PAGES

MISSING

The Canadian Engineer

WEEKLY

ESTABLISHED 1893

VOL. 17. TORONTO, CANADA, DECEMBER 24th, 1909. No. 25

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	$3.00	One Year	$3.50
Six Months	1.75	Six Months	2.00
Three Months	1.00	Three Months	1.25

Copies Antedating This Issue by Two Months or More, 25 Cents.

ADVERTISEMENT RATES ON APPLICATION.

HEAD OFFICE: 62 Church Street, and Court Street, Toronto, Ont. Telephone, Main 7404 and 7405, branch exchange connecting all departments.

Montreal Office: B33, Board of Trade Building. T. C. Allum, Editorial Representative, Phone M. 1001.

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

London Office: 225 Outer Temple, Strand, T. R. Clougher, Business and Editorial Representative. Telephone 527 Central.

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, DECEMBER 24, 1909.

CONTENTS OF THIS ISSUE.

ENGINEERING DEPARTMENT, QUEEN'S.

Thirteen may be an unlucky number, but the thirteenth annual dinner at the School of Mines was no unlucky function. Queen's Engineering Department know how to entertain and how to properly mix good-fellowship and education.

Queen's University has a total enrolment of fifteen hundred and seventeen, an increase of one hundred and sixty-six over the registration of the previous year.

In the department of engineering the registration for 1909-10 is three hundred and ten, an increase of twenty over the 1908-9 enrolment. The work this department is doing for the university and for the engineering profession has for some time been recognized. The world of affairs and business must respond to a department which yearly sends out sixty or seventy men to take part in its activities.

Queen's men are loyal to Queen's, to their chosen life-work, but they are not so clannish but that they can recognize the good work of others.

In that spirit Queen's graduates have made good—they are benefiting; so will Queen's.

INDUSTRIAL EDUCATION.

K. A. Mackenzie, B.A.Sc., in Applied Science.

Beyond all question the movement for the improvement and extension of education along technical and industrial lines has come to stay. Each country must choose for itself whether it is to keep up with the procession or drop out of it; no country has any other choice left. On the broad lines of technical education Canada is twenty years behind Europe and at least ten years behind the United States.

The example of Germany is continually quoted in furtherance of all appeals for advancement along these educational lines. In Germany the education is threefold—the masses or the ordinary laboring man; the university or the engineer; and, lastly, the manufacturer. All will admit the extent to which Germany has succeeded in every branch of industry to which scientific method is applicable; and at the present day that includes all industries. It is just a question how much of this success is due to secondary education. The fact is that the German labor material is somewhat different from the English. The German will apply himself and work harder than the average Canadian, and this in some measure is the secret of German success. The average Canadian is just as intelligent, just as ingenious, and besides has infinitely more initiative than the average German.

Many claim that the real secret of German success lies in higher technical education; i.e., in the education

of the German engineers, given at the great engineering laboratories of the Fatherland and in the research laboratories of the large industrial corporations, manned by the graduates of these universities. Does not a great measure of German success lie in the fact that they can in a great number of cases produce better goods at less cost, through improved processes, which are the result of careful, continuous and painstaking scientific research? In Canada in a great number of cases the difference between failure and success to produce dividends, does not lie in the cost of raw material, high wages or in imperfect factory organization, but in the wastes, in the processes of manufacturing and in the treatment of the bye-products.

Supposing the Government aid secondary technical education to produce intelligently trained workmen and our universities continue to turn out men prepared to become engineers, thoroughly trained to direct the product of our technical schools, are our manufacturers educated to the point of making use of them?

Up to the present it is a lamentable fact that our industrial corporations refuse to give our young graduates a fair show, and consequently many of our brightest graduates are still drifting across the line, where their abilities are recognized and their services properly remunerated. In the United States the engineering faculties of universities are turning out six or seven thousand graduates every year, and they are all snapped up immediately by manufacturers, railroad companies and engineering corporations. In fact, most of the best institutions cannot supply the demand for engineers and chemists of all sorts and students who have been trained along scientific lines. These men go into manufacturing establishments, and if they are the right kind and have been properly trained, the manufacturer is regarded as short-sighted, indeed, who does not realize the man's ability and give him an opportunity to do the work he is especially fitted for. Take the Steel Corporation—the great Trust—about which so much is said. It is largely manned by young men—men who have come out of colleges within the last ten years. Some not over twenty-five or twenty-six years of age are superintending some of their finest plants and getting $6,000 to $8,000 a year. These men never received any training at all except the college training, and then went in at the bottom of the Steel Corporation's works. Their ability was soon recognized, and they were pushed on. It would probably be a revelation to some to see how young the men are who are in charge of these works.

Canadian interests seem slow to follow in the footsteps of their fellows across the line, but conditions are rapidly approaching which must make some change expedient. We are rapidly approaching the condition the United States reached ten years ago. "A wealth of raw material was ready to hand. An excessive tariff, a facility for business intrigue, which compensated for waste in the factory by combinations to eliminate competition, and the needs of an expanding and not too particular population; all these combined until a few years ago to cause waste in manufacture. Then came over-production, in business intrigue there was no more to learn, raw material had accumulated in the hands of the few, and the tariff, high as it was, could no longer exclude many goods made under scientific supervision. American manufacture was approaching a crisis, and began to realize that safety lay only in efficiency. To-day few men have any idea of the ever-increasing anxiety of the American manufacturer to secure factory efficiency." Already the supply of research chemists, etc., is inadequate, and during the next few years the need must be increased.

It would be interesting to know the reason of the lack of intercourse between our Canadian industrial corporations and our universities. Does it lie in the conservatism of the manufacturer or in the inefficiency of our graduates? Assuredly not the later, for our men go across the line and hold their own with the best. Some Canadian industries are using a large number of our men, but these, like the Westinghouse Company, are Canadian branches of American corporations.

A canvass of our leading business men has revealed a remarkable ignorance of just what our universities are doing along the line of technical and engineering education. Their knowledge of student action is confined to athletics and highly-colored accounts of street rowdyism.

EDITORIAL NOTES.

The total tonnage of freight handled by Canadian canals for the season just closed was 32,735,898, as compared with 17,103,613 last year, or an increase of 15,632,285. The increase in the traffic of the "Soo" Canal alone was 14,533,611. The Welland Canal showed an increase of 308,944 as compared with last year. The only canal which shows a decrease in traffic is the Trent, which dropped behind last year's record by 21,738 tons.

* * * *

On January 4th the Railway Commissioners for Canada will consider the advisability of issuing an order prohibiting brakemen from riding on the top of freight cars. Such an order has long been required. In countries where the traffic is much heavier than in America the movement of trains is accomplished without standing or running over the top, and it can be successfully worked out here. Such an order would make it possible to reduce the overhead bridge clearance to about seventeen feet, thus making it possible to more easily do away with many level crossings.

COMING MEETINGS.

Montana Society of Engineers.—January 6-8. Annual meeting at Butte, Mont. Secretary, Clinton, H. Moore, Butte.

American Association for the Advancement of Science.—December 27. Annual meeting at Boston, Mass. Secretary, L. O. Howard, Smithsonian Institution, Washington, D.C.

American Society of Agricultural Engineers.—December 28-29. Annual meeting at Ames, Iowa. Secretary, L. W. Chase, University of Nebraska, Lincoln, Neb.

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

Indiana Engineering Society.—January 14-16. Annual convention at Indianapolis, Ind. Secretary, Chas. Brossmann, Union Trust Building, Indianapolis, Ind.

Michigan Engineering Society.—January 12-14. Annual meeting at Lansing, Mich. Secretary, Alba L. Holmes, 574 Wealthy Ave., Grand Rapids, Mich.

STRENGTH OF BRITISH COLUMBIA TIMBER.

Showing the weights, specific gravities, deflection, breaking and crushing loads of some of the British Columbia woods. The pieces tested for transverse strength were one inch square, with a span of one foot, supported at both ends and loaded at the centre. The pieces tested for crushing were rectangular, and twice as long as they were thick. All pieces were fair average specimens of timber, partly seasoned, but free from knots and flaws. The results obtained from exceptionally good or bad specimens are not included in this table.

Description of Timber.		Weight of a cubic foot in lbs.	Specific Gravity.	Mean Deflection of Inches. 200 lbs.	250 lbs.	300 lbs.	350 lbs.	400 lbs.	450 lbs.	500 lbs.	550 lbs.	600 lbs.	650 lbs.	Highest breaking load.	Lowest breaking load.	Mean breaking load.	Mean crushing load in lbs. per sq. in. End-wise.	Side-wise.
Alder	(Anus rubra)	Bongard ...	32.16	.5158	.092	....	.177	....	.158	.2	.25	....	....	....	600	530	567	6500	1500
Arbutus	(Arbutus Menziessii)	Pursh	53.29	.8547	....	....	....	....	....	....	....	....	....	....	....	....	....	5900	1600
Birch	(Betula papyrifera)	Marsh	37.57	.6025	.05	.087	.1	.117	.142	....	.2	.325	.25	....	660	630	650	7000	1750
Cedar	(Thuga gigantea)	Nutt	24.95	.4001	.1	.133	.158	.2	.25	....	....	....	....	....	460	450	453	5500	1500
Crab Apple	(Pirus rivularis)	Dougl	50.21	.8052	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Cypress	(Chamæcyparis nutkaensis)	Spach	31.21	.5005	.05	....	.082	.147	....	.15	.2	....	.25	....	790	689	693	5900	1400
*Fir, Red	(Pseudotsuga Douglassi)	Carriere ..	34.	.5453	....	.075	.09	.114	.119	....	.181	.2	.25	.31	650	600	638	7000	1750
Hemlock	(Tusga Martensina)	Carriere ..	31.41	.5037	.09	.1	.14	.18	....	....	...	....	....	....	420	380	400	5000	1000
Maple	(Acer Marcrophyllium)	Pursh	37.41	.5999	.063	....	.113	.15	.2	....	.27	....	....	....	610	550	580	6500	1000
Oak	(Quercus Garryana)	Dougl	51.73	.8296	.06	.16	.228	.312	.344	.354	.458	....	....	....	550	550	550	7000	1500
Pine, White	(Pinus Monticola)	Dougl	27.79	.4457	.1	.125	.15	.2	.25	....	...	....	....	....	500	400	473	6500	1000
Spruce	(Picea Sitchensis)	Carriere ..	25.88	.4150	.1	....	.15	.2	.3	....	...	....	....	....	440	420	427	5000	1000
White Thorn	(Cratœgus Douglasii)	Lindi	51.04	.8185	....	....	....	....	....	....	...	....	....	....	...	...	...	5200	1600
Yew	(Taxus Brevitolia)	Nutt	49.05	.7865	....	....	....	....	....	....	...	....	....	....	...	...	...	5900	2400

*Now frequently known as Abies D.

(By the courtesy of Edward Mohun, C.E.)

PRECIPITATION FOR NOVEMBER.

During November an exceptionally heavy rainfall occurred over the southern coast districts of British Columbia, the total amount averaging nearly twice the normal quantity. From Ontario to the Maritime Provinces, with few exceptions, the fall exceeded the average, whereas it was almost generally deficient over the Prairie Provinces.

Snow fell occasionally in all the provinces, and on the last day of the month from 1 to 8 inches were reported to be on the ground in the West, and from 1 to 4 inches in Quebec.

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

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

Station	Depth in inches	Departure from the average of twenty years
Calgary, Alta.	0.20	— 0.52
Edmonton, Alta	1.20	+ 0.36
Swift Current, Sask.	0.40	— 0.25
Winnipeg, Man.	0.90	— 0.18
Port Stanley, Ont.	4.10	+ 1.09
Toronto, Ont.	3.37	+ 0.70
Parry Sound, Ont.	2.80	— 1.20
Ottawa, Ont.	3.70	+ 1.35
Kingston, Ont.	3.80	+ 1.21
Montreal, Que.	4.10	+ 0.66
Quebec, Que.	3.70	+ 0.63
Chatham, N.B.	4.20	+ 0.50
Halifax, N.S.	5.00	— 0.64
Victoria, B.C.	11.50	+ 5.43
Kamloops, B.C.	0.80	— 0.32

FACTORY POWER.

The English Textile Committee were appointed to make an investigation and report upon the adaptability of electric power for driving purposes in the factories of north England. The report states in part:—(1) In good installations there is practically no difference in cyclical variation between mechanical and electrical transmission when measured at the end nearest the main drive. (2) Any initial cyclical variation which may exist at the driving end is liable to be increased if transmitted through long shafts. (3) So far as any irregularity is concerned (excluding breakdowns) electrical transmission will maintain its condition better than mechanical transmission. (4) In modern textile factories of ordinary dimensions, and where the power is generated on the site, power is conveyed with less loss by mechanical than by electrical transmission, but where the plan of the buildings involves awkward angles of drives or irregular arrangement of machinery, the saving in power by electrical transmission begins to appear.

The question of the adoption of electrical or mechanical driving is largely one of cost. By adopting electric driving the following advantages can be obtained: (1) Ease of checking daily power required for running individual machines and departments. (2) Ability to run only a portion of the plant. With mechanical transmission the same object may be attained by the judicious application of clutches and similar devices. (3) Reduction in the number of belts, shafts, gears, etc. (4) Ease of regulating the speed and of introducing periodical speed variations if individual driving be adopted. (5) Ease of utilizing the available space to the best advantage. (6) Saving in the cost of the engine house and its foundations; or if an outside source of supply is available it should result in a reduction in the first cost of the installation and buildings due to the absence of the power-generating plant.

SETTING PLANIMETER.

Alex. C. Craig.

The usual method of using this instrument seems to be to set the measuring wheel more or less accurately to zero by turning it with the fingers, a method not in the best interests of the instrument.

Others more conscientious, or moved by a desire for greater accuracy, take readings at the beginning and end of the operation.

The following method is commended to their attention:—

Hold the tracing point at the starting point and keep it there throughout the operation of setting. Then run the measuring wheel over the paper towards the zero position by

moving the needle point. Raising the wheel clear of the paper, put the instrument in its former position and repeat the operation as often as necessary to bring the wheel near the zero position. Then swing the instrument round the tracing point into a convenient position for measuring the area, keeping the measuring wheel clear of the paper the meanwhile. Make the final adjustment by slow careful movements of the needle point, and when the wheel exactly registers zero push the needle point into the paper.

The formidablity of the above description is equalled by the simplicity of the operation, as a few trials will demonstrate.

WILL DEFAULT INTEREST

(The Monetary Times).

On First Mortgage Bonds of Quebec and Lake St. John Railway—Company to be Reorganized.

That the Quebec and Lake St. John Railway Company will default on the payment of its first mortgage bonds on January 1st, 1910, and that the company will then be re-organized is the information learned on the best authority by the Monetary Times.

There is much speculation in London as to why the bonds of this company have severely and persistently declined. According to the latest mail advices from London, the price of the first mortgage bonds has dropped to 64. They have been as high as 90⅝ this year. The income bonds which have touched 24⅞ are quoted below 14. The highest price for the prior lien bonds this year has been 95⅝ and apparently in sympathy, these securities too have lost more than 10 points.

Yearly and October Traffic Returns

The traffic returns for October show gross receipts of $53,000, or a decrease of $11,900, making the aggregate gross receipts for the ten months to date $497,700, or a decrease of $32,600. These decreases, taken in conjunction with the position shown in the report, have given rise to misgivings. Gross earnings for 1908 amounted to $606,300, or a decrease of $56,900, and net earnings were only $78,900, a decrease of $84,500, or 51.78 per cent., over those for 1907. These net earnings, the report shows, did not cover the interest on the Prior Lien bonds, whose annual charge is $97,300, quite apart from the interest on the First Mortgage bonds, which requires $106,100. Allowing for the payment of the interest on the Prior Lien and First Mortgage bonds and other charges, apart from the Income bonds, there was a debit balance on the year of $148,700. The interest on the Prior Lien and First Mortgage bonds was paid apparently by means of loans, there being an item in the balance-sheet of $567,800 for advances on capital account re La Tuque and Gosford branches, and advances to meet interest charges and other pressing debts.

Expectations Were Not Realized

The directors state that a considerable portion of the loss on working expenses was incurred in connection with the La Tuque branch, which was undertaken on the assumption that its cost would be somewhat more than half of what proved to be the case, and in the expectation that the near approach of the completion of the Quebec Bridge would soon secure to the Company a large freight business from the paper and pulp mills that were to be constructed at La Tuque. But the collapse of the bridge, which postponed for several years the advantageous rates, in expectation of which the construction of the branch was undertaken, together with the depression in pulp and lumber industries, retarded the development of this property, and there is apparently no immediate prospect of extensive works at the La Tuque Falls being undertaken. Meanwhile, the directors continue, the outlay on maintenance and unremunerative service must be continued.

Will Mean Reorganization

Freight rates were raised in 1908. Had this not been done, the receipts from that traffic, say the directors, would only have been $269,600, or $79,200 less than they really were. For 1907 the net earnings were short of the amount required to pay all interest and charges other than that on income bonds by $40,100, but in 1906 they were $4,300 in excess.

The reasons accepted in London for the decline in the company's securities are the poor traffic returns and the unsatisfactory state of affairs shown in the last report. But the real reason the Monetary Times learns on the best authority is that the company will default on the payment and interest on its first mortgage bonds on January 1st. The interest on the prior lien bonds will be paid. A meeting of the shareholders and various owners will then be called to consider the re-organization of the company. The Railway Share and Trust Company represent the Quebec & Lake St. John road in London.

History of the Road

The road which is controlled by stock ownership, was incorporated in 1869 in Quebec and the first section was opened in 1871. The principal line runs from Quebec to Chicoutimi, Que., a distance of 227 miles. The total mileage is 286.5 miles with 39 miles of sidings. The equipment consists of 23 locomotives, 30 passenger cars, 745 freight and other cars and 28 service cars. A majority of the stock is owned by the same interests which control the Canadian Northern Quebec Railway Company. The bonded debt is made up of £500,000 prior lien 4s., dated April 1st, 1901, a first lien on the property of the company; £442,400 first 5s. due December 31st, 1924. (The interest on these bonds was at the rate of 4 per cent. per annum until July 1st, 1905), £640,000 non-cumulative income 6s.

The reorganization will probably put the road in better financial and physical shape.

NEW INCORPORATIONS

James Richardson & Sons, Kingston, Ontario, $750,000; will carry on an elevator and warehouse business. H. W. Richardson is one of the incorporators.

The Torrey Asbestos Machinery Company, Limited, Montreal, Quebec, $50,000, will manufacture mining, milling and general machinery. Chas. G. Greenshields of Montreal, is a provisional director.

The Canada Bolt & Nut Company, Toronto, Ontario, $500,000; will carry on business of iron founders, manufacturing and dealing in all kinds of machinery and implements. Gerard B. Strathy, solicitor, Toronto, is interested.

Cartwright Automatic Press Company, Montreal, Que., $500,000; will carry on business of iron founders, makers of printing presses, etc. John W. Blair, advocate, Montreal, is a provisional director.

Baillot's Gas and Steel Machine Company, Montreal, $45,000, will construct and operate a steel plant. L. J. Beique advocate, is interested.

Yellowhead Coal Company, Limited, Toronto, Ontario, $2,000,000; Harcourt Ferguson, lawyer, is a provisional director.

RECENT PATENTS.

The following patents have been issued, recently, through the agency of Fetherstonhaugh, Dennison & Company, patent solicitors, Liverpool and London and Globe Building, Montreal; Alex. Bertram, gypsum cement; J. M. Coleman, railway car construction and roller side bearings; Arthur Drowley and Donald D. McLean, snow plough; C. W. Metcalf, acetylene gas generators; R. Mortimer axe; R. D. Smith, weeder and cultivator; Harry Swales, wheel tyres; Lionel Turner, wheels for vehicles; S. A. Youngberg and J. B. Parnall, car fender.

Messrs. Marion & Marion, patent attorneys, Montreal and Washington, D.C., report the following Canadian patents recently secured through their agency: 121,939, F. Walton, London, England, road vehicle suspension arrangement; 122,019, Wilhelm Sonnberg, Charlottenburg, Germany, cages for ball bearings; 122,043, A. Allan and T. Bowling, Wellington, N.Z., fire alarm; 122,111, James A. McNeill, Digby, N.S., press stand and iron stand combined; 122,147, Arthur Wilzin, St. Quen (Seine), France, screw closure for bottles and other receptacles; 122,194, A. Baillot and A. Menager, Montreal, furnace grate.

THE

Sanitary Review

SEWERAGE, SEWAGE DISPOSAL, WATER SUPPLY AND WATER PURIFICATION

LOOKING BACKWARD.

In wishing the many readers of the "Sanitary Review" the Compliments of the Season and a prosperous New Year, we are inclined to look backwards over the few months since the management of The Canadian Engineer decided to devote a special part of this journal to Sanitary Engineering.

On March the 5th of this year we announced that in the future we proposed to publish in concrete and concise form up-to-date information on subjects affecting engineering hygiene. How far we have maintained this promise we must leave to the judgment of our readers.

On every hand, however, we have met with encouragement in our efforts, and we believe that, generally, engineers in Canada are taking an increasing interest in this particular line of work.

The problems affecting health engineering are always in any new country necessarily of slower development than purely utilitarian problems, such as questions of transit and power. Canada, however, appears to have arrived at that point of her history when it is possible to breathe more freely and take into consideration factors relating to conservation of natural resources. We see signs of this development on every hand. A tendency to think of the multitude instead of the individual, to consider the country as a whole instead of one little plot bounded by a deed of purchase, and to consider the value of the country as a continuous nation and not as an object for spoliation and a medium for getting rich quick.

The continued prosperity of the nation, just as with the individual, mainly lies in the factor of good health. Good health depends upon good air, pure food and wholesome hygienic surroundings. These are the most valuable assets of the people. They cannot be maintained by isolated or individual action, but are communal, depending upon joint action and unselfish enlightenment.

Valuable information has been added to our knowledge of sanitary engineering during the present year. It has been our endeavor to place before our readers as much of this knowledge as space would allow. In Europe, in the States and in Canada valuable papers have been contributed to societies by men whose grand motto is "Socialism in Knowledge."

For many of the valuable papers which we have been enabled to publish, either in full or in part, we are indebted to the research work of the American Technology Societies, and for many of the British papers we must acknowledge that splendidly conducted journal in its successful efforts to lead the van in sanitary engineering in England, viz., "The Surveyor and Municipal and County Engineer."

Among some of the papers contributed to societies, etc., during the past year we may mention as follows:—

"The Disinfection of Sewage and Sewage Filter Effluents," by Earle Bernard Phelps. This forms the most complete and valuable work yet produced on the subject.

"Purification Effects in Water by Storage," by Dr. A. C. Houston, Metropolitan Water Board Research Laboratories.

"The Practical Sterilization of Water and of Sewage Effluents," by H. C. N. Shenton, England.

"Sewage Purification versus Water Filtration," by Geo. C. Whipple, U.S.A.

"Bacteria in Sewer Air," by Prof. C. E. A. Winslow, U.S.A.

"The Divided Responsibility in Regard to Public Health," by Dr. C. A. Hodgetts, Canada.

"Water Supply," by Prof. Muir Edwards, Alberta, Canada.

"Water Sterilization at Boonton, N.J., by Geo. A. Johnson, C.E.

"Notes on the Separation of Solids from Sewage and Waste Liquors," by James P. Norrington, England.

"The Present Position of the Sewage Disposal Question," by W. I. Dibdin, England.

"The Chadwick Lectures," by Scott Moncrieff, England.

Among the many books published during the year on Sanitary Engineering we would again mention:—

"Principles of Sewage Treatment," Prof. Dunbar, Hamburg.

"Sanitary Engineering," Moore & Silcock, England.

The Sanitary Review has also endeavored to add its little share to the literature on the subject, and has published among its special articles continuous articles dealing with sewage disposal:—

"Septic Tank Process Relative to Treatment of Solids," by T. Aird Murray, C.E., Canada.

"Removal of Solids," by T. Aird Murray, C.E., Canada.

"Removal of Putrescibility," by T. Aird Murray, C.E., Canada.

Other special articles and editorials have dealt with "Purification of Water by Ozone," "Size of Sand Grains for Water Filtration," "Contact Beds versus Percolating Filters," "Water Supply and Infiltration Methods," "Is Sewerage a Paying Proposition?" etc.

It will be our endeavor during 1910 to maintain these columns as a review of what we consider best in sanitary thought. We would ask, however, Canadian engineers and all those interested in sanitary work to co-operate with us in sending in descriptions of works they have in hand or work in which they are interested. It is only by the publicity of knowledge and the scat-

tering of knowledge that the sum total of knowledge can grow and real progress be made in general improvement in methods of design and construction.

If we attempted to answer the question, In what particular aspect has the increased knowledge in sanitary engineering made itself manifest in 1909, we would answer, in an increase in modesty and greater recognition of limitations. It is no longer common to hear of the absolute solution of the sludge difficulty, of the total disappearance of everything organic, of wonderful bacteria, which eat up everything and nothing remains, of the total destruction of pathogens, either in tanks or filters, of a liquid effluent equal in every respect to good drinking water. All these assumptions are fast becoming things of the past. They were but the optimistic products of half knowledge. Even the word sterilization is being modified to the reasonable term disinfection. But having learned more definitely the reality of limitations, we are also learning in what manner these limitations can be modified. The year 1910 will see great advance made in the science of sanitary engineering.

A TOWN ENGINEER'S SALARY.

At times we hear murmurs of discontent from Canadian engineers because of the difficulty of persuading some practical people that advice (the result of special scientific and technical training) is something which should command a monetary value. However, we have not yet been able to report of any Canadian municipality as the "Surveyor and Municipal and County Engineer" journal reports in its issue of 3rd inst.

We occasionally hear of starvation wages and the difficulty of eking out an existence in the Old Country, and as an example which, we trust, is remarkable as an exception we quote this interesting case, vouched for by the above journal:—

"At an inquiry recently held by Mr. P. M. Crosthwaite, a Local Government Board inspector, into the details of a loan for which official sanction was sought by the Okehampton Corporation, a request was urged by the town clerk that the borough surveyor's remuneration should come out of the proposed loan. The inspector stated that this was contrary to the Local Government Board's practice. Replying to a question, the borough surveyor, Mr. F. J. Worden, said he received $12.50 per quarter as surveyor. "Do you do any work for this?" Mr. Crosthwaite asked, in terms that seem to suggest more than irony, while he added grimly: 'I suppose they cannot expect much.' In this supposition he would appear to be quite wrong, for the clerk promptly replied, 'I think they do.' Here, indeed, is an example for admiration of the inverse order, for it is surely a matter of difficulty to determine which to admire least, the effrontory of a municipal authority which offers such a 'salary,' or the excessive modesty of the official whose self-appreciation is such as to enable him to accept it. Now that we know the remuneration of the surveyor the public interest in the internal affairs of the Okehampton Corporation might be meticulously extended so as to inquire the salary by means of which the lucky office boy is assisted to lead a life of affluence and self-indulgence."

THE SANITARY ENGINEER IN RELATION TO THE CHEMIST.*

The chemist can be of some help to the engineer when designing the works to purify a given sewage; such help can only be of use when the chemist has the confidence of the engineer with respect to the proposed scheme.

A sample of sewage is often sent to the chemist; all that he is asked to do is to analyse it; most probably the items of the analysis he gives are to the engineer of very little use—e.g., the total solids are given which includes grit and sludge, also that in solution, and presuming the engineer is proposing to construct grit tanks and sedimentation tanks, the total solids give him the combined quantity, and therefore he has no information from the analysis of the amount of grit to expect and the amount of sludge to clean out from his tanks. If the chemist was informed that two tanks for the separation of each class of solids were proposed to be constructed, he would know, if he had any practical experience of the subject, exactly what was required, and so be able to give the engineer a result of analysis of practical use.

With the experience gained during the past fifteen years by those who have studied and worked amongst sewage purification plants, the final results are not such chance results as formerly. A new works can be so constructed as to give any desired state of purification with certainty. To do this, much information must be gathered both of an engineering and chemical nature. With regard to the latter, the following points must be known: (1) Quality of the sewage both chemically and physically; (2) the final state of purification required under the circumstances. These having been obtained and combined with the engineering portion, would give the engineer data on which he could construct works to give the desired purification.

Where the works chemist has charge of the sewage purification plant, he must necessarily have some little knowledge of engineering, as he has often to do work that is more of an engineering nature than chemical, such as gauging the volume being treated, etc. With sewage purification, engineering is really more in evidence with respect to the physical side, but the works' chemist has also to study the physical portion in some degree to find out the cause of many of the effects he meets with. When the chemist has some little knowledge of engineering he can give his deductions a more practical value to the engineer.

Many results of analyses are made valueless for practical purposes through many causes, the following being a few:—Where a number of samples are taken at different parts of the process, due regard not being taken of the time of passage, such as through tanks, filters, etc., consequently the samples are not in series and cannot be strictly comparable; the taking of samples without any record of the conditions prevailing before or at the time which might alter the composition, and so not allow a proper deduction to be made from the results obtained; taking a sample in a dirty bottle; not filling the bottle when the amount of dissolved oxygen is required to be estimated, and many other details in which a sample may be spoiled.

To know exactly whether a purification plant is working to the best advantage, samples should be taken at regular intervals of time; a record kept of the working of the plant, so as to be available for reference in case of any deductions required from results obtained by analysis."

*Extracts from a paper by M. G. E. Farmer, F.C.S., chemist, Croyden Sewage Works.

NEW YORK HARBOR AND SEWAGE TREATMENT.*

After describing the various sewer outlets into the rivers and harbor, it is stated that samples taken from the bottom of the lower Hudson River and various portions of New York Bay appeared to be sewage sludge, in a fairly advanced stage of decomposition. It is found as far out as the inner end of Ambrose Channel; it diminishes rapidly in volume toward the crest of the bar, and at the outer end of the channel the material dredged up appears to be clean sand.

Much evidence was found that near the mouths of sewers, under the piers, and in partly enclosed waters surrounding the harbor, the deposits of sewage sludge are great enough to require dredging at intervals, and at places the waters are so badly contaminated as to constitute a nuisance. On the other hand, in the open harbor and bay, but little inconvenience has as yet been felt. Colonel Black quotes evidence given by the engineers of the Passaic Valley Sewerage Commission that surface water in summer at ebb tide at Robbins Reef contains 88.5 per cent. of the normal quantity of oxygen, while the condition of the water will not be serious, it is, stated, until the oxygen is reduced below 50 per cent. of the normal. From the viewpoint of the general shoaling of the harbor to be produced by the sewerage projects, it is considered by Colonel Black that the increased cost of dredging the deposits from the navigable channels amounts to less than the cost of disposing of the sewage in some other manner.

The pollution of the waters of the harbor to an extent that would be prejudicial to commerce as well as to the interests of the people living and doing business along its shores is more important than the matter of shoaling, according to the report. After an examination of the evidence at hand Colonel Black accordingly stated in his June report that the untreated sewage from the Bronx Valley sewer could not be poured continuously into the river at a single point without creating a local nuisance, although the volume of water in the Hudson is sufficient to deal ultimately with such a discharge. He accordingly stated that a tank should be built of sufficient size to contain the total discharge for one day. This should be arranged to allow facilities for screening, sedimentation and septic action. In addition to this, the effluent could be further purified, he believed, by aerating it with air forced into the outfall pipes under some pressure. The outfall sewers should be arranged to distribute the sewage in deep water over a comparatively large area through numerous outlets. As the population increases, new tanks can be added, but in case permission for this type of disposal is granted the permit should carry with it the condition that the sewage which is discharged into the river should always have a given minimum standard of purity.

In the report dated October 4th the conclusion is reached that the purification of sewage before its discharge into the harbor, on the ground that it may contaminate shell-fish in waters receiving it, is not advisable. These waters are seriously contaminated by surface wash from all the populated areas surrounding the harbor, so that the complete purification of all sewage would not render them free from objection. The complete purification of sewage in thickly-populated districts along the water front is considered impracticable, owing to the excessive cost of the property necessary for the purpose. The problem, therefore, is to attain such a degree of partial purification of the sewage that its subsequent discharge into the harbor will not make the latter offensive. Colonel Black has accordingly recommended that sewage discharge should be permitted only under the following conditions:—

(a) "The sewage effluent before discharge shall be purified to such an extent as to contain in a putrescible condition not more than 75 per cent. of the organic matter found in average American sewage, as described by Winslow & Phelps on pp. 13 et seg. of their "Report of Investigations in the Purification of Boston Sewage," published in Water Supply and Irrigation Paper No. 155, of the U.S. Geological Survey.

(b) "No solid material shall be present in the sewage at the point of discharge excepting as matter in suspension, and the particles of solid matter then in suspension shall be so small as not to be clearly noticeable when the sewage in a diluted form has reached the surface of the water near the point of discharge.

(c) "There shall be no escape of noxious gases at the surface of the water at the point of discharge.

(d) "No sleek shall be apparent at the point of discharge.

(e) "The discharge shall be so distributed as to cause no apparent discoloration at the surface of the water.

(f) "It shall be further stipulated that, should a sewer be built and operated under these or similar conditions, the officials legally charged with the construction and operation of the said sewer system shall, whenever so required, furnish to the proper official or officials of the United States designated by the Secretary of War such expert and other assistants as the representatives of the United States may deem necessary to determine whether the conditions are being complied with."

*A digest from the Engineering Record of two recent reports.

CONTROL OF WORKMANSHIP ON ASPHALT PAVEMENTS.*

By L. Kirschbraum, Municipal Asphalt Laboratory, Chicago.

(Continued from last week.)

This, in the course of years is absorbed into the top, softening it and resulting in displacement or grinding out. The only test of a good open binder is that it should appear, on close inspection with the eye, to be uniformly and well coated, and when rolled and cold, should sustain the traffic incidental to laying the top without breaking up. With closed binder, there is not so much danger of separation of the cement, but the point most generally overlooked is in getting a uniform amount of fine material mixed with the stone, and this can be accomplished only by receiving the stone and sand in separate bins and mixing them in uniform proportions. This material, when laid and compacted, should, on breaking, appear solid and well filled, but not over-filled.

The proper proportioning of the materials entering into the wearing surface presents the most difficulty, for the reason that the amounts of asphalt cement, filler and sand vary and are interdependent upon each other, according to the characteristics of each material. Failure to recognize this fact, and work by rule of thumb, has produced many unnecessary failures. Density, toughness and elasticity are the characteristics to be sought for in preparing a durable mixture, and wide latitude is usually allowed the contractor in producing this result. Unfortunately, such latitude often leads the contractor to economizing on such materials as increase the cost, so that it is much more satisfactory to

*From a paper in the Michigan Technic.

specify within reasonable limits, certain requirements of bitumen and aggregate as have been shown by actual practice to produce successful results. These requirements, as provided in the new specifications prepared for the city of Chicago, are as follows:

	Per Cent.
Bitumen soluble in cold carbon bisulphide	10.5—13
Portland cement and mineral dust passing a 200 mesh sieve	12.0—18
Sand passing an 80 inch sieve	18.0—18
Sand passing a 40 mesh sieve	30.0—50
Sand passing a 10 mesh sieve	8.0—20

The sieves being used in the order named.

A mixture prepared without discretion, to come within these limits, might still be unsatisfactory. For example, should the mineral aggregate grade according to the maximum coarseness allowable, a bitumen content of 13 per cent. would be entirely too much likewise an extremely fine aggregate would have more than the minimum percentage of bitumen to produce a satisfactory mixture. Given a sand of a definite grading and a specified amount of filler to be incorporated, the amount of asphalt cement to be used can be regulated by the appearance of a stain produced by compressing a portion of the hot mixture between a sheet of light manila paper. If the mixture is rich, the excessive amount of asphalt cement will stain the paper heavily; if dry, the stain will be light. In making this test, it is necessary to consider the temperature of the mixture tested and the manner in which the pressure is applied. A very hot sample and excessive pressure will indicate a degree of saturation not at all true, so that it is necessary to apply such test with discretion.

It is the duty of the inspectors at the plant to watch the surface mixture as produced, very carefully, and to make such rough tests as described above to ascertain its correct proportioning. When a mixture has once been established as satisfactory, it is their duty to see that the established proportions are uniformly mixed. The carelessness of the men employed in the actual mixing of the material is sometimes remarkable. The great desire at many plants is to turn the mixture out fast. The greater output means economy in cost of production, and in the attempt to hurry the mix the proportions are often inaccurately gauged and the material is imperfectly mixed. The measuring and weighing devices are liable to get out of order and register inaccurately, and many a street, the mixture of which has been planned with the best of intention, has been faulty for reasons of this nature. The inspector must see that nothing of this sort occurs, that the mixture is actually being produced according to approved proportions. While any error would eventually be checked up by the laboratory, in a large city it might be days before this were accomplished.

The temperature at which the mixture is produced is of great importance, and there is a tendency among most plant men to neglect this altogether, or to heat the mixture unnecessarily in order that it may work easier on the street. The minimum heat compatible with proper workmanship is desirable. There is no occasion for heating above such a temperature. A mixture may not be actually burned by an elevated temperature, for there is every stage of injury between being first-class and the final stage of being burned, and while a mixture may show very little evidence of heat injury, its ultimate life may nevertheless be seriously shortened. Inspectors are required to hold their mixtures at low workable temperatures, keeping the sand passing out of the drums at such heat as to insure the desired temperature in the final mixture. Plant inspectors report daily on the following form:

Report of Asphalt Plant.

Plant No. 8 October, 14, 1908.

Asphalt Cement.

Kettle No.	Lbs. Flux to 100 R. A.	Kind of Asphalt
1	22	Top, Trinidad
2	22	
3	22½	Binder Trinidad

Kind of Flux, Texas

Binder	Lbs.	Top	Lbs.
A. C.	65	A. C.	165
Sand	105	Dust	110
Stone	815	Cement	
		Sand	740
Total per box	985		1,015
No. boxes binder, 42		No. boxes top, 300	
Sent to Lake Avenue, 37th Street to Oakwood Blvd.		Sent to Lake Avenue, 37th Street to Oakwood Blvd.	

New materials received this day:
1 Car Trinidad Asphalt
3 Loads Stone Dust
Remarks .....

A. Smith, Inspector.

Samples of the mixture are sent in daily to the laboratory from the street in a special envelope giving necessary data as shown in the following form:

City of Chicago Board of Local Improvements.

Lab. No. ..... October 14, 1908.
Sample of Asphalt Top from Lake Avenue.
Between 37th and Oakwood Boulevard, opposite house No. 3,902 on west side of street .....
Here is inserted a plat of the square on which a star locates the place from which the sample was taken.
Load No. 18 Remarks .....
Time 11.15 a.m. .....
Plant 8 O. H. Noyes,
Sub-Paving Inspector.

The street inspection in the City of Chicago is under separate head.

These samples are analyzed and filed.

From the descriptions given it is possible to locate defective mixtures, and, further, at the end of the season, it is possible to make up plats of each street showing where various mixtures and various materials have been laid. To insist in this the plant inspectors are directed to locate in the street points where new materials or changes of mixture have been made, so that in after years it would be possible to judge of the causes of failure or success of any street with accurate knowledge of materials and conditions under which it was laid. A final record is made up and filed, giving complete data regarding the street, including plats, nature and analysis of all materials used in its production, with daily record of the composition of the mixture and any physical condition of base, sub-grade and traffic affecting the life of the pavement.

In conclusion may be emphasized the absolute necessity of keeping accurate records as described above. For scientific progress in this industry it is essential that the actual results obtained be closely observed, so that with known conditions it is possible to benefit by good results, to be able to reproduce them and to avoid such influences as are demonstrated to involve error and failure. An asphalt laboratory is valuable only for the practical results attained, and not for new theories evolved each year, unless such theories are sufficiently demonstrated by actual results obtained, under known conditions.

A PAGE OF COSTS
ACTUAL, ESTIMATED and CONTRACTED

COST OF CONCRETE FENCE POSTS.

The cost of reinforced concrete fence posts depends in each case upon the cost of labor and materials, and must necessarily vary in different localities. An estimate in any particular case can be made as follows: One cubic yard of concrete will make 20 posts measuring 6 inches by 6 inches at bottom, 6 inches by 3 inches at top, and 7 feet long, and if mixed in the proportions 1:2½:5, requires approximately:—

1.16 barrels of cement at $2	$2 32
0.44 cubic yard of sand at 75 cents	33
0.88 cubic yard of gravel at 75 cents	66
Materials for 1 cubic yard concrete	$3 31
Concrete for one post	$0 17
28 feet of 0.16-inch steel wire at 3 cents per pound	06
Total cost of concrete and metal for one post	$ 23

To this must be added the cost of mixing concrete, moulding and handling posts, and the cost of moulds, an addition which should not in any case exceed 7 cents, making a total of 30 cents per post.

COST OF POWER.

Mr. Charles T. Main and F. M. Gunby divide the items entering into the cost of power into two classes in their paper, "Cost of Power for Various Industries Under Ordinary Conditions." After defining Independent Charges and Proportional Charges, mention is made of what Dr. Steinmotz calls the "Reliability Factor." The paper, which was recently read before the Boston Society of Civil Engineers, says; The cost of producing power may be divided into two parts:—

1st.—Independent Charges, or, the part which is independent of the output, embracing fixed charges on the plant, as interest, depreciation, insurance, and taxes, and to a certain extent, of repairs.

2nd.—Proportional Charges, or, the part which is proportional to the output, including such charges as coal, labor, supplies, etc.

Steam plants in general, may be said to have low independent charges, and high proportional or operating costs.

Water power plants are usually the reverse, with high fixed charge accounts and low operating costs.

Another item which should be mentioned as affecting the cost of power, is what Dr. Steinmetz calls "Reliability Factor," which takes into consideration the spare machinery needed to insure continuous service. The charges on this spare equipment are apt to have quite a bearing on the cost of power in a central station supplying power of public uses, where reliability must be one of the chief considerations, and more spare or duplicate plant is usually maintained than in a private plant.

The same factor, too, may have quite an important bearing on the value of a water power privilege, because generally speaking, a water power may have a low reliability factor, due to the fact that there is usually only one dam, one power house, and sometimes a long transmission line, and that there are certain elements of risk from floods, droughts, and other causes over which man has no control. It is true that some of these disadvantages practically disappear in large systems, but as a general thing, there is a feeling of greater confidence in the reliability of steam plant, in close connection with a manufacturing plant than with a remote water power development.

The Cost of Water Power.

The cost of water power depends upon a great variety of factors, but the essential feature is usually the fact as to whether the combined result of all these factors is such as to make the cost of the development per horse-power delivered, a reasonably small amount, so that fixed charges shall not be excessive. In the determination of the cost of power, the cost per horse-power of development should not be allowed to confuse or cause misrepresentation of the actual cost of power delivered. The larger the development installed, the smaller is the cost per horse-power of development, but it does not follow that the cost of delivered power will be smaller per horse-power. As one of my assistants said;—"The large development and small cost per horse-power of development looks good in New York where the securities must be sold."

After the engineers have made their estimates of the cost of physical structures for these modern developments, there must be added generous items for rights-of-way, and legal expenses, called by one of our men "illegal expenses."

It is neglect of the consideration of a few things like this that has caused several of the recent developments to get into disrepute.

There is an idea common to some people that if a development will cost $100 a horse-power for the development, if carried to its most economical point, that it will be a safe investment, but when it reaches $200 a horse-power it will be well to proceed cautiously before investing any money in it. There are sometimes exceptional markets, for example,—in mines and other remote places where power costs are high and where high prices can be obtained. Under such conditions, a large cost for development is warranted.

The estimates given a little farther on, for the cost of water power when the cost of development was taken at $75 a horse-power plus the supplementary steam power make the total cost of water and steam $15.38 a year per horse-power. With coal at $4 a ton, the cost of steam power alone was given as $20 a year per horse-power.

If the cost of the water-power development is taken at $100 a horse-power, the yearly cost of water and steam power would be $17.53.

If the cost of the water developments was $150 per horse-power, the yearly cost of water and steam power would be $22, which is more than the cost of steam alone with coal at $4 a ton.

As stated before for some particular uses, like mining, where there is no supply of wood and coal is expensive, a high cost of development is warranted, and a high price can be obtained for the power. For example, there is one development in Mexico, for which we were consulting engineers,

where the cost of power at the mines was from $150 to $200 a year, gold. A hydro-electric development was made and power delivered at $100 a horse-power, this making a great reduction in cost to the mine-owners and yielding a substantial profit to the electric company.

We once reported on a development in California which cost about $400 a horse-power to develop. A small portion of this power could be disposed of at the mines for $75 a horse-power with comparatively short transmission lines, but the remainder had to be carried a long distance and sold in competition with other power. The fixed charges alone on this development were at least $30 to $35 a year, and the running expenses were also high. It was impossible to produce power cheaply enough to compete with other sources of powers and pay the fixed charges on the investment.

Value of Water Power.

The value of water power to various industries will vary in approximately the same ratio as the cost of producing power in some other way, if considered as power, pure and simple, without taking into consideration other important items affecting the business which are sometimes more vital than the cost of power itself.

To illustrate the value and cost of power under different conditions, it may be well to mention two recent cases which we have passed upon.

As consulting engineer for a hydro-electric company, we were asked to submit prices for electric power to a colored textile mill for which we were also engineers, and were engaged at that time in planning a new steam power plant for the textile mill. The price quoted was 1.2c. per kw. hour. As engineers for the textile mill, we were obliged to reply to ourselves as engineers for the hydro-electric company that we could not afford to accept the offer, the principal reasons being;—

First.—On account of the use of steam for manufacturing purposes, and of the water of condensation for dyeing that the net cost of steam power would be less than the price of hydro-electric power.

Second:—That it was better for the textile company to own and control its own plant, if it had the capital to build it, which it had, than to purchase current brought over many miles of pole line, and be tied up to some foreign company.

The cost of power per kilowatt at the switchboard from the hydro-electric company for the operating time of the mill was about $35 per kw. per year; and for the steam plant which the mill was proposing to install, this cost was about $34 per kw. year, but if the power had been bought from the hydro-electric company, the mill would have had to install and operate a boiler plant nearly as large as the one required for both power and manufacturing steam.

It was estimated that the use of the waste products from the steam plant would reduce the net cost of the power at least $8 per kw.

The other case was where we were also making plans for a plain cotton mill for a new steam plant and where there were offers from two hydro-electric companys to furnish power. One offer was promptly turned down, asking too high a charge. A second offer was to furnish current at 1.2c. per kw. hour, which is the same price which we refused for the color mill. For a plain cotton mill, however, we concluded that it was proper to accept the offer at 1.2c. per kw. hour, and there has been a contract signed for the delivering of the current.

The principal reasons for accepting this offer, were:—

First:—1.2c. per kw. hour equal about $36 a kw. per year, or $27 an electric horse-power delivered. This reduced back to 1 horse-power equals about $23.50 per year, which was very near the estimated cost of steam power for the quantity required, and at the price of coal for this particular industry.

Second:—The mill desired to postpone the expenditure necessary for the steam plant if it could be done without serious loss.

TURNTABLE CONSTRUCTION WITH SOME DATA ON COSTS.*

The following questions were submitted by the committee and following are a few written answers:—

(1) Proper length, allowing for probable future increase in length of locomotives. (2) Plate girder tables, and cost. (3) Cast iron tables, and cost. (4) Gallows frame tables, and cost. (5) Other designs, and cost. (6) Foundation, circle wall, paving if any and pit drainage. (7) Power for operation; electricity, air and other power.

J. P. Canty, Boston & Maine R. R.—Anticipating the probable length of a turntable required for future locomotive service, is rather an uncertain problem just at this period. However, it is the opinion of many that, on the division where I am located, the lately purchased steam locomotives have apparently reached their economical limits in both length and weight, provided the class of traffic remains similar to that which is now being handled.

The largest engines on our division are turned easily on turntables 70 ft. long. This is now our standard length, and as far as we are able to predict, will answer for future requirements.

The steel work in these tables cost approximately $2,500 on board cars delivered to our road by the contracting bridge company. There is nothing unusual about the design. However, I will mention that we specify that four cast steel end wheels shall be furnished on each end of table and the centre pivot bearing shall be of the disc pattern; meaning that the table turns on a composition disc on top of the centre cast steel pivot casting, instead of on the familiar roller bearing.

Our turntable centre foundations have, of late, been made of concrete, being 10 x 10 ft. on bottom and bearing on piles when there is doubt about the earth being sufficiently solid to carry the maximum load on this area without settling. The bottom course of concrete is generally 2 ft. in depth. The foundation is then stepped 7½ ft. square by 2 ft. thick, and a granite cap 5 ft. square by 2 ft. in depth is placed on top to receive the cast steel centre pedestal.

There are 330 cu. yds. of masonry in our 70-ft. turntable pits. The whole outfit, including turning motor, costs us between $6,000 and $7,000. Figures vary for different locations, depending upon whether or not we are obliged to drive piles, provide expensive drainage, etc.

Practically all of these new outfits have been put in where older and smaller tables were installed and as the older tables were kept in service just as long as possible so as to avoid delays to engines, our work has always been made more expensive than if new tables were constructed where we would not be handicapped by keeping the old table in use.

We use gasoline power turning device.

The floors of the turntable pits are covered with a coal-tar concrete paving, about two and one-half inches thick, somewhat similar to that which is used extensively in small cities and towns in New England for sidewalk surfaces.

*Abridged from the committee report, of the American Railway Bridge and Building Association, Annual Convention, October 19, 1909.

This gives a fairly hard and elastic surface, and does not crack when soil underneath heaves with frost, and is comparatively smooth, so that it is easily kept clean, and snow may be removed from pit without much trouble. The cost is about fifty cents per square yard.

A. H. Beard, Philadelphia & Reading Ry.—The cost of our plate girder standard 75-ft. table in place ready for the track rails is $7,785.00, as follows:—

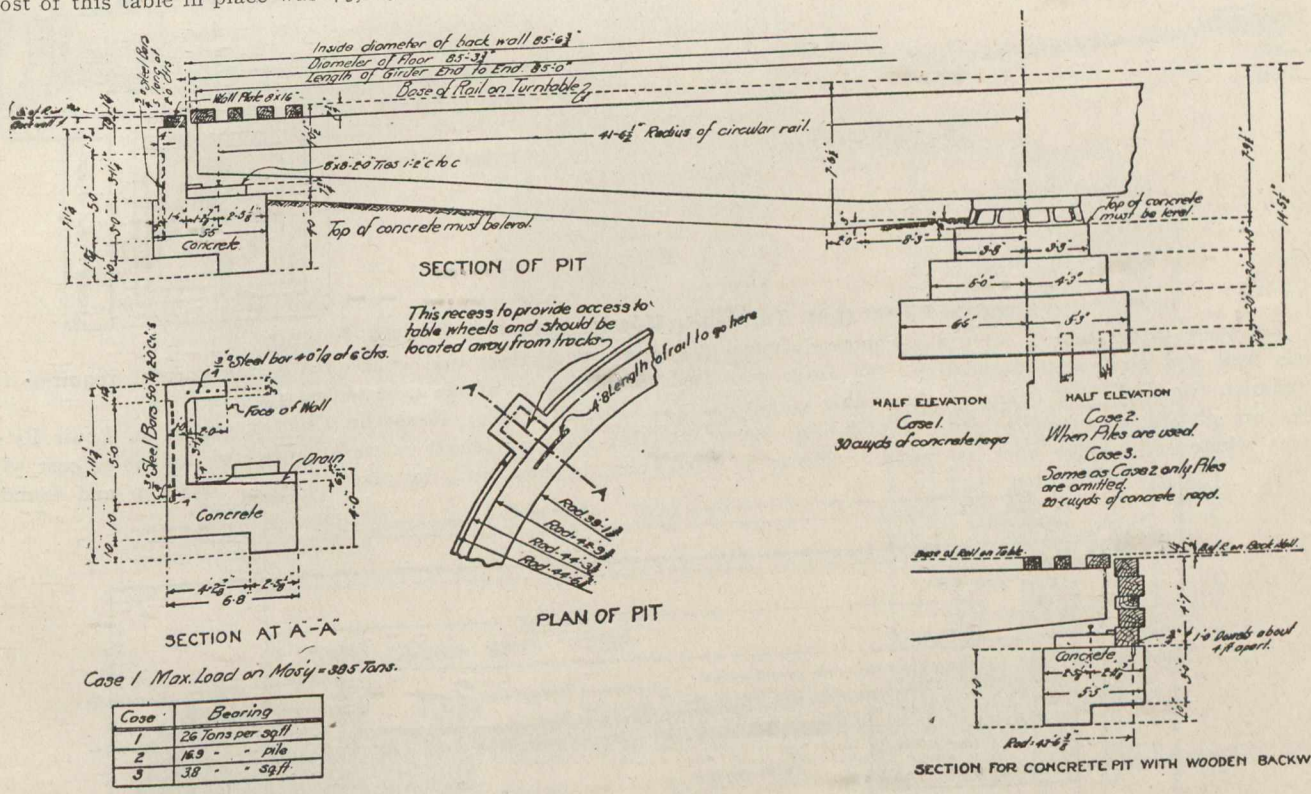
Masonry	$2,500.00
Miscellaneous	500.00
Table	4,785.00
	$7,785.00

A 65-ft. plate girder table has been in service at the roundhouse at Reading since 1897. This was manufactured by the Pottstown Bridge Co. Engines of all classes are turned on this table, the number turned every 24 hours (although the table is short for some engines) is 75 to 80. The cost of this table in place was $5,825. This table at present is operated by an 8-h.p. gasoline engine, manufactured by the Williamsport Gasoline Engine Co., the cost of same in place was a fraction over $1,000, and costs for operating about $165 per month, this includes labor, oil, gasoline and repairs; we are now arranging to install an electric motor on the same table to replace the gasoline engine.

E. E. Schall, Lehigh Valley R. R.—Our 80-ft. turntable is constructed as follows: Deck plate girders 5 ft. 6¼ ins. deep at centre and 2 ft. 8¼ ins. at ends, spaced 6 ft. c. to c., conical wheel centre bearings with live ring, built for a moving load of Cooper's E. 50 engines or 4,500 lbs. per lin. ft. of table. Cost about $3,200 delivered f.o.b. cars within 200 miles of bridge shop.

The centre foundations and circular rim walls are generally of concrete, the circular rail resting on short sawed ties. The top of rim is covered by a white oak timber coping to act as a cushion with rail tie-plated. The pit is paved with concrete about 6 ins. thick, and provided with drainage. For outlying districts, and tables not used extensively, the rim wall is at times omitted, using only a segmental wall at entrance and run-off of table, using ballast under the ties of circular rail.

7. For operation we have in use electric motors, gasoline engine motors and air motors; all are giving satisfaction. When electric power is at hand, it is the most suitable power to use; when electric current must be purchased from other parties or when none is available, gasoline engine motors of from 8 to 10 h.p. will prove very satisfactory. The air motor will also prove efficient it properly installed and arranged to take proper adhesion on circular rail, obtaining a sufficient supply of air from locomotives to be turned, unless the air can be taken from a compressor near by. The air motor will not turn as many engines in a given time as either of the other two kinds, on account of the time required in making couplings, but for outlying districts it is the best motor attachment available at this time. The cost of installing one of the motors ranges from $900 to $1,200.



Case	Bearing
1	26 Tons per sq ft
2	16.9 - - pile
3	38 - - sq ft

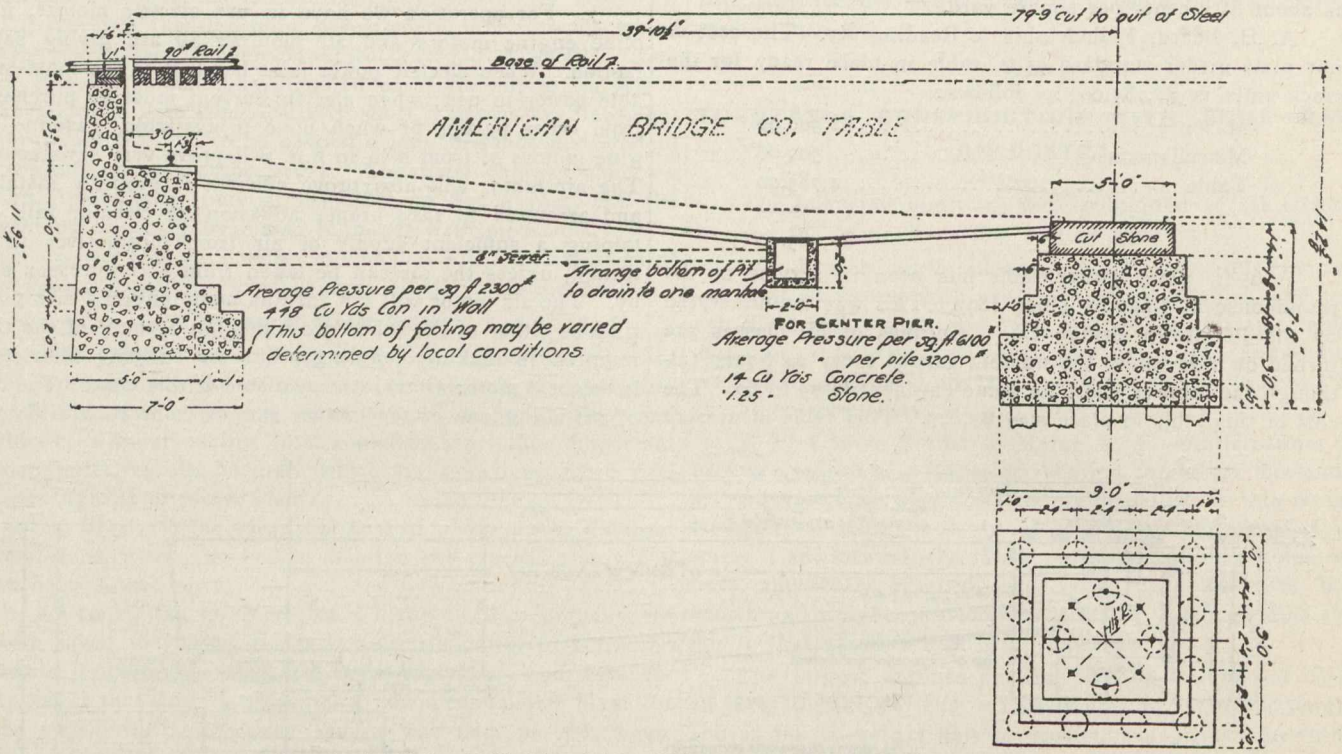
Standard 85-ft. Deck Turntable, Chicago, Milwaukee, and St. Paul Ry.

Moses Burpee, Bangor & Aroostook R. R. — I would think that 70 ft. length of turntable would be necessary for heavy locomotives for general use. Sometimes such length is necessary for cars, but usually it is not the length of wheel base which determines the length of turntable so much as their position in balancing on the table. In one case 70 ft. turntable installed, including masonry of foundation and ring, as well as drainage cost about $4,500. We usually find drainage of turntable necessary, and provide for it in all of our plans. We do not as yet use any kind of power for operating.

A. A. Wolf, Chicago, Milwaukee & St. Paul Ry.—We use 85-ft. turntables on mountain division where the heaviest power is used, and 75-ft. tables on other main line divisions. We have three types of the plate girder tables, which we distinguish as through, semi-through and deck. The reason for these various designs is occasioned by the difficulty in many places of getting drainage from the pit to a sufficient

depth to accommodate a deck table. These plate girder tables cost from $6,000 to $8,500, varying somewhat with local conditions, pertaining to the nature of foundations, etc. The labor amounts to from 35 to 40 per cent. of the total cost.

We use gasoline and electric motors only for power; the electric motor, in our estimation, furnishes the ideal power for turntable operation where it can be procured without excessive cost. At several of our division points we have our

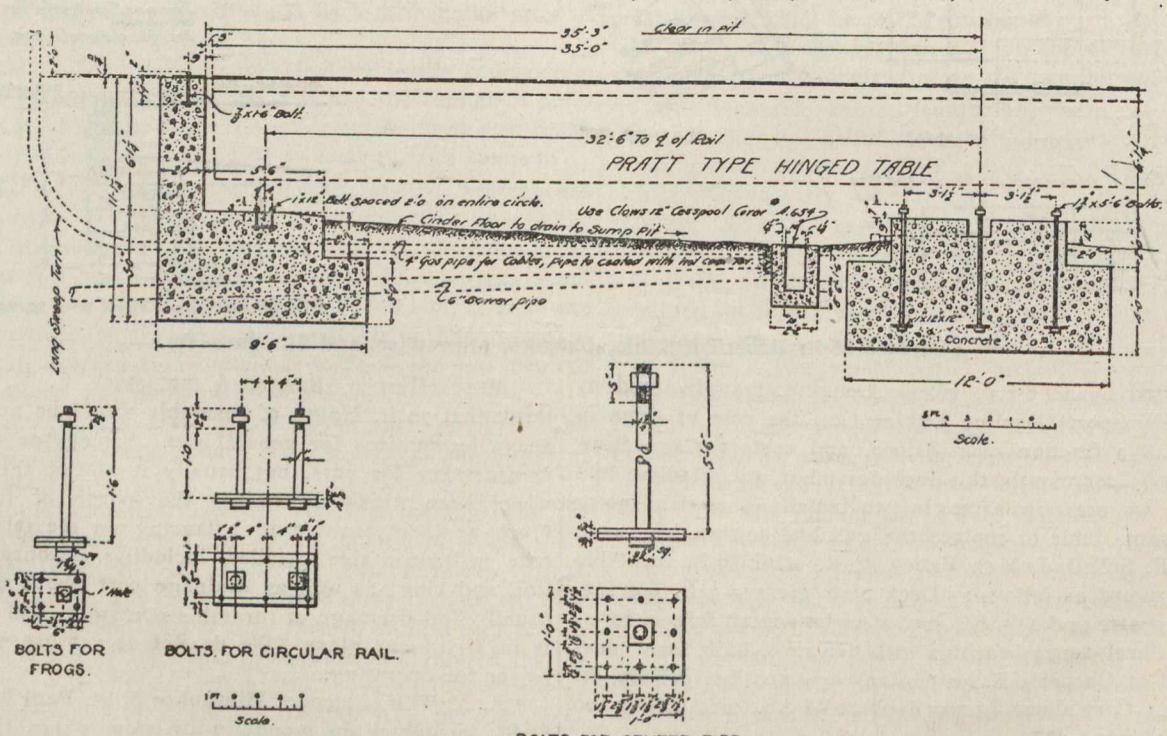


Standard Pit for 80-ft. Turntable, Chicago and North Western Railway.

For plate girder tables, we use a concrete centre pier, circle wall and circle rail foundation; the circle wall and foundation for circle rail being of monolithic construction. Piles are always used under centre foundation, except at places where solid ledge rock is found. Piling is used

own generators and consequently the current required for operating turntable costs but very little.

I. O. Walker, Nashville, Chattanooga & St. Louis Ry.—Our standard length is 70 ft. Plate girder tables cost with ties, latches, etc., in place $3,200. Masonry and founda-



Standard Pit for 70-ft. Pratt Type Turntable, Chicago, Lake Shore and Eastern Railway.

under circle wall except where rock or other firm soil is found. We do not make it a practice to pave the pits. Drainage is provided by means of connection to roundhouse sewer or to low adjacent ground, according to local conditions.

tions $2,000. The cost of the masonry is extremely variable however.

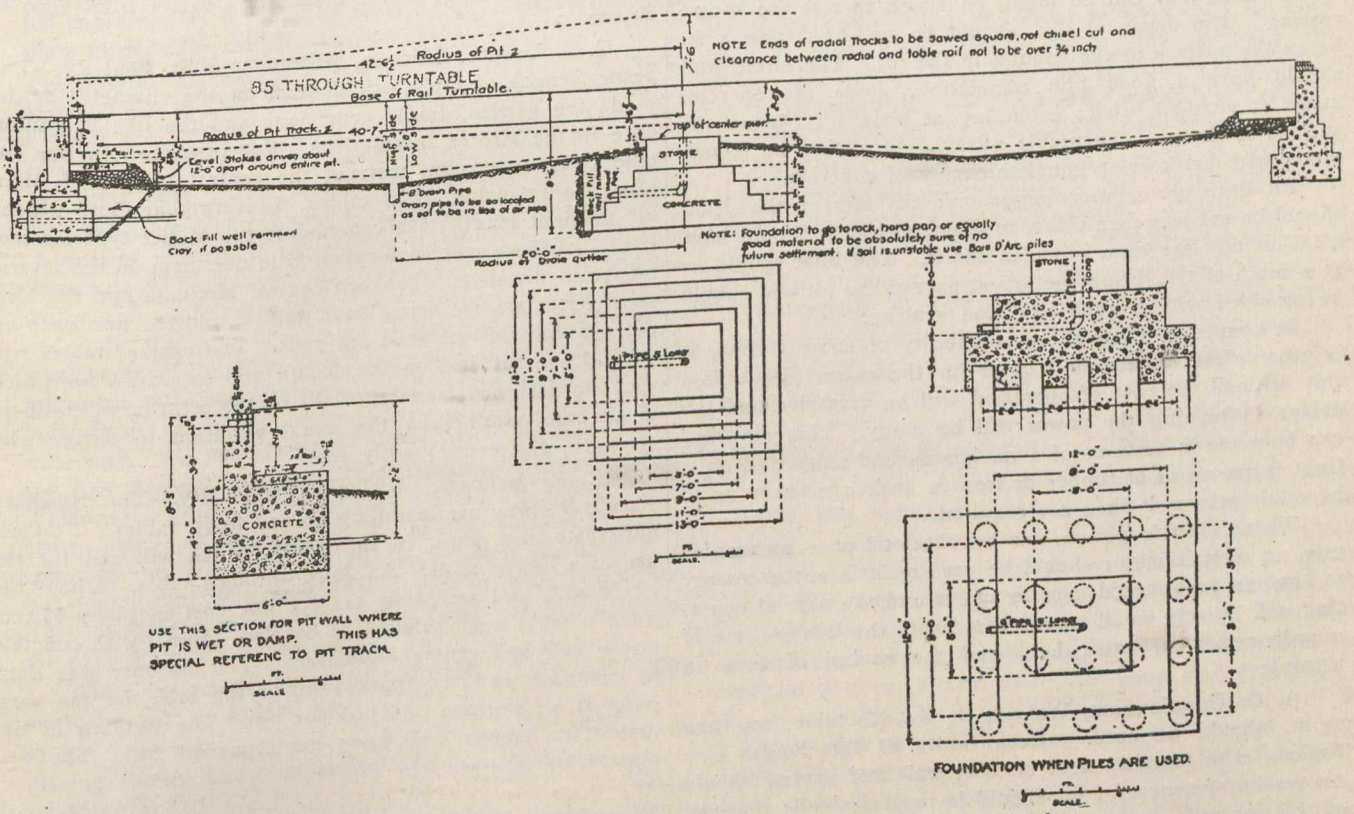
W. T. Main, Chicago & North Western Ry.—Turntables newly installed in the future should be 80 ft. in length. A 70-ft. King Bridge Co., deck plate girder turntable installed

at Chicago Ave., in 1907, cost as follows:—

Material	$2,570.46
Labor	2,262.00
Total	$4,832.46

This table replaced an old 60-ft. deck plate girder and was installed under continuous traffic except for two days while new concrete centre pier was allowed to set. Over 400 engines were turned every 24 hours on old table during construction of new circle wall which will give some idea of conditions under which work was done and reason for high cost. Table is operated by 10 h.p. electric motor which was used on an old table but furnished with new frame. A 70-ft. King Bridge Co., deck plate girder turntable installed in 1907 cost as follows:—

Circle walls should preferably be built of concrete except when table is renewed under traffic, where rubble masonry can be used to better advantage while working in cramped space. Centre pier may require pile foundation unless subsoil is good, where a spread foundation of concrete or masonry 12-ft. square will serve. The advantage of paving in pit will hardly justify the additional expense though it is easier to keep pit clean when paved and helps the drainage. The best drainage possible should always be secured. Circle walls should have an offset at one point to allow of examination and repairs to end rollers and boxes, particularly where table has rollers between girders. Masonry circle rail seat should be extended at two points, diametrically opposite, to afford support for jacks for raising table and examining centre. This saves placing cribbing on soft ground when using jacks and renders the operation much safer.



Standard Pit and Masonry for 85-ft. Turntable, Sante Fe, Coast Lines.

Material	$2,890.00
Labor	2,262.00
Total	$5,380.00

This table replaced an old 60-ft. Lassig plate girder and was installed under traffic in same manner as the one before mentioned. About $500 of the cost was due to renewal of radial tracks. The circle wall was built of concrete and the centre pier of concrete, reinforced with scrap rails in order to spread the load over old masonry foundation. The table is operated by 10 h.p. Pilling air motor and has six reservoirs under runways, the air being furnished by air compressor.

A 60-ft. Stroebel deck plate girder table installed at Chicago Ave., in 1899 on old masonry wall and new centre pier cost $2,500. A 60-ft. Greenleaf cast iron table installed at Milwaukee, 1899, including new centre pier, cost $3,100; the table alone cost $1,160. A 50-ft. gallows frame turntable installed at Evanston in 1896 with timber circle wall and centre pier cost $983.

Would recommend the use of electric motor for operating table wherever possible and where service demands the quick handling of engines; second choice, gasoline engine; third choice, air motor. The latter gives excellent service, where there is plenty of time for handling engines and where there is sufficient supply of compressed air which can be piped to reservoirs, but it is slow in operation where engine to be turned must supply the air.

B. J. Swatt, Contractor, Boone, Ia.—For western railways using the larger type of locomotives, I do not consider that the length of table should be less than 75 ft., and 80 ft. would be preferable, where the tendency is to an increase in the length of locomotives and tenders.

In my opinion plate girder tables are the best for general use, the deck type being the most satisfactory and also the most economical where drainage of the pit is practical. The cost will of course, depend on market value of iron, but will compare very favorably with any other type of table.

My experience with cast iron tables convinces me that they should never be used, except for lengths under 60 ft. and then only where the traffic is very light. All of the cast iron tables with which I have had anything to do had to be reinforced with heavy iron truss and even when so strengthened they were very unsatisfactory. I have no data on the cost of this type of table.

Gallows frame tables are, or at least they should be, relegated to the scrap heap by any railway that can afford an iron table.

The foundation for a table is in my opinion very important; piles should be driven in all cases where solid rock, hard clay or cemented gravel is not found. The piles for centre foundation should be spaced not more than 36 ins. apart and the number of piles should be not less than 20. Concrete is about the best, and at the same time the cheapest material that can be found on which to rest the centre casting. The depth of this should be not less than 4 ft. below the surface of the ground in the pit. The circle wall should have a good pile foundation, made of concrete, stone or vitrified brick; extending at least 4 ft. below the surface of the pit. Turntable pits should always be paved, either with brick or an equal thickness of concrete.

Pit drainage is very important; the size of the drain should be not less than 6 ins. in diameter and it should have a fall of not less than 2 ins. in 100 ft. The inlet should be at a depth of 1 ft. below the lowest part of the pit and should be provided with a good cast iron grating.

In countries where there is liability of snow storms, it is economical to provide a cover for the entire pit; unless this is done the cost of operation will be excessive and the delays in turning the power will be many. This covering can be made in sections of 1 in. boards and supported on a light frame work of timber or iron in such a manner as to be easily removed when not required.

Where electric power can be obtained at a reasonable rate, an electric motor should be used as it is not necessary to have an experienced man to run it and the cost of operating will be very small as compared with the loss of time of roundhouse men, extra help and the saving of time in turning.

A. O. Cunningham, Wabash R. R.—No table less than 75 ft. should be used. Deck tables of this length cost $2,600. The foundation of circular wall and paving should always be of concrete; pit should be well drained; the cost of this for 75-ft. deck table would be $3,700.

Electricity is the ideal power for operating a table. If this cannot be obtained a gasoline engine may be employed of about 6 h.p. The cost of the electrical equipment would be $1,150, and for the gasoline engine equipment $1,000.

W. H. Moore, New York, New Haven & Hartford R. R.—The standard length for turntables on our road is 75 ft., but we build some tables 80 ft. long. The approximate average cost for a 75-ft. deck plate girder turntable is about $3,500, and for a half through plate girder turntable about $5,750. The cost of foundation of the circular wall, etc., varies so much, depending on the nature of the ground, that it would be hardly proper to name any average. I may say, however, that for a concrete pit with granolithic floor and granite centre stone, in a location where there was good firm sand requiring no piles and where drainage could be cheaply taken care of, the total cost is about $3,800. For power operation we use mostly gasoline motors; some air motors, and electric motors where current can be conveniently obtained. The cost of power installation averages about $1,000.

G. Aldrich, New York, New Haven & Hartford R. R.—For the requirements of modern engines, 75-ft. minimum; 80-ft. recommend; 75-ft. deck plate girder, erected complete $3,600, base of rail on table to top of centre pier, 6 ft. 4 ins.; base of rail on table to top of circular rail, 4 ft. 8 ins.; 75-ft. through plate girder, cost with floor erected complete, $5,750. Base of rail on table to top of centre pier, 3 ft. 11 ins.; base of rail to top of circular rail, 2 ft. 9 ins. The foundation, circular wall and centre pier are constructed of concrete; the pit is usually paved with granolithic pavement. The cost varies in accordance with local conditions, ranging from $2,500 to $4,000.

For power we use: (a) air supplied by the engine being turned; (b) air supplied from compressors in adjacent shops; (c) gasoline engines; (d) electric motors. Electric motors preferred where current is available; air motors, supplied by compressors, second, and gasoline motors third choice. The cost of power installation varies from $900 to $1,200.

C. F. Loweth, Chicago, Milwaukee & St. Paul Ry.—The proper length of table will depend on the character of the road; the grades, traffic conditions and the like will influence in the size of locomotives. For instance: on our Pacific Coast extension, west of the central portion of Montana, we are using 85-ft. tables, figuring that these will be of sufficient length to accommodate the Mallet type locomotives should we ever have occasion to use them on the several mountain divisions. Between central Montana and the Missouri River we are using 80-ft. tables, and the new ones on the old lines of our road are 75-ft. The cost of tables will depend a great deal on the design and capacities for which they are designed, and especially on the centres, where there is perhaps more than the usual variation in design and strength, and consequently cost.

N. F. Helmers, Northern Pacific Ry.—The Northern Pacific Railway are installing 80 and 85-ft. tables. I do not anticipate any power in the future, which will call for the use of a larger table. An 80-ft. through table, without the circle rail, and weighing 114,855 lbs. cost in place $4,600. Such a table was installed at Staples, Minn., with concrete circle wall and centre foundation. The masonry was done by contract, and the installation of the table by the company at an expense of $3.92 per ton. The framing of ties and other timber cost $4.05 per thousand feet. The cost was as follows:—

	Labor.	Material.
Turntable	$211.44	$4,198.52
False work		12.93
Timber, ties, planking, etc.	35.23	77.49
Painting	27.49	44.78
	$274.16	$4,333.72

Total cost (not including masonry), $4,607.88.

In 1908 an 80-ft. table of the same type was installed at Minneapolis replacing one 64 ft. in length. The foundation work was done under traffic, and the change of tables was done with a total interruption of 15 hours; itemized statement follows:

	Labor.	Material.
Excavation	$ 463.94	.....
Gravel	92.14	.....
Concrete work	408.28	$ 651.52
Forms	21.76	134.19
Circle rail	38.74	.....
Table proper	361.36	4,040.95
False work for curbing	.....	.....
Removal of old brick curbing	104.42	.....
Cleaning girders	37.98	.....
Painting	23.76	21.04
Ties and coping	79.71	188.89

Engineering	.....	14.66
	$1,632.09	$5,117.61

The total cost was $6,749.70.

I consider that ordinary conditions do not require the necessity of paving for the pit, but good drainage is essential in most cases.

For power we are using electricity and compressed air, while some of the 80 and 85-ft. tables are being turned by hand. Air motor in use at Jamestown, N.D., cost at St. Paul, $450; installation $19.81; total, $469.81. Electric tractor furnished by Nichols and Brother, cost $1,104.37; installation, $115.86; total, $1,220.23.

W. T. Powell, Colorado & Southern Ry.—The up-to-date table should be 80-ft. long, with a capacity for turning 200-ton engines. We installed recently an 80-ft. 200-ton through-plate girder table which cost as follows:—

Table f.o.b., Denver, including circle rails.....	$3,700.00
Material for concrete foundations and walls.....	1,090.00
Labor	1,600.00
Total cost	$6,390.00

This table replaced a 66-ft. table and we were compelled to excavate and put in the curbing under 42 tracks and keep them safe while in use. We drove 24 piles for centre foundation and capped it with a block of concrete 12 ft. square and 4 ft. thick; a deck table of this length and capacity would cost about $600 less. We use concrete entirely for masonry; rails are fastened with bolts and cast clips, the bolts being set in the concrete; no paving; drained when necessary. We use air power with a two cylinder motor.

J. S. Browne, New York, New Haven & Hartford R. R.—We have recently installed an 80-ft. table at Providence. The centre pier is of concrete, reinforced with steel rails, on account of the irregularity of the supporting material, as it was feared that the concrete might be fractured by the load if laid without re-enforcement. The outer wall of the pit and the paving are also of concrete.

While an accurate record was not kept of the cost it was approximately as follows:—

80-foot steel table delivered at Providence.....	$3,400.00
Placing coping and circular rail and moving table into pit	800.00
Concrete in outer wall and centre, including forms	2,800.00
Excavation, including disposal of material.....	1,500.00
Paving	300.00
Drain pipe to connect with sewer.....	200.00
Total	$9,000.00

The work was done by the company's force, and the high cost of excavation was due to the fact that a portion of the work was done in freezing weather, and it was necessary to handle the material more than once before its final disposal by work trains.

The company's standard main line turntable is 75-ft. long, but 80 ft. is considered better at points where the largest type engines are turned, to permit of properly balancing them. Deck plate girder tables are used where sufficient depth is available without excessive cost, but where this is not feasible, half through plate girder tables are used. The superstructure of deck tables is about 30 per cent. cheaper than that of half through tables, but this saving is balanced by the greater cost of the pit, so that under ordinary conditions the total cost of these two types is about equal. Gasoline motors are generally used for power, although electric motors may be used to considerable extent in the future.

CURRENT CONSUMPTION.*

By R. S. Pilcher (General Manager, Corporation Tramways, Aberdeen).

Everyone connected with the management of electric railways in these days realizes the importance of the subject of current consumption, whether the railway department has its own power station or not. The cost of electricity to any railway system may be the question of a profit or loss on the year's working. In Aberdeen the cost of current averages at 22 cents per unit, and the units consumed work out at 250 per car mile, making a cost of 26 cents per mile run. The proportion of this to our working expenses is 23 per cent., or more than half the cost of all our wages paid. I notice that in some of the largest towns in the country, the power expenses are about 30 per cent. of their total working expenses, and in one town they are as high as 35 per cent. I think you will agree with me that no effort should be spared in trying to prevent the systematic increases in current consumption which are to be seen all over the kingdom.

It is a fact, I believe, that the records of most towns in the United Kingdom and Ireland show an increase year by year in the consumption of current per car mile, and this is chiefly owing to track and car equipments becoming older, as well as to the great increase there has been in recent years in the number of top covered cars in use. I believe the increase through top covers is due in a small degree to the extra weight and windage of the covers, but in a larger degree to the extra carrying capacity of the cars in wet weather, and, in consequence, the greater number of stops which the cars have to make in a given time.

I have heard some railway officials speaking on this subject, who think that there is a great deal of current wasted through defective motor fields, badly worn pinions and gears, bent axles, etc., and I believe that in systems which have only been running a few years, much of the increased consumption may be due to this. But most of our systems have now been running over five years, and have replaced pinions, started to replace gears and field coils, in this way continually renewing the car equipments, so that I am inclined to think that the bringing forward of these causes of increased current consumption is rather apt to blind us to the true remedy, which, in my opinion, is to be found in the correct method of driving. We, in Aberdeen, could not afford to scrap any more field coils, and we get the full life from gears and pinions, but, we can afford to give a great deal of attention to the motormen.

Five years ago I experimented on one of the English railway systems with a view to saving current, and by instructing the motormen in the series parallel system of controlling motors, and by showing how it was possible to save current without decreasing the speed of cars, a reduction of over 7 per cent. was made.

In Aberdeen I started a similar system three years ago, which has also been very successful. In the first place, each motorman is brought into the office, and before a blackboard thoroughly instructed in the series parallel system of control by means of diagrams. I spent a great deal of time in illustrating the difference between two motors running in series and two motors running in parallel, also how it is that when motors are in series they only have half pressure, half speed and half the consumption of current. I find that it has to be

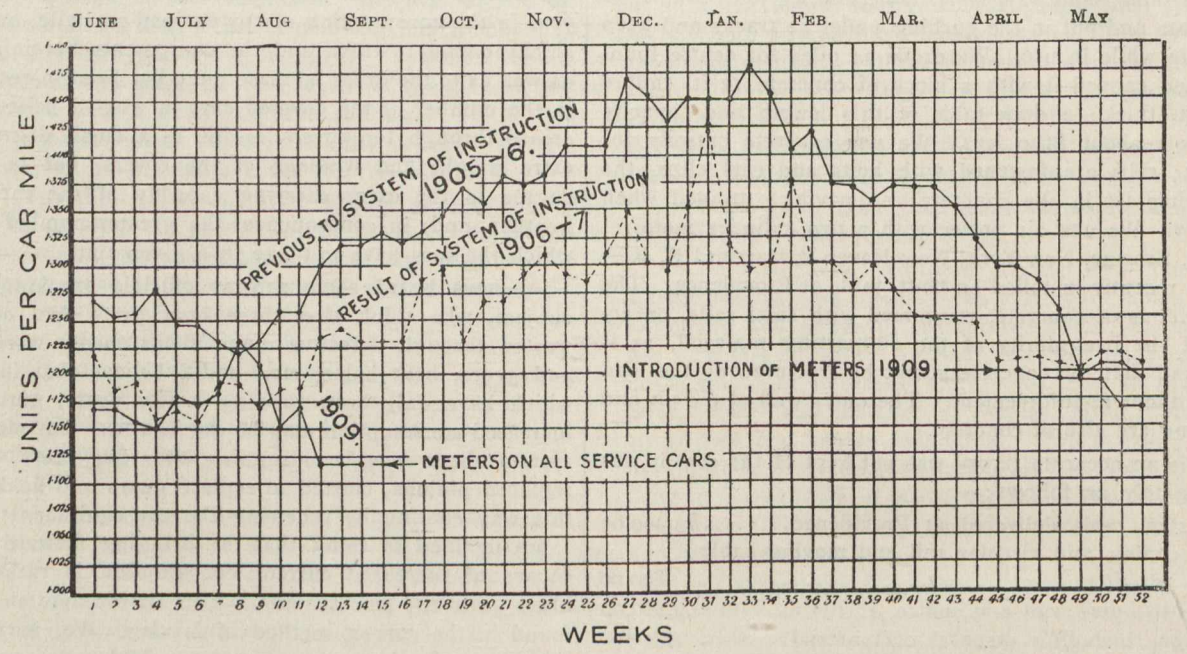
* Paper read at Eighth Annual Conference of Municipal Tramways Association.

very simply illustrated before the men can understand. My usual illustration takes the form of water, as I find that the men seem to grasp my meaning much sooner when referring to water than speaking of electricity.

The motormen seem to have great difficulty in realizing how it is that parallel consumes so much more than series, and especially how the first notch in series and the first notch in parallel consume more than the second and third notches. Each man is instructed how to use the momentum of his car to the best advantage, and he is shown how to keep up the same speed with less use of the power notches of controller. He is shown how the careful driver can, after arriving at the top speed, maintain it off the series position, whilst the careless driver would have his controller on parallel all the time. The men are also instructed not to run their cars on parallel, unless they have sufficiently clear space ahead to get the full benefit in speed of extra consumption. All the motormen are informed of the cost of current, and it never fails to impress them, because they previously did not appear to realize that electricity cost anything. Each motorman is put upon his honour to do the very best he can for the department, and he is informed of the reductions made. After having been thoroughly instructed in the office, he is given a printed instruction paper which shows where he should be running in parallel, and where in series, also where he should be coasting. I find that he soon learns the instructions, and gets into the habit of abiding by them. All our drivers are kept to their respective routes, otherwise I could not expect them to know the routes so well. A good inspector, who is tactful and not likely to ruffle the men, is put on the road to see that they carry out their instructions and to see there is no rushing to and from the different termini.

Previous to this system being introduced into Aberdeen, the rise in current consumption each year had varied between 6 and 12 per cent. per car mile, and immediately it was introduced there was a reduction. The first year the reduction was 6 per cent. on the previous year, or a saving of $3,200, in addition to which the gradual increase was checked. Since then we have maintained the same consumption per car mile, i.e., for three years, and as we have been adding to the number of top covered cars, at the rate of six each year, I consider that this is equivalent to a gradual reduction.

Some months back I experimented with 10 ampere-hour meters, each meter being placed on a different route, and I noticed a further decrease in the consumption of current. The Aberdeen tramways system has now got all its service cars fitted with ampere-hour meters, and the consumption of current is lower at present with 41 top covered cars than it has been for the last five years, although there were only three top covered cars in use five years ago. These meters have already paid for themselves by the reductions made. One of the meters had been on a car for a month, and, thinking that the consumption on this car was rather high, I changed the drivers, and the first week after the change, the current consumed by the new driver showed a decrease of $4, which has since been maintained. This will serve to show what could be done when applied to a large system. The current of consumption is shown each day and week against each man, a sense of healthy rivalry thus being created between the different men on each route in their effort to show the lowest consumption per car mile. I find that our motormen like the cars with the meters on them; they become interested in watching the current consumption each trip and each day, and I do not think it is necessary to become arbitrary or too strict with the men. I believe good results can be obtained without severe measures. Although we have saved several thousands of pounds in three years in Aberdeen, there has never been a single motorman suspended in connection with this subject. The average motorman is a little slow to understand the subject, but the explanation should be simplified. The main point is to get them interested in the subject, and when they understand they will certainly reduce the consumption of current.



I find that in Aberdeen the routes which use the most current are not always those routes which have the steepest gradients, but that the speed of the car and the number of stoppages has a material effect upon the current consumed. The cars which run the slowest, even although there are several fair gradients on the routes, use the least current, and on other routes where there is hardly any gradient the consumption is high, because of the high speed at which the cars have to travel, together with the greater number of stops.

Theory would teach us that the faster the car travels the more economical is the current consumption per car mile; in

practice I find just the opposite. It is of no use to give the efficiency of a car running in parallel against a car running in series, without taking into consideration the conditions of starting and stopping, combined with the fact that it is harder to keep time with a high average speed than with a low average speed, and will, in consequence, use more current when accelerating its speed. We have a route in Aberdeen on which seven cars operate. Some time back one car was taken off this route, but the six cars which were left used much more current than the seven cars had done, proving that in practice the faster the cars run the more current they will use per car mile.

Sometimes mechanical controller regulators are advocated to save current, but I think that they are of little use except to prevent the abuse of the equipments by notching up too fast. My own impression is that any system of electric tramways which has no method of checking current consumption will use at least 5 per cent. more current per car mile than a system which has a systematic check upon its drivers. Of course, I believe that in those towns where there are very many steep gradients and few level tracks, there is not so much scope for this subject as in fairly level towns. If current is to be saved without interfering with efficiency (and it can be saved), the first thing to do is to instruct your motormen specially on this subject, and follow this up by a direct check upon them. It matters little whether you use watt-hour meters, ampere-hour meters, or time-meters. I believe the same effect can be obtained by any of these. It is not so much a question of accurately measuring the consumption of current by each car, but rather of having a comparison day by day with other cars on the same route.

On dry days, or after several dry days, when there is a deal of dust accumulated about the rails, the current consumption rises upon the car meters, and as Aberdeen is fortunate enough to possess a special sprinkling car fitted with rail nozzles, which the cleansing department use for watering the streets, this water car is sent out to clean the rails.

Different rail cleaners are often advocated for the purpose of reducing current consumption, but I think that most of them, although they clear the groove, leave a lot of dirt and dust upon the tread of the rail in dry weather; therefore, I think that the best rail cleaner is a water car. Although the current consumed on a wet rail is less than on a dry rail, I find that on rainy days the consumption of current is higher that on dry days, but this is owing to the greater number of passengers carried at rush-hours, and, consequently, the greater number of stoppages.

In Aberdeen, simultaneously with the introduction of systematic supervision of the drivers, I noticed a great improvement in the time-keeping of cars; also, which is very important, a great reduction in motor troubles, the number of armatures in for repair being greatly decreased. The car repairs for Aberdeen last year stood at .41d. per car mile, and I believe this is largely due to the reduction in current consumed.

I think the question "which particular type of meter should be adopted?" is quite a secondary point. We in Aberdeen saved a great deal before adopting any meter. There is no doubt, however, that the meter is a most valuable part of our system of check now, and saves a great deal of supervision.

PROBLEMS IN APPLIED STATICS.

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

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

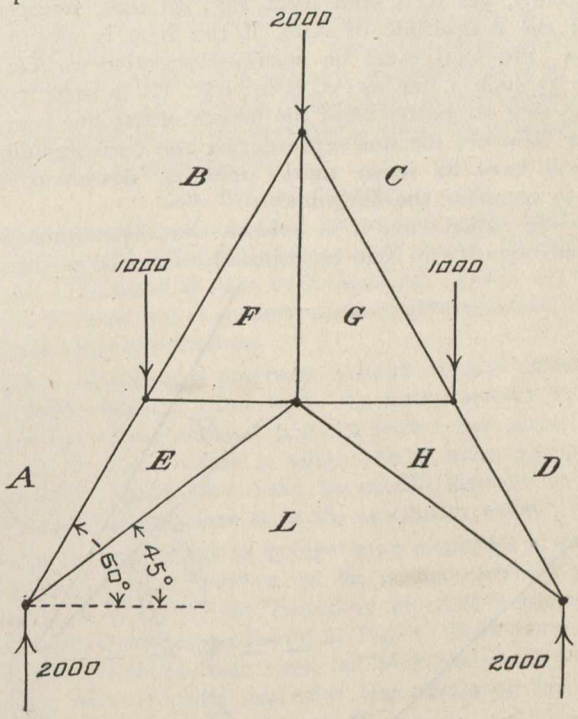


Fig. 96.

Considering the forces acting **on** the truss and applying the equation $\Sigma M = 0$, taking moments about a point in the line of action of either abutment reaction, it is seen that the abutment reactions are both equal to 2,000 pounds.

Consider the forces acting at the point LHD (Statical Diagram, Fig. 97). Since these forces are in equilibrium, $\Sigma X = 0$, $\Sigma Y = 0$, $\Sigma M = 0$.

$$\Sigma X = X_{LH} + X_{HD} + X_{DL} = 0.$$

LH and HD being both unknown, assume their X's positive.

$$LH \cos 45^\circ + HD \cos 60^\circ + 0 = 0.$$

$$LH \cdot \frac{1}{\sqrt{2}} + HD \cdot \frac{1}{2} = 0.$$

$$LH = \frac{\sqrt{2}}{1} \cdot \frac{HD}{2.}$$

$$= \frac{HD}{\sqrt{2}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1.)$$

It is evident that in order to solve for the two unknowns, LH and HD, another equation must be formed in terms of the same unknowns, this equation to be used simultaneously with equation (1.). Using $\Sigma Y = 0$ as the other equation:—

$$\Sigma Y = Y_{LH} + Y_{HD} + Y_{DL} = 0.$$

Since the equations ΣX and ΣY are being used simultaneously, we are not at liberty to assume the Y's of the unknown forces LH and HD positive (as would ordinarily be done) without first considering the assumptions in the first equation. **The assumptions as to the**

signs of the Y's of the unknown forces must be in accordance with the assumptions as to the signs of the X's of the unknown forces in the first place. Referring to Fig. 98, let AB represent the line of action of the force LH (Fig. 97), and, since the XLH was assumed positive, the line CB with sense mark to the right evidently represents the assumed XLH. Now, although the magnitude of XLH is unknown, since the magnitude of the force LH is unknown, yet it is seen from Fig. 98 that, irrespective of the magnitude of XLH, if the XLH is assumed positive, the YLH must be assumed negative as represented by such a line as AC (Fig. 98). (It is seen from Fig. 98 that no matter what the length of the line representing XLH be, the line representing the corresponding YLH will have its sense mark pointing downward in order to complete the diagram.)

In the same way, it is evident that YHD must be assumed negative if XHD be primarily assumed positive.

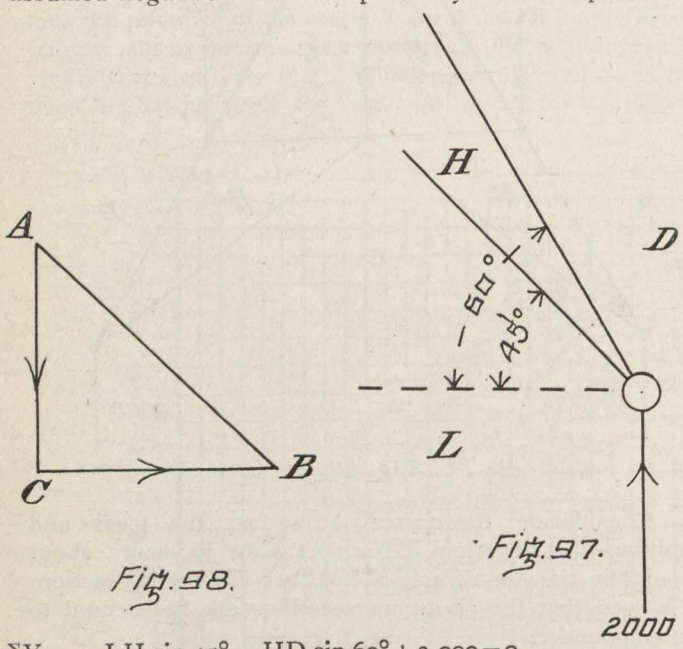


Fig. 98. Fig. 97.

$$\Sigma Y = -LH \sin 45° - HD \sin 60° + 2{,}000 = 0.$$

$$-LH \frac{1}{\sqrt{2}} - HD \frac{\sqrt{3}}{2} + 2{,}000 = 0 \ldots\ldots (2.)$$

Substitute value of LH from (1.) into (2.).

$$-\left(-\frac{HD}{\sqrt{2}}\right).\frac{1}{\sqrt{2}} - HD.\frac{\sqrt{3}}{2} = -2{,}000.$$

$$\frac{HD}{2} - \frac{HD}{2}.\sqrt{3} = -2{,}000.$$

$$\frac{HD}{2}(1 - \sqrt{3}) = -2.000.$$

Multiplying both sides of the equation by -1:—

$$\frac{HD}{2}(\sqrt{3} - 1) = 2.000.$$

$$HD = \frac{4{,}000}{(\sqrt{3} - 1)} \ldots\ldots\ldots\ldots (3.)$$

From the positive sign of the result, it is seen that the assumptions as to the XHD and YHD are correct. **The YHD was assumed negative and XHD positive,** which is seen to be correct; the force HD, therefore, acts against the point; i.e., the member HD is in compression $\frac{4{,}000}{(\sqrt{3}-1)}$ pounds.

Substituting the value of HD from (3.) into (1.):—

$$LH = -\frac{HD}{\sqrt{2}} \ldots\ldots\ldots\ldots (1.)$$

By substitution:—

$$LH = -\frac{4{,}000}{(\sqrt{3} - 1)\sqrt{2}}$$

It is evident from the negative sign of the result that the assumed signs of XLH and YLH are wrong; i.e., XLH is negative and YLH positive. The force LH, therefore, acts away from the point; i.e., the member LH is in tension $\frac{4{,}000}{(\sqrt{3}-1)\sqrt{2}}$ pounds.

The same results would have been obtained had the equation $\Sigma Y = 0$ been used first, although the work would have been slightly more involved. The point of the preceding discussion is that, **if the equations have to be used simultaneously, the assumptions as to signs in the second equation must be in accordance with the given lines of action of the unknown forces and the assumed signs in the first equation.**

The construction and loading of the truss (Fig. 96) are symmetrical about the same axis. From this fact we are at liberty to say that the left-hand half of the truss will have the same stress in any of its members as the corresponding members in the other half of the truss. It would, therefore, be unnecessary to consider the forces at the point LEA in order to find the stress in the members LE and EA (LE will be in tension and EA in compression to the same extent as the members LH and HD, respectively). It is advisable, however, that the reader go through the analytical determination of these stresses.

Consider the forces acting at the point LEA.

REPORT OF THE COMMITTEE ON POWER DISTRIBUTION.*

By James Heywood, Chairman; W. J. Harvie, G. W. Palmer, Jr., S. L. Foster, W. G. Matthews, and E. J. Dunne.

The committee decided to work as closely as possible to the outline submitted by last year's committee, giving special attention to those subjects which were designated by the executive committee. It has been thought advisable to submit with this report a number of specifications for material used in power distribution.

High Tension Feeders.

Underground high tension cables have passed the experimental stage, and are giving satisfactory service in a large number of installations. The majority of the latter installations have been made with paper insulation. The highest volage of which the committee has knowledge is 25,000, and this is rather the exception than the rule. From 11,000 to 13,200 seems to be the most popular range of voltage.

In Appendix A [Not republished.—Eds.] will be found a specification for use in purchasing high tension underground cables. In view of the high cost of cable of this kind, the committee recommends that in general cables be made large enough to accommodate future needs; in fact, in usual

* Abstract of report read before the American Street & Interurban Railway Engineering Association, at Denver, Colorado.

installations it is well to install as large a cable as can be pulled through the ducts. This applies to entire underground installations.

Rubber and cambric are sometimes used for high tension underground cables, and if it is desired to use rubber, the committee recommends that the specifications in Appendix B [Not republished.—Eds.] be used to determine the quality of rubber compound.

High tension cables should be protected outside the lead where they pass through manholes, the common practice being to cover the lead with woven asbestos saturated with a solution of silicate of soda. The silicate of soda solution should be omitted in manholes that are full of water. This method of protection is recommended by the committee.

Where overhead high tension transmission circuits are used, the committee recommends steel supports in the form of towers where the line is isolated, and when along the tracks to be supported from extensions to the structure that supports the trolley wires. All steel towers should be galvanized, and subjected to the test for galvanizing given in last year's report, to obtain the most economical results.

Some special conditions demand the use of wood poles instead of steel towers, for instance on streets where the line must be carried along the sidewalk, and in climates where wood is not subject to decay.

As illustrative of special conditions, Appendix C gives a discussion by S. L. Foster, of this committee, showing some results with moderately high tension transmission lines in California. [Appendix C presented elsewhere.—Eds.]

With the new form of suspension insulator, and with ten feet of vertical separation between conductors, the use of wood poles for even ordinary spans is out of the question when ample clearance between lowest conductor and foreign wires or even the earth is maintained. The steel tower or pole is practically invulnerable to fire and is safe from deterioration and from short circuits by climbing animals.

The suspended insulator is built up of a series of insulator units connected together by hooks and eyes. Each disc-shaped unit has a mechanical breaking strength factor of safety of from 25 to 50, even after all the flange has been broken off. In case of a broken or burned off conductor, this reserve strength in the insulator would take care of the unusual strain, and not result in a broken insulator or a split cross arm. The flexibility of the suspended type of insulator also raises the factor of safety. On one California 154-mile steel tower line now being operated at 75,000 volts and intended to be operated later at 110,000 volts, five units in series are used, each tested at 65,000 volts giving an ultimate factor of safety of three. On another 150-mile steel tower line in the same State with 60,000 volts at present and 100,000 volts as prospective, five units tested to 90,000 volts each are used, giving a factor of safety of 3.6. Another 13,200-volt transmission in the same locality contemplates a three-part insulator of a test voltage of 80,000, or a factor of 6.06. Assuming that city construction averages $50,000 per mile, and high tension insulators cost 40 cents each, the cost of high tension i nsulators is a little over 1/100 of 1 per cent. of the total cost of construction, exclusive of cars, buildings and power houses on a large street railway system there. Such being the case, the advance from an admittedly inadequate factor of 5.34 to one of 6.06, the sufficiency of which is yet to be demonstrated, seems not over-cautious in the light of the great importance of absolute continuity of service in heavy street railway operation demanded now.

Other qualifications of the suspended insulator are: Superior accessibility for cleaning and observation; and superior resistance to missiles.

If wood construction were to be attempted on a scale corresponding to that of the steel tower, the cost would probably exceed that of the steel tower and would last only eight or ten years, whereas the galvanized iron tower should last indefinitely. Also, greater durability of the conductor is assured when it is strung on suspended insulator because of less crystallization at the point of support. It has been the experience in California where after a year's operation on spans varying from 350 to 4,000 feet and towers varying from 50 to 300 feet high and 60,000 volt lines that no short circuits are made in high winds. As steel towers consist of many separate pieces which are only assembled when at the point of erection, it is easier to transport a tower piecemeal to a location difficult of access than it would be to transport a wooden pole of equal height.

Low Tension Feeders.

The committee recommends the use of paper insulated and lead covered cable for underground service. Specifications for this material have been prepared. There are two methods of disposing of condemned underground cables, viz., scrapping and rehabilitation.

Where re-leading is practised, a small stock of cables is maintained. When a cable fails, the faulty section is replaced from stock, the bad piece re-leaded and placed in stock. It is also possible to splice two or more pieces of cable together and re-lead them, the outside diameter at the splice remaining the same as in the continuous cable.

When it is necessary to change large quantities of cable from one location to another, as for instance when a new substation is installed, the re-leading of cable becomes a very attractive method, as shown by Fig. 1. It is more economical to re-lead the large sizes, but when the size is small re-leading becomes more expensive than scrapping the old cable and purchasing new.

A difference of opinion exists in reference to the use of concrete around wooden poles. Good results, however, have been obtained in San Francisco by means of concrete setting, poles having been in service fourteen years set in concrete and are still in good condition. These poles, however, were of redwood, which is not available in all parts of the country.

A patented process for reclaiming wood poles, which have been decayed at the butt, by means of reinforced concrete, has been brought to the attention of the committee. It is too early at this time to say what the results will be.

Repair of Poles.

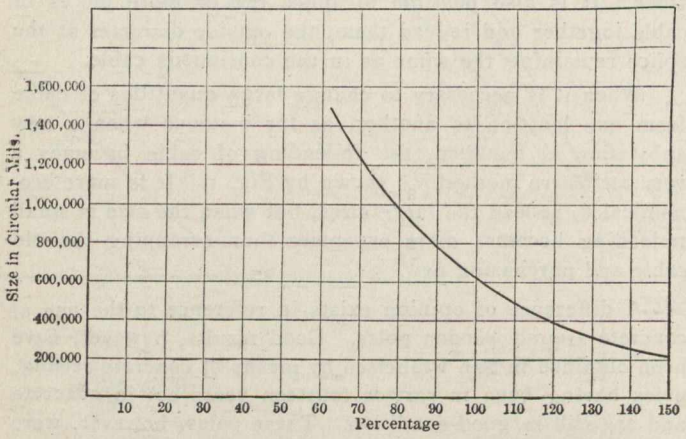
The principal seat of trouble in old poles is at the ground level, where the moisture lies the longest and either corrodes metal poles or rots wooden poles. In selecting a method for repair, the essentials are: The work should be done with common labor; no special tools should be required if possible; the fault should be entirely eliminated—i.e., further corrosion or rotting of the pole stopped; the repairs should be permanent, i.e., no further maintenance should be required; when complete the poles should be as strong as when new; the cost must be low. To attain this there are at present several methods in use:

One method, applicable to metal poles only, consists of filling the inside of the pole with grout in which steel rods are bedded. A second method, applicable to wooden poles only, consists of driving U-shaped rods around the pole at the point where the timber has been rotted away and then filling in space with concrete. A third method, applicable either to wooden or metal poles, consists of placing metal clamps and bolting these together. A fourth method, also applicable to either metal or wooden poles, consists of using a metal sleeve either of pipe section or split, depending on

the number of fixtures on the pole. This sleeve has a larger diameter than the pole, and is placed over the corroded or rotten portion of the pole, and the space between is filled in with some material.

Some of these methods have very serious objections.

In the first method, since the diameter of the pole is fixed, in order to obtain the desired strength of the original pole, computation shows that a considerable amount of steel must be bedded in the grout, and then the cost becomes almost prohibitive. With fewer rods only part of the original strength is obtained. The concrete being entirely enclosed, it takes a very long time for it to set; in the meantime, if the pole is badly corroded, and as the corrosion is all the time going on and increasing on the outside, the pole is liable to bend or collapse; further, the swaying and vibration of the pole is liable to loosen the bond between concrete and the metal, and therefore the strength to be greatly decreased. It has been found out from actual experience that in the winter time, when the metal of the pole contracts, the inside plug of concrete does not permit of such a shrinkage, and the pole splits. There are known instances in which such poles split the entire length. The pole itself continues to corrode on the outside, and in course of time some other method must be applied on the outside to eliminate the trouble.



Power Distribution—Fig. 1.—Cost of Re-Leading Cable According to Cost of New Cable Less Scrap.

The second method would appear to be quite effective on wooden poles, but it has not been tried a sufficient length of time to prove its efficiency. It would appear that the concrete surrounding the pole must shrink away from the wood, thus permitting water to percolate and a further rotting of the portion repaired.

The third named is quite costly, as the clamps have to be very heavy to be efficient, and even then, being held by bolts, the latter in time may become loose and corroded, and it requires constant inspection and maintenance. At best it is only temporary. It also does not stop the further corrosion of the weak spots.

The fourth method from every standpoint seems to be the most efficient. It is applied at the spot where the trouble originates, and entirely eliminates further corrosion or rotting. It is permanent in its nature. It brings the pole to its original strength, and, as a matter of fact, poles that have been tested with such sleeves have stood a greater stress than new ones. It looks well and neat in the street. And finally, its cost is the lowest. This method is especially efficient when the filling material is introduced in a molten state, e.g., molten brimstone. In making this repair, some sleeves have been filled with grout, but this method is not recommended by the committee.

(To be Continued.)

ENGINEERING SOCIETIES.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—413 Dorchester Street West, Montreal. President, George A. Mountain; Secretary, Professor C. H. McLeod.

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

TORONTO BRANCH—
96 King Street West, Toronto. Chairman, J. G. G. Kerry; Secretary, E. A. James, 62 Church Street, Toronto. Meet last Thursday of the month.

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

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

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

MUNICIPAL ASSOCIATIONS.

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

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

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

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

CANADIAN TECHNICAL SOCIETIES.

ALBERTA ASSOCIATION OF ARCHITECTS.—President, R. Percy Barnes, Edmonton; Secretary, H. M. Widdington, Strathcona, Alberta.

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

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

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

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

CANADIAN MINING INSTITUTE.—Windsor Hotel, Montreal. President, W. G. Miller, Toronto; Secretary, H. Mortimer-Lamb, Montreal.

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

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

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

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

DOMINION LAND SURVEYORS.—Ottawa, Ont. Secretary, T. Nash.

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

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

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

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

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

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

ONTARIO LAND SURVEYORS' ASSOCIATION.—President, Louis Bolton; Secretary, Killaly Gamble, 703 Temple Building, Toronto.

ROYAL ARCHITECTURAL INSTITUTE OF CANADA.—President, A. F. Dunlop, R.C.A., Montreal, Que.; Hon. Secretary, Alcide Chausse, 5 Beaver Hall Square, Montreal, Que.

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

AMERICAN TECHNICAL SOCIETIES.

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

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

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION.—President, Wm. McNab, G.T.R., Montreal, Que.; Secretary, E. H. Fritch, 962-3 Monadnock Block, Chicago, Ill.

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

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

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

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

RAILWAY EARNINGS AND STOCK QUOTATIONS

NAME OF COMPANY	Mileage Operated	Capital in Thousands	Par Value	EARNINGS Week of Dec. 14 1909	EARNINGS Week of Dec. 14 1908	STOCK QUOTATIONS TORONTO Price Dec. 17 '08	Price Dec. 9 '09	Price Dec. 16 '09	Sales Week End'd Dec 16	MONTREAL Price Dec. 17 08	Price Dec. 9 09	Price Dec. 16 '09	Week End'g Dec 16
Canadian Pacific Railway	8,920.6	$150,000	$100	1,746,000	1,523,000	175	181	180½ 179¾	485	176	175¾ 181½	181⅜ 180¼	180½ 2607
Canadian Northern Railway	3,180												
*Grand Trunk Railway	3,536	226,000	100	779,135	731,257			*1st. pref. 103¾, 3rd pref. 50½, ordinary 20½					
T. & N. O.	334	(Gov. Road)		34,597	17,970					203½	202½	215 214¾	215½ 214½ 652
Montreal Street Railway	138.3	18,000	100	73,989	67,189					106	105½	126 125⅜	126¾ 126⅜ 2060
Toronto Street Railway	114	8,000	100	77,795	70,271	106½ 106½	125½ 125⅜	127	842		165		185
Winnipeg Electric	70	6,000	100			167½ 166	185	185					

These prices are quoted on the London Stock Exchange.

* G.T.R. Stock is not listed on Canadian Exchanges

HALIFAX ELECTRIC TRAMWAY EARNINGS.

Halifax Electric Tramway earnings for week ended December 14th were:—

1909	$3,436.29
1908	3,249.10
Increase	$187.19

And for week ended December 17th:—

1909	$3,464.63
1908	3,151.30
Increase	$313.33

Mileage operated, 13.3 miles.

Montreal Street Railway for the two months of its new fiscal year is making a very good showing. Net earnings show a gain of $29,925, or 10½ per cent. over last year.

ONTARIO ELECTRIC RAILWAYS.

From week to week we propose to give, on our page devoted to transportation interests, particulars of the equipment, mileage, and other information regarding the railways of Canada, together with a list of the officials. This series of articles commenced in our issue of October 1st.

Previously Given:—

Brantford and Hamilton Railway.
Chatham, Wallaceburg and Erie Railway.
Cornwall Street Railway.
Guelph Radial Railway.
Galt, Preston and Hespeler Railway.
London St. Railway.
International Transit Co., Sault Ste. Marie.
Kingston, Portsmouth & Cataraqui Elec. Ry., Kingston
Toronto & York Radial Railway.
Windsor, Essex & Lake Shore Railway.
Ottawa Electric Railway.
Southwestern Traction Co., London.
Toronto Street Railway.
Niagara, St. Catharines and Toronto Railway.
Peterborough Radial Railway.

BERLIN AND WATERLOO RAILWAY.

Commission, A. L. Breithaupt, chairman.
Purchasing Agent, V. S. McIntyre, secretary-treasurer.
Kind of Road: Single track street railway, 3½ miles long.
Type of cars: Closed, 40.
Number of motors, 4.
Power of motors, 35 horse-power.
Method of braking, air.
Gauge of track, 4 ft. 8½ in.
Weight of rails, 56-72 lbs.
Power:
Direct current, 500-550 v.
Alternating current.
Voltage of transmission.
Trolley voltage, 550 v.

NEW INCORPORATIONS.

Quebec.

The Fassett Lumber Company, Limited, Fassett, Que., $1,000,000; lumbering. Louis Boyer, advocate, Montreal, is an incorporator.

Ontario.

The Temiskaming and Gow Ganda Transport Company, Ltd., of Toronto, capital $40,000; provisional directors, G. H. Gautheer, J. D. McMurrich, T. G. Ferriss, V. E. Taplin, S. Willows, W. Jamieson, J. Harris, and J. S. McLean.

Thomas Meredith & Company, Ltd., Toronto, hardware, capital $40,000; provisional directors, Thomas Meredith, Richard Meredith, and Austin Meredith.

The Essex Light and Power Company, Ltd., of Essex, capital $30,000.

R. Bigley Manufacturing Company, Ltd., Toronto, capital $100,000, stove founders; provisional directors, A. E. Randall, G. M. Mulholland, A. Todd, R. Bigley and J. H. Young.

American Road Machine Company of Canada, Ltd., Goderich, capital $100,000.

The Smith & Travers Diamond Drill Company, Ltd., Sudbury, capital $100,000.

The Canada Refining and Smelting Company, Ltd., Toronto, capital $40,000; provisional directors, A. E. Stevens, of Providence, R.I., E. H. Fairbrother, H. E. Smith, H. T. Smith, and W. J. Elliott.

McLean Temagami Mining Company, Ltd., of Ottawa, capital $1,000,000.

Boston & Ontario Silver Mines Company, Ltd., Toronto, capital $40,000; provisional directors, R. Credicott, W. Gilchrist, C. Y. Spearing, J. Stewart, and G. E. Hancock.

Porcupine Lake Gold Mines, Ltd., Toronto, capital $1,000,000; provisional directors, H. J. Lewis, J. S. McCullough and James Linton.

Wellington Mines, Ltd., Guelph, capital $750,000.

Dominion Limestone Company, Ltd., Port Colborne, capital $50,000.

The Caledonian Gypsum Company, Ltd., Hamilton, capital $150,000.

Cedar Lake Cobalt and Silver Mines, Ltd., Toronto, capital $1,000,000; provisional directors, A. W. Holmested, A. L. Ross, D. L. Brebner, A. R. Bickerstaff, F. H. Potts, W. L. Carr and E. M. Carruthers.

Union Creek Mining Milling Company, Ltd., Peterborough, capital $100,000.

British Columbia.

The following new companies have been incorporated in British Columbia:—

Mission Water, Light & Power Company, Ltd., capital $50,000; to take over the water rights and records of H. Windebank, and to supply the city of Mission with water, etc.

The Buccaneer Bay Mining & Development Company, Ltd. (non-personal liability); capital $500,000; to purchase from the Hunter Syndicate the mineral claims Golden Eagle and Little Wonder, situate in Buccaneer Bay, and on Thormanby Island, and held by the Hunter Syndicate in the names of James A. Muir and James L. Lougheed, and to pay therefor the sum of four hundred thousand shares of the capital stock of the company at par.

The Surrey Nurseries, Ltd.; capital $25,000.

The Sheep Creek Bonanza Mining Company, Ltd., capital $500,000; general mining.

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.

Ontario

FORT WILLIAM.—Tenders for Post Office Fittings will be received until December 30, 1909. Mr. W. T. Rankin, Clerk of Works, Fort William. Napoleon Tessier, Secretary, Department of Public Works, Ottawa.

OTTAWA.—Tenders will be received up to January 5th for six hundred and twenty-four tons of steel plates and shapes required at the Government Shipyard at Sorel, P.Q., delivered free. Specifications and detailed information can be obtained from the Purchasing Agent of the Department of Marine and Fisheries, Ottawa, and from the Director of Shipyard, Sorel, P.Q. G. J. Desbarats, Deputy Minister of Marine and Fisheries. Ottawa.

STRATFORD.—Until Saturday, January 15th, the city of Stratford wants tenders for two electrically-driven turbine pumps of one million and one and a half million gallons capacity. They should be addressed to Mr. J. Davis Barnett, chairman, water commissioners. Mellis Ferguson is city engineer.

TORONTO.—Tenders will be received until Thursday, December 23rd for plumbing, ventilating and metal ceiling work, required in lavatory, Central Building, Department of Education, Toronto. Mr. H. F. McNaughten, secretary Public Works Department.

WHITBY.—Tenders for interior, fittings, Post Office, Whitby, will be received until January 7th. Napoleon Tessier, Secretary, Department of Public Works, Ottawa.

Manitoba

WINNIPEG.—Tenders will be received up to Tuesday, January 18, for removing the present superstructure and furnishing and erecting new steel superstructure and floor, complete, for Louise Bridge across the Red River. Plans, specification and forms of tender may be obtained at the office of Colonel Ruttan, the city engineer. M. Peterson, secretary Board of Control.

Alberta.

MEDICINE HAT.—Tenders will be received until Tuesday, January 4th, for clay products plant, including three high-pressure boilers, 120 horse-power Corliss engine, generator and engine, pumps, pans, elevator, pulley, belting, sewer pipe press, structural steel, 4 horse-power gas engine, four side-dump cars, gap lathe, iron planer, forge and blacksmith tools, 500 horse-power heater and fire hose. Address communications to Warren Overpack, 404 N. Des Moines Street, Webster City, Iowa.

British Columbia

NORTH VANCOUVER.—Tenders will be invited for the construction of a new ferry boat by the North Vancouver Ferry Company which is owned by the city.

U. S. A.

DETRIOT, MICH.—Tenders for furnishing and erecting machinery for a Sewage Pumping Station to be located at the foot of Park View Avenue, Detroit, will be received until the 5th January, 1910. Proposals shall include two centrifugal pumps, capacity 100 cubic feet per second, one centrifugal pump capacity 30 cubic feet per second, engines, motors, boilers and other machinery and apparatus necessary for a complete installation. Jacob J. Haarer, Commissioner.

GUAYAMA, PORTO RICO.—Tenders will be received until January 17th, 1910, for the construction of an earth and gravel dam, to be known as the Patillas Dam and Appurtenant Structures near the town of Patillas, Porto Rico, requiring the excavation of about 726,000 cubic meters of earth, rock and gravel, and the placing of about 2,000 cubic meters of concrete. The estimated cost is about $500,000. Plans and specifications may be obtained from the Commissioner of the Interior, San Juan, Porto Rico, from the U. S. Reclamation Service, Washington, D. C. A deposit of $2.00 is required for the plans, which will be refunded on the return of plans prior to the date set for opening bids. B. M. Hall, Chief Engineer, Porto Rico Irrigation Service. At a later date invitations will be issued for proposals, to be opened at the same time and place on the construction of about 6,000 feet of rock tunneling in connection with this project. Opportunities will be afforded, at future dates, of bidding on the construction of additional dams and canals, estimated to cost abut $1,200,000.

CONTRACTS AWARDED.

Quebec

HULL.—City Engineer R. W. Farley, recommended for consideration the following tenders for the construction and erection of duplex and triplex power pumps, capacity six million United States gallons per day, likewise turbine wheels for operation of same:

Canada Foundry Company, Toronto, $18,000.
John Inglis Company, Toronto, $17,350.
Wm. Hamilton Company, Peterboro, Ont., $14,500.

The contract has not yet been awarded.

MONTREAL.—William Duquette was awarded a contract by the town of St. Louis who received the following tenders for the construction of a subway under the C.P.R. tracks:—W. Duquette, $80,000; Henault & Hefferman, $120,000; the Clinton Company, $187,467. Mentioned in last week's issue.

Ontario.

DUNNVILLE.—Tenders were recently invited for constructing about 18,000 feet of tile sewers, the contractor to furnish all materials. Contract was awarded to the Excelsior Constructing and Paving Company, Limited, of Toronto, at $15,073. Following were the bids received:—$18,186, $24,284, $22,067, $21,083, $20,501, $25,493, $25,327, $15,073, $23,643, $27,862, $21,140. Mr. Willis Chipman, of Toronto, is chief engineer.

HAMILTON.—Contracts for motors and pumps for the Beach pumping plant and the east end Annex sewage disposal works were awarded as follows:—Canadian Westinghouse Company two motors and two transformers for the beach pumping plant, at $16,626, and with the J. McDougall Caledonian Iron Works Company, Montreal, two 6,000,000 gallon pumps $7,220. Westinghouse Company two 3,000,000 gallon pumps for the east end annex sewage disposal works, two small motors and one small transformer for lighting purposes, at $4,065.

LATCHFORD.—The contract for the construction of the Dam and Sluiceways at Latchford has been awarded to Messrs. W. H. Sinclair and D. B. Campbell of West Toronto, Ontario.

TORONTO.—The Factory Products Company have been awarded contracts for the following supplies in connection with the municipal electrical distribution plant:—30-foot poles, @ $2.35 each; 35-foot poles, @ $3.90 each; 40-foot, @ $5.25 each; 45-foot @ $6.50 each; 50-foot, @ $9 each; 65-foot, $11 each; crossarms, $2,462; braces, $2,527; guy wire, $347. The Northern Electric & Manufacturing Company were given a contract for machine bolts at $1,493, while an order was placed with Brazil & Company for 45-foot poles at $6.50, 50-foot poles @ $9, and 60-foot poles @ $14.

TORONTO.—The tenders for roofing have been closed by the National Iron Works in favor of Factory Products, Limited, for asbestos roofing, manufactured by the Canadian H. W. Johns Manville Company, Limited.

TORONTO.—Tenders were received as follows for two steam fire engines for the fire department, each to be of 800 American gallons capacity:—

Waterous Engine Works Co., Brantford, Ont., $10,500.
Canadian Fire Engine Company, London, Ont., $10,280.
American LaFrance Fire Engine Co., Elmira,
New York ..... $11,600.

The contract was awarded to the Waterous Engine Works Company. (Mentioned in last week's issue.)

TORONTO.—For annual supplies, the following tenders were received by the City of Toronto:—

SEWER PIPE; (2 foot lengths)—The Dominion Sewer Pipe Company, of Swansea, Ontario, were awarded the contract at the following prices per foot: for 4 inch, 5 cents; 6-inch, 6 1/5 cents; 9-inch, 13 4/5; 12-inch, 23 cents; 15-inch, 30 cents; 18-inch, 39c.; 24-inch, 81 cents; for 1 foot lengths: 6-inch, 8c. per foot; 9-inch, 17c. per foot. Other tenders were:—For 2 ft. lengths, per foot—4-inch, 6c.; 6 inch, 10c.; 9-inch, 21c.; 12-inch, 35c.; 15-inch, 47¼c.; 18-inch, 59½c.; 24-inch, $1.13¾; for one-foot lengths: 6-inch, 10c.; 9-inch, 21c.

CURVES, ELBOWS AND BENDS:—

6-in., ¼, each.	6-in., ⅛, each.	9-in., ¼, each.	9-in., ⅛, each.	12-in., ¼, each.	12-in., ⅛, each.
cts.	cts.	cts.	cts.	$ c.	$ c.
*27½	*27½	*60	*60	*1 00	*1 00
38½	38½	84	84	1 40	1 40

*Prices of Dominion Sewer Pipe Company, who received contract.

LUMBER—Pine lumber, hemlock lumber.

1-in., per 1,000 ft.	2-in., per 1,000 ft.	3-in., per 1,000 ft.	1-in., per 1,000 ft.	2-in., per 1,000	3-in., per 1,000 ft.
$	$	$	$	$	$
23 37	22 37	25 37	18 37	18 37	20 37
22 69	22 97	26 73	21 97	21 97	22 97

Contracts for lumber were given to Reid & Company, and the Gall Lumber Company, for lowest price in each instance.

LEAD PIPE.—Per 100 lbs.

⅜-inch.	½-inch.	⅝-inch.	¾-inch.	1-inch.
$ c.	$ c.	$ c.	$ c.	$ c.
5 29	5 29	5 29	5 29	5 29
5 35	5 35	5 35	5 35	5 35

Contract awarded to the James Robertson Company. at $5.29.

BRASS AND BRONZE CASTINGS.—Per lb.

Phosphor Bronze.	Tobin Bronze.	Brass Castings.	Babbitt, A 1 quality.
cts.	cts.	cts.	cts.
18½	20	18	8
19	25	18¼	12½
20	..	18	..

Contract awarded to No. 1, the Canada Metal Company.

CAST IRON PIPE—12-inch—Awarded to Canada Foundry Company, Toronto, at $16.75 a length.

LIMESTONE DUST: f.o.b. cars, C. P. Railway, per ton, $4.90, $5.55, $5.40—awarded to Eureka Dust Company, @ $4.90.

HYDRANTS, &c.:—

	No. 1.	No. 2.
3 way hydrants	$44.90	$42.00
2 " "	42.20	39.70
Frost jackets (additional)	5.80	8.00
3-foot pipes (additional)..	7.00	10.00

Contracts awarded as follows: Hydrants, Canada Foundry Company (No. 2); additional frost jackets and additional 3-ft. pipes, Canada Steam Pump and Machine Company (No. 1).

SPECIAL CASTINGS.—$2.35, $2.10, $2 per 100 lbs., to Reid & Brown, of Toronto, at $2.

PORTLAND CEMENT:—

Brand	In Barrels Per 350 lbs. net.	In Sacks Per 350 lbs. net.
	$ c.	$ c.
Star or Lehigh	*1 98	*1 98
Superior	.....	1 62½
National, etc.	....	1 57
Maple Leaf	.....	1 75
City Engineer	.....	1 70

*Including 4 sacks at 10c. each; this amount allowed for all sacks returned.

Tender No. 3, from the National Portland Cement Co., of Durham, Ontario, at $1.57 per 350 lbs. net was accepted.

SEWER BRICKS.—Per 1,000.

East of Don.	Between Don and Bathurst St.	West of Bathurst St.
$ c.	$ c.	$ c.
10 50	10 00	12 00
10 25	9 50	9 50

The contract for the entire supply of sewer bricks was awarded to the Port Credit Brick Co. (tender 2), being the lowest throughout.

SAND FOR ASPHALT PURPOSES.—Per cubic yard, 95 cents, 95 cents, 85 cents, *40 cents, $1.00.

*Foot of Spadina Avenue loaded in waggons.

The contract was awarded to the Sand & Dredging, Limited, at 85 cents.

ROUGH RUBBLE STONE.—F.O.B. Cars, G. T. Railway, per ton $1.10. Awarded to Britnell & Company, Ltd.

Manitoba.

WINNIPEG.—The Norcross Company, of New York, have been awarded the contract for the Bank of Montreal building, Winnipeg. The same company built the main body of the Montreal building, and have done extensive work in other cities for the bank. They were the lowest tenderers. The contract price will involve an expenditure of about $1,250,000.

WINNIPEG.—The Stuart Machinery Company of Winnipeg have just supplied two large boilers to J. D. McArthur for his 12-story office building. These large internal furnace boilers are 250 h.p., and weigh 45,000 pounds each. They are 9 feet, 6 inches in diameter and 16 feet, 4 inches long. The shell is ⅞ths of an inch thick and the boilers are tested to 240 pounds pressure.

Alberta

CALGARY.—The commissioners have opened the tenders for the six new street cars and again find the Ottawa and Preson Car companies the lowest. The tenders were as follows:—

	Preston Car Co.	Ottawa Car Co.
Bodies	$2,175	$2,396
Trucks	763	749
Air brakes	522	540
Scrapers	30	28
Fenders	52	49

U. S. A.

ALBANY, N. Y.—The itemized bids received by F. C. Stevens, Superintendent Public Works, for Contract No. 54, for constructing Lock No. 7 at Fort Edward; Contract No. 69, for constructing in the Hudson River Lock No. 2 below Mechanicville, together with all appertaining construction; Contract No. 72, for dredging a channel in the Hudson River and performing work incident thereto from Lock No. 2 to Lock No. 4, a distance of 4.1 miles; and Contract No. 2E, for completing the construction of the canal from the Mohawk River at Waterford to a point about one-fourth of a mile above the head of Lock No. 3, were as follows: Contract No. 54—(A) Engineer's estimate; (B) Scott Bros., Baldwinsville, N. Y., who were the only bidders. (Awarded contract.)

	(A)	(B)
45,600 cu. yds. excavation	$0.30	$0.36
2 M. ft. B. M. sheeting and bracing, per M. ft.....	50.00	50.00
11,300 cu. yds. forming embankment..	.15	.18
1.1 M. ft. B. M. sawed lumber (yellow pine or Douglas fir, per M. ft.	50.00	55.00
16 M. ft B. M. sawed lumber in needles, per M. ft.	100.00	100.00
6.8 M. ft. B. M. white oak lumber in miter sills, lock gates and buffer blocks, per M. ft.	100.00	120.00
60,600 lin. ft. foundation piles, 16 to 30 ft. long	.25	.25
130 lin. ft. mooring piles, 20 ft. long	.30	.32
225 M. ft. B. M. wooden sheet piling, per M. ft.	50.00	50.00
21,700 cu. yds. second-class concrete..	6.00	6.40
600 cu. yds. wash wall	2.50	2.50
240 cu. yds. second-class rip-rap...	2.75	2.75
3,660 cu. yds. third-class rip-rap.....	2.50	2.50
7,200 lbs. structural steel	.045	.05
376,000 lbs. metal reinforcement	.035	.0375

9,800 lbs.	steel castings	.045	.05
7,300 lbs.	iron castings, machined...	.08	.08
250 lin. ft.	wrought iron pipe, 3 ft. diam.	.40	.40
480 lin. ft.	wrought iron pipe railing	1.00	1.10
200,000 lbs.	metal in lock gates.....	.05	.055
92,000 lbs.	metal in buffer beams.....	.055	.06
25,000 lbs.	metal in lock valves	.08	.09
	Coffer-damps, pumping, bailing and draining (lump sum)	15,000.00	18,000.00
	Totals	$232,908	$250,590

RAILWAYS—STEAM AND ELECTRIC.

Ontario

LONDON. — The formal transfer of the Southwestern Traction line to the recent purchasers was made last week. The following committee of directors are to manage the line: Messrs. Murray N. Verner of Pittsburg and Brantford, W. S. Dinnick, W. K. George, George B. Wood, S. C. Smoke, Toronto; T. H. Purdom, K.C., and John Milne, London. The former manager, Mr. S. B. Mower, is retained in the same position. It is stated that $150,000 will be spent in correcting grades, improving curves, and purchasing new cars.

OTTAWA.—The Minister of Railways, has given his approval to the following general route maps in the West:—C. P. R. Alderside branch. G. T. P. from Apollon main line west of Pembina river, crossing southwesterly towards the headwater of Little Pembina River, Alberta. Pacific Northern and Omineoa railway, from Edmonton northwesterly to the boundary between Alberta and British Columbia. Canadian Northern railway, revision of route of Oak Point extension, Manitoba. G. T. P. amended general location between Edmonton and Prince Rupert. C. P. R. Sedgwick and Ellerslie branch. C. N. R. Crooked Lake branch.

WINDSOR.—The Sandwich, Windsor & Amherstburg Railway will probably place contracts in a few days for two 500 k.w. three-phase, direct connected alternators and two 750 h.p. engines. James Anderson, general manager.

Alberta

EDMONTON.—The Grand Trunk Pacific bridge over the Pembina river will be completed by December 20th, in readiness for the laying of the steel. The bridge which is being erected by the Canadian Bridge Works, of Walkerville, is practically completed this week and there remains only the finishing touches before it will be possible for trains to cross. The track laying machine, which has been working on the Melville branch, will be put to work at once laying steel from the Pembina to the McLeod river, where two other larger bridges are in course of erection.

British Columbia.

NEW WESTMINSTER.—The British Columbia Electric Railway will open their Fraser River Valley Line as far as Cloverdale about December 20th. The distance is about 12 miles.

VANCOUVER.—The British Columbia Electric Railway Company are considering the expenditure of $200,000 for cars, locomotives, etc., early next year, according to general manager Sperling.

VICTORIA.—Wade, Wheeller & McQuarrie give notice in the British Columbia Gazette of intention to apply for incorporation for a company with power to build, and operate a railway, commencing at Port Moody, for 20 miles. Davis, Marshall & Macneill ask for the same power for a company regarding a proposed line commencing near where the Salmon river crosses the international boundary line, between British Columbia and Alaska; thence following the Salmon river to its source.

LIGHT, HEAT, AND POWER

Ontario.

BELLEVILLE.—On January 7th the ratepayers will vote on a by-law to authorize an agreement between the Trenton Electric and Water Company, Ltd., and the corporation of Belleville.

Alberta

CALGARY.—On Saturday, December 18, tenders closed with Smith, Kerry & Chace, consulting engineers, for the erection of a sub-station at Horse Shoe Falls, for the Calgary Power and Transmission Company.

FINANCING PUBLIC WORKS.

The following municipalities recently sold debentures:—

Cardston, Alta.—$5,440, local improvements.
Osgoode Township, Ont.—$7,456, drainage.
Roxborough Township, Ont.—$11,681, drainage.
Dover Township, Ont.—$11,026, drainage.
Strathroy, Ont.—$20,000, sidewalks.
Midland, Ont.—$12,000, sidewalks and sewers.

Ontario

WALLACEBURG.—The ratepayers will vote on two by-laws in January, one to borrow $20,000 for the erection of a new public schoo and the other for local improvements, such as granolithic walks.

LONDON.—The ratepayers will vote on a $60,000 sewerage by-law.

BRACEBRIDGE. — Tenders for $45,000 electric light plant debentures are invited until December 21st. Alex. C. Salmon, Treasurer.

Manitoba

STE. ANNE.—The ratepayers will vote on a by-law to issue $20,000 debentures for roads and bridges. J. A. Lacerte is secretary-treasurer.

Saskatchewan

BATTLEFORD.—A by-law to provide $5,000 for an electric light pole line extension will be voted on shortly.

PERSONAL NOTES.

MR. McCULLOUGH, city electrical engineer of Vancouver, B.C., has resigned.

MR. D. M. DUNCAN has resigned from the position of registrar of the Manitoba University to accept the Principalship of one of the Winnipeg Collegiates.

OBITUARY.

MR. WALLACE BELL, president of the Wallace Bell Drilling Company, of Montreal, died recently. Prior to moving to Montreal Mr. Bell had been engaged in drilling operations at Petrolea. During his career he was connected with some very important drilling contracts, one of the largest being for the sinking of a shaft to a depth of 2,600 feet for the Laprairie Brick Company.

PATENTS.

The following is a list of Canadian patents, granted on December 7, 1909, by the Canadian Patent Office to Canadians in Canada, and furnished by Fetherstonhaugh & Company, 5 Elgin Street, Ottawa, Canada, Russel S. Smart, resident, from whom information concerning the same may be obtained:—

R. Armstrong, Victoria, B.C., compressed air signals. J. Pattison, Prescott, Ont., thermo electric alarms. Redington, Cobalt, Ont., air or steam rock drills. F. C. Simson, Halifax, N.S., illuminating signs.

Below will be found the list of patents granted in Canada, furnished by Fetherstonhaugh & Company, Toronto:—

T. C. Mussen, Toronto, Ont., vehicle tires; J. Muir, Brantford, Ont., traction engines; A. Baillott, Montreal, Quebec; furnace grates; T.. Clouston, Vancouver, B.C., gas producers; D. L. Davies, Montreal, Que., nut locks; N. Lang, Vancouver, B.C., railway track indicator; A. O. Lavoie, Montreal, Que., hydraulic motors; R. Maw, Montreal, Que., car-stopping devices; W. C. Mitchell, Sydney, N.S., centrifugal drying machine; W. W. Salter, Toronto, Ont., flue doors; T. G. Thorne, Vancouver, B.C., wrenches; C. W. Vollman, Montreal, Que., insulating compounds; J. Veno, Vancouver, B.C., screw presses.

COMING MEETINGS.

Canadian Society of Civil Engineers.—Annual meeting at Ottawa, Ont., January 25th, 26th, 27th, 1910. Mr. C. H. McLeod, secretary, 413 Dorchester Street West, Montreal, Canada.

American Society of Civil Engineers.—January 19-20. Annual meeting at New York City. Secretary, Charles W. Hunt, 220 West 57th Street, New York City.

Illinois Society of Engineers and Surveyors.—January 26-28. Annual meeting, Cairo, Ill. E. R. Tratman, secretary, 1636 Monadnock Block, Chicago, Ill.

Connecticut Society of Civil Engineers. — February 8. Annual meeting, New Haven, Conn. J. Frederick Jackson, secretary, Box 1304, New Haven, Conn.

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

SOCIETY NOTES.

Engineers' Club, Toronto.—The officers for 1910 were elected at the annual meeting of the Engineers' Club last Thursday evening as follows: Hon. President, Professor Galbraith, School of Practical Science; president, Mr. Willis Chipman, 103 Bay Street; first vice-president, Mr. C. M. Caniff; second vice-president, Professor R. W. Angus; chairman library committee, Mr. W. Almon Hare; chairman rooms committee, Mr. W. V. Reynolds; chairman papers committee, Mr. C. R. Young, B.A.Sc.; treasurer, Mr. L. J. Street, 37 Melinda Street; secretary, Mr. R. B. Wolsey, 25 Lowther Avenue.

Engineering Society, Queen's.—The Engineering Society of Queen's University, Kingston, held their thirteenth annual dinner on December 15th, 1909. The attendance was large, the speeches bright and the guest list representative. After the toast to the King had been received Principal Gordon proposed Our Country. He reviewed briefly the history of Canada, pointing out that in overcoming natural, political and social difficulties Canadians had developed a strong national life.

Mr. M. J. Butler, Deputy Minister of Public Works, Ottawa, was the first to reply. Mr. Butler referred to the place of the engineer in nation building and referred to transportation as the present great Canadian problem.

Colonel Crowe, commandant of the Royal Miltiary College, Kingston, also replied and outlined the engineers place in defence. The name of W. R. Givens, B.A., editor of the Standard was also coupled with this toast. To his mind Canada's present task was a task of assimilation. A correct solution of our labour problems was our salvation.

The University was proposed by Mr. Charles Macdonald, B.A., past president of the American Society of Civil Engineers, and replied to by Dr. Jordan of Queen's.

In proposing the Profession, Mr. L. W. Gill referred to the desirability of engineers taking a more prominent place in the social and political life of a country. He also thought the engineer should enter the field of management in industrial corporations.

In reply R. W. Brock, Director Geological Survey of Canada; H. E. T. Haultain, Professor of Mining, Toronto University; C. H. O. Pook, Canadian Westinghouse, Hamilton, Ont., and R. H. Seely, Hamilton, Ont.

The Faculty were proposed by Mr. A. M. Bateman, and responded to by Dr. Goodwin and Professor MacPhail. Sister Institutions were proposed by Mr. K. S. Clarke, and replied to by Mr. W. J. Walker for the Students in Engineering Toronto and representatives of McGill and R.M.C.

Canadian Society of Civil Engineers, Montreal.—A very interesting meeting of the Canadian Society of Civil Engineers was held last Thursday night in their assembly rooms on Dorchester Street, Montreal. Mr. A. D. Swan, M. Can. Soc. C.E., resident engineer of the harbour of Montreal, delivered a paper on the new King Edward Docks at Avonmouth, Bristol, where he was resident engineer on construction. The lecture, which was fully illustrated by lantern slides, provided those present with an excellent idea of the vastness of the undertaking. Mr. Swan stated that a large area of land had been reclaimed and was now being used for railway terminals and industrial purposes. The first work undertaken was that of sinking trial cylinders to ascertain the nature and extent of the excavations necessary. The lecturer pointed out the great variation in tide levels, and how this natural difficulty was overcome by the construction of temporary dams. He explained the process of rock breaking under water, without explosives, and described the main features in connection with the construction of the west dock walls of the entrance piers and the concrete monolith structures, of the pier head monoliths, entrance locks, graving dock with its elaborate system of culverts and sluices, lighthouses, railway terminals, lock-gates of iron and steel, which are the largest in the world, and the mechanism known as the boom relieving chain protection for lock-gates, which prevents ships from running into and destroying the gates. After the lecturer had dealt with the constructive principles of this great work, he described the equipment of the dock, and finished his discourse with a reference to the materials used in construction, and the relative merits of each. He said that the cost of the entire undertaking was about $15,000,000, and this, he maintained, was about one-half of what the work would have cost in America. The opening ceremony was performed by Their Majesties, King Edward and Queen Alexandra. After the lecture, a discussion followed, in which Mr. John Kennedy, Mr. F. W. Cowie, and Mr. J. A. Jamieson took part, the latter taking an opposite view to the speaker, regarding the possible cost of such a work in Canada. Mr. Cowie referred in complimentary terms to the work of the speaker in his capacity of resident engineer of the works at Avonmouth. Mr. John Kennedy, consulting engineer of the Montreal Harbour Board, explained why, in a new country like Canada, it was not advisable to build too much of a permanent character, on account of the changing avenues of trade, and the generally unsettled state of the country. At the conclusion of the meeting a hearty vote of thanks was tendered Mr. Swan by the chairman, Mr. Ernest Marceau, and it was decided to continue the discussion by correspondence, to be incorporated in the reports of the society.

Builders' Exchange, Winnipeg.—The annual meeting of the Winnipeg Builders' Exchange was held Wednesday and besides the election of officers for the ensuing year, matters of future policy were discussed. It has been decided to secure a central site and erect a fine structure to be known as the Builders' Exchange Building. The meeting was largely attended, and there was great enthusiasm. William H. Carter, of the Carter, Halls, Aldinger Company, was re-elected president, the meeting complimenting him highly on his work during the last year. It was pointed out that when he took office in December 1908 the exchange had only 100 members, and that now its membership was 303. F. H. Davidson was elected first vice-president. Thomas Kelly, of Thomas Kelly & Sons, was elected second vice-president, T. D. Robinson, treasurer, and J. H. Buxton was reappointed secretary. The following directors were re-elected by acclamation for a three-year term: W. P. Alsip, J. W. Morley, H. C. McMartin, Charles S. Shipman.

Guild of Civic Art, Toronto.—At the annual meeting, held in Toronto, December 21st, 1909, the following officers were elected for the ensuing year: President, Mr. John A. Ewan; first vice-president, Mr. K. J. Dunstan; second vice-president, Mr. C. H. Mitchell; executive committee, Messrs. H. C. Cox, J. P. Hynes, T. C. Irving, junr., Ford Howland, F. B. Fetherstonhaugh, J. B. O'Brien, Edmund Burke; treasurer, R. J. Dilworth, and secretary, W. S. Armstrong.

Central Railway and Engineering Club, Toronto.—The regular monthly meeting of the Central Railway and Engineering Club of Canada was held at the Prince George Hotel, Toronto, last Tuesday night. The business of the evening consisted of an address on "The Manufacture of Commercial Gas," by Mr. C. J. Herring, chief draftsman, Consumers' Gas Company, and the election of officers for the ensuing year. Mr. C. A. Jefferis, the retiring president, occupied the chair. About fifty members attended. The following were elected officers: President, Mr. J. Duguid, general foreman G.T.R.; first vice-president, Mr. G. Baldwin, general yardmaster Canada Foundry Company; second vice-president, Mr. J. Bannon, chief engineer, City Hall, all of Toronto; executive committee, Messrs. C. A. Jefferis, master mechanic Consumers' Gas Company; W. R. McRae, master mechanic Toronto Railway; O. A. Cole, A. M. Wickens, chief engineer Canadian Casualty and Boiler Insurance Company; A. E. Till and A. Taylor of Toronto, and Mr. Patterson of Stratford.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

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

8819—December 3—Extending until the 1st of June, 1910, the time within which the Canadian and Dominion Express Companies may file tariffs of tolls to be charged for the carriage of goods are temporarily approved.

8820—December 2—Dismissing complaint of Wagstaff, Limited, of Hamilton, Ontario, that the rate of $1.20 per hundred pounds charged by the Dominion Express Company on shipments of black currants from Montreal to Hamilton is excessive and discriminative as compared with the rate of eighty cents per 100 lbs. charged on like shipments from Hamilton to Montreal.

8821—December 3—Extending until the 1st of June, 1910, the time within which the National and American Express Companies may file tariffs of tolls to be charged for the carriage of goods, are temporarily approved.

8822—December 3—Extending until 1st June, 1910, the time within which the Maritime Express Company may file tariffs of tolls to be charged for the carriage of goods, with the Board.

8823—December 4th—Authorizing the C.P.R. to open for the carriage of traffic the second track of the Ontario and Quebec Railway, Smith's Falls Section, from Vaudreuil to St. Lazare, also from mileage 44.9, just west of Dalhousie Mills, to mileage 48.6; and from mileage 48.8 to Avonmore.

8824—December 2—Extending until 1st June, 1910, the time within which the United States and the Great Northern Express Companies may file with the Board tariffs of tolls to be charged for the carriage of goods.

8825 and 8826—December 2—Authorizing the corporation of the city of Hamilton, Ont., to lay sewer under the track of the Hamilton Radial Electric Railway at Lot 7, First Concession Township of Barton, County Wentworth, Hamilton, Ont., also under the track of the Toronto, Hamilton and Buffalo Railway at Lot 8, First Concession Township of Barton, County Wentworth, Hamilton, Ont.

8827—December 6—Authorizing the G.T.P. Railway to cross, at grade, Pheasant Hills Branch of the C.P.R. in Sec. 13, Tp. 21, R. 12, west of the 2nd Mer., Balcarres, District Assiniboia, Sask.

8828—December 4—Authorizing the C.P.R. to construct, maintain, and operate spur line to serve the Continental Oil Company and the Canadian Petrified Brick & Stone Company at Winnipeg, Man.

8829—December 6—Authorizing the corporation of the city of Hamilton, Ont., to lay and thereafter maintain sewer under the track of the Northern and North Western Division of the G.T.R. on Lot 7, 1st Con. Tp. of Barton, County Wentworth, Hamilton, Ont.

8830—December 4—Granting leave to the Manitoba Government Telephones to erect, place and maintain its telephone wires across the track of the C.N.R. at public crossing near Bethany, Man.

8831 and 8832—December 4—Granting leave to the North Huron Telephone Company to erect, place, and maintain its wires across the track of the G.T.R. at private crossing on farm of T. M. Henderson, 1st Con. Tp. of Morris near Wingham Station, Ont., (half mile east), and at public crossing 1¼ miles east of Wingham Station, Ont.

8833 to 8837 Inc.—December 4—Granting leave to the Board of Light and Heat Commissioners of Guelph, Ont., to erect, place, and maintain its wires across the C.P.R. at three points and the G.T.R. at two points in the city of Guelph, Ont.

8838—December 7—Authorizing the Temiscouata Railway Company and the Transcontinental Railway to operate their trains where the Temiscouata Railway crosses the Transcontinental Railway at a point about 12.2 miles west from the town of Edmunston, N.B.

8839—November 16—Authorizing the Town of St. Louis, P.Q., to carry its highway under the track of the C.P.R. at St. Lawrence Boulevard in said town.

8840—December 4—Granting leave to the Bell Telephone Company to erect, place, and maintain its underground wires across the track of the Hamilton Radial Electric Railway about two miles east of Burlington, Ontario.

8841—December 4—Authorizing the C.P.R. to construct, maintain, and operate an industrial spur for the Riordon Paper Mills, Limited, at mileage 95.16 from St. Therese, Co. Labelle, P.Q.

8842—December 4—Authorizing the Toronto, Hamilton, & Buffalo Railway to construct, maintain, and operate two branch lines of railway or spurs in the north-east part of the city of Hamilton, Ont.

8843—December 4—Authorizing the C.P.R. to construct, maintain, and operate an industrial spur in the city of Lethbridge, Alta.

8844 and 8845 Inc.—December 7—Granting leave to the Bell Telephone Company to erect, place, and maintain its wires across the track of the G.T.R. near Callander Station, Ont., and near New Toronto, Ontario.

8846—December 7—Granting leave to the Port Hope Telephone Company to erect, place, and maintain its telephone wires across the track of the G.T.R. at Newcastle Station, Newcastle, Ont.

8847—December 6—Directing that the Toronto Suburban Railway install and maintain, at its own expense, derails in their tracks at crossing with G.T.R. at Davenport Road, Tp. of York, Toronto, Ont.

8848—December 7—Authorizing Quebec Railway, Light and Power Company to cross with its tracks, tracks of C.P.R. at St. Valier Street, Quebec, P.Q.

8849—December 7—Approving location of C.P.R. Company's station at Grassy Lake, Alta.

8850—December 2—Directing the G.T.R. to install distant semaphore at crossing with Galt, Preston, and Hespeler Railway Company, at rail level, Hespeler, Ont.

8851—November 24—Authorizing the corporation of city of Saskatoon, Sask., to carry Saskatchewan Drive under bridge of C.N.R., Saskatoon, Sask.

8852—December 7—Approving stress sheets of G.T.R. for proposed renewal of viaducts near Tansley & Stewarton, Ont.

8853—December 7—Authorizing the Erie Telephone Company to place its wires across the track of the G.T.R. two miles west of Canfield, Ont.

8854—December 7—Authorizing the corporation of the city of Toronto, Ont., to lay sewer under C.P.R. on Huron Street.

8855—December 7—Authorizing the Bell Telephone Company to place its aerial wires across the telegraph lines of the G.T.R. two miles east of Burlington Junction Station, Ont.

8856—December 6—Authorizing the G.T.R. to construct proposed bridge over Ham's Creek, near Ernestown Station, Ont.

8857—December 3—Directing the C.P.R. to provide and construct suitable highway crossing at Murray Street, town of Sault Ste. Marie, Ont.

8858 and 8859—December 10—Authorizing the Ontario Power Co. of Niagara Falls, Ont., to erect its wires across the G.T.R. at Lot 28, in Thorold Township, Welland County, Ontario; also at Lot 29, Thorold Township, Welland County, Ontario.

8860—December 10—Directing that all railways subject to the jurisdiction of the Board where shippers are compelled to supply car doors to enable cars to be used for traffic, make allowance therefor to such shippers be made upon the following basis; (a) At and west of Fort William, lower car door, $1; upper car door, 50 cents; (b) East of Fort William, upper or lower car door, each 50 cents.

8861—December 2—Authorizing the C.N.O. Railway to carry its proposed line of railway under tracks of G.T.R. near Scarboro Junction, Ont.

8862—December 9—Approving proposed bridge of Atlantic, Quebec and Western Railway Company over Grand Pabos Gully, at mileages 41 and 40.8.

8863—December 9—Authorizing the C.P.R. to construct industrial spur for the Western Canada Timber Company at mile 29.5 north from Lardo, Kootenay District, B.C.

8864—December 9—Authorizing the C.P.R. to construct industrial spur at Gerrard Station, Kootenay District, B.C.

8865—December 10—Approving and sanctioning location of the C.P.R. Company's revision in a portion of its Kininvie Branch.

8866—December 10—Approving and sanctioning location of the C.N.O. Railway line at Greenwood, Township Pickering, Ontario County, Ontario.

8867—December 10—Directing that the P.M.R.R. erect suitable fences along its railway where the same crosses near Cedar Springs, Raleigh Township, Kent County, Ont.

8868—December 10—Authorizing the G.T.P. Railway to construct its railway across highways between Secs. 35 and 34, and 34 and 33, Tp. 52, R. 27 west 4th Mer., District of North Alberta, Alta.

8869 to 8875 Inc.—December 10—Authorizing the Manitoba Government Telephone System to erect its wires across the track of the C.P.R. at seven points in Province Manitoba.

8876 and 8877—December 10—Authorizing the Bell Telephone Company to erect its wires across the track of the G.T.R. at West and Market Streets, Brantford, and at public crossing 1¼ miles north of Whitby Station, Ont.

8878—December 11—Approving and sanctioning C.N.R. Company's location of line through Township 5, R. 7-11, west of 2nd Meridian, Sask.

8879—December 10—Directing that the trains of the C.P.R. and P.M.R.R. may operate their trains over interlocker installed at Walkerville Junction, Ont.

8880—December 10—Authorizing the C.P.R. to construct industrial spur for Messrs. Andrews & Son, Winnipeg, Man

8881—December 10—Authorizing the C.N.O. Railway to construct bridge over Rouge River, Scarboro Township, York County, Ont.

8882—December 10—Authorizing the C.P.R. to construct branch line on its Westminster Branch, near Westminster Junction, B.C.

8883—December 9—Authorizing the C.P.R. to construct industrial spur at mileage 86 from Lethbridge, on its Crow's Nest Branch.

8884—December 11—Authorizing the Dominion Natural Gas Company, Limited, to lay gas main under track of G.T.R. at Maple Street, Simcoe, Ont.

8885—December 11—Authorizing Dr. A. L. Russell, of Bailieboro, to erect private telephone wires across track of G.T.R. at Fraserville, Ont.

8886 and 8887—December 11—Authorizing the Government of the Province of Alberta to erect its wires across the track of the C.P.R. at Camrose, Alta., and Sedgewick, Alta.

8888—December 11—Authorizing the Bell Telephone Company to erect its wires across the track of the G.T.R. at public crossing 2½ miles south of Harriston Station, Ont.

8889—December 13—Authorizing the C.N.R. to cross with its Goose Lake Branch the track of the G.T.P. Railway near Saskatoon, Sask.

8890—December 13—Authorizing the C.N.R. to cross with its line the track of the C.P.R. near Bienfait, Sask.

8891—November 22—Authorizing the Ontario Power Company to cross with its transmission line the track of the M.C.R.R. at Lots 174 and 175, Stamford Tp., Ont.

8892—December 11—Authorizing the C.N.O. Railway to construct bridge over Dixie Creek, Pickering Tp., Ont.

8893—December 11—Authorizing the C.N.O. Railway to construct proposed bridge over Greenwood Creek, Pickering Township, Ontario County, Ont.

8894—December 11—Authorizing the C.N.Q. Railway to construct its lines and tracks across public crossing on Lot 408, St. Marc Parish, Portneuf Co., P.Q.

8895—December 11—Authorizing the Canada Atlantic Railway to reconstruct bridge across River St. Lawrence, between Giroux Island and Isle aux Seines.

8896—October 17—Approving crossings of the C.P.R. at Blackstone Road, Moor's Road, Gough's Road, mileages 118.09; 119.67 and 120.25, and Portage Bay Road, mileage 123.21.

8897—December 11—Amending Order No. 2139, December 6th, 1906, which approved the form, size, and style of the tariffs of telephone tolls by striking out clause "a" and substituting following:—(a) That the tariffs of telephone tolls hereafter filed with the Board be printed on sheets, or in books, uniform in size, viz.:—Long distance tariffs, 10 inches in length and 7¼ inches in width; all other tariffs and rate sheets, 10¾ inches in length and 8¼ inches in width.

8898—December 13—Authorizing the C.P.R. to divert Hamilton St., city of Regina, Sask.

8899—December 14—Authorizing the C.N.O. Railway to construct proposed bridge over public crossing and creek, Lot 13, Con. 3 and 4, Tp. Whitby, Ont., County Ontario.

8900—December 13—Approving plan of proposed subway at intersection of Albert St., Regina, Sask.

8901—December 14—Authorizing the corporation of the city of Brantford, Ont., to lay sewer under track of G.T.R. across West Street, Brantford, Ont.

8902—December 13—Authorizing C. S. Hyman & Company, of London, Ont., to lay heating pipes on Richmond Street under track of C.P.R.

BOOK DEPARTMENT

Address: THE CANADIAN ENGINEER, 62 Church St., TORONTO.

Cash must accompany order. Give name of Book and Author, and we can furnish any book published. The list below is especially recommended. All books sent by mail free for price named, unless otherwise stated.

SANITARY SCIENCE.

WATER-FILTRATION WORKS. By James H. Fuertes, 12mo, xviii + 283 pages, 45 figures and 20 half-tone plates. Cloth, $2.50. Contents.—Introductory. Intakes, Sedimentation, and Settling Basins. The Purification of Water by Slow Sand-filtration. The Design, Construction, and Operation of Slow Sand-filters. The Purification of Water by Rapid Sand-filtration. The Construction and Operation of Rapid Sand-filters. Filtered-water Reservoirs.

DISPOSAL OF MUNICIPAL REFUSE. By H. de B. Parsons, Consulting Engineer, 8vo, x + 186 pages, 73 figures, mostly half-tones. Cloth, $2.00. Contents.—Foreword. Conditions. Waste Materials. Collections. Methods of Disposal. Reduction and Incineration. Economics. Snow Removal. Practical Incineration. Tables: Classification of City Wastes. Unburned Coal in Steam-ash. Analyses of Household Ash and Mixed Ashes. Analyses of Garbage. Composition of Rubbish. Composition of Street-sweepings. Annual Collection of City Refuse in Tons. Collections of City Refuse in Pounds per Capita. Average Collections per Capita per Day. Approximate Calorific Value of Refuse.

METHODS AND DEVICES FOR BACTERIAL TREATMENT OF SEWAGE. By William Mayo Venable, 8vo, vi + 236 pages, 43 figures. Cloth, $3.00. Contents.—Introduction. Sources of Information about Sewage Purification. Aerobic Treatment of Crude Sewage. Mechanical Removal of Sludge. Anaerobic Treatment of Sewage. Intermittent Contact Systems. Automatic Discharging Devices. Percolating Filters. Summary of Engineering Principles regarding the Design of Sewage Purification Works. Difficulties experienced in some Actual Installations. Suggested Designs to Meet Typical Conditions.

THE FILTRATION OF PUBLIC WATER-SUPPLIES. By Allen Hazen. Third Edition, Revised and Enlarged, 8vo, xii + 321 pages, fully illustrated with line and half-tone cuts. Cloth, $3.00. Contents.—Introduction. Continuous Filters and Their Construction. Filtering Materials. Rate of Filtration and Loss of Head. Cleaning Filters. Theory and Efficiency of Filtration. Intermittent Filtration. Turbidity and Color, and the Effect of Mud Upon Sand-filters. Coagulation of Waters. Mechanical Filters. Other Methods of Filtration. Removal of Iron from Ground-waters. Treatment of Waters. Water-supply and Disease. Appendices (eleven) and Index.

WATER-SUPPLY ENGINEERING. The Designing, Construction, and Maintenance of Water-supply Systems, both City and Irrigation. By A. Prescott Folwell. Second Edition, Revised and Enlarged, 8vo, xiv + 570 pages, illustrated with 95 figures and 19 full-page plates. Cloth, $4.00. Contents.—Part I.—Designing. Synopsis. Requisites of a Supply—Quality. Requisites of a Supply—Quantity. Sources of Supply. Rainfall. Surface-water. Rivers and Lakes. Ground-water. Gravity Systems. Pumping Systems. Hydraulics. Dams and Embankments. Purification of Water. Pumping and Pumping-engines. Designing. Part II.—Construction. Supervision and Measurement of Work. Practical Construction. Part III.—Maintenance. Reservoirs, Head-works, and Intakes. Pumping-plants and Filters. Pipes and Conduits. Clerical and Commercial.

SEWER DESIGN. By H. N. Ogden, C.E., Assistant Professor of Civil Engineering, Cornell University, 12mo, xi + 234 pages, 54 figures, 5 plates. Cloth, $2.00. Contents.—General Considerations. Preparatory Maps and Data. Excessive Rains—Proportion Reaching the Sewers. Relation of Density to Percentage. Mathematical Formulae. Estimating Future Population. Amount of Sewage per Capita. Ground-water Reaching Sewers. Grades and Self-cleansing Velocities. Developments of Formulae for Flow. Kutter's Formula. Sewer Diagrams. Use of Diagrams. Sewer Plans. Sewer Cross-sections. Flushing. Use of Tanks.

SEWAGE AND WATER, THE PURIFICATION OF. By W. J. Dibdin, F.I.C., F.C.S., etc., formerly Chemist to the London County Council. Third Edition. Re-written and considerably Enlarged, With additional Tables, Illustrations, and Diagrams. 379 pages. Demy 8vo. $6.00. Synopsis of Contents.—General Considerations. Antiseptics, or Preservation for Limited Periods; Bacteriological Methods. Precipitation. Experiments at Massachusetts and London. Sutton Experiments. The Septic Tank and other Systems. Land Treatment v. Bacteria Beds. Manchester Experiments. Leeds Experiments. The Bacterial Treatment of Factory Refuse. Screening. The Purification of the Thames. The Discharge of Sewage into Sea-water. The Filtration of Potable Water. Systematic Examination of Potable Water. The Character of the London Water Supply. The Action of Soft Water upon Lead. The Absorption of Atmospheric Oxygen by Water. Analyses and their Interpretation. Ventilation and Deodorisation of Sewers. The Royal Commission on Sewage Disposal. Appendices: (I.) Examination for Matters in Suspension. (II.) Dissolved Oxygen.

SEWAGE, MODERN TREATMENT OF. The preparation of Schemes, Laying of Sewers, and Sewage Disposal. By H. C. H. Shenton, M.S.E. Second Edition. Illustrated. Crown 8vo, $1.00.

ROADWAYS AND PAVEMENTS.

A TREATISE ON ROADS AND PAVEMENTS. By Ira Osborn Baker, C.E., 8vo, viii + 655 pages, 171 figures, 68 tables. Cloth, $5.00. Contents.—Introduction, Part I.—Country Roads. Road Economics. Road Location. Earth Roads. Gravel Roads. Broken-stone Roads. Miscellaneous Roads. Equestrian Roads and Horse-race Tracks. Part II.—Street Pavements. Pavement Economics. Street Design. Street Drainage. Curbs and Gutters. Pavement Foundations. Asphalt Pavements. Brick Pavements. Cobble-stone Pavements. Stone-block Pavement. Wood-block Pavements. Comparison of Pavements. Sidewalks. Bicycle Paths and Race Tracks.

A TEXT-BOOK ON ROADS AND PAVEMENTS. By Frederick P. Spalding, Second Edition, Revised, 12mo, viii + 235 pages, 44 figures. Cloth, $2.00. Contents.—General Consideration. Drainage of Streets and Roads. Location and Improvement of County Roads. Broken-stone Roads. Foundations for Pavements. Brick, Asphalt, Paved, Stone-block Pavements. City Streets.

HIGHWAY CONSTRUCTION. A Treatise on Highway Construction. By A. T. Byrne, C.E. Fifth Revised and Enlarged Edition, 8vo, xliii + 1040 pages, upwards of 300 illustrations. Cloth, $5.00. Contents.—Pavements. Materials Employed in the Construction of Pavements. Stone Pavements. Wood Pavements. Asphaltum and Coal-tar Pavements. Brick Pavements. Broken-stone Pavements. Miscellaneous Pavements. Foundations. Resistance to Traction. Location of Country Roads. Width and Transverse Contour. Earthwork. Drainage and Culverts. Bridges, Retaining Walls, Protection Works, Tunnels, Fencing, City Streets. Footpaths, Curbs, Gutters, Reconstruction and Improvement of Country Roads. Maintenance—Repairing, Cleansing, and Watering. Trees. Staking Out the Work. Specifications and Contracts. Implements and Prices. Miscellaneous Notes. Appendix. I.—Naming and Numbering Country Roads and Houses. II.—Methods of Assessing the Cost of Street Paving. III.—Ordinance Regulating the Width of Wagon-tires. IV.—Cycle-paths.

MODERN METHODS OF STREET CLEANING.—By George A. Soper, Ph.D. Cloth; 6 x 9 inches; 200 text pages; 100 illustrations. Price, $3. Contents:—The Use and Abuse of City Streets; Fundamental Principles Applicable to Street Cleaning; The Cleaning of Pavements; The Disposal of Refuse; Summary of European Methods of Street Cleaning; London; Westminster, London; Manchester; Paris; Berlin; Hamburg; Cologne; Amsterdam; New York. Index.

ROAD PRESERVATION AND DUST PREVENTION.—By William Pierson Judson. Cloth; 6 x 9 inches; 144 pages; 16 illustrations. Price, $1.50. Contents:—Road Dust, Its Control and Prevention—Moisture—oil Emulsions—Oils—Coal-Tar Preparations—Tar-Spraying Machines—Tar-Macadam—Rock-Asphalt Macadam—Bitulithic Pavement. The preservation of surface and the prevention of dust on macadamized roads constitute two important problems to be solved by engineers charged with the maintenance of many thousands of miles of broken stone roads. On these matters road builders have been working and experimenting for some years; the methods, costs, tests, and other results of this work are here for the first time compiled in book form. A necessary and timely book for every engineer.

RAILROAD ENGINEERING.

A FIELD MANUAL FOR RAILROAD ENGINEERS. By J. C. Nagle, Professor of Civil Engineering in the A. and M. College of Texas. Second Edition, Revised. 16mo, xv + 403 pages, 99 figures. Morocco, $3.00. Contents.—Reconnoissance. Preliminary Surveys. Location. Transition-curves. Frogs and Switches. Construction. Tables.

MANUAL FOR RESIDENT ENGINEERS CONTAINING GENERAL INFORMATION ON CONSTRUCTION. By F. A. Molitor and E. J. Beard, 16mo, iv + 118 pages. Cloth, $1.00. Contents.—Alignment. Address. Back Filing. Bench-marks. Berm. Borrow. Borrow Pits. Books. Bridges. Classification. Clearing. Contract. Contractors. Cross-section. Curves. Cut Ditches. Diary. Ditches. Easement Curves. Embankments. Employees. Estimates. Excavations. Expense. Extra Bills. Express. Final Estimates. Finishing. Foundations. Grades Grubbing. Haul. Instruments. Inspectors Levels. Level Notings. Masonry. Mile-posts. Monuments. Monthly Estimates. Pay Rolls. Party. Plans. Plat. Pile Recorder. Pile and Trestle Bridges. Post-office. Profiles. Qualifications. Quantities. Rates. Report. Resident Engineers. Road-bed. Shrinkage. Specifications. Storms. Station Grounds. Staking. Stationery. Supplies. Superelevation. Surface. Swell. Tables. Track. Transit. Titles. Vertical Curves. Work. Waste.

FIELD MANUAL FOR ENGINEERS. By the late Philetus H. Philbrick, C.E., M.S. 16mo, xv + 388 pages, 152 figures. Morocco, $3.00. Contents.—Preliminary Operations. Adjustments, Use, and Care of Instruments. Plane Trigonometry. Simple Curves Connecting Right Lines. Leveling, Stadia Measurements, etc. Compound Curves. Reversed Curves. Turnouts. The True Transition Curve. Calculation of Earthwork. Approximate and Abridged Computations. Construction. Explanation of Tables and Miscellaneous Topics.

RAILROAD ENGINEERS' FIELD-BOOK AND EXPLORERS' GUIDE. Especially Adapted to the Use of Railroad Engineers on Location and Construction, and to the Needs of the Explorer in Making Exploratory Surveys. By the late H. C. Godwin. 16mo, xii + 357 pages, 100 figures. Morocco, $2.50. Contents.—Part I.—Dealing with Railroad Location. Part II.—Dealing with Railroad Construction. Part III.—Dealing with Reconnoissance and Exploratory Surveys. Part IV.—Giving Various General Information. To these are added a Short Appendix and a Set of Tables, comprising those generally required for field use.

THE ECONOMICS OF RAILROAD CONSTRUCTION. By Walter Loring Webb, C.E. Large 12mo, viii + 339 pages, 34 figures. Cloth, $2.50. Contents.—Introduction. Part I.—Financial and Legal Elements of the Problem: Railroad Statistics; The Organization of Railroads; Capitalization; The Valuation of Railway Property; Estimation of Volume of Traffic. Part II.—Operating Elements of the Problem; Operating Expenses; Motive Power; Economics of Car Construction: Track Economics; Train Resistance; Momentum Grades. Part III.—Physical Elements of the Problem: Distance; Curvature; Minor Grades; Ruling Grades; Pusher Grades; Balancing Grades for Unequal Traffic. Index.

No matter what technical book you want we can supply through our Book Department.

MARKET CONDITIONS.

Montreal, December 19th, 1909.

The present dullness in transactions in pig-iron and in steel products, in the United States, is only temporary, and is the natural result of the previous heavy buying and specifying, coupled with the usual quietness incident to the close of the year. It was impossible that the immense volume of business put through in September and October last should continue, and the present lull is regarded as a healthy sign. The general view seems to be that the New Year will see a renewal of the upward trend of prices accompanied with a renewal of activity in trade. Prices of finished products are being maintained and, in fact, some further advances have been made during the past week, although pig is showing a weakness in some quarters. It has practically been decided that prices on Lake Superior ores will be advanced 50c. per ton, and consumers at Atlantic points are being compelled to pay 40 to 50c. per ton over last year's figures. The high prices for coke and coal will add very materially to the cost of production and there is therefore no probability of any concession in prices. Specifications for structural material and railway supplies, such as rails, locomotives, cars, etc., are being received by the mills in a satisfactory manner, many of the mills being several weeks behind in their deliveries.

The English and Scotch situation is showing a more hopeful tone, once more. The home trade is picking up and there appears to be a better feeling, generally. Export trade is not satisfactory, but even this is showing some improvement, especially as the advances in the United States and Germany are likely to open markets in these countries for tonnage of British manufacture. Pig-iron markets have developed strength, showing an advance of 1s. to 1s. 6d. during the week. It is pointed out that steel making irons will all be higher in Great Britain, than it was this year, owing to the fact that Spanish mine owners, who supply the bulk of the ore, are insisting on prices delivered at Middlesboro and Glasgow, of 19s. per ton, as against 15s. 6d. to 16s. during the first half of 1909, and about 17s. 6d. of recent months.

The local trade shows no sign of abatement. Enquiries are being received very generally for a liberal tonnage, and several good contracts have been placed during the past week. Many good consumers are now inquiring for prices for delivery during the last half of 1910, thus indicating their opinion that prices are likely to be maintained for some considerable time to come. Canadian furnaces are declining to quote thus far ahead and it is practically impossible to get satisfactory prices from English or Scotch makers, they also being satisfied that conditions are going to show an improvement. In the meantime, the metal held is being rapidly taken out and foundries requiring further supplies for winter consumption are being required to pay higher freights.

The markets for finished and semi-finished material are very dull and uninteresting. It is impossible to get prices up here, notwithstanding that several lines are being advanced in almost all other markets. Dealers are awaiting the turn of the year, it being their hope that the market will be stronger and more active, thereafter:—

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

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

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

Cement.—Canadian cement is quotable, as follows, in car lots, f.o.b., Montreal:—$1.30 to $1.40 per 350-lb. bbl., in 4 cotton bags, adding 10c. for each bag. Good bags re-purchased at 10c. each. Paper bags cost 2½ cents extra, or 10c. per bbl. weight.

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

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

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

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

Galvanized Iron.—The market is steady. Prices, basis, 28-gauge, are:—Queen's Head, $4.10; Colborne Crown, $3.85; Apollo, 10¾ oz., $4.05. Add 25c. to above figures for less than case lots; 26-gauge is 25c. less than 28-gauge, American 28-gauge and English 26 are equivalents, as are American 10¾ oz., and English 28-gauge.

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

Iron.—The outlook is strong. The following prices are for carload quantities and over, ex-store, Montreal, prompt delivery; No. 1 Summerlee, $21.50 to $22 per ton; selected Summerlee, $21 to $21.50; soft Summerlee, $20.50 to $21; Clarence, $19.50 to $20; Carron, No. 1, $21.50 to $22, and Carron special, $21 to $21.50.

Laths.—See Lumber, etc.

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

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

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

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

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

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

Pipe.—Wrought and Galvanized.—Demand is much better and the tone is firm, though prices are steady, moderate-sized lots being: ¼-inch, $5.50 with 63 per cent. off for black, and 48 per cent. off for galvanized; ⅜-inch, $5.50, with 59 per cent. off for black and 44 per cent. off for galvanized; ½-inch, $8.50, with 69 per cent. off for black, and 59 per cent. off for galvanized. The discount on the following is 72½ per cent. off for black, and 62½ per cent. off for galvanized; ¾-inch, $11.50;