

PAGES

MISSING

The Canadian Engineer

WEEKLY

ESTABLISHED 1893

VOL. 15.

TORONTO, CANADA, NOVEMBER 27th, 1908.

No. 48

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 27, 1908.

CONTENTS OF THIS ISSUE.

Editorial:	Page.
Minister of Mines	835
Sanitary Journal of Ontario.....	835
Leading Articles:	
Artistic Expression in Concrete.....	837
Value of Fuel Gas Analysis.....	838
Tight Joints in Pipe Sewers.....	839
T-Rails in Paved Streets.....	843
Supervision of Concrete Construction.....	844
Boiler Scale	848
Legal Notes:	
Mining Lease	841
Division of Award	841
Duty of Employee	841
Breach of Contract	842
Title by Possession	842
Construction News	845
Market Conditions	848

Copies of the Canadian Engineer for Nov. 6th, 1908,
are required. Any subscriber who is not binding his En-
gineer will have his subscription extended if he will send
in a copy.

THE CANADIAN SOCIETY OF CIVIL ENGINEERS.

You have often meant to attend the annual meeting of the Canadian Society of Civil Engineers, but you have hesitated, wondering whether you would meet any old friends there. Why not arrange with your friends to meet you in Toronto on January 28th, 29th and 30th, 1909? There will be a good time, why not be there and enjoy it?

CANADA'S FIRST MINISTER OF MINES.

When the Canadian Parliament created a Department of Mines it was but natural to expect the minister for the department would be a man in sympathy with mining operations. William Templeman, a member of the House for a British Columbia constituency became the first Minister of Mines for Canada, and right well has he filled the position. He quickly made himself familiar with the condition of the Mining Industry in Canada, and made personal inspection of certain mining districts. It is to be regretted that in the recent general elections Mr. Templeman was not again returned to the House, but it is to be hoped the Premier will not allow this misfortune to deprive the country of the services of an able, informed and progressive Minister of Mines.

THE SANITARY JOURNAL OF THE PROVINCIAL BOARD OF HEALTH OF ONTARIO, 1907.

Under this title the annual report of last year's work of the Ontario Provincial Board of Health is now to hand.

As well as containing a great amount of information and useful statistics relative to the health conditions of the Province, it also contains much special information dealing with the struggles of the town of Berlin, Ont., in order to obtain an efficient sewage disposal system.

Berlin has recently installed a sewage disposal plant of a comparatively complete nature which, up to the present, appears to be giving satisfaction. The system consists of pumping the sewage to a high level with 24 hours storage to save continuous pumping. Septic tanks with a joint capacity equal to 24 hours flow, followed by intermittent filtration over sand land, of which there is any quantity available in the neighborhood. Fourteen acres of this land has been utilised. The underdrains were placed 6 feet below the surface, the sand however ran to much greater depths, at some points to at least 20 feet.

The sewage discharge per 24 hours approximates 450,000 gallons. Of this amount about 200,000 gallons is made up of trade effluents.

The trade effluents, however, although forming a large proportion of the total discharge, have not apparently been a difficult factor in the problem. By experiment it was shown that there was insufficient antiseptic ingredients to unduly interfere with nitrification. All that was found necessary was that certain of the factories should partly treat their sewage locally so as to remove in some cases certain fatty matters and in another case waste from a tannery. The new plant has been constructed under the direction of Mr. Mahlon Davis, C.E. Dr. Amyot, Provincial Bacteriologist, says of the effluent

from the new tanks: "It is a clear sparkling water giving rise to no nuisance in the neighborhood."

Berlin has then to be congratulated on its new sewage scheme, of which it can, we think, be safely said, there is none better in Canada.

Berlin has, however, had its trouble, has had to pay something like \$16,000 as damages for causing nuisances in the past. So troubled were they by the failure of their early attempts at sewage disposal that in 1902 they waited on the Government, requesting that something might be done to assist them by some sort of reliable experimental work, to get trustworthy data to assist them in choosing a method of sewage disposal. The legislature appropriated \$2,000 for the above purpose, and Dr. Amyot was put in charge of the work.

The report contains details of the experiments made, and are interesting, as being practically the first of this nature in Canada. Dr. Amyot says: "The most efficient time for septic tank action was worked out. It was found that when there passed through a tank of 100,000 gallons capacity, 100,000 gallons of sewage per 24 hours." The best results were obtained. Any increase in the rate decreased efficiency. Contact beds of an experimental nature were also tried, the tests proved that such beds were unsuitable for the requirements of Berlin. A continuous filtration method was also tried and showed itself unsuitable for their purposes.

The Experiments.

Septic tanks. There were four of these with a capacity as follows:—

A—capacity, 600 gallons run at rate of 1,200 gallons per 24 hours.

B—capacity, 600 gallons run at rate of 1,200 gallons per 24 hours.

C—capacity, 1,800 gallons run at rate of 1,800 gallons per 24 hours.

D—Capacity, 60,000 gallons run at rate of 100,000 gallons per 24 hours.

In tank C it will be found that the capacity is equal to the daily flow; in the others the rate was approximately double the capacity. Tank C gave the best results. The average analysis of samples from June 26th, 1902, to Sept. 4th, 1902, being as follows:—

Affluent.			Effluent.		
Free Ammonia	Alb. Ammonia	Oxygen Consumed	Free Ammonia	Alb. Ammonia	Oxygen Consumed
2.317	1,835	57.08	1.966	0.860	27.56

Throughout the whole of the experiments with septic tanks no information is given as to the amount of solid matter in suspension either in the affluents or in the effluents. Such would have been of great interest to the engineer at the present time, and might have been reliable data as to the effect of the tanks in keeping back and digesting solids in this particular class of sewage.

Here at Berlin we have an extremely strong sewage partly due to the admixture of trade affluents and mostly due, we think, to the fact that surface and storm water are carried away separately. An analysis of the sewage gives per 100,000 parts: Free ammonia, 2.542; albuminoid ammonia, 2.017; oxygen consumed, 49.05; chlorine, 61.00.

The amount of oxygen consumed, viz., 49.05, points to an abnormal high proportion of organic matter.

The average composition of American sewage in parts of 100,000 is as follows:—Free ammonia, 1.8591; albuminoid ammonia, .6644; oxygen consumed, 3.44; chlorine, 5.73.

In the experiment with Tank C we find that there has been a reduction of organic matter as compared with the affluent and effluent to the extent of 29.52 parts oxygen consumed.

What we would like to know is where is the organic matter gone represented by the parts 29.52? Does it remain as sludge and if so, how much if any has been digested? We know that no oxidation takes place in the

septic tank. Therefore, it has not been oxidized. If it remains as sludge it is still sewage to be treated.

At the present time these are important points on which it is unfortunate that the experiments throw no light, or otherwise they might have been of a useful character. The only fact ascertained as far as Berlin is concerned, is to use Dr. Amyot's own statement, that the 24 hours flow capacity is the best. This, however, is no news to the sewage world. This data flow has been acknowledged ever since the slow movement septic tank was first brought to notice at Exeter, Eng. As far as this point is concerned the experiments were unnecessary, and Berlin might have gone ahead safely without the result of the experiments.

Contact Beds.

There were three of these, consisting each of about 3 feet depth of gravel with 3 inches topping of clean sharp sand, and underdrained with tile pipes. The gravel in each of the beds was of different sizes.

The finest gravel gave the best effluent.

The results are as follows:—

CONTACT BED I.

1/200 acre. (Parts per 100,000). Quarter inch gravel.

Averages July 8th to Sept. 4th.

Affluent.			Effluent.		
Free Ammonia	Alb. Ammonia	Oxygen Consumed	Free Ammonia	Alb. Ammonia	Oxygen Consumed
2.306	1.022	33.72	1.383	.678	16.59

Interspace capacity 234,400 gallons per acre. Run at three times this rate for first half of experiment per acre per day. Run at twice this rate for second half.

CONTACT BED II.

1/200 acre. (Parts per 100,000). One-eighth inch gravel.

Averages July 8th to Sept. 4th.

Affluent.			Effluent.		
Free Ammonia	Alb. Ammonia	Oxygen Consumed	Free Ammonia	Alb. Ammonia	Oxygen Consumed
2.247	1.042	34.21	1.562	.596	16.43

Interspace capacity, 187,400 gallons per acre. Run at three times this rate for first half of experiment per acre per day. Run at twice the rate for second half.

CONTACT BED III.

1/200 acre. (Parts per 100,000). One-half inch gravel.

Averages July 8th to Sept. 4th.

Affluent.			Effluent.		
Free Ammonia	Alb. Ammonia	Oxygen Consumed	Free Ammonia	Alb. Ammonia	Oxygen Consumed
2.262	1.041	36.19	1.502	.758	20.07

Interspace capacity 257,800 gallons per acre. Run at three times the rate first half of experiment per acre per day. Run at twice this rate for second half.

There was still another contact bed with coke as the filtering media. This, however, proved as unsatisfactory.

It was run at the rate of 712,000 gallons per acre per day.

Now with a known sewage such as at Berlin it is difficult to understand how any other than the above unsatisfactory results could be expected.

The rate of filtration for a sewage of such abnormal strength is enormous. And the results simply proved this and nothing more. But all this information could readily have been obtained elsewhere. And it is difficult to see that there is anything gained by simply repeating what is generally and universally accepted by sewage engineers.

Had the sewage been of the ordinary average character such as the above representative American one might have expected good results.

The accounts of the experiments, however, fail to give us just the information which, in any case, would have made them of value, viz., the time of contact of the

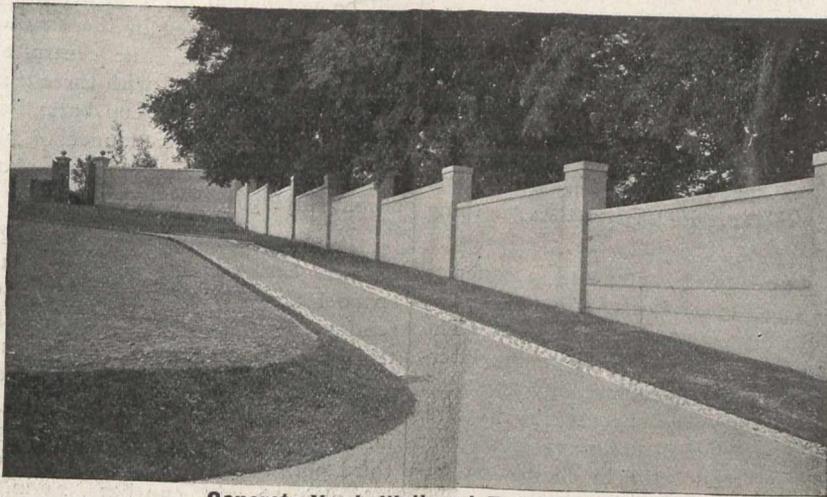
(Continued on Page 848.)

ARTICTIC EXPRESSION IN CONCRETE.

Although cement was familiar to the ancients, they appear to have been almost devoid of any sense of its value as a means of artistic treatment. But the architect

crete cannot and must not be expected of the every day mixer of cement and sand and gravel.

The architect who attempts the impossible soon finds the limitations to the use of concrete in the hands of the practical contractor. And the contractor, with an artistic temperament and ready wit gradually forces his way into



Concrete Yard, Wall and Entrance.

of the present day recognizes in concrete a material susceptible of serving as a medium for the expression of his individuality and originality. Prejudice is being fast over-



Concrete Fence.

ridden and a "concrete-style" is developing. The process was at first necessarily slow because of the necessity of ex-

unexplored fields of development and overcomes the hitherto impossible. But such contractors are relatively few, they grow to their work, develop their organization and methods; they become specialists. Excellent examples of work by this class of contractors is increasing on every hand—in private as well as public structures. The accompanying illustrations are typical of such work done by such a concern—the Aberthaw Construction Co. of Boston—by whose courtesy they are presented.

The art of the architect is shown by simple, perhaps even more distinctly than by complex designs. Thus the detail of a column executed in concrete, stands as a thing of beauty, handsome as though of cut stone, but vastly less expensive.

The yard wall around the Larz Anderson estate at Brookline, Mass., is simplicity personified, but with the posts and caps in relief and a difference in finish, simplicity becomes expressive of beauty.

The post caps which embellish the gate way, are simple but decorative, clean cut in design and finish.

Another design, more ornate, but not any more artistic, is shown in the illustration of the fence enclosing the Portugese Jewish Cemetery at Montreal. The posts and arch are of reinforced concrete, while the panels are of expanded metal, plastered with concrete on both sides. A more handsome effect would be hard to obtain. Messrs.



Walley Bridge (span 80 ft.), Williamstown, Mass.

perience gained only by trial, by success and failure. Such experience must be mutual in its character—combining that of the architect with that of the skilled contractor, who executes the work. Artistic attainment in the working of con-

Swann. Church and Co. of Montreal, were the builders.

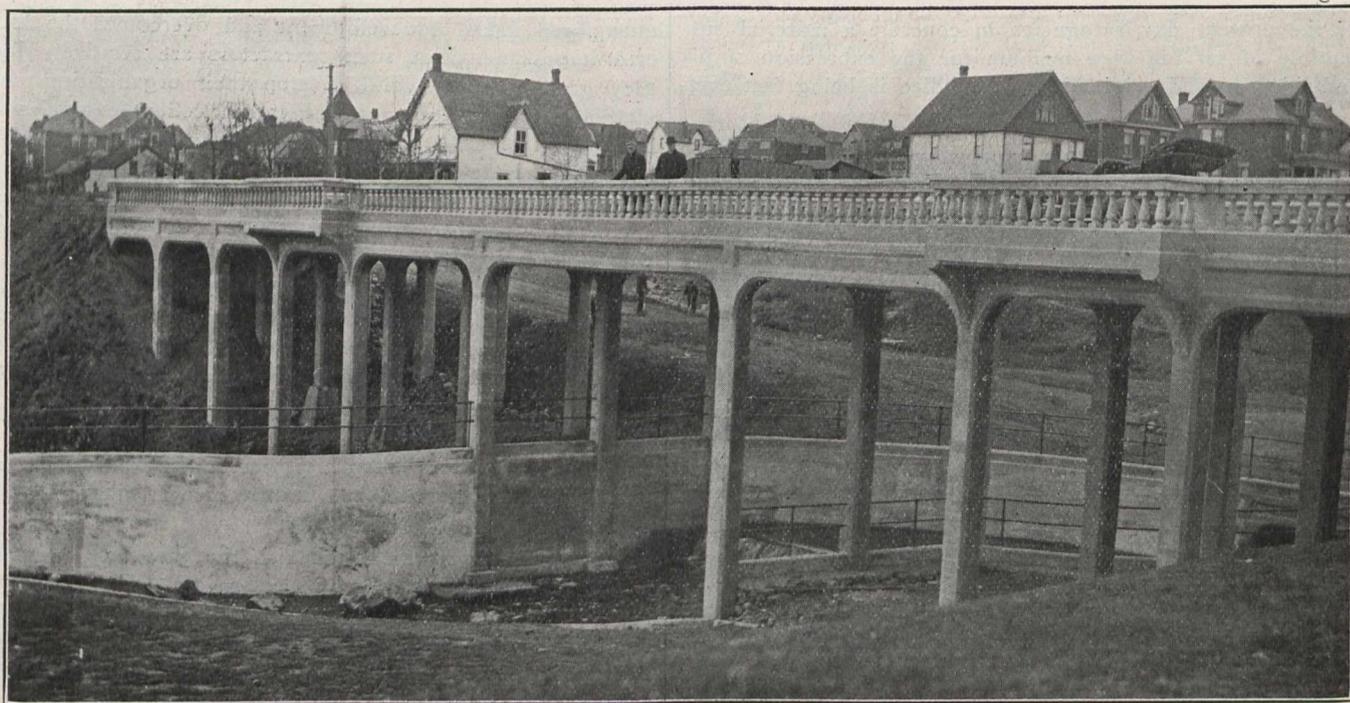
These two designers, entirely different in their treatment of the same subject, give some idea of the possibilities of this material for such work.

One of the most artistic and at the same time practical applications of cement has been in the reinforced concrete bridge, where utility is combined with attractiveness. The illustration of the single span Walley Bridge at Williamstown, Mass., built by the Aberthaw Construction Co., well serves to emphasize this point. The span is 80 feet, the arch and overhanging cap which are in slight-relief accent the principal lines. The simple pipe rail fence is in perfect harmony. With such a structure maintenance expenses vanish, it is built for time unknown. It is well then that it should artistically be the best, for it should stand as a monument to some one's wisdom or sense of beauty, otherwise it may but speak of some one's folly and failure to realize the truth of the trite saying that "a thing of beauty is a joy forever."

But not to the arch alone is pleasing effects in concrete bridge building confined. The city of Port Arthur, Ont., has just completed a girder bridge of unusual design. The bridge spans the creek crossing Algoma Street on the intersection of Dawson Street. Mr. J. Antonisen, city engineer, was in charge of the work, which was executed by Messrs. Stewart and Hewitson. The finished structure reflects great credit upon the engineer and contractor in charge on account of the careful and good workmanship done. The

over the points of support, with the diagonals bent down to assist against shearing, and to take up reverse moments due to continuity. The 22 ft. girders are 12 x 32 in., and are reinforced with three 1 x 3 in. bars placed in the same manner as the 3-4 in. bars in the shorter span, and also have two 1 x 3 in. reverse moment bars over the supports. It will be noted that these girder beams are of the same dimensions as those used in the smaller span, this being done for effect in design. The central span girders are 14 x 32 in., and are reinforced with three 2 x 3 1-2 in. bars, one 1 x 3 in. bars, and two 1 in. cup bars; also with two 2 x 3 1-2 in. continuity bars. The manner of placing the reinforcement in these larger spans is plainly shown on the line drawing accompanying this article.

Running across bridge at right angles to the main girders between columns, stiffening beams in the form of spandel arches were built. These stiffening beams were reinforced with 3-4 x 2 in. bars. The floor slab rests upon the three lines of concrete girders already described, span being 12 ft. 6 in. from centre to centre of girder. The slab is 10 in. thick, is reinforced with 3-4 x 2 in. bars spaced 9 in. on centres, having 12 in. diagonals, sheared from the third points to the end, the centre third of the bars being left plain; 3-4 in. cup bars, 24 in. on centres, were laid on



Girder Bridge

accompanying illustrations clearly show the effect obtained. The structural design and reinforcing material used in both bridges was supplied by the Trussed Concrete Steel Company of Canada, Limited, the Kahn system being used throughout. The bridge was designed for vehicular and street car traffic, with a sidewalk on one side for foot passengers.

The bridge is 182 ft. 6 in. long, 25 ft. wide, the design consisting of a series of flat girder spans, resting upon concrete columns. The spans in this case vary from 31 ft. 8 in. down to 15 ft., centre span being 31 ft. 8 in., adjoining spans on either side of centre being 22 ft. 2 in., and the remaining spans 15 ft., reinforcement used throughout being Kahn trussed bars and cup bars. The column footings are 5 and 8 feet square, respectively, and are reinforced with 3-4 x 2 in. bars running in both directions. The columns are from 15 to 27 ft. high, and are 20 ft. square. They are reinforced with four 1 in. cup bars, laced every 12 in. with 5-16 in. steel wire. The girders of 15 in. span are 12 x 32 in., reinforced with three 3-4 x 2 in. bars at bottom of beam, two running straight through from support to support, the third one being bent at an angle of about 30 degrees from a point about two feet from the centre to the point of support. They also are reinforced with two 3-4 x 2 in. bars, placed

top of and at right angles to the bars to take up temperature stresses.

On one side of the bridge a sidewalk was formed by building up the slab 6 in. higher than the main road slab. On either side of the bridge provision was made in a raised curbing to receive a balustrade handrail, the design and method of building this balustrade having been particularly happy and successful. The rail consists of concrete stringer and moulded concrete balustrades, with square posts placed equi-distant throughout the length of the bridge. To further enhance the architectural design two balconies were added, placed symmetrically on each side of the bridge. These balustrades are cantilevered from the main structure.

The finished bridge presents a pleasing and solid appearance, and it is but another example of what may be obtained through the use of concrete in the way of artistic, permanent and durable construction.

VALUE OF FLUE GAS ANALYSIS.

In a recent boiler plant test made by the Coal Department of the Arthur D. Little Laboratory, Boston, the loss due to unburned gases from a thick, uneven fire was illustrated by an interesting occurrence in connection with the

flue gas analysis. The test showed the following relative conditions:—

	5:00 P.M.	5:30 P.M.
Sample of gas taken.		
Carbon dioxide, CO ₂ , per cent...	11.3	14.3
Oxygen, O ₂ , per cent.	6.5	5.5
Carbon monoxide, CO, per cent...	2.4	0.0
Nitrogen, N ₂ , per cent.	79.8	80.2
Air excess, per cent.....	45	36
Temperature flue gas, of.	545	700
Heat lost due to CO, per cent....	9.7	
Heat lost due to increased temperature of flue gas, per cent.		4.3

The first analysis shows a considerable amount of CO to be present. Before taking the next sample the CO started to burn through the passes of a 600 horse-power Aultman & Taylor boiler, and the CO was being entirely consumed. The flue temperature rose 155 degrees on account of the burning of the CO through the passes of the boiler instead of in the furnace. There was no combustion chamber and the fire was so thick that it came close to the bottom row of tubes.

A number of points can be drawn from this instance.

(1) Had the boiler been set with an ample combustion chamber all gases would have been burned before coming in contact with the heating surface, resulting in a gas analysis like No. 2, but with a temperature corresponding to No. 1.

(2) The fire should not be carried so thick that CO will be formed, as it is very difficult to burn it all in a boiler furnace when once formed and the loss due to small percentages of CO is very great.

(3) The determination of CO₂ alone is not sufficient to determine whether the boiler is being properly fired. In the case of No. 1 sample a CO₂ indicator should have shown 11.3 per cent. CO₂, which would ordinarily have been considered very good, but there would have been no indication that CO was present, while the loss due to it was as great as if the CO₂ had been only 7.5 per cent. with no CO

TIGHT JOINTS IN PIPE SEWERS.*

B. E. Briggs, Engineering Department, Erie, Pa.

The importance of tight joints in pipe sewers was impressed upon my mind early in life in a small western town for which I prepared plans and specifications for a sewer. It was my first experience in this sort of work and I prided myself that I had fixed the joints so that none of the sewage would get away, by providing that the pipe layer should use his hands in applying the cement mortar until the joints were evenly filled on the bottom, sides and top of the pipe, and that the joints be swabbed from the inside to remove any mortar that might have passed through between the ends of the pipe. The town council decided to import from a neighboring city an experienced sewer man. He proved to be a big husky son of Erin, who, after looking over my specifications proposed to tell me "more in a minute about sewers than the person who wrote those specifications would ever know." He said, "the joints should be open on the bottom so that a portion and sometimes all the water would seep out, thereby causing less odor at the outlet," and added, "whoever heard of a man using his hands to place mortar when trowels were made for that purpose," together with many caustic remarks which caused my ears to burn for days.

Some 2,000 feet of sewers were laid under those specifications by the experienced sewer man from the city, but not under my supervision. So well did the contractor carry out his idea of open joints that when, several months later, I examined the work, I found, to my great mortification, a small creek of spring-like water flowing from the outlet, the sewers having drained a number of wells and cisterns along their course.

The ordinary contractor is averse to making tight joints.

*Abstract of paper read at Society of Municipal Improvement, Atlantic City.

arguing that they are an unnecessary expense. I have found it exceedingly difficult, and in many cases impossible, to satisfactorily impress on the average person that has to do with the laying of sewers, the importance of making the joints tight, and I have personal knowledge of cases where due consideration was not given this important feature in sewer work by those who prepare plans and specifications for sewer systems. I recently examined a few sewers with a view of determining as near as possible the exact amount of infiltration. To my surprise I found that in one extreme case fifty-two gallons per minute was flowing from four hundred and twenty feet of nine inch sewer laid in 1896 for a real estate company. There is but one small residence connected with that sewer.

Sewer contractors have frequently assured me that it is not at all difficult to make tight joints in a dry trench, meaning probably that the joint they make, though imperfect according to my standard, would answer the purpose under such conditions. I have found, however, that when they were permitted to use water to settle the earth in the trench, a method which I avoid if possible, there was considerable leakage into the sewer whether the trench was dry or wet.

The Department of Engineering of the city of Erie, which I represent, has expended during the past fifteen years a great deal of money repairing breaks in sewers and streets, caused by defective joints. In an effort to stop that financial leak on future improvements, I procured copies of sewer specifications from neighboring cities and personally experimented with every scheme suggested for making tight joints. All kinds of trouble was experienced in trying to persuade or compel the pipe layer to follow instructions and give the various methods a fair trial. The main fault seemed to lie in his failure to properly place the gasket in the socket under the pipe. For after a pipe was finally set, it was often found that the gasket, on the under side, was either out of the socket or had been caught by the pipe which was being laid and jammed between the ends of the two pipes. From the point of view of the inspection, at the top of the trench, the joint would appear to have been perfectly made. It soon became evident to me that success depended as much upon the man in the trench as upon the method. The man had to be taught and this I did by giving demonstrations.

I decided to use a fairly large oakum gasket, prepared in advance in lengths sufficient to pass around the pipe and with the ends lapped over enough to equal the diameter of the pipe. The gasket should be immersed for several minutes before using in a bucket of Portland cement and water mixed in the proportions of about one to one. It should be so placed in the bucket that it can be readily removed and speedily placed in position by the pipe layer's assistant by taking one end in each hand, in which position, he draws it around the end of the pipe as it is being laid, or he drops the centre of it in the lower part of the socket of the pipe previously laid and the next pipe is laid on it. Then the ends of the gasket are drawn across the top of the pipe and it is driven into the annular space, working from the sides to the top, after which the joint is neatly trimmed with stiff mortar. Either manner of placing the gasket, as mentioned above, is satisfactory in a dry trench, but in a wet trench the best results are obtained by placing it around the end of the pipe as it is laid.

The greatest difficulty encountered was to procure a desirable oakum and in such form as to insure economy and dispatch in preparing the gaskets. The common practice of using plain or tarred baled oakum, from which the contractor twisted his gaskets, proved unsatisfactory because the gaskets were of uneven thickness and could not be forced into the joint, and the tarred spun oakum was discarded because it would not absorb the cement. An investigation among the dealers in hemp, from which oakum is produced, revealed a product spun into strands, of which two or more were twisted into a loose rope called "hemp packing." It can be cut into the desired lengths with a very small per cent. of waste and it absorbs a large quantity of the thin cement mortar. One strand is about the proper thickness for an eight-inch pipe, and two strands for a

twelve-inch pipe. By using the largest gasket that will permit the pipe to enter to the full depth of the socket and having it well filled with cement you will make a good tight joint, although the pipe layer may neglect, as he often will, to fill the lower part of the socket with mortar.

As the joint is the weak point in all pipe sewers and the cause of most of the trouble, I considered it advisable to eliminate as many joints as possible, which was accomplished by adopting the three-foot lengths of pipe with deep, wide sockets in place of the standard pipe in common use. A local pipe dealer informs me that the long pipe, of twelve inch diameter, cost about three per cent. more per foot than the standard pipe. We still permit the use of standard lengths of pipe, to some extent, when they are cemented together in pairs for about four days before laying. The difficulty of safely laying a piece four feet long was carefully considered, and in order to have it evenly bedded in such a position that it will not break, the contractor is required to make a soft bed in a hard bottom trench, remove the earth from beneath each collar, and in back filling have a man stand on the pipe to detect and prevent any moving of the pipe while he tamps the earth around it, alternating from side to side, with an iron tamper similar to that used in railroad track work.

An argument in favor of laying the longer sections of pipe, aside from the fact that there are a less number of joints to be made in the trench, is that owing to their increased weight they are less liable to crawl under the weight of a sliding back fill, which, no doubt, is the cause of many open joints in wet, heavy soils.

As the greatest difficulty in producing a tight joint occurs in a very wet trench where the best possible joint is most necessary, I have devoted more time in an effort to accomplish the desired result under such conditions, and have finally adopted and required the use in very wet trenches, of the W. S. Gasket, which, I believe, is a patented article. These are made for various sizes of pipe and consist of a narrow bag of cheese cloth, slightly longer than the outer circumference of the pipe, with a strand of oakum passing through one side. Then the bag is divided into pockets by means of pasted seams, and filled with cement. The paste is readily dissolved by the water, permitting the cement in the pockets to unite as the gasket is driven into the annular space. The use of this gasket runs the cost, per joint, up to about three times that of the common oakum and cement-filled joint, but an amount equal to that difference is allowed the contractor on each joint. The city furnishes the gaskets to the contractors at cost.

Another method of making a good tight joint in the water is by the use of a mixture of one part coal tar and three parts of Portland cement thoroughly mixed into a putty. After an oakum gasket is placed this putty is forced in by hand. The operation is simple and effective against the water. The workmen, however, object very seriously to the tar on their hands. The material required for one joint for a twelve-inch pipe with deep and wide socket depends largely on the size of the gasket, but ordinarily one pint of tar and three pints of cement completely fills the joint. The material best suited for this work is called hydrated tar, which is crude coal tar with the ammonia water removed.

In several instances, when repairing breaks in sewers carrying a large amount of water, where it was found impossible to stop leaks at the joints with oakum and cement. I have used plaster of paris with oakum with fair success, afterwards finishing the joint with cement mortar. The plaster is made in a thin paste and worked into the gasket until it contains all it will carry. As the plaster sets very quickly the work of preparing and placing the gasket and setting the pipe must be performed with great rapidity.

The methods outlined above have thus far proved satisfactory. Of course time alone will prove whether they are the best or not. It is, however, an indisputable fact that the success of any method depends largely upon the intelligence of skill of the workman. Also, that the average man working in the trench to-day is a very different speci-

men from the one of twenty years ago. The foreigner of to-day cannot be depended upon to understand or follow verbal instructions. I find, however, that he learns quickly by sight, and will follow a given line. It is to this fact that I attribute the success of my methods.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

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

5524—Oct. 22—Authorizing the C.N.R. to open for carriage of traffic portion of line on its railway from Brandon, Man., to Regina, Sask.

5525 and 5536—Granting leave to the British Columbia Telephone Co. to erect, place, and maintain its wires across tracks of the C.P.R. at Wentworth Street and Fifth Street, Nanaimo, B.C.

5527 to 5535—Oct. 30—Granting leave to the Manitoba Government Telephone Commission to cross the tracks of the C.N.R. at various points in the Province of Manitoba.

5536—Sept. 18—Directing the C.P.R. to carry freight traffic over portion of its line known as "Moose Jaw Branch" from mileage 14.5 to mileage 63, provided trains are not run at a greater speed than thirteen miles (13) per hour.

5537—Oct. 16—Granting leave to the Manitoba Government Telephone Commission to erect, place, and maintain its wires across the track of the G.T.P.R. at Carberry, Man.

5538 and 5539—Oct. 29—Granting leave to the B.T. Co. to cross the G.T.R. and C.P.R. at Strathmore Station, Ont.

5540 to 5545—Oct. 30—Granting leave to the rural municipality of Strathcona to cross the C.N.R. at various points in the municipality of Strathcona.

5546—Oct. 29—Approving "La France" fire extinguisher for use on the C.P.R. in the Province of British Columbia.

5547—Nov. 3—Authorizing the C.P.R. to use and operate various bridges on its Ignace section.

5548—Nov. 3—Approving location of V.V. and E. Ry. from the New Westminster District Line to the West Line of Township 26, New Westminster District, B.C.

5549—Granting leave to the C.P.R. to operate various bridges on its Kenora section.

5550—Nov. 3—Granting leave to the corporation of the city of Toronto to construct sewer under tracks of the C.P.R., near Rosedale Creek, Toronto, Ont.

5551—Nov. 3—Authorizing the C.P.R. to construct, maintain and operate branch line to and into the premises of the Gordon Pulp and Paper Co., Lot 4, Concession 5, Township of Van Horne, Rainy River District.

5552—Oct. 29—Authorizing the corporation of the town of Hespeler, Province of Ontario, to lay water pipe under G.T.R. at Avenue Street, Hespeler.

5553—Oct. 29—Authorizing the Peterboro' L. and P. Co. to lay gas pipe under G.T.R. tracks at Smith Street, Peterboro', Ont.

5554—Nov. 3—Granting leave to the B.T. Co. to cross the T.H. and B. Ry. at public crossing, Trolley Street and Barton Street, Hamilton, Ont.

5555—Nov. 3—Granting leave to the G.T.P. Telegraph Co. to erect, place, and maintain its wires across the track of the Pheasant Hills Branch C.P.R. at Nokomis, Sask.

5556—Nov. 3—Authorizing the G.T.R. to operate its trains over the crossing of the Toronto Railway Company at Front Street, Toronto, Ontario.

5557 to 5563 Inc.—Oct. 30—Granting leave to the British Columbia Telephone Company to cross the C.P.R. at various points on its Cascades Section in the Province of British Columbia.

5564—Nov. 3—Approving Standard Passenger Tariff of the O. & N.Y. Railway, No. C.R.C. 131, covering rates over bridge section of the St. Lawrence River Bridge, Cornwall Ont.

5565—Nov. 3—Authorizing the Municipal Corporation Town of Welland, Ont., to lay sewers across the G.T.R. at various points in the town of Welland, Ont.

LEGAL NOTES.

[This department will appear in the third issue of every month. Should there be any particular case you wish reported we would be pleased to give it special attention, providing it is a case that will be of special interest to engineers or contractors.—Ed.]

MINING LEASE—FORFEITURE ON BREACH OF COVENANTS—LESSEE ENTITLED TO INQUIRY—OPINION OF EXPERT.

Bonanza Creek Hydraulic Concession vs. Attorney-General of Canada.

On 3rd November, 1899, the plaintiff company took a lease from the Government of certain claims in the Yukon Territory. This lease stipulated that machinery should be in place and operations commenced within one year of date: further that "if during any year the lessee failed to expend upon mining operations the sum of \$5,000—of the fact of which failure the Minister and the Interior should be the sole and final judge—the lease and all rights and privileges thereunder should become absolutely null and void" and the Government might resume possession. It was further provided by the mining regulations in force at the time, that in case of breach of any covenant, the Gold Commissioner might placard a notice upon the location—also mail a copy to the last known address of the lessee and if the breach was not remedied in three months the lease should ipso facto become null and void.

The company it was alleged did not live up to the agreement in the lease and did not expend the \$5,000 per year, whereupon the Minister, without notice to the lessees decided that they were in default and declared their rights forfeited.

The Supreme Court of Canada holds that this is beyond the Minister's power. They say that the provision that he shall be "sole and final judge" as to whether default has taken place is merely a stipulation that reference shall not be taken to any third party or court, that while he is the sole judge as to whether default has been made that question must be decided in the affirmative prior to declaring the lease forfeited, and that in giving such decision he is not an arbiter but a judge, and is bound to give a hearing to both parties. As no such opportunity was afforded to all parties of hearing what was alleged against them, the lease is not validly cancelled, but still exists and the mining company can still hold the claim. 40 S.C.R. 281.

* * * *

This is similar to the case of *Armstrong and South London Tramway Company*. The plaintiff engaged as conductor under an agreement that any breach of the company's rules should render him liable to dismissal, together with forfeiture of any wages already earned but unpaid—and that the certificate of the manager as to whether breach had in fact occurred should be conclusive evidence in any court. The manager, without hearing the plaintiff certified there had been such breach, but the court held that the certificate was ineffectual, saying: "A party cannot be deprived of wages already earned without a hearing. It is a necessary implication that the party should be heard, and it would be monstrous to suppose otherwise." 7, Times L.R. 123.

* * * *

The court notes a distinction between a right of decision such as possessed by the Minister of the Interior in the case above and that of experts. Where a question is referred to an expert he depends solely and primarily upon his own judgment and experience—employs his own eyes, knowledge and skill and gives his decision accordingly. Thus, if the agreement had referred the question of expenditure to the Minister

as being an expert mining engineer and stipulated as it does that he should "be sole and final judge," an expression of his opinion would end the matter absolutely. Now he is not an expert, but an official without practical knowledge of the matter: he is not on the spot and it must be assumed he will rely upon information obtained at second hand. Possibly he is not confined to any manner of obtaining evidence, nor restricted to such as is admissible in a court of law, but nevertheless it is an inquiry which may lead to forfeiture of the property rights of one of the parties and, therefore, he is bound to conform to all requirements of substantial justice, and the party liable to lose is entitled to be heard.

Unsafe Method—Division of Award.

Lappage vs. C.P.R.—

The plaintiff's husband was employed in the defendants' yards at West Toronto. He was working upon a car held up by trestles without the trucks beneath when the car fell and he was crushed.

One witness was called on behalf of the company—this was their divisional foreman, who testified that in his opinion the car was securely jacked up: he did not consider it unsafe and, in fact, he would prefer that method to any other.

It took the jury two hours to reach a verdict, but they found the company guilty of gross negligence in not taking proper precautions. They held that the supports used were not sufficient to carry the weight of such a heavy car and that jacks and trestles were both needed. In addition they considered the system of jacking defective and that the foreman had not paid proper attention to the support of the trestle which collapsed.

The case was tried before Mr. Justice Clute at Toronto and the jury awarded \$4,000 damages, which his lordship apportioned equally between the widow and the one infant child.

It is interesting to note a distinction in the measure of damages between cases where death results and those where the unfortunate is injured only. In the latter the plaintiff's business suffers and he may recover for the time lost, the pain suffered, and any reduction of his earning power—in fact for any and all direct injuries that can be proved. Where death results it is an entirely different action, thus personal pain or grief has nothing to do with the cause of action. If he suffered for several months prior to decease the grievance ceases with his death. The new action arises out of the death—belongs to those bereaved and is for loss of support only: therefore a widow or infant child has good ground for action and will generally secure a considerable award, as they depended on the deceased for support, where as a grown up family or a widow with independent means do not suffer loss of support and can seldom succeed.

So, too, if the deceased be a young man and able bodied the verdict will be great, while if he be advanced in years or incapacitated the verdict must be small, as in such cases the amount of support which could be reasonably expected is small and the loss according.

Insulation of Electric Wires—Negligence—Duty of Employee.

Fortin vs. Quebec Railway, Light & Power Company—

The company have a power-house at Montmorenci Falls, from which they supply light and power to the City of Quebec and other places. In their power house were a great many wires, some of high voltages, all strung high overhead and reached by means of a moveable ladder which led to a platform above three or four feet wide and stretching from side to side.

The plaintiff's husband was line foreman for the company. On the day of the accident he was directed to change some wires and ascended the ladder to the platform—he then

tried to pass beneath some wires above and was killed. On trial it was shown that he himself had on special instructions several months previous placed that particular wire in place—also that his death resulted through several inches of the wire lacking insulation—but it could not be proved how long it had been without such insulation.

The point of the case was as to whose duty it was to see to that particular wire—if the duty was upon him then he came to his death through an act involving negligence on his own part and his widow could not recover; but if his duties related only to lines outside the power-house the company would be liable. The evidence of all parties showed he had always been a most careful and efficient man, which shows improbability that he neglected to insulate the wire or to inspect it later. Only two men were over him, the head mechanic and the superintendent. The first could not speak as to duties of deceased: the superintendent engaged him and said “he had charge of all the linemen and work around the power house.” The court said that as the death arose from a defect in part of the plant the company was liable unless they could prove the defect existed through negligence of the deceased. Now the only evidence they can adduce as to his being responsible for, or in charge of the lines inside the house is that of some specific occasions, when he did particular work inside the building, and on each of these occasions he acted upon special instructions from one or other of his superiors.

Held, there is no sufficient evidence of negligence on part of the deceased; judgment for the plaintiff. 40, S.C.R. 181.

Breach of Contract—Measure of Damages.

Battle vs. Willox—

The defendant Willox was the owner of certain gravel lands in the County of Welland, Ontario; as he lacked capital to develop same he approached the plaintiff Battle, who gave him the assistance asked for, upon obtaining an agreement under which Willox undertook to secure contracts for supplying sand to some five large companies doing business in the locality, and Battle was to be entitled to one-fourth of the profits arising from the business—if either party desired to sell his interest the other party to have first opportunity to purchase. Operations were commenced—two of the contracts spoken of were secured and carried out, but when some three months later the defendant got a good offer of purchase at \$35,000, he accepted the same without notice to Battle. He then repaid the moneys advanced by Battle and notes endorsed by the latter and ceased business altogether.

The plaintiff brings this action for damages, and claiming his share of the profits that would have been earned if the five contracts had been entered into and duly carried out.

Held, that the defendants undertaking to secure the five contracts, at least, was absolute, and as by the sale he put it out of his power to perform same he is liable to the plaintiff, who is entitled to damages. The amount of which will be determined by supposing that those five contracts were obtained and carried out, whereupon the plaintiff would have received one-fourth of the profits. 40, S.C.R. 198.

Principal and Agent—Secret Profit.

Fleming vs. Hutchinson—

This case, tried some months ago in British Columbia, has again come up on appeal before the Supreme Court of Canada. The plaintiff went to defendant, a real estate broker in Vancouver and inquired for investments in that city, whereupon the defendant recommended two lots he had listed at certain prices, and plaintiff agreed to buy same, but any brokerage chargeable was to be gotten from the vendors in each case. The defendant bought the first lot at \$180 per acre, said nothing whatever to his client, but receiving from the latter the list price of \$220 per acre retained the difference to his own use. He then tried to buy the second lot, and as the owner would not sell below the list price he reported to plaintiff that a higher price must be paid to secure this, and his client again consenting he again appropriated the difference in price. The plaintiff later discovered the scheme which had been worked upon him and brought action to re-

cover the additional sums paid to and retained by the defendant.

Held, that the defendant stood in the fiduciary position of an agent for Fleming, and as such could not make any profit out of principal unknown to that principal. His duty as agent was to buy the lands for Fleming on the best terms possible for the latter, the law does not allow him to assume a new roll whereby his duty and personal interests conflict. Judgment for the plaintiff is, therefore, upheld. 40, S.C.R. 134.

Room in a Building is “Land”—Title May be Acquired by Possession.

Iredale vs. Loudon—

A very unique case is that arising out of the plaintiffs tenancy of a certain room in Toronto. He entered into possession some years ago and for a time paid rent, then he continued to hold for twelve years without paying rent or acknowledging himself to be a tenant. At the expiration of this period the owners of the building proposed to pull down the building, which was an old one, and in doing so they would, of course, destroy the plaintiffs shop on the second floor with stairway leading up, and the plaintiff brought this action to restrain them from proceeding.

Under Ontario statutes (as also of most of the other Provinces) ten years actual and continuous and undisputed possession gives a title to land. Now it is a well recognized principle of English law that land may be divided horizontally as well as perpendicularly, e.g., a company may own seams of coal beneath the surface which belongs to an agriculturist and, indeed, different strata may belong to different owners.

Held, therefore, that Iredale had acquired title to the room together with stairway leading to same.

But what of the right to support? He never did have actual possession of the supports below, and how could he acquire title to these? Moreover, if he claims not the supports themselves, but a right to be supported, that is an easement upon the land below, and cannot be established except by 20 years of continuance, and he has only been there 12 years. The judges differ as to reasons, but fail to give him any right to support. He is, therefore, owner of certain space to which he cannot gain access and of which he cannot make any use. 40, S.C.R. 313.

CEMENT STATISTICS FOR CANADA.

	Barrels.	Barrels.
	1906.	1907.
Portland cement sold	2,119,764	2,368,503
Portland cement manufactured ...	2,152,562	2,413,513
Stock on hand, January 1st.....	269,558	299,015
Stock on hand, December 31st....	302,356	343,935
Value of cement sold	\$3,164,807	\$3,574,828

The average price per barrel at the works in 1907 was \$1.43, as compared with \$1.40 in 1906, and \$1.42 in 1905.

The imports of Portland cement into Canada in 1907 were:—

	Cwt.	Value.
Six months ending June	732,684	\$277,133
Six months ending December	1,621,520	560,387
The year 1907	2,354,204	\$837,520

According to the annual statement of the Pullman Car Company, Chicago, just made public, the company during the fiscal year ended July 31, carried 18,603,067 passengers, compared with 18,020,370 in the year previous. The financial statement shows after deducting the expenses, dividends of \$7,998,356, depreciation, etc., a net surplus for the year of \$1,790,567.

T-RAIL IN PAVED STREETS.

By R. A. Dyer, Jr., Assistant General Manager, Auburn & Syracuse Electric Railroad.

The two railways with which the writer is connected, the Auburn & Syracuse Railroad and the Rochester, Syracuse & Eastern Railroad, have now the greater part of their city lines laid with T-rail. On the Auburn & Syracuse line 90-lb. A. S. C. E. section rail has been laid, to replace girder rail, in several streets in Auburn and Skaneateles where the street is paved with brick or macadam. So far, the results have been generally satisfactory to the company, to the city authorities and the public. T-rail in Auburn is not new, for in 1891, when the first electric lines were built there, the Seymour Street and Owasco Street lines were constructed with T-rail, and some of it is still in service. This was a 45-lb. rail about $4\frac{1}{4}$ -in. high, and was laid in macadam road, but with a scarcity of ties and ballast which would not be considered as even fair construction to-day. The rail fastening used was the old fish plate, and the natural result was a rough track. Many rails were surface bent at the joints and the whole track was in bad condition. Although considerable money was spent each summer for maintenance, the greater part of it was practically wasted. It is proper at this point to explain that T. H. Mather, the present chief engineer of the company, was not then connected with the company. If he had been, the writer is quite sure conditions would have been different.

A few years later these tracks were rebuilt, new ties and stone ballast being used under the old rail, and Weber joints taking the place of the old fish plates. The track was not an ideal one, for, notwithstanding the good foundation, the rails were still surface bent, but after a time these deformations gradually disappeared. As the cars running over this track are comparatively light, the track has for some years past been in fair condition, the chief expense being the occasional raising of a joint and the filling in between the rails with fine broken stone to maintain the road surface and to fill the ruts worn by wagon wheels driven close to the rail.

About 12 years ago, considerable additional trackage was laid in Auburn, largely of the 6-in. 70-lb. girder rail. The head of the rail was only about 15-16-in. above the tram, as was common practice at the time, the wheel flanges usually being $\frac{5}{8}$ -in. or $\frac{3}{4}$ -in. high. This rail answered very well until the advent of the interurban cars, with wheel flanges $\frac{7}{8}$ -in. high or over, due to the wear of wheel treads. While some of this rail is still in service in streets not used by the interurban cars, it has been necessary to replace it in streets through which the interurban cars enter and leave the city. With the necessity of renewal, the question of using T-rail came up, and the city authorities finally gave consent that a short section of one street should be relaid with 90-lb. T-rail. The rail was laid on new ties, with 6-in. of stone ballast under the ties, and the space to the top of the rail was filled with broken stone, with a top dressing of fine stone for a binder. No repairs have been made to this track since it was put down, except to keep the space between the rails up to the level of the street by spreading fine broken stone over it about once or twice a year. The track is in a very satisfactory condition. Since that time no girder rails have been laid in Auburn, and several miles of T-rail are now in service in both brick, asphalt and macadam paved streets.

In macadam roads the space between the rails is filled with crushed stone, but in all streets paved with brick or asphalt the space between rails, and for 6-in. or 8-in. outside of the rails, is paved with brick, a special block being used to form the flangeway along the inside of rail. This block is nothing but the ordinary paving brick, with a beveled corner, made in full size and half-size for breaking joints.

*Paper read at quarterly meeting of the Street Railway Association of the State of New York, held at Utica, N.Y., November 10th, 1908.

The usual construction is 6-in. of broken stone under the ties, and in case of paved streets the space between the ties is filled with concrete to the top of tie. Then $1\frac{3}{8}$ -in. of sand for bedding the bricks is put down, and the bricks are laid on this in the usual manner.

To form the flangeway, a mortar composed of one part Portland cement and two parts sand is plastered against the web of the rail. The ends of the beveled bricks are embedded in this as they are laid, and finally the whole surface is flushed with a thin grout of cement and water in the usual way, care being taken, however, to prevent the flangeway from being filled with cement. Judging from the approval which has been expressed by succeeding city officials, no opposition is anticipated to laying of T-rail in any of the streets of Auburn in future. A better looking street can be made by the use of T-rail than with any other type of rail which engineers consider practicable to use. At the same time the track can be crossed by a narrow-tired vehicle at any angle which is safe with any kind of rail. There appears to be less difficulty in turning off of the track with T-rail in brick pavement than with girder rail, as the tire of a wheel will cling to the brick much more than is the case where the tires of both wheels come in contact with the rail. Just what the life of the brick forming the flangeway will be, of course depends largely on the amount of travel on the track and in the street. In Auburn, where this style of construction has been in service for three years, the brick does not yet show wear to any extent that is detrimental or inconvenient to vehicles of any class. It will readily be appreciated that even should the pavement require repairs or renewal of the brick forming the flangeway, the long life of the T-rail in comparison with any type of girder rail will show a large saving both in first cost and maintenance at the time the T-rail would have to be replaced.

Not only can the head of the T-rail be worn down several times the amount possible with present girder rails, but the maintenance of the track will be greatly reduced, particularly under heavy travel, because of the centre-bearing feature of the T-rail and the possibility of applying rail fastenings which support the joint better than the plates used with girder rails. This refers only to the angle-bar type of fastenings, as the writer has had no experience with any of the welding processes.

On the Rochester, Syracuse and Eastern, which passes through the streets in seven villages, 90-lb. T-rail was laid and has been in service $2\frac{1}{2}$ years under cars with a light weight of as high as 84,000 lbs. The cost of track maintenance has been small both with brick and macadam paved roads, and the construction has been very satisfactory.

While these two companies have voted the T-rail in streets a success and are laying it in nearly all cases on new construction and where tracks are being replaced, they have found one objection to it where laid in brick pavement, the trouble being somewhat in a ratio to the profile of road. This trouble comes in winter, from ice and snow freezing to the brick flangeway very much more than is the case with girder rail; it is also much more difficult to remove. In stormy weather, when snow is drifting and the frequency of service is not sufficient to prevent the flangeway filling between the interval of cars, considerable difficulty has sometimes been experienced in maintaining operation on grades from 4 per cent. to 8 per cent., and it has been necessary to keep a sweeper on this track almost constantly to prevent snow filling the flangeway and being packed to such an extent that it would freeze to the brick immediately. In some localities this might be a serious objection, and no remedy has been found except as stated, or perhaps the use of salt, if the city authorities will allow it. Otherwise, the experience has been much in favor of the use of T-rail in streets, and so far has brought only the objection noted.

The trustees and faculty of Thomas S. Clarkson Memorial School of Technology, Potsdam, N.P., have issued invitations for Founder's Day exercises, December 1st, 1908.

VANADIUM AND ITS USE IN WARSHIPS.

J. L. Stuart.

In addition to the use of nickel and cobalt in the strengthening of steel, vanadium is beginning to play a most prominent part, both in strength and ductility. There have been many tests into which this new-found alloy has entered. Vanadium, it is claimed, makes steel free of the gases, oxygen and nitrogen, which are its weaknesses now, and which increase the value of its other elements, such as nickel and chrome. The tensile strength of the mass is increased anywhere from 50 to 500 per cent. In armour plate the resistance is increased 150 per cent. Further than this, the steel which vanadium makes possible can be greatly reduced in weight, thus permitting in warships a greater opportunity for fuel room, and consequently swifter and better armoured cruiser. The American Vanadium Company control a great part of the known supply. The property of the company was discovered by a Peruvian mining engineer in the Cerro de Pasco Mountains of Peru. The mine is about five miles long by two miles wide. The ore is brought to Bridgeville, a few miles out of Pittsburgh, which is reduced and made into ferrules, which are turned over to the steel-makers who desire to use it. Five pounds of vanadium are used to every ton of steel. Large quantities of this new alloy are being used by the big steel industries. It is used in all kinds of forging steels, as well as entering the field of automobile manufacture.

Recently at the Union Steel Castings Company a vanadium steel engine frame required twenty blows from a 5,000 trip or ball-drop from a height of nineteen feet, while a carbon, the regular carbon steel frame—of similar composition, except the one-fifth of one per cent. of vanadium added—required but two blows.

Not only in armour plate is the new steel likely to prove valuable, but also in the new vanadium steel protective dock plate, where it is 260 per cent. stronger than the new plate now in use. It would be a rare gun that would explode or suffer by corrosion when made of vanadium steel. The use of vanadium marks an epoch in offensive and defensive steel for naval warfare, and the steel will enable the ship designer to increase the protective value of the ship without a sacrifice of other qualities.

SUPERVISION OF CONCRETE CONSTRUCTION.

Speaking of the marvellous adaptability of concrete to building construction, Mr. Leonard C. Wason, President of the Aberthaw Construction Company, of Boston, Mass., recently emphasized the absolute necessity of technical knowledge and experience in its use and of the most thorough supervision in connection therewith. He points out that "in the case of the common or careless contractor, the steel setter is usually little better than a poor carpenter, in fact hardly more than an intelligent laborer. Upon him falls the whole duty of setting the steel, often sorting it from the stock pile to get the right sizes. Sometimes he is checked by the foreman; often not. If the job is carelessly handled, it is not inspected and as a consequence this cheap man becomes responsible for one of the most critical features of the entire work.

"In such an organization the mixture of cement is no more intelligent—usually less so. Inaccurate setting of the reinforcement is immediately hidden from sight as the work progresses and poor workmanship in the matter of materials and mixing is not readily revealed. Herein lies the great danger in the use of reinforced concrete, a danger which is always present where an inspector is not employed on the work.

"The ordinary contractor, who does not realize the importance of exact location seems to think that if his steel is merely buried out of sight it is sufficient. But the experienced who understands the vital necessity of an accurate setting and mixing delegates men to check one another in the selection and placing of steel. The best contractors also employ engineers whose duty it is to supervise and check all

work, thus eliminating the errors which are always certain to occur where cheap and inexperienced labor is relied upon. Where a job is being executed under the supervision of an independent engineer, his inspector ought, and usually does, note the setting of every bar. It is also his duty to see that every batch gets its full amount of cement and is properly mixed.

ENGINEERING SOCIETIES.

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

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

CANADIAN STREET RAILWAY ASSOCIATION.—President, J. E. Hutcheson, Ottawa; Secretary, Acton Burrows, 157 Bay Street, Toronto.

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

CANADIAN SOCIETY OF CIVIL ENGINEERS.—413 Dorchester Street West, Montreal. President, J. Galbraith; Secretary, Prof. C. H. McLeod. Meetings will be held at Society Rooms each Thursday until May 1st, 1908. Annual meeting at Toronto Jan. 28, 29 and 30, 1909.

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

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

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

ENGINEERS' CLUB OF TORONTO.—96 King Street West. President, J. G. Sing; Secretary, R. B. Wolsey. Meeting every Thursday evening during the fall and winter months.

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

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

CANADIAN CEMENT AND CONCRETE ASSOCIATION.—President, Peter Gillespie, Toronto, Ont.; Vice-President, C. T. Pulfer, London, Ont.; Secretary-Treasurer, Alfred E. Uren, 62 Church Street, Toronto.

NOVA SCOTIA SOCIETY OF ENGINEERS, HALIFAX.—President, J. H. Winfield; Secretary, S. Fenn, Bedford Row, Halifax, N.S.

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

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—29 West 39th Street, New York. President, H. L. Holman; Secretary, Calvin W. Rice.

SOCIETY NOTES.

Nova Scotia Society of Engineers.

At a well-attended meeting of the Nova Scotia Society of Engineers, held on November 17th, 1908, in the Telephone Building on Hollis Street, Halifax, N.S., a paper on "Highway Improvements," by D. McD. Campbell was read. The paper, a valuable one, was discussed by R. McColl, Provincial Engineer; F. W. W. Doane, City Engineer; J. W. McKenzie, Assistant Road Commissioner, and others. At the suggestion of H. Donkin it was decided to continue the discussion at the society's next meeting, to be held on the second Thursday in December.

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.

ST. JOHN.—The School Board are in the market for new fire escapes for the city schools.

Ontario.

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.

TORONTO.—Tenders will be received until December 15th, 1908, for the construction of Section No. 3 of the high-level intercepting sewer. Joseph Oliver, Mayor. (Advertised in the Canadian Engineer.)

TORONTO.—Tenders for heating, etc., addressed to the undersigned, will be received at this Department up to five o'clock on Monday, the 30th day of November, 1908, for the heating and plumbing required in the Hygienic Building, London, and for the heating of the workshop at the Institution for the Blind, Brantford. H. F. McNaughten, Secretary Public Works Department, Ontario.

TORONTO.—Tenders will be received by the undersigned at his office for the purchase and removal of brick and stone on the property of the Eckardt estate, new Union Station site. Brick to be sold by the thousand and stone per ton. Tenders close 12 noon, November 30th. Geo. A. Mitchell, Master of B. and B., Grand Trunk Railway. Room No. 414, Union Station.

Manitoba.

WINNIPEG.—The Board of Control are calling for tenders for fifty arc lamps for street lighting.

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.

SYDNEY.—It is reported that the Dominion Iron and Steel Company have received a large order for fish plates from the Sandberg Company, of London, Eng., and work will be started at once in filling the contract. Mr. Sandberg, jr., member of the English firm, is now on his way to Sydney from London, and while there will inspect the 16,000-ton New South Wales order which was lately received. Mr. Sandberg inspected the first order of steel rails rolled at the steel plant, a contract of 25,000 tons, under the Sandberg process, and so well has the rail stood the test that a repeat order has been received from the I.C.R. by the Dominion Iron and Steel Company.

New Brunswick.

ST. JOHN.—Mr. James H. Doody has been awarded the contract for Winter Street School at \$6,500.

Quebec.

MONTREAL.—The Grand Trunk has just placed an order for 1,000 steel hopper coal cars with the Pressed Steel Car Company of New York.

Ontario.

MERRITTON.—The contract for transformer for stepping down from 2,200 to 110 volts, and for wire goose-neck lamps and all other fixtures for a complete incandescent street lighting system was let to Robertson Electric Company, of Buffalo, their tender being considerably below Canadian firms.

Manitoba.

MARQUETTE.—The contract for the Woodlands drainage ditch was awarded to William Hill, Plumas, Man., at 14 cents per cubic yard. Mr. Hovine, of Headingly, Man., tendered at 17 cents per cubic yard.

British Columbia.

NORTH VANCOUVER.—The contract for supplying 10,000 feet of four-inch waterpipe was awarded to the Canadian Pipe Company at 19½ cents per foot.

Foreign.

PITTSBURG, OHIO.—An order has been received by the Nernst Lamp Company, for 3-glower lamps to replace the 6-glower Nernst lamps in the corridors of the Frick Building, Pittsburg. Nernst lamps have been used in this magnificent building for the past five years, the new lamps will give the same volume of light as the old at a saving of 25 per cent. in the current consumption. Besides this they have the advantage of greatly simplified renewal at a material reduction in cost.

WASHINGTON.—Last June the Isthmian Canal Commission invited bids for a large quantity of bronze globe and angle valves fitted with seats and discs that were capable of being renewed. The order comprising upwards of seven thousand valves, in sizes ranging from ¼ to 3 inches exclusive, has just been placed for the Lunkenheimer "Renewo" renewable seat and disc regrinding valve, manufactured by the Lunkenheimer Company, of Cincinnati, Ohio.

RAILWAYS—STEAM AND ELECTRIC.

Nova Scotia.

NEW GLASGOW.—The latest move talked of in I.C.R. circles is that the District Divisions will be reduced by one. The new adjustment will be one division for Nova Scotia, one for New Brunswick, and one for Quebec. If the change is put into effect, undoubtedly Y. C. Campbell will be the Nova Scotia, district superintendent.

Ontario.

FORT FRANCES.—The C.N.R. have an option on the Rainy River Railway, which runs from Fort Francis to Duluth. Should they take over the road it would mean a large development of mineral land and pulp forests in this district.

NIAGARA FALLS.—The costly and difficult task of constructing a bridge similar to the Michigan Central's across the Niagara River, by the Trans-Niagara Bridge Company, is again being discussed. It is stated that the Electrical Development Company is a shareholder. On the completion of this undertaking, it is said, the International Railway, Niagara, St. Catharines, and Toronto Railway, and the Hamilton, Grimsby and Beamsville Railway will be consolidated, and the trolley system into Toronto made complete by construction of missing sections. That work will commence soon on this structure is denied by those whose names are associated with the undertaking.

UDNEY.—The C.N.O. Railway spur line from Udney to Orillia is graded as far as Atherley and steel is laid for four miles from Udney. Ewan Mackenzie has the contract.

and Joseph Geroux, Dan O'Donald and Cavan & Watson have four, one and three miles respectively of this work.

ST. THOMAS.—The Council have made a recommendation suggesting that the street railway be used as part of an interswitching scheme. Every part of the town would then have railway accommodation and the street railway revenue increased.

TORONTO.—Messrs. Joseph Battle and Thomas Conlon of Thorold, and John H. Armstrong of Toronto, contractors, who had a contract to build a portion of the C.P.R. line between Toronto and Sudbury, which had been awarded to Deeks & Company, but which they undertook to build if paid at the same rate as the other firm was to get, claim that they were not paid at the same rate, and accuse Manager Leonard of fraud and misrepresentation. They moved November 17th before the Master of Chambers at Osgoode Hall to have the statement of claim amended.

Alberta.

CALGARY.—A charter is being applied for to incorporate a company which will build an electric line from Calgary to Millarville, a distance of 28 miles by the trail. Active work is to be started as soon as the company is legally organized. Assurances have been received from financial men that they will support the project, but a very large amount of the necessary capital will come from the farmers themselves.

EDMONTON.—Premier Rutherford has announced that the Government had decided on a policy of railway extensions in all parts of the province. He intends to establish a department, make it one of the most important, and give it his personal attention. The northern part of the province, with rich agricultural possibilities, must secure transportation facilities and wholesome competition must be insured in other parts. Alberta will continue to ask for federal assistance, but if it is not accorded, they will do it themselves.

EDMONTON.—Steel on the Grand Trunk Pacific will not reach Edmonton this year, but will probably be in early in 1909. R. W. Jones, divisional engineer of the Grand Trunk Pacific from Saskatoon to Prince Rupert, who has just returned from an inspection trip, stated that the Grand Trunk Pacific bridge across the Battle River would be completed early in December, and the bridge across the Saskatchewan River at Clover Bar would be ready early in January. This will enable the steel-laying gang to reach Edmonton in the early part of next year.

Saskatchewan.

SASKATOON.—Work on the C.N.R. Goose Lake line is now closed for the season, the steel being laid for 75 miles out from Saskatoon. The grading and steel-laying gangs are coming in en route to their homes in Winnipeg and other parts of Manitoba, from which province most of the men came. The C.P.R. will commence operations on its new roundhouse at Sutherland next Monday. The building is at present equipped for twelve engines, and is capable of being doubled in size. Blacksmith and machine shops of the most modern character adjoin the roundhouse, and the whole layout is very complete generally.

LIGHT, HEAT, AND POWER.

Ontario.

BELLEVILLE.—Government assistance for the development of water power on the Moira River was the request of a deputation from Hastings County which waited on Hon. Frank Cochrane at Toronto. The Moira River runs through Hastings County to the Bay of Quinte. It has been found to be capable of 22,300 horse-power for a twenty-four hour day. It had a natural reservoir until the timber was cut. What is needed now, the deputation said, is to construct concrete dams on the lakes, so as to store the water and let it loose as needed. The work, the deputation claimed, would only cost about \$30,000. The scheme had been approved by the Hydro-Electric Commission. They urged that it would confer all the great benefits of cheap power on Belleville,

Tweed, Madoc, the mining camps of Hastings, and various towns and villages of the district.

OTTAWA.—The exceptionally light rainfall for many months past has had the effect of reducing the flow in the different rivers and streams of the province to such an extent that, in many cases, owners of waterpowers are face to face with a dilemma and in several instances have been compelled to shut down their mills and power houses altogether. It is now stated that there is fear of a water famine in the City of Ottawa, during the coming winter, the water in the river being so low that, when the ice forms, the intake pipes may not receive a sufficient supply.

WINDSOR.—At the approaching municipal elections in Windsor, ratepayers probably will be asked to vote on a by-law to authorize the expenditure of \$25,000 or \$30,000 in order to provide a practically new lighting plant for the city. As an alternative proposition they may have an opportunity to express themselves on the project of purchasing Niagara power from the Hydro-Electric Commission.

Manitoba.

WINNIPEG.—Mayor Ashdown now approves of the municipality going ahead with their power scheme and the development at Point du Bois.

SEWERAGE AND WATERWORKS.

Ontario.

GUELPH.—Rapid work is still being done on the waterworks conduit. Mr. Conn writes to the Commissioners that the water should be running by the first of December and more men will be put on if necessary. Contractor Conery completed work on the cement reservoir before the heavy frosts set in.

OTTAWA.—Water has been turned on in the Ottawa South extension of the waterworks. To supply that district with water was one of the undertakings of the annexation agreement. Six miles of mains have been constructed and the services number two hundred. The extra demand will be quite a severe tax on the pumping station, and it is probable that the auxiliaries in Ottawa East and Hintonburg will regularly operated for some time at least.

TORONTO.—The new 6,000,000 gallon engine at the high level pumping station, which was constructed by the Caledonian Iron Works Company, of Montreal, at a cost of \$45,000, has been put into operation. It can pump against a pressure of seventy-five pounds in the discharge mains, and for fire purposes can raise this to 100 pounds.

FINANCING OF PUBLIC WORKS.

Nova Scotia.

WESTVILLE.—Tenders for debentures will be received until December 14th, 1908, for the purchase of \$7,000 20-year 4½ per cent. town of Westville Waterwork Debentures. Alex. W. McBean, town clerk.

Ontario.

DURHAM.—A bridge over the Saugeen at a cost of \$4,000 is to be built by the town of Durham, debentures for which were approved by the Ontario Railway Board yesterday.

TORONTO.—A by-law will be submitted to the people in January, 1908, for the proposed expenditure of \$215,000 on a bridge across the Don at Wilton Avenue.

WESTON.—At the January elections the ratepayers will vote on a by-law to authorize the establishment of a municipal waterworks system.

Manitoba.

BRANDON.—In December 1908 the ratepayers are to vote on a by-law to provide \$25,000 for the First St. Bridge. W. H. Shillinglaw, city engineer.

SWAN RIVER.—Tenders will be received up to December 15, 1908, for the purchase of six thousand dollars worth of six per cent. local improvement debentures of the town of Swan River. B. E. Rothwell.

SOURIS.—Tenders will be received up to Saturday, December 12, 1908, for the purchase of \$6,798.04 of local improvement debentures. J. W. Breakey, secretary-treasurer.

Saskatchewan.

PRINCE ALBERT.—The city of Prince Albert is calling for tenders for \$40,000, part of a \$9,000 issue, worth of bonds, the money to be used for building a High School. C. O. Davidson, treasurer.

British Columbia.

ROSSLAND.—Tenders for debentures will be received up to December 15th, 1908, for the purchase of the following debentures of the City of Rossland:—\$21,000 5 per cent. Fire Department Debentures; \$22,000 5 per cent. Waterworks Debentures. J. F. Collins, city treasurer.

TELEPHONY.

Ontario.

FERGUS.—The A. E. Nichols Telephone System has a line about completed from Fergus into Eramosa Township, through Speedside. This is the first of several lines that are to radiate from Fergus under the same system.

MISCELLANEOUS

Quebec.

MONTREAL.—The Goulds Manufacturing Company of Seneca Falls, N.Y., have established a house in Canada to be known as the "Goulds Pump Company," with office in the Coristine Building, Montreal, Que., with a view to taking better care of their Canadian customers. The Goulds Efficient Power Pumps are well and favorably known throughout Canada, and the establishing of a Canadian office will doubtless lead to an increase of Canadian business.

Ontario.

BRADFORD.—A staff of government surveyors have been in this vicinity for several weeks. It is rumored that there is a possibility of the Government abandoning the Holland Landing stream in connection with the canal to Newmarket and taking another course starting from the bridge. Another staff of surveyors have also been here for some days, and from what we have been able to learn they have been surveying in the interest of the Metropolitan Electric Road, with the view of an extension of that line to this town next year.

CORNWALL.—Repair work on the Cornwall Canal above lock 18, which was carried away on June 23, wrecking the O & N. Y. bridge, has almost been completed. The gap has been filled by a solid concrete wall, into which a pier has been built for the swing bridge.

FERGUS.—The ratepayers will vote in January on a by-law to raise \$12,000 (15-year debentures) to replace all board sidewalks with concrete next summer.

KINGSTON.—At an estimated cost of \$19,000, the Rideau locks in Ottawa will shortly receive the first masonry repairs since their construction in 1834. It is now 75 years since the first steamer passed through the canal.

PORT ARTHUR.—The Canadian Carbon Company have some idea of locating here and are anxious to purchase for a site the piece of land formerly occupied by the North American Live Stock Association.

TORONTO.—The York County Council received applications for the position of county engineer from W. S. Brook, O. W. Smith, A. W. Connor, F. Barber, D. E. James, D. O. Lewis, C. F. Harrington, A. F. B. McCallum, Henry De Quincey Sewell.

WELLAND.—Joseph Battle, the contractor for the new dock on the Welland Canal, has begun operations. The dock will be 600 feet by 35 feet, and will cost \$50,000.

Manitoba.

WINNIPEG.—Mr. H. McKay, Mayor of Strassburg, Sask., and T. F. Stedman, secretary-treasurer of the Town Council, arrived in Winnipeg to purchase fire apparatus for

the town. The building of a town hall and fire hall, to cost approximately \$3,000, is now being undertaken by the town, and it is expected that it will be completed before Christmas.

Alberta.

CALGARY.—John Lineham, of Okotoks, Alta., states that only twenty more cars will be required to complete the large contract that he obtained from the G.T.P. early this year for ties to be used upon the construction of a portion of their lines. This contract called for 100,000 ties, and this large order has caused both the Okotoks and High River mills to be operated day and night the whole of the past season.

Saskatchewan.

MEDICINE HAT.—It is expected that Mr. Warren Overpack, of Webster City, Iowa, will establish here a sewer pipe factory. Suitable clay has been found and tests made which indicate that pipe of first quality can be produced.

British Columbia.

NORTH VANCOUVER.—The City Council have accepted the resignation of Mr. William Loutit, city engineer, and are advertising for a city engineer.

PERSONAL.

MR. LEONARD H. ROBINSON, formerly of Vermilion Bay, Ont., is now engaged on Residency, No. 26, Transcontinental Railway, near Dryden, Ont.

MR. J. V. DILLABOUGH, of the Transcontinental Railway, has been transferred from Dugald, Man., to St. Boniface, Man.

JENS ORTHEN-BOVING has opened an office as a consulting hydraulic engineer at 72 Victoria Street, London, England.

BAKER & JORDALL, engineering contractors, are moving from the Manning Chambers to larger offices in the Confederation Life Building, Toronto, Ont.

MR. WALTER B. SNOW, publicity engineer, of Boston, has been appointed by Governor Guild a member of the Massachusetts Commission for the Blind.

MR. R. D. SMITH has been appointed district master mechanic of the second district of the C.P.R., with headquarters at Medicine Hat, Sask.

The Concrete Engineering and Construction Co., of Toronto, with offices formerly in the Stair Building, have taken up their new offices in the Union Bank Building, Wellington Street West.

MR. A. A. BOWMAN, Toronto manager of Canadian Rand Co., has returned from Winnipeg, where he has been for several months looking after the Western business of the Canadian Rand Co.

OBITUARY.

GENERAL JOHN E. MULFORD, the founder and for thirty-one years president of the Prentiss Vice Company, 44 Barclay Street, New York, died at his home, Montour Falls, N.Y., on the 18th of October, 1908.

MR. SAMUEL CARSLY, Sr., head of the well-known departmental store in Montreal, who died last week, was also interested in the production of electric light and power. He was president of the Central Heat, Light and Power Company, the steam plant of which is just opposite the Carsley store and connected with it by a tunnel passing under Notre Dame Street. He was also president of the Canadian Vacuum Cleaning Company.

On November 16th the president of the U. S. Steel Corporation stated: "We are now working 60 per cent. capacity, and I look for improvement until about the middle of next summer, when business will reach a normal and healthful state."

(Editorial—Continued from Page 836.)

sewage with the filtering media. The time allowed for rest or recover and the number of times applied per day. Any experimental information in contact beds without this essential information is next to useless.

Continuous Filters.

The bed was made 2 square yards area and 4 feet deep. It was fed with septic sewage from the large septic tanks continuously in a rain at the rate of 5,000,000 gallons per acre per day.

Continuous Filter.

(Parts per 100,000.)

Averages August 8th to Sept. 4th.

Affluent.			Effluent.		
Free Ammonia	Alb. Ammonia	Oxygen Consumed	Free Ammonia	Alb. Ammonia	Oxygen Consumed
2.538	1.069	30.52	2.151	1.191	29.12

Run at the rate of 5,000,000 gallons per 24 hours per acre.

Is this experiment a joke, or what is it? It is very difficult to take it seriously.

The rate of 5,000,000 gallons has up till now been unheard of, undreamed of. It is about equal to 1,000 gallons per cubic yard per day. Whereas the rate at present allowed in Great Britain for continuous filters may not exceed 168 gallons per cubic yard per day. In fact, with ordinary average sewage good results can not be obtained by any greater rate than 168, and then only with very careful filtering and with the use of the dosing tank discharging at each dose not more than 2 gallons per super yard of filtering area. It is not difficult to understand that with the result of such an experiment as this continuous filtration was condemned at Berlin. In fact, the effluent was worse than the affluent. See increase of alb. ammonia.

However, these experiments have persuaded the people of Berlin that it was necessary to go in for a broad and extensive scheme of sewage disposal, whereby they have about an acre of sandy land to about every 40,000 gallons of sewage which, with good management, should prove ample.

The experiments, however, do not prove that with either properly sized contact beds or continuous filters equally good results might not have been obtained.

Sewage of as strong a character as that of Berlin has been treated successfully in the past by means of continuous filters, but no doubt with an ample quantity of natural filtering land available, Berlin has probably been led into a proper and advisable course of action.

BOILER SCALE AND ITS PREVENTION.

It is seldom that information regarding the cause and formation of boiler scale, its effects and the best means of its prevention are more clearly presented than in the following extract from a report rendered some time since by Arthur D. Little, Chemist, of Boston.

"All water, especially surface waters, contain more or less mineral matter in solution which remains in the boiler as an encrustation when the water is boiled away or converted into steam. The mineral ingredients most commonly found in water and which cause the formation of boiler scale are the salts of calcium and magnesium. When the water is converted into steam those substances gradually separate from the solution in the form of deposits and coat the inner surface of the boiler with scale.

"Scale formation is detrimental in several ways. It is a non-conductor of heat and the fires must therefore be driven harder to accomplish the same results. The water becomes separated from the boiler plates and these latter become overheated and are gradually burned out. The tubes and feed-pipes of the boiler become more or less clogged and consequently become less efficient. Some of the scale-forming ingredients, especially magnesium chloride, also exert a corrosive action upon the iron.

"The aim of a boiler compound is to convert these substances into insoluble compounds which settle in the form of sludge or mud and can be removed from the boiler by blowing or washing.

"We could prepare a list of nearly two hundred materials which are known to have been used for boiler cleaning purposes, but there are only four of these which are worthy of mention. They are:—

Soda Ash, or Sodium Carbonate.
Caustic Soda.
Tannin.
Kerosene.

"Soda ash is an alkali and will neutralize any acid in the water, and also precipitate salts of lime, magnesia, iron, and alumina, in the form of soft sludge which can be easily removed when the boiler is cleaned.

"Caustic soda is also an alkali and neutralizes acids and aids in the precipitation of the various salts.

"Kerosene is used in connection with the above to prevent foaming or priming.

"Tannin is also used to prevent foaming or priming, and will precipitate certain mineral matters, although it is not so efficient in this report as soda ash or caustic soda."

STATEMENT OF ACCIDENTS DURING SEPTEMBER, 1908, BY INDUSTRIES AND TRADES.

Trade or Industry.	Killed.	Injured.	Total.
Lumbering	2	3	5
Mining	9	16	25
Building trades	4	19	23
Metal trades	5	30	35
Railway service	23	12	35
Navigation	7	2	9
General transport	7	10	17
Miscellaneous	9	6	15
Unskilled labor	11	5	16

MARKET CONDITIONS.

Toronto, Nov. 26, 1908.

Advanced freights, consequent on Montreal navigation, puts pig iron prices here a dollar a ton higher for British, but Hamilton can still be had at a smaller advance. Iron and steel prices are for the most part steady or indeed firm, but no special activity is to be remarked. The other metals as remarked last week.

Other building materials do not offer much field for comment, activity in them is now slackening off. Cement has been flat and weak in price for a long time, and any change must be for the better, one would think. Bricks have kept up well in price and are even yet active. Lumber moves in small parcels, with a preference shown for cheaper grades.

A. W. FABER'S "CASTELL" PENCILS

The Finest in Existence

16 Degrees 6 B to 8 H.

Unequaled for PURITY, SMOOTHNESS, DURABILITY
or GRADING

A. W. FABER'S
"CASTELL"
Copying Pencil

A. W. FABER
149 Queen Victoria Street
LONDON, E.C.

Manufactory Established 1761

WANTED

Associate to manage Branch Office of leading Hydro-Electric Engineer. Only young Civil Engineers with Hydraulic experience and business tact, who can invest small capital need apply. Address
Box 6, CANADIAN ENGINEER