $56. Galvanized, ¼-inch, $2.86; ⅜-inch, $3.08; ½-inch, $3.48; ¾-inch, $4.71; 1-inch, $6.76; 1¼-inch, $9.22; 1½-inch, $11.07; 2-inch, $14.76. Colder weather causes more movement.

Lead.— Consumption has increased, the market is fairly firm at $3.90 to $4.00.

Lead Wool.—$12 per 100 lbs. f.o.b. factory.

Lime.—In adequate supply and moderate movement. Price for large lots at kilns outside city 22c. per 100 lbs. f.o.b., cars; Toronto retail price 35c. per 100 lbs. f.o.b. car

Lumber.—Dressing pine we quote $32 to $35 per thousand for usual lengths (12, 14, and 16 ft.), and stock sizes of boards, and $38 to $40 for special lengths, common stock boards, as to grade, $24 to $28; Cull stocks, $20; sidings, $17.50; Southern pine, moderately firm; Norway pine rather easy. Hemlock moves steadily in small quantities. British Columbia shingles still $3.20; lath, No. 1, $4; No. 2, $3.50, with perceptible stiffening; spruce flooring, $25. No quotable change in price anywhere, but a more settled feeling.

Nails.—Wire, $2.55 base; cut, $2.70; spikes, $3. There is a fair supply and no especial activity.

Pitch.—An active trade at unaltered prices, at 70c. per 100 pounds.

Pig Iron.— Business is only moderate; pries are decidedly maintained. Clarence quotes at $19.50 for No. 3; Cleveland, $19.50 to $20; in Canadian pig, Hamilton quotes $19.50 to $20.

Plaster of Paris.—Calcined, wholesale, $2; retail, $2.15.

Putty.— In bladders, strictly pure, per 100 lbs., $2.25; in barrel lots, $2.05.

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

Sewer Pipe.—

	4-in.	6-in.	9-in.	10-in.	12-in.	24-in.
Straight pipe per foot	$0.20	$0.30	$0.60	$0.75	$1.00	$3.25
Single junction, 1 or 2 feet long.	.90	1.35	2.70	3.40	4.50	14.63

In good demand; price 70 per cent. off list at factory for car-load lots; 60 per cent. off list retail.

Steel Beams and Channels.—Quiet. We quote:—$2.50 to $2.75, according to size and quantity; if cut, $2.75 to $3; 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; Montreal, 12-lb. $45, 16-lb. $44, 25 and 30-lb. $43.

Sheet Steel.—Market steady, with fairly good demand; 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.

Tool Steel.—Jowett's special pink label, 10½c. Cyclops, 18c.

Tank Plate.—3-16-inch, $2.50.

Tin.— The market is still strong with a steady demand, at 31 1-2 to 33c.

Wheelbarrows.—Navvy, steel wheel, Jewel pattern, knocked down, $21.35 per dozen; set up, $22.35. Pan Canadian, navvy, steel tray, steel wheel, per dozen, $3.30 each; Pan American, steel tray, steel wheel, $4.25 each.

Zinc Spelter.— Business fairly active at better prices, $5 to $5.50.

* * * *

Montreal, November 11th, 1908.

All the signs, at the present moment, indicate an improvement in the iron and steel markets of the United States after the turn of the year. There is reason to believe that the succession of declines in the price of pig-iron, which have been in evidence since May, 1907, have ceased and that the next movement will be upwards. Since the date mentioned, standard Bessemer iron has experienced a total decline of $8.70 per ton, the average price last month being $14.58. It would seem that producers are now selling special lots for prompt delivery, at $14.50, Valley furnaces, and that they are asking from that figure to $14.75 for deliveries after the beginning of next year. This would give a higher average for November than for October, and, while almost unchanged, as yet, the market for current pig is very strong and tending in the direction of higher levels. Naturally, however, only time can show whether higher or lower levels will be reached.

The English markets have been unchanged during the past week. Demand is slow and stocks are increasing and were it not that the home consumption is fairly satisfactory, prices would probably have declined. The German situation is largely in control of the English market, as, should price cutting become prevalent among makers there, it will be practically impossible for any exporting to be done from England. Makers of good Scotch brands are well taken care of for the next three or four months to come, and are not disposed to make any concessions. Germany has been the biggest consumer of Middlesboro iron; but very little Scotch iron goes there, so that the Scotch are very little disturbed over the situation.