

Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

Coloured covers/
Couverture de couleur

Coloured pages/
Pages de couleur

Covers damaged/
Couverture endommagée

Pages damaged/
Pages endommagées

Covers restored and/or laminated/
Couverture restaurée et/ou pelliculée

Pages restored and/or laminated/
Pages restaurées et/ou pelliculées

Cover title missing/
Le titre de couverture manque

Pages discoloured, stained or foxed/
Pages décolorées, tachetées ou piquées

Coloured maps/
Cartes géographiques en couleur

Pages detached/
Pages détachées

Coloured ink (i.e. other than blue or black)/
Encre de couleur (i.e. autre que bleue ou noire)

Showthrough/
Transparence

Coloured plates and/or illustrations/
Planches et/ou illustrations en couleur

Quality of print varies/
Qualité inégale de l'impression

Bound with other material/
Relié avec d'autres documents

Continuous pagination/
Pagination continue

Tight binding may cause shadows or distortion along interior margin/
La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure

Includes index(es)/
Comprend un (des) index

Title on header taken from: /
Le titre de l'en-tête provient:

Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/
Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

Title page of issue/
Page de titre de la livraison

Caption of issue/
Titre de départ de la livraison

Masthead/
Générique (périodiques) de la livraison

Additional comments: /
Commentaires supplémentaires:

This item is filmed at the reduction ratio checked below /
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	14X	18X	22X	26X	30X
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12X	16X	20X	24X	28X	32X

CANADIAN CONTRACT RECORD

A WEEKLY JOURNAL OF PUBLIC WORKS, TENDERS, ADVANCE INFORMATION AND MUNICIPAL PROGRESS

EVERY THURSDAY

THIS PAPER REACHES EVERY WEEK THE TOWN AND CITY CLERKS, TOWN AND CITY ENGINEERS, COUNTY CLERKS AND COUNTY ENGINEERS THROUGHOUT CANADA.

Vol. 5.

SEPTEMBER 20, 1894

No. 33

THE CANADIAN CONTRACT RECORD,
PUBLISHED EVERY THURSDAY
As an Intermediate Edition of the "Canadian Architect and Builder."

Subscription price of "Canadian Architect and Builder" (including "Canadian Contract Record"), \$2 per annum, payable in advance.

C. H. MORTIMER, Publisher,
CONFEDERATION LIFE BUILDING, TORONTO.
Telephone 2362.
New York Life Insurance Building, Montreal.
Bell Telephone 2249.

Information solicited from any part of the Dominion regarding contracts open to tender.

Advertising Rates on application.

At its Convention held in Toronto, Nov. 20 and 21, 1890, the Ontario Association of Architects signified its approval of the CANADIAN CONTRACT RECORD, and pledged its members to use this journal as their medium of communication with contractors with respect to advertisements for Tenders.

The following resolution was unanimously adopted at the First Annual Meeting of the Province of Quebec Association of Architects, held in Montreal, Oct. 10th and 11th, 1890: "Moved by M. Perrault, seconded by A. F. Dunlop, that we the Architects of the Province of Quebec now assembled in Convention being satisfied that the CANADIAN CONTRACT RECORD affords us a direct communication with the Contractors, resolved, that we pledge our support to it by using its columns when calling for Tenders."

Subscribers who may change their address should give prompt notice of same. In doing so, give both old and new address. Notify the publisher of any irregularity in delivery of paper.

BARTER AND EXCHANGE.

This department has been opened for the speedy barter and exchange of second-hand plant or material, or small lots of new or second-hand materials by builders and others not regularly engaged in the sale of such articles. Advertisements other than those of the above description will not be inserted.

RATES—12 words and under, 15 cents; each additional word, 1 cent (three figures count one word); on two or more subsequent insertions a discount of 10 per cent. will be allowed. Not more than four insertions of an advertisement can be granted.

Replies to advertisements may be addressed to a box at this office, in which case necessary stamps must be sent for re-mailing replies. Advertisements for this department must be prepaid.

FOR SALE AT HALF PRICE—Willer Blinds (60 sets); Wilson Blinds (English Venetian, large size); Hemlock Joisting (dry), Butternut, 1 1/2 inch (dry); Birch 1 1/2 inch (dry), Cherry, 3/4 inch (dry); Cedar Posts; quantity sash frame material. GEORGE CLATWORTHY, 46 Richmond St. West, Toronto.

FOR SALE—Wood and glass partition, 9 feet high, 18 1/2 feet long, including door 3x3 feet. Pine, natural finish, ground glass in panels. In use little more than a year. Cost over \$30; will be sold at a sacrifice. Box 50, CONTRACT RECORD office.

CANADIAN CONTRACTOR'S HAND-BOOK

A new and thoroughly revised edition of the Canadian Contractor's Hand-Book, consisting of 150 pages of the most carefully selected material, is now ready, and will be sent post-paid to any address in Canada on receipt of price. This book should be in the hands of every architect, builder and contractor who desires to have readily accessible and properly authenticated information on a wide variety of subjects adapted to his daily requirements.

Price, \$1.50; to subscribers of the CANADIAN ARCHITECT AND BUILDER, \$1.00. Address C. H. MORTIMER, Publisher, Confederation Life Building, Toronto.

NOTICE TO CONTRACTORS

Plans and specifications of the Brick Building proposed to be erected by the United Counties of Leeds and Grenville for use as a House of Industry, and the out-buildings in connection therewith, may be seen on and after Thursday, the 27th inst., at the office of G. A. Allan, Architect, Brockville, and at the residence of J. B. Saunders, Esq., Athens.

Tenders, addressed to the undersigned, will be received up to 12 a.m. on

THURSDAY, THE 4TH DAY OF OCTOBER NEXT,

and must be marked "Tender for Construction of House of Industry Buildings," and be accompanied by a certified bank cheque for \$500, payable to the order of the undersigned, which cheque will be forfeited should the party tendering refuse to sign the contract when called upon to do so.

The lowest or any tender not necessarily accepted.

R. L. JOYNT,

Chairman of Building Committee.
P.O. Box 519, Brockville.

Brockville, Sept. 14th, 1894.



Sealed Tenders addressed to the undersigned, and endorsed, "Tender for Post Office, Victoria, B.C.," will be received at this office until FRIDAY, 19TH OCTOBER, 1894, for the several works required in the erection of a Post Office at Victoria, B.C.

Plans and specifications can be seen at the Department of Public Works, Ottawa, and at the office of F. C. Gamble, Esq., Resident Engineer, Victoria B. C., and tenders will not be considered unless made on the form supplied and signed with the actual signatures of the tenderers.

An accepted bank cheque, made payable to the order of the Minister of Public Works, equal to five per cent. of the amount of tender, must accompany each tender. This cheque will be forfeited if the party decline the contract or fail to complete the work contracted for, and will be returned in case of non-acceptance of tender.

The Department does not bind itself to accept the lowest or any tender.

By order,

F. F. E. ROY,

Secretary.

Department of Public Works,
Ottawa, 6th Sept., 1894.

Rules for draining land have been prepared by Mr. P. C. Knight, of Pontiac, Ill., for the Illinois Society of Engineers and Surveyors. Where the subsoil is sandy, gravelly, or both, and the main drain can be laid between 4 and 5 feet deep, the laterals may be laid 250 feet apart. In more compact soils, the laterals must be laid closer, 150 to 200 feet in yellow clay and 50 to 150 feet in blue clay. It is not advisable to lay tile in blue clay at the depths they may be laid in sand, gravel, or yellow clay; a depth of from 3 to 4 feet for the main and from 2 to 3 1/2 feet for the laterals is the best. As the depth of the laterals decreases, the closer should they be laid, smaller tile being employed. Mr. Knight states that he has found 4-inch laterals 800 feet long, having a fall of 1 in 900, and 250 feet apart to work well. Perfect alignment, especially vertical, is the most important factor in underdrainage, in his opinion.

Send for a copy of the second edition of the CANADIAN CONTRACTOR'S HAND-BOOK. Price, \$1.50; to subscribers, \$1.

CONTRACTS OPEN.

LISTOWEL, ONT.—A dam is to be built across the river here.

GLENCOE, ONT.—The question of constructing waterworks is under consideration.

NORWICH, ONT.—A by-law to raise \$5,000 to build a new town hall has been defeated.

BURGESSVILLE, ONT.—The G. T. R. will build an iron bridge over the Otter river near this place.

CHATHAM, ONT.—Plans are being prepared for a parsonage in connection with Victoria avenue Methodist church.

NFEPAWA, MAN.—The electors will vote on a by-law to provide the sum of \$2,000 for erecting a school in the north end.

SUSSEX, N. B.—Plans are being prepared for a new bridge to cross the stream running into the Kennebecasis river near this town.

ALEXANDRIA, ONT.—The site for the boys' reformatory to be erected by the Government near here is likely to be selected at an early date. About 150 acres will be required.

NEW GLASGOW, N. S.—The Steel Co. and the Iron and Railway Company are negotiating with a view to an amalgamation, which, if carried out, will result in the erection of additional plant.

ST. JOHN, N. B.—The construction of a cold storage warehouse is being agitated. A local firm has offered to erect a suitable building for \$9,500, the machinery to cost about \$5,000 extra.

DIGBY, N. S.—A joint stock company has been formed, with a capital of \$30,000, to erect a summer hotel capable of accommodating 150 guests. It is to be located on Robinson's Point.

EDMONTON, N. W. T.—The town council has voted \$1,000 towards the erection of the general hospital.—McKenzie, Powis and Co., wholesale grocers, intend putting up a building, 26 x 50 feet.

PRESTON, ONT.—H. R. Barber, architect, of Hamilton, has designed and is superintending the construction of a brown stone villa residence here for Peter Bernhardt, to be fitted with all modern improvements.

CHATHAM, ONT.—A petition has been presented to Council asking for the construction of a granolithic pavement on King street, north side, from Fifth street to the Chatham Loan Building, and the work is to be proceeded with at once.

CALGARY, N. W. T.—The Calgary Irrigation Company have filed the necessary plans with the Interior Department at Ottawa, and will make application to divert sufficient water from the Elbow river to irrigate lands amounting to 45,000 acres.

HULL, QUE.—The City Council has decided to accept the proposition made by Mr. Bourque, of Ottawa, for the extension of the waterworks system, and the work,

which will cost about \$30,000, will be proceeded with at once. Mr. Frank Hibbard, C. E., will make the necessary estimates and superintend the construction for the city.

KINGSTON, ONT.—A syndicate of British capitalists has been formed to work mining properties in the County of Frontenac. Capital \$450,000.—Improvements are to be made to the City Hotel.—Petitions for water mains on Elliot and Collingwood streets, at a cost of \$2,227 and \$2,800 respectively, have been sent to Council.

DUNDAS, ONT.—A deputation from this vicinity recently interviewed the Provincial authorities asking that the sum of \$4,000 set apart by the Government for the purpose of draining 200,000 acres of land, and the deepening of the Nation river, be expended, and that the work be proceeded with. The money will be forthcoming.

LONDON, ONT.—The Free Library Board has decided to erect a public library building at once at a cost of \$12,000. The plans of Mr. H. Mathews, of Brooklyn, N. Y., have been accepted. The structure will be of red brick, 100 x 60 feet. The first floor will be devoted to library purposes, and the second to a museum.—Mrs. Esther Cousins, of Wellington road, will erect a brick veneer residence on Simcoe street to cost \$1,000.

WINNIPEG, MAN.—Manager Witt, of the Grand Forks Opera House, St. Paul, has had plans prepared for the remodeling of the brick block next the Manitoba Hotel for an opera house, with a seating capacity of 2,000 persons. All modern improvements will be employed. The plans have been sent to St. Paul for approval, and it accepted of work will probably be commenced this fall.—The C. P. R. Company are making extensive preparations for the irrigation of the company's lands in Assiniboia and Alberta.—Mr. Ruttan, City Engineer, has prepared a report on the drainage of the northwestern portion of the city, which will be considered by the Council at an early meeting.

OTTAWA, ONT.—J. H. Balderson, Secretary Department of Railways and Canals will receive tenders until noon on Tuesday, the 18th October, for the supply of the following: 1000 tons of 50-lb. steel rails to be delivered C.I.F. on the Prince Edward Island railway wharf at Summerside, Prince Edward Island; 300 tons 56-lb steel rails to be delivered C.I.F. on the Intercolonial railway wharf at Richmond, (Halifax), Nova Scotia; 3000 tons of 67-lb. steel rails to be delivered on the Intercolonial railway (Princess Pier) wharf, at Levis, opposite Quebec. All the above rails to be delivered in the month of June, 1895.—Surveys are being made by the Government for the improvement of the canal bank in the vicinity of the Deep Cut.—Mr. Collingwood Schreiber, chief engineer of Railways and Canals, has recently returned from the Trent Valley district. In about three weeks time tenders will be called for portions of

the work, on which construction is to be commenced without delay, namely the 9-mile section between Peterboro' and Lakefield, and the 14-mile section between Aros, on Balsam lake, and Game bridge on Lake Simcoe. Tenders will shortly be asked by the Department of Public Works for the construction of the bridge over Pond Creek between Gatineau Point and Hull, and construction is expected to commence in a couple of weeks.—Tenders will be received until the 22nd inst. for heating the St. Lawrence hall with steam. The proprietors of the hotel are Messrs. Lebarge & Co.—The erection of a fire station in the south-west end of the city has been petitioned for.

TORONTO, ONT.—The Separate School Board has decided to purchase a site on Bolton avenue and erect thereon a two-roomed brick school house.—In a report presented to the Board of Works on Monday last, the City Engineer again recommends the construction of a 24-inch main on Front street, from Simcoe to Sherbourne, and a 36-inch force main from the intersection of Bathurst and College streets to Rose Hill reservoir. The former is estimated to cost \$36,000 and the latter \$135,000. The sum of \$3,000 is also asked by the City Engineer to place the Lake Shore road in proper condition, and a cedar block pavement is recommended outside of track allowances on Bloor street, from Dufferin street to Lansdowne avenue.—Hon. Wm. Harty, Commissioner of Public Works, has entered into negotiations with the City Council for the purpose of placing under Government control the whole of that portion of Queen's Park extending from Park road to Parliament buildings, with a view to improving the grounds. It is proposed to construct a granolithic pavement running through the centre of the park up to the main entrance of the buildings.—The by-law providing for the issue of debentures to cover the cost of widening the Queen street subway will be submitted to the ratepayers on the 20th of October.—A building permit has been granted to Mrs. R. C. Dancy, for alterations and additions to dwelling, 127 and 129 D'Arcy st., cost \$2,500.

MONTREAL, QUE.—Contracts will be awarded this week by the Road Department for the construction of a number of sewers and for the paving of several streets with asphalt. A. Davis, Superintendent of Waterworks, will receive tenders until noon on Monday, the 24th inst., for the supplying of cast iron water pipes and special castings for the city, in quantities and at dates specified.—The Road Committee has given notice that permanent pavements will be constructed on the following streets: Ernest street from St. Denis street to Laval avenue; Laval avenue, from Albina street to Ernest street; St. Peter street from Commissioners street to Notre Dame street; St. James street from Windsor to Mountain sts. Messrs. Perrault & Mann, architects, have prepared plans for the proposed Isolation hospital, but a definite site has not as yet been decided upon. It has been decided to pave the Brock street tunnel with block stone, at a cost of \$10,000.—The Finance and Road committees have concurred in favor of spending \$15,000 for the paving of St. Peter street from St. James to Commissioners street.—The new building of the Merchants Bank of Halifax, to be erected at the corner of Notre Dame and Seigneurs streets, will have a frontage of 36 x 87 feet, and will cost in the neighborhood of \$50,000. The plans were prepared by Mr. Edward Maxwell.—Mr. C. St. Jean, architect, is calling for tenders for a three story stone front tenement building on Amherst street for Mr. Desforges.—Messrs. J. B. Resther & Son, architects, have prepared plans and specifications for a three story stone front building on Notre Dame street west for Louis Barr, and also for a three story stone front residence for Mrs. J. C. Robert.—Mr. Theo. Daoust, architect, has prepared plans for an extension to the "Fabrique de Notre Dame" for the Seminary of Montreal.

FIRES.

The creamery building at Marsh Hill, Ont., was destroyed by fire on the 15th inst. Loss, \$3,000; insurance, \$1,700.—John Riley's grain elevator at Cypress River, Man., was burned to the ground last week.—The residence of Capt. W. Smyth, at Elginburg, Ont., was consumed by fire last week. Loss, \$2,000; no insurance.—The livery stables of Taylor & Bradshaw, at Brantford, Ont., were destroyed by fire on the 13th inst. Second & Perley's implement warehouse adjoining was damaged to the extent of \$4,000.—The saw and grist mills and two dwellings at Dartford, Ont., were burned recently. Loss, \$5,000.—A brick livery stable at St. Catharines, Ont., owned by Walter Haynes, has been destroyed by fire.

CONTRACTS AWARDED.

PRESTON, ONT.—The Galt and Preston Railway Company have awarded the contract to A. McAuslan, of Galt, for the construction of a bridge over the Speed river at this place.

OTTAWA, ONT.—The contract for one thousand barrels of Portland cement, to be used on the Lachine canal, has been let to Mr. Desota, of Montreal, agent for a Belgian firm.—The Public Works Department have awarded the contract for building the steam dredge for salt water operations, to be delivered at Halifax, to Messrs. Carrier, Laine & Co., of Quebec.

TORONTO, ONT.—Messrs. Bennett & Wright, of this city, have been awarded contracts for the plumbing and heating of the large store and office building of McLaughlin & Co., at Postage La Prairie, Man., and the business block of the Canada Permanent Loan & Savings Co., at Winnipeg.—The Toronto Radiator Mfg. Co., of this city, have been awarded the contract for supplying the new Parliament buildings at Victoria, B. C., with Safford radiators.

MONTREAL, QUE.—Messrs. J. B. Resther & Son, architects, have awarded the masonry contract for a three story stone front residence, corner Rachael and Panet streets for M. Thibodeau, to C. Lemay; also the contract for the fixtures and furnishing of the premises of Messrs. Hudon Hebert & Co. to Grothe Freres.—The Government contract for the deepening of the Lachine canal from the St. Gabriel locks to Lachine has been awarded to Messrs. F. B. McNamee and William Mann, of this city. The contract price is said to be in the neighborhood of half a million dollars. The work, which is to be completed in three years, will be commenced in a few weeks.—Mr. Charles Bernier, architect, has awarded contracts as follows: the carpenter and joiners' work of two three story tenement buildings on Notre Dame street west for A. L'Allemand to H. Plante, the carpenter and joiners' work of a three story tenement and stone building on St. Catharine street west for A. L'Allemand to H. Plante; the carpenter and joiners' work of a three storey stone front store and tenement building on Notre Dame st. west for A. L'Allemand to H. Plante, the carpenter and joiners' work of a 2½ story cottage at Beauport, Que., for J. Giroux, to G. Parent.

BIDS.

TORONTO, ONT.—At a meeting of the Fire and Light Committee, held on Monday last, the tenders for an electric light plant and for electric and gas lighting were opened. Seventeen tenders were sent in for the supply of an electric light plant, the lowest tender for dynamos being from the Siemens Co., of Chicago, which was \$24,500. Tender No. 6 quoted the price at \$54,968 for engines, boilers, economizers, condensers and pumps, piping and valves. For street lighting the Toronto Railway Company tendered to supply 2,000 candle power arc lights at 23 cents per night for five years, 22½ cents for 10 years, 22 cents for 15 years, 21½ cents for twenty years, and 21 cents for 25 years, and the Toronto Electric Light Co. offered to supply 1,500 lights at 20½

cents per night. The only tender for gas lighting was from the Consumer's Gas Co., who tendered at \$22 per lamp yearly on old mains, and \$23 on new. The tenders were all referred to the City Engineer and the Secretary of the Fire and Light Committee for a report.

PORTLAND CEMENT TESTING.

Engineering for July 13th, after discussing some of the present methods of testing cements, arrives at the following conclusions:

1. That the strength of a mixture of cement and sand is the most reliable of the present tests.
2. That the tensile strength of neat cement may be omitted altogether as a test of good quality.
3. That the weight per bushel is misleading, and should be omitted altogether.
4. That colour is not of sufficient importance to be considered as a test.
5. That extreme fineness of grinding is so absolutely essential that a sieve of not less than 175 to 180 meshes to the lineal inch should be used for testing purposes.

MUNICIPAL DEPARTMENT.

BOREHOLE WELLS FOR TOWN WATER SUPPLY.*

BY HENRY DAVEY, M. I. C. E.

At the Cardiff meeting of this association the author proposed a new system of borehole wells for town water supply. Since that time the system has been carried into effect at several places, and he describes one of the most important examples of executed work—viz., that of the Netherly pumping station of the Widnes Waterworks. The subject was dealt with under two heads—(1) the system of boreholes, (2) the application of the pumping power.

The system of boreholes.—In procuring water for town water supply it is the usual and necessary practice to provide duplicate pumping engines, and where two engines are made to pump from the same well, the well must be very large that it may accommodate two sets of pumps. Such wells are usually 12ft to 14ft. in diameter. To sink such a well in the ordinary way is a very long and costly undertaking, especially if soft strata are met with, where lining becomes necessary. On the completion of the well it may be necessary to drive adits to increase the water supply. A simple borehole is made very cheaply and very expeditiously. Four 30in. boreholes can be put down in a very small fraction of the time required to sink a 12ft. well. Instead of making a large well, the author puts down four boreholes to accommodate the pumps for duplicate pumping engines—a pair of pumps to each engine. The boreholes being completed, the pumps are lowered into them and coupled up to the permanent engines. Immediately that is done the water found in the boreholes can be pumped and supplied to the town. Should it be insufficient then a small well would be sunk in the dry to the bottom of the borehole pumps. The water being kept down by the pumps the boreholes at the level of the pumps would be connected to the center well, and adits driven to collect more water. Should the boreholes yield sufficient water it would not be necessary to sink the well. It would be absurd to advocate any particular system of well-sinking as being universally applicable; this system, however, of making wells offers advantages under favorable conditions, but the advisability of its adoption in any particular case must be a matter of judgment with the engineer planning the work. The boreholes at the Netherly, two in number, are sunk in red sandstone rock, and are placed 20ft. apart, each bored to a diameter of 30in. for a depth of 200ft., and to a reduced diameter of 18in. for a further depth of 200ft. and 300 ft. respectively, thus making the first hole 400ft. deep, and the second 500

ft. deep. On the completion of the boring the water stood 70ft. to 80 ft. from the surface of the ground, when the quantity pumped by the old engine on the same site was 1¼ million gallons per day. The main pumps were then lowered into the boreholes, each pump extending to the bottom of the large part of the hole, 200ft. from the ground-level. In that position the pumps were suspended from a cast-iron bed-plate supported on a concrete foundation formed round the top of the hole, a block of oak being inserted between the head of the pump and the bed-plate. In this suspended position the pumps worked without the slightest unsteadiness. The engines were made for the purpose of pumping 2¼ million gallons per day, but it was found that working up to their full capacity of 2¾ millions the yield of the boreholes was not reached. On starting the new pumps it was found that when pumping 2¾ million gallons per day the water level was lowered to 100ft. from the surface of the ground.

The application of the pumping power.—The motive power consists of a 230 H.P. compound surface-condensing engine, employed to pump from the boreholes into a masonry tank by the engine foundations, from which tank the water is forced by the same engine to a reservoir at an elevation of 260ft. The engine is made to work the force pump by means of a tail rod from the low-pressure cylinder, the borehole pumps being worked by means of rocking levers actuated by a connecting rod from the cross-head of the engine. There is no flywheel or rotary motion, but a very simple expedient is resorted to to enable the engine to work expansively. This steam distribution is effected by giving a peculiar bell-crank form to the levers which convey motion to the well pumps. The effect of this mode of coupling the pump piston or plunger to the engine piston is to make the pump-resistance diagram so nearly approach the shape of the combined engine diagram that the weight of the moving parts of engine is of itself, by its inertia, sufficient to equate the two diagrams.

Steam distribution.—The engine is of the receiver type, having separate expansion valves on both high and low pressure cylinders, adjustable by hand whilst the engine is in motion.

A careful trial of the engine has been made, and as it is provided with a surface condenser, it was quite easy to ascertain the exact quantity of steam used by the engine by measuring the air-pump discharge, and adding that discharged from the steam jackets. The efficiencies are as follows: (1) engine efficiency, the proportion which the area of the actual indicator diagrams bears to the area of the theoretical diagram for the steam admitted to the engine = .644; (2) mechanical efficiency, or the portion of the indicated power utilized by the pumps = 87 per cent.; (3) thermal efficiency, or the proportion of the energy due to the fall in temperature of the steam which has been utilized by the engine = .433. Units of work per unit of heat = 110.8. The steam cylinders are both steam jacketed completely—bodies and ends—with steam at boiler pressure. The following summary gives the general particulars and cost of the installation:

Steam pressure	70lb. per square inch.
Diameter of cylinders	32in. and 60in.
Length of stroke	6ft. 3in.
Diameter of force pump	18½in.
Height of lift	260ft.
Length of stroke	6ft. 3in.
Diameter of borehole pumps	18½in.
Height of lift	100ft.
Length of stroke	6ft. 6in.
Number of strokes per min.	1 ½
Depth of boreholes	400ft. and 500ft.
Diameter of boreholes	30in. for 200ft. and then 18in.
Tube surface of condenser	420 square feet.
" " feed heater	140 square feet.
Water pumped in 24 hours	2¼ million gallons.
Duty of engine on an evaporation of 10lb. water per lb. coal	124 millions.
Pounds of steam per i.h.p. per hour	15.6.
Pounds of steam per p.h.p. per hour	18.0
Indicated horse-power	230.
Pump horse-power	200.
Mechanical efficiency	87 per cent.
Cost of engines and pumps	£6,000 to £30 per p.h.p.
Total cost of engine, pumps, boreholes and buildings	£9,700 = £48½ per p.h.p.

*Abstract of paper read before the Mechanical Science Section of the British Association.

MUNICIPAL ENGINEERS, CONTRACTORS, AND MATERIALS.

J. M. SHANLY
 M. CAN. SOC. C. E. M. AM. SOC. C. E.
CIVIL ENGINEER.
 STANDARD BUILDING - MONTREAL.
 Surveys, Plans, Estimates, &c., for Water Works,
 Sewerage, Water power projects, Bridges, Railways, &c.
 CONSTRUCTION SUPERINTENDED

WILLIS CHIPMAN, B. A. Sc.,
 M. Can. Soc. C. E.; M. Am. Soc. C. E.;
 M. Am. W. V. Ass'n.
CIVIL AND SANITARY ENGINEER
 Water Works - Sewerage
 Sewage Disposal
 103 BAY STREET - TORONTO.

J. McDOUGALL, C. E.,
 ENGINEER OF THE COUNTY OF YORK
GENERAL MUNICIPAL ENGINEER
 Consulting Engineer for Municipalities in regard to
 Electric Railway and other Franchises.
 Specialties: Bridges, Foundations, Electric Railways,
 and Roads. Surveys made; Plans, Specifications and
 Agreements prepared, and work superintended.
 COURT HOUSE, - TORONTO.

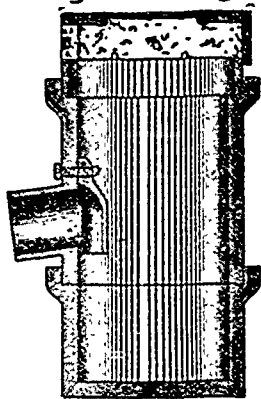
JOHN GALT
 C. E. AND M. E., M. CAN. SOC. C. E.,
 Consulting Engineer.
 20 Years' Practical Experience in England, United
 States and Canada in Civil, Sanitary, Hydraulic,
 and Mechanical Engineering.
SPECIALTIES:
 Waterworks, Sewerage, Electric Railways
 Office: Rooms 99 and 100,
 CANADA LIFE BUILDING, - TORONTO.

ALAN MACDOUGALL
 M. Can. Soc. C. E. M. Inst. C. E.
**CONSULTING CIVIL, SANITARY AND
 HYDRAULIC ENGINEER**
 32 East Adelaide St. - TORONTO
 NOTE.—Mr. Alan Macdougall is NOT the
 engineer for the County of York.

JOHN D. EVANS, O.L.S.
 M. CAN. SOC. C. E.
LAND SURVEYOR
 Civil Engineer : Architect
 and Patent Solicitor.
 Special attention given to Consulting and
 Municipal Work.
 GRASS' BLOCK, FRONT ST., TRENTON, ONT.

E. D. MORRIS
 Direct Importer and Dealer in
 Best English and Canadian
PORTLAND CEMENTS
 Vitrified, Paving and Fire Bricks,
 Fire Clay, &c.
 Offices: 36 Victoria St. - TORONTO

**THE "IMPROVED"
 ST. GEORGE GULLEY**
 OR STREET DRAINING WELL.



PATENTED 1885
 AND 1893.
 Made of cast iron
 and vitrified tile.
 OVER 6,000 NOW
 IN USE.
 Not ONE com-
 plaint.
 For further par-
 ticulars, apply

LEWIS SKAIFE, Manager
 New York Life Building - MONTREAL.

Fire Bricks and Cement
 DRAIN AND WATER PIPES
 SANITARY EARTHENWARE
 LONDON PORTLAND CEMENT
 GUARANTEED GENUINE.

Paving and Scoria Bricks for Stables,
 Sidewalks, Yards, etc.
 Large quantities on hand and to arrive. We handle
 only the best quality. Prices lower than cost.
F. HYDE & CO.
 31 Wellington Street, - MONTREAL,
 Sole Agents for
 THE "GRANTRYX" SMOKE TEST AND
 DISINFECTING MACHINE.

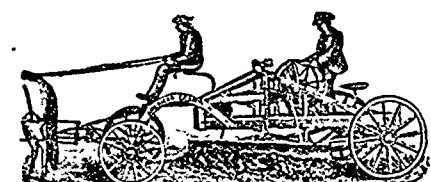
**Artificial . . .
 Granite Stone
 . . Pavements**

... FOR ...
 STREETS, SIDEWALKS, BASEMENT
 FLOORS, ETC.
 The attention of municipalities and others in-
 terested is called to the excellence of this material.
A. GRAHAM
 Sole Proprietor and Patentee
 226 Picadilly St., - LONDON, ONT.

PORTLAND CEMENT

BEST AND CHEAPEST IN TORONTO.
 JOSSON, PETERS and BURHAM Brands for highest class work.
 WHITE HORSE, R. W., IMPERIAL, &c., FROM \$2 00 PER BARREL.
A. E. S. Smythe & Co., - 25 George St., Toronto.
 Telephone 1948 or call and see us.

THE GOPP BROS. CO., (LIMITED)



The only Manufacturers in Canada and Sole Owners
 of the Canadian Patents of the American
**CHAMPION ROAD MACHINES
 CHAMPION ROCK CRUSHER
 CHAMPION SGEEL ROAD ROLLER**
 Catalogues Free. Correspondence Solicited
 ADDRESS:
COPP BROS. CO. - HAMILTON, ONT.

CANADA PIPE AND FOUNDRY CO.

MANUFACTURERS OF
 **Cast Iron Pipes and Special Castings**
 Works: MONTREAL AND ST. HENRI, QUE.
 CORRESPONDENCE SOLICITED.

THE STANDARD DRAIN PIPE CO.
 OF ST. JOHNS, P. Q., (LIM.)



Manufacturers of
 Salt-Glazed
 Vitrified
**SEWER
 PIPES**
 Double Strength
 Railway Cul-
 vert Pipes,
 Inverts, Vents,
 AND ALL KINDS OF FIRE CLAY GOODS.

THE G. & J. BROWN MFG. CO.
 Railway and Contractors' Plant.

BRIDGE BUILDERS
 BELLEVILLE, ONT.

DEBENTURES WANTED.
 Municipalities issuing debentures, no matter for what
 purpose, will find a ready purchaser by applying to
G. A. STIMSON, 9 Toronto Street, Toronto.
 N.B.—Money to loan at lowest rates on first mortgage.

**TESTS OF OUR
 Thorold
 CEMENT**

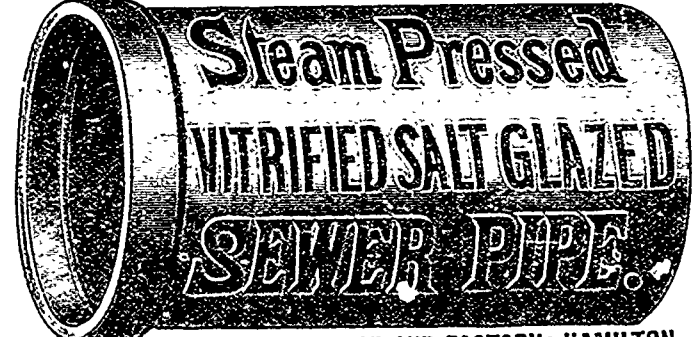
Show it is the best Hydraulic Cement for Abut-
 ments and Piers for Bridges, Concrete for
 Foundations, Cisterns, Cement Drain Pipe,
 Floors for Cellars and Stables, Sewers, and
 all Mason Work in moist or wet places.
10,000 BARRELS
 of Thorold Cement were used in the con-
 struction of the Great St. Clair Tunnel,
 Joseph Hobson, Esq., Grand Trunk Rail-
 way, chief engineer, Wm. Gibson, Esq.,
 M. P., contractor.

MANUFACTURED BY
ESTATE OF JOHN BATTLE,
 Thorold, Ontario.

Drummond McCall Pipe Foundry Company,
MONTREAL
 MANUFACTURERS OF

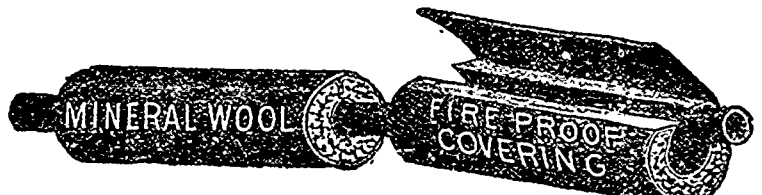
CAST IRON WATER AND GAS PIPES
 WORKS: LACHINE, QUE. PRICES ON APPLICATION.

HAMILTON AND TORONTO SEWER PIPE CO.
 - FOR -



**SEWERS,
 CULVERTS,
 AND
 WATER PIPES.
 INVERTS**
 Fire Brick Sewers
 Write for Discounts.
 HEAD OFFICE AND FACTORY: HAMILTON, CANADA.

MUNICIPAL OFFICIALS should see to it that in the erection of town and city PUBLIC BUILDINGS the installation of water works plant, etc., the advantages of . . .
MINERAL WOOL



are made use of for deadening sound in floors and partitions, insulation of heat and cold, fireproofing,
 etc., also SECTIONAL MINERAL WOOL COVERING for steam pipes, boilers, exposed water
 pipes, etc.
CANADIAN MINERAL WOOL CO., Limited, 122 BAY ST., TORONTO
 Montreal Agent: LEWIS SKAIFE 707 NEW YORK LIFE BUILDING

CENTRAL BRIDGE AND ENGINEERING COMPANY, (LIMITED) Peterborough, Ont.

WM. H. LAW, Manager and Engineer. MANUFACTURER OF

RAILWAY AND HIGHWAY BRIDGES

Viaducts, Piers, Roofs, Turntables and Girders in Steel and Iron.

Tension members forged without welds. Riveting done by hydraulic or compressed air machines. Specialties: Good workmanship and strict adherence to specifications and drawings.

CAPACITY: 2,000 TONS PER ANNUM.

D. BAER & CO. BUILDERS OF THE

Bear Patent COMBINATION - BRIDGE DOON, ONT.

All communications promptly answered.

Prices of Building Materials.

CONDITION OF THE MARKET.

With the country trade the demand for builders supplies is keeping up fairly well, but there has been no marked improvement in the city trade. General hardware is moving freely, the demand being mostly for self goods. A moderate jobbing improvement is reported in lead pipe and galvanized iron.

LUMBER.

CAN OR CARGO LOTS.

Toronto. Montreal.

Table listing lumber prices for various grades of wood, including clear picks, Am ins, and various sizes of planks and shingles.

VOID QUOTATIONS.

Table listing void quotations for materials like mill cull boards, shipping cull boards, hemlock scantling, and various types of lath.

Toronto. Montreal.

Table listing prices for white ash, black ash, dressing stocks, and American inspection items.

BRICK - 2 M

Table listing prices for common walling, good facing, and sewer pipes.

Pressed Brick, Per M:

Table listing prices for various types of pressed bricks, including Red No. 1, Brown, Roman Red, Buff, and Ornamental.

Table listing prices for 1st quality, f.o.b. at Port Credit, and hard building bricks.

SAND.

Table listing prices for sand per load of 1 1/2 cubic yards.

STONE.

Table listing prices for common rubble, large flat rubble, foundation blocks, Kent freestone, and various types of granite and marble.

SLATE.

Table listing prices for roofing slate in various colors and sizes.

PAINTS. (In oil, @ lb.

Table listing prices for various types of paint, including white lead, red lead, and yellow ochre.

Toronto. Montreal.

Table listing prices for cement, including Belgian, Canadian, Roman, and Parian.

Table listing prices for Keene's coarse white, calcined plaster, and fire bricks.

Table listing prices for lime, plaster, and hair plasterers.

HARDWARE.

Table listing prices for cut nails, steel nails, and various types of spikes.

CUT NAILS, FENCE AND CUT SPIKES.

Table listing prices for various sizes of cut nails and spikes.

FINE BLEND NAILS.

Table listing prices for fine blend nails in various sizes.

CASING AND BOX, FLOORING, SHOOK AND TOBACCO BOX NAILS.

Table listing prices for casing and box nails.

FINISHING NAILS.

Table listing prices for finishing nails in various sizes.

SLATING NAILS.

Table listing prices for slating nails in various sizes.

Toronto. Montreal.

Table listing prices for common barrel nails in various sizes.

CLINCH NAILS.

Table listing prices for clinch nails in various sizes.

SHARP AND FLAT PRESSED NAILS.

Table listing prices for sharp and flat pressed nails.

STEEL WIRE NAILS.

Table listing prices for steel wire nails in various sizes.

Iron Pipe:

Table listing prices for iron pipe in various sizes.

Black wrought iron pipe, 6 1/2% off above prices.

Galvanized and cast and soil.

Lead Pipe:

Table listing prices for lead pipe in various sizes.

Galvanized Iron:

Table listing prices for galvanized iron in various sizes.

Structural Iron:

Table listing prices for structural iron in various sizes.

INDEX TO ADVERTISEMENTS

In the "Canadian Architect and Builder."

Large index table listing various services and companies, including Architects, Cements, Heating, Roofers, Contractors' Plant and Machinery, etc.