

CANADIAN CONTRACT RECORD

*A Weekly Journal of Engineering, Public Works,
Tenders, Advance Information and Municipal Progress*

This Paper Reaches Every Week the Town and City Clerks, Town and City Engineers, County Clerks and County Engineers, Leading Civil Engineers and Contractors throughout Canada, and Purchasers of Municipal Debentures.

VOL. 17.

TORONTO, MONTREAL — JANUARY 2, 1907 — WINNIPEG, VANCOUVER

No. 44

THE CANADIAN CONTRACT RECORD PUBLISHED EVERY WEDNESDAY

As an intermediate Edition of the Canadian Architect and Builder.

THE C. H. MORTIMER PUBLISHING COMPANY of Toronto, Limited.

Subscription Price, \$5 per annum, payable in advance.

CONFEDERATION LIFE BUILDING, TORONTO
Telephone Main 2362.

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Telephone Main 2999.

750-751 Union Bank Building, Winnipeg.
Telephone 1274

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For Sale

Two Canadian patents, covering Labor-Saving Device. Information given on application.

Box 512, St. Catharines, Ont.

Bridge Tenders Wanted

Sealed tenders will be received by the undersigned at Auburn P. O. or by Wm. Lane, clerk, county of Huron, Goderich P. O., Ont., until MONDAY, 21ST DAY OF JANUARY, 1907, for the erection of the Superstructure of a steel bridge to be erected over the Maitland River at the village of Bluevale, County of Huron, about one mile from the G. T. R. station. The bridge is to be one span 100 feet clear between abutments. Pratt truss 18 feet high from floor of bridge, 7 panels, 9 joists, 7 inches, roadway to be 16 feet wide. Railing to be 4 feet high of four tiers of 1 1/2 inch gas pipe. Floor to be of concrete not less than 5 inches thick and composed of 1 part best Portland Cement to 3 parts sand and gravel and to be properly reinforced with iron. The bridge must be strong enough to carry traction engines and all ordinary traffic. The bridge will be about 14 feet from the bed of stream, good bottom. Bridge to be completed on or before the 25th day of July, 1907.

Tenders to be accompanied by marked cheque equal to 10 per cent. of the contract price and payable to the Treasurer of Huron County. Cheque will be forfeited should any contractor fail to enter into satisfactory agreement for due fulfilment of contract. The deposits of unsuccessful tenderers will be returned. The lowest or any tender not necessarily accepted.

D. PATTERSON,
County Commissioner,
Auburn P. O., Ont.

Dated December 28th, 1906.

CITY OF WINNIPEG

TENDERS FOR ELECTRIC GENERATING PLANT

Sealed tenders, addressed to the Chairman of the Fire, Water and Light Committee, for supply of a 750 kilowatt Electric Generating Plant, will be received at the office of the undersigned up to 2.30 p. m. on

MONDAY, JANUARY 14, 1907.

Specifications and form of tender may be obtained upon application to H. N. Ruttan, City Engineer, Winnipeg, Canada.

Each tender must be accompanied by an accepted cheque or draft payable to the order of the City Treasurer, or a cash deposit for the sum called for in the form of tender supplied, which will be subject to forfeiture in case of failure on the part of the contractor to enter into a written contract with the approved sureties, if called upon to do so.

The City reserves the right to reject any or all tenders, or to accept any bid which appears advantageous to the City of Winnipeg.

City Clerk's Office,
Winnipeg, December 22, 1906.

C. J. BROWN,
City Clerk.

CITY OF WINNIPEG

TENDERS FOR STEAM BOILERS.

Sealed tenders, addressed to the Chairman of the Fire, Water and Light Committee, for supply of two 250 h. p. water tube steam boilers for the City Water Works, will be received at the office of the undersigned up to 2.30 p. m. on

MONDAY, JANUARY 14, 1907.

Specifications and forms of tender may be obtained upon application to H. N. Ruttan, City Engineer, Winnipeg, Canada.

Each tender must be accompanied by an accepted cheque or draft payable to the order of the City Treasurer, or a cash deposit for the sum called for in the form of tender supplied, which will be subject to forfeiture in case of failure on the part of the contractor to enter into a written contract with the approved sureties, if called upon to do so.

The City reserves the right to reject any or all tenders, or to accept any bid which appears advantageous to the City of Winnipeg.

City Clerk's Office,
Winnipeg, December 22, 1906.

C. J. BROWN,
City Clerk.

CONTRACTS OPEN.

NANAIMO, B. C.—J. H. Good will erect a warehouse 35 x 75 feet.

SUMMERSIDE, P. E. I.—A water-works system is to be installed here.

FOREST, ONT.—C. A. Decker will build a new pump factory next year.

SARNIA, ONT.—Debentures will be issued for \$7,687.80 to redeem those outstanding at present.

PORT CREDIT, ONT.—The Public School Board have decided to make additions to the school building.

BRANDON, MAN.—The International Gas Company are applying to the City Council for a franchise.

SARNIA, ONT.—The Canadian Pacific Railway engineers are looking over several entrances to this town.

CAMPBELLFORD, ONT.—The ratepayers will shortly vote on a by-law to raise \$12,000 for cement walks.

WELAND, ONT.—J. S. O'Neill will receive tenders up to January 26, for the erection of a two-storey brick block.

VICTORIA, B. C.—The Alaska Steamship Co. are having plans prepared for the construction of a wharf, cost \$25,000.

RENFREW, ONT.—A by-law is to be submitted to the ratepayers to raise \$6,000 for extensions to the sewerage system.

KINCARDINE, ONT.—The ratepayers will vote on the question of issuing debentures for \$2,500 for the purchase of a park.

Nicola, B. C.—Col. Tracey, C. E., of Vancouver, is preparing a report in re-



TEMISKAMING AND NORTH- ERN ONTARIO RAILWAY COMMISSION

TENDERS FOR OFFICE BUILDING

Sealed tenders addressed to the undersigned and endorsed "Tender for Office Building" will be received up to 5 p. m. on the 18TH DAY OF FEBRUARY, 1907, for the erection of a General Office Building at North Bay, Ont.

Plans and specifications may be seen at the offices of the Commission, 25 Toronto Street, Toronto, and at the office of the Chief Engineer, North Bay.

A certified cheque for \$2,500 must accompany each tender.

The successful tenderer must enter promptly into a contract and furnish security for the amount of \$10,000.00 for due completion of same.

Cheques of unsuccessful tenderers will be returned to them.

The lowest of any tender not necessarily accepted.

H. W. PEARSON,
Secretary Treasurer.

Toronto, Dec., 21st, 1906.

Papers inserting this advertisement without authority will not be paid for same.

ference to the construction of a water-works system.

WETASKIWIN, ALTA.—The Canadian Pacific Railway will erect a new brick station and freight sheds to cost \$20,000.

ST. JOHN, N.B.—W. B. Tennant has purchased a brick building on Canterbury street and intends to make alterations to same.

HULL, QUE.—The Town Council have agreed to grant concessions to the Canadian Ore Refining Co., who intend to establish a refinery here.

CHATHAM, ONT.—The City Council have withdrawn the by-law for expending \$41,000 on municipal waterworks and electric light extensions.

VANCOUVER, B. C.—J. S. Emerson has purchased property, corner of Davey and Cerdero streets, and will erect a large residence thereon.

LONDON, ONT.—The City Council are negotiating with the Pere Marquette Railway in reference to the rebuilding of the Port Stanley railway bridges.

WOODSTOCK, ONT.—The Fire Chief has recommended the purchase of new hydrants and 500 feet of hose, also additions to the fire alarm system.

RED DEER, ALTA.—The Alberta Central Railway Co. are applying to the Dominion Government for an extension of time in which to construct their road.

ST. BONIFACE, MAN.—F. Gelinus, Department of Public Works, Ottawa, Ont., will receive tenders up to January 11th for construction of post office building here.

PETERBORO, ONT.—The Canadian General Electric Co. are having plans prepared for an addition to their premises, 250 feet long and two storeys high.

HALIFAX, N.S.—The City Council have agreed to grant concessions to the Silliker Car Works Co., who have definitely decided to construct their factories at this place.

KENORA, ONT.—A by-law will be voted on January 7th, 1907, to provide for the issuance of debentures for \$100,000 for completing the water power development scheme.

WALKERVILLE, ONT.—The Trussed Concrete Steel Co., Detroit, Mich., have purchased 5½ acres of land here, and have had plans prepared for the erection of branch factories thereon.

PORTAGE LA PRAIRIE, MAN.—J. & D. Brown have purchased property on which to erect a modern office building.—The Home Bank are negotiating for the purchase of a site on which to erect a building.

GASPE BASIN, QUE.—The Gaspeian Railway Co. will apply at the next session of the Quebec Government for incorporation, with power to construct a road from Paspébiac through the county of Bonaventure.

HAMILTON, ONT.—The Dominion Sewer Pipe Co. have purchased a site on which they will erect a factory.—The St. Patrick's school building has been sold and a more modern structure will be erected on King street east.

NEW WESTMINSTER, B.C.—The Great Northern Railway are contemplating the erection of car shops and other works here.—The Canadian Pacific Railway are considering improvements to be made to their terminal facilities.

GRAVENHURST, ONT.—The Corporation have been granted the right to develop South Falls on the Muskoka River. Work will be commenced at once. T. T. Simpson, civil engineer, Ottawa, has been engaged as engineer.

PARRY SOUND, ONT.—The Corporation will apply for a water power on the Seguin River, where a large power plant will be built. T. T. Simpson, civil engineer, Ottawa, has been engaged as engineer. The corporation will also install a system of septic tanks.

MICHIPICOTEN RIVER, ONT.—The Algoma Power Co. will develop a water power on the Michipicoten river. Electrical power will be supplied to mines. T. T. Simpson, civil engineer, Ottawa, has been engaged to design the plant.

EDMONTON, ALTA.—Tenders for the purchase of city debentures have been opened but owing to the low bids, were rejected. The debentures will be re-advertised in the near future.—A new Methodist church is to be erected here, cost \$40,000.

ST. JOHN, N. B.—S. E. Elkin has secured an option on property here, and it is probable that a large rolling mill plant will be established.—It is probable that the suspension bridge will be widened and strengthened by the Dominion Government.

TWEED, ONT.—At the request of the ratepayers the Town Council have decided to cancel the by-law which was to provide for an expenditure of \$15,000 for a trunk sewer and granolithic walks, and which was to be voted on shortly.

MONTREAL, QUE.—The Chiougamou & James Bay Railway Co. will apply to the Legislature of Quebec for incorporation, with power to construct a line from Roberval to the Mistassimi lakes.—The Canadian Bank of Commerce have decided to demolish the Temple building and erect a new bank building on the site.—The City Council will borrow \$2,000,000 with which to improve and enlarge the waterworks system.—W. H. Buckley, who is promoting the company who intend to erect a large hotel, has secured options on all the necessary property.—The Canadian Light, Heat & Power Co. have leased the Beauharnois canal and will develop electric power. The capital of the company is \$4,000,000, and among those interested are F. H. Wilson, W. C. MacIntyre, G. G. Foster, K. C., and others.

OTTAWA, ONT.—The Canadian Northern Railway have filed maps with the Government which show that the company purposes constructing the following lines: Toronto to Hamilton, Brantford, Woodstock, London, Chatham, Windsor and Detroit; Brantford to Port Dover; Ancaster to Galt, Waterloo, Berlin and Goderich; Brantford to Waterloo, Berlin, Mount Forest and Owen Sound; Owen Sound to Collingwood, and a junction in township of Pickering with the main line east of Toronto; Kincardine to Barrie, Orillia and Washago, from which latter place there will be an extension to the Georgian Bay; Pembroke to Peterboro and Cobourg; Arnprior to a point on the St. Lawrence in Leeds township, east of Howe Island; Hawkesbury to a point of junction with the main line in Bastard township, south of Rideau Lake.—The Intercolonial Railway Co. will invite tenders for motor cars for their branch lines in Prince Edward Island.

WINNIPEG, MAN.—A. Wagner is applying to the Dominion Government, on behalf of Manitoba Radial Railway Co., for incorporation, with power to extend their line from Lundar to a point near the Hudson Bay post on Lake Winnipeg.—Tenders have just been taken by the Chairman of the Fire, Water & Light Committee, for supply of lead pipe for the city.—Dobson & Jackson have taken out a building permit

for a brick apartment block to be erected at corner Balmoral street and Ellice avenue, cost \$50,000.—Tenders will be received by R. Rogers, Minister of Public Works, up to January 15th, 1907, for 5,000 poles 30 feet long, and 45,000 poles 25 feet long, diameter at top to be 6 inches in both cases.—Tenders will be received by Chairman of the Fire, Water & Light Committee up to January 14th, 1907, for supply of two 250 h. p. water tube steam boilers and up to same date for supply of a 750 kilowatt generator plant.—Joseph Reid has purchased the hotel Waldorf and will add a new wing to the building.—Tenders will be received up to January 11th, by Fred Gelinus, Department of Public Works, Ottawa, Ont., for construction of post office building at St. Boniface. Plans with J. Greenfield, Superintendent of Public Buildings, this city.—G. H. Walton and Suckling & Co. have purchased property, corner Broadway and Hargrave streets, and will erect a modern apartment block thereon.—The Works Committee have taken tenders for laying several granolithic walks at a cost of \$5,108 and also the following sewers: Cathedral avenue, Powers street to McGregor street, cost \$2,315; Main street from Logan to Higgins avenues, cost \$2,980; Jasper street from Stadacona street to east end of street, cost \$10,150; Montcalm avenue, Jasper to Poplar streets, cost \$5,220; Higgins avenue from Park to Gunnell streets, cost \$1,276; Henry avenue Beacon to Knox streets, cost \$2,663; Asphalt pavement, Kate street from William to Elgin avenues, cost \$2,330.—Tenders will be received by the General Health Committee up to January 15th for installation of twenty five systems of plumbing in residences in this city. Plans at office of City Engineer.

TORONTO, ONT.—The T. Eaton Co. have purchased the property, corner of Yonge and Albert streets, now occupied by Bachrack & Co., and will make extensive alterations to the building.—Tenders will be received by H. F. McNaughton, Secretary Public Works Department, Parliament Buildings, up to January 15th, 1907, for the erection of Normal school buildings, excepting heating, plumbing, ventilating and electric wiring, in Peterboro, Stratford, Hamilton and North Bay. Plans at the offices of this department, at Public School Board offices at Peterboro, Hamilton and North Bay, and at City Engineer's office, Stratford.—Gordon McKay & Co. purpose erecting a five storey factory, corner Queen and Crawford streets, to cost \$60,000, work to be commenced as soon as possession of the land can be secured.—Building permits have been issued as follows: J. W. Siddall, 2-storey and attic brick dwelling, Oakland avenue, cost \$4,000; George Aldridge, 3 1/2-storey and mansard brick dwellings, 24 Dufferin Street, cost \$6,000; J. H. Klein, 2 1/2-storey brick building, 48 Cowan avenue, cost \$3,200; Toronto Carpet Co., 1-storey brick and steel building, King Street and Fraser avenue, cost \$9,000; Massey Harris Co., 1-storey brick addition to factory, King street west, cost \$3,000; Chas. Robb, 2-storey brick dwelling, 901 Shaw street, cost \$2,000; Davis & Carter, 1 pair 2 1/2-storey brick dwellings, Bloor street west, cost \$4,600; Thomas Clark, 2-storey brick dwelling, Galley avenue west, cost \$2,500; R. Dale, 3 attached 2-storey brick dwellings, 271 Grace street, cost \$7,000; Mrs. Francis Toby, 2-storey and attic brick dwelling, Havelock street, cost \$2,500; Mr. Wells, 2 1/2-storey brick dwelling, 119 Beatrice street, cost \$3,000; E. G. Switzer, 2 pair semi-detached 2-storey brick dwellings, 30 Grace street, cost \$8,000; Fred Elliott, 2-storey and attic brick dwelling, Geoffrey

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MINING

MUNICIPAL

AND

CONTRACTORS'

MACHINERY AND SUPPLIES

OF EVERY KIND

MUSSENS LIMITED

(Formerly W. H. C. Mussen & Co.)

MONTREAL

street, cost \$2,000; C. A. Ward, 1-storey brick driving shed, 28 Oxford street, cost \$1,850, R. J. Score, 2-storey and attic brick dwelling, Huron street, cost \$5,000, Canadian Pacific Railway Company, 3 1/2-storey brick addition to building, corner King and Yonge streets, cost \$10,000.—R. G. Cluff & Co. will shortly commence work on their new factories on St. Helens avenue, estimated cost \$100,000.—The City Engineer will again recommend the purchase of a new pump for the waterworks station, estimated cost \$250,000.—The by-laws providing for the trunk sewer, Yonge street bridge and eastern entrance to Exhibition grounds were defeated by the rate-payers on Monday last, while the power by-law was carried by a large majority.

CONTRACTS AWARDED.

DELHI, ONT.—Supply of a 200 kilowatt generator: Warren Electric Co., Sandusky, Ohio.

ST. BONIFACE, MAN.—\$100,000 debentures awarded to Wood, Gundy & Co., Toronto, at a premium of \$1,165.

PORT ARTHUR, ONT.—Erection of buildings for Meisel Manufacturing Co.: Shephard & White, this town, contractors.

SELKIRK, MAN.—Dobson & Jackson, Winnipeg, Man., have been awarded the following contracts: Construction of sewers, \$60,100, and supply of sewer pipes and specials.

GODERICH, ONT.—Supply of a 75 kilowatt generator for the town: Allis-Chalmers-Bullock, Limited, Montreal, successful tenderers at \$3,574.

BOULEVARD, ST. PAUL, QUE.—The contract for the supply of electric light for the town has been awarded to L. J. Marchand, as follows: Up to 40 lights, \$75 per arc lamp; between 40 and 75, \$72 per lamp; 100 or more, \$70 per lamp.

MONCTON, N. B.—The Contract for the Locomotive Shops for the Intercolonial

Railway was awarded to E. A. Wallberg, Montreal, at a price of about a half million dollars. They will be built entirely of Concrete and Steel. This is the last group of the shop system to be built there.

FIRES.

Store of W. H. Watson, Scotts Bay, N. S., totally destroyed.—Factory of the

Canadian Typograph Company, Windsor, Ont., damage \$5,000.—Warehouse at Fredericton, N. B., of F. S. Williams, Marysville, damage \$1,500.—The Yukon Block, Brandon, Man., loss \$8,000.—J. A. Tofts & Son's store, St. John, N. B., property of the Alexander Esate, loss \$7,000.—Bank of British North America building Duck Lake, Sask., totally destroyed.

A. & E. LOIGNON, C. E.

17 Place D'Armes Hill, MONTREAL

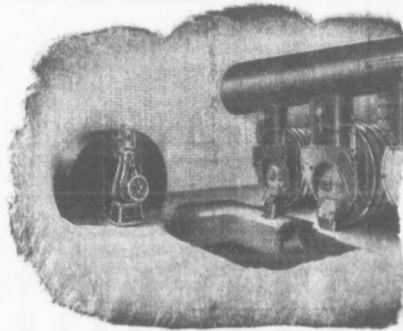
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Steel Structures for Bridges and Buildings
Warehouses, Factories, Water Power Developmen

Portland Cement...

HIGH GRADE GERMAN BRANDS FOR GRANOLITHIC AND ARTIFICIAL STONE SIDEWALKS.

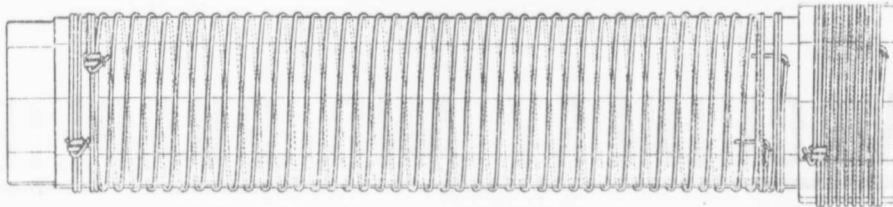
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Short Stacks
Positive Draft
Saves Fuel
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Constant Steam
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Independent of Weather
Catalogue ?

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FORGE COMPANY, LTD.
MONTREAL, QUE.**



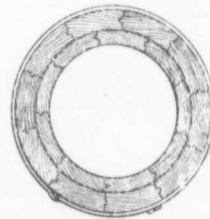
The Dominion Wire Wound Wood Water Pipe

Showing special method of winding with two independent parallel wires.
The great advantage of this is, that in event of one wire becoming damaged, the pipe still retains a factor of safety of 2.5.

Made only by
THE DOMINION WOOD PIPE CO., LIMITED
NEW WESTMINSTER, B. C.

Also Manufacturers of Continuous Stave Pipe for Irrigation and Power Purposes.

WRITE FOR CATALOGUE.



End view of Pipe and Coupling.



Star Portland Cement

THE CANADIAN STANDARD

The Canadian Portland Cement Co., LIMITED

502 Temple Bldg.,
TORONTO

203 Board of Trade Bldg.,
MONTREAL

CONSTRUCTION NOTES.

The Canadian Pipe Company, Limited, have installed the complete water-works system in the town of Enderby, B. C. The system includes the supplying and laying of about 5 miles of 4-in. and 6-in. wood stave pipe, the supply and setting of the intake pipe, the settling tank, fire hydrants, gates, in fact the complete system. The total cost will be about \$20,000. The pipe company expect to turn the water on and hand the plant over to the town immediately.

The Canadian Pipe Company, Limited, of Vancouver, B. C. have completed the installation of 13,000 feet of 30-in. and 36-in. continuous stave pipe up the Capilano Canyon, for the supply of water to Vancouver City. Water was turned on about 11,000 feet of it last week and the work was found to be a perfect success throughout the entire length of piping. This will give the city about twice as much water supply as formerly, and will increase the pressure about 20 pounds.

The City Council of Prince Albert, Sask., have offered the position of City Engineer, to Mr. E. D. Willson, at a salary of \$2,000 a year.

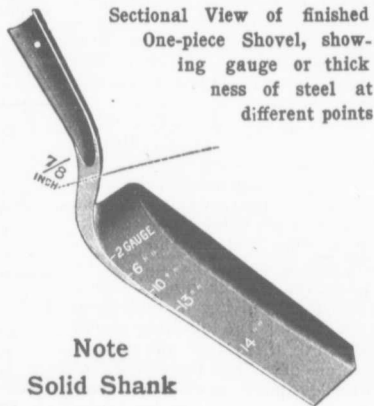
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METALLIC ROOFING CO.
LIMITED.
TORONTO, CANADA.
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"BULL DOG" SHOVELS

forged from one piece of High Carbon Bar Steel without weld or rivet, solid neck and blade, tempered in oil, straight chucked handle can be replaced when broken.

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WRITE FOR CATALOGUE LIMITED **HAMILTON, CANADA**



Sectional View of finished One-piece Shovel, showing gauge or thickness of steel at different points

Note
Solid Shank

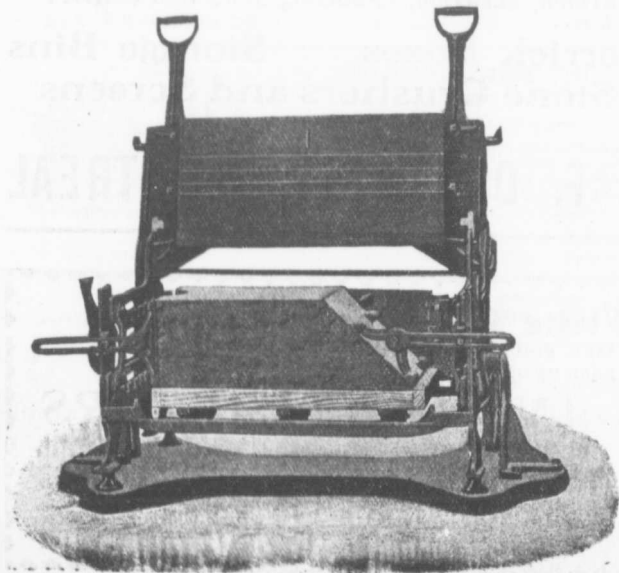
... Speaks For Itself ...

THE MILES CONCRETE BUILDING BLOCK MACHINE

Makes 40 Different Sizes of Stone in Any Design, as well as the Specials, viz.:

Water Table, Gable, Circle, Angle, Chimney, Cornice, Pier Blocks, etc

Catalogues and Information Cheerfully Furnished.



This Machine makes all blocks face down—"the only practical way"—allowing of a richer and finer facing, producing blocks that are perfect in appearance and impervious to moisture.

Let us tell you how the "Miles" will pay for itself over any other machine in three months' operation.

Manufactured and Sold by
VINING BROS.
M'f'g. Co.
 Niagara Falls, - Can.

CALENDARS RECEIVED.

The Canadian Fairbanks Company, Limited, Montreal, Toronto, Winnipeg and Vancouver, have again favored their customers and friends with a calendar, on which are shown many of the specialties which they manufacture. A copy of this calendar may be had by any of our readers for the asking.

MUSSENS LIMITED.

The business which has been carried on by Messrs. W. H. C. Mussen & Company for some years will hereafter be known as Mussels, Limited. We understand that the change in the name has been made in order to facilitate the handling of the business, which can be done to greater advantage in the form of a joint stock company. The change, however, in no way alters the personnel of the company.

At this time some particulars of the business of W. H. C. Mussen & Co. would seem appropriate. The company commenced business June 15th, 1901, occupying one building at 763 Craig Street, Montreal, as office and warehouse. In 1903 they doubled the capacity by taking over the adjoining building of same size, giving a total space of ten floors. The following year in addition to these two offices they took an office on the corner of Victoria square and St. James street formerly occupied by James Cooper, the Dominion Wire Rope Company and the James Cooper Mfg. Company. The following year they again doubled the office space by acquiring the entire ground floor at the corner of Victoria square and St. James street. In 1905 they opened a branch office in Toronto, and in 1906 gave up their warehouse on Craig street, Montreal, and purchased a large new warehouse on Colborne street, with a capacity for 100 car loads of stock. In 1906 they opened branch offices in Winnipeg and Vancouver and are this month opening a branch office in Quebec.

Mussels, Limited, will handle a very large line of railway, mining, and contractors' supplies, including Smith concrete mixers, Austin jaw and gyratory crushers, contractors' wagons, New Era graders, Ideal

concrete block machinery, Marsh & Henthorn hoisting engines, Bucyrus steam shovels, railroad cranes and railroad pile drivers, etc., etc.

In the short space of five and one-half years this business has grown up to the position which it now holds, namely, one of the largest supply firms in the Dominion.

The Climax Road Machine Company, Hamilton, Ont., have published a booklet showing the line of goods handled by them, including Robinson's patent moulds, Climax road machines and crushers, drag scrapers, automatic distributing wagons and corrugated steel arch coverings for bridges, the latter a modern substitute for the old fashioned wooden arch frames.

A. LEOFRED

(Graduate of McGill).

Consulting Engineer**WATERWORKS** A SPECIALTY.**30 St. John Street QUEBEC**

Metropolitan Ins. Bldg.

Phone 545.

THE GREY AND BRUCE PORTLAND CEMENT COMPANY

of Shallow Lake, Limited.

Manufacturers of

"HERCULES" BRAND OF PORTLAND CEMENT

Very finely ground. Unsurpassed for Sidewalks, Floors and all work requiring the Highest Grade of Portland Cement. For prices address.

A. D. CREASOR, Sec'y-Treas.
Head Office, Owen Sound, Ont.

CONCRETE MIXERS

MANY KINDS

MANY SIZES

STEAM, ELECTRIC, GASOLINE, HAND AND GRAVITY**Derrick Boxes Storage Bins
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Etc., Etc., Etc.

E. F. DARTNELL, MONTREAL**JNO. S. FIELDING**

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CONSULTING ENGINEER

Concrete Dams**Power**

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25 Years' Experience

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**Matthews
Fire
Hydrant**

Is the recognized Standard Hydrant, and is the easiest Hydrant to keep in order.

Our Hydrants are thoroughly tested before shipment, and are of substantial proportions and weight.

Have your Engineer specify "The Matthew's" and get our tender.

THE KERR ENGINE CO., LIMITED
Walkerville - Ont.

Canadian White Company, Limited

SOVEREIGN BANK BUILDING, MONTREAL, CANADA

WINNIPEG OFFICE: BANK OF BRITISH NORTH AMERICA BUILDING

ENGINEERS AND CONTRACTORS

FOR

Steam and Electric Railroads: Electric Light and Power Plants: Building Construction: Water and Gas Works: Docks, Harbor Works, etc., etc.

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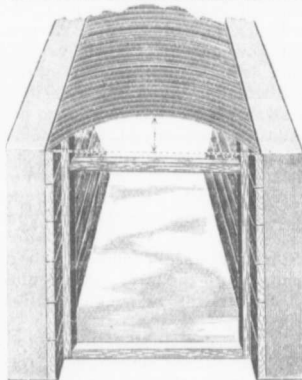
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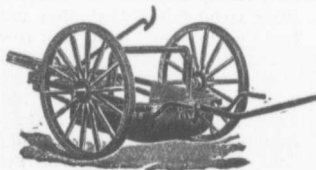
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HIGHWAY CONSTRUCTION*

The subject of highway construction has been so extensively discussed among laymen and engineers that it would seem to be difficult to raise any question that would be novel or interesting in a gathering of this kind, save for the fact that this Association is a gathering of laymen and experts, and probably the laymen would desire to gather data from the experts as his future guide in his official capacity, as to what pavement to use and what to reject, and on what basis his use or rejection should be made. The assumption of the laymen that road construction is a simple mechanical proposition, easy of achievement by an ordinary untrained intellect, while commonly accepted heretofore, has been somewhat gainsaid in the last few years as the scattered attempts in this country of road improvement have been a success or a failure in the ratio that a competent engineer has or has not been in control.

The sentiment of the country at large is in favor of good roads. The engineering part in this work has hardly been in proportion to the growth of the movement, and the result has been attempts on the part of one man or another to promote his own individual ideas of the work in total disregard of the peculiar requirements of his own locality. The extent of this country is so great, the supply of road material so diverse, the climatic conditions so varying, and the practice of road building so uncrystallized that it is impossible to give hard and fast rules for road construction for any given locality. One expert in roads will tell you that drainage is the sine qua non of road construction; but when it is conceded that one-third of this continent is arid or semi-arid, the problem of drainage ceases to be a factor. Another expert will declare that Telford and MacAdam laid down the principles of road construction which cannot be properly departed from; yet if no material of MacAdam's standard can be found within 500 miles, the question of economy will put MacAdam into innocuous desuetude. Another expert has found a natural material in his section that is so applicable to the requirements of his locality that in his broad-minded philanthropy no other material is of any account or any use.

The fact of the matter is that road construction in the United States has to be developed on its own peculiar standard, which standard will vary in every locality according to topography, climate, geological formation, density of population and particular require-

ments of that population. What is a good pavement in one section for climatic reasons may be a poor pavement in another, and what may be proper in one section may be too expensive in another under similar conditions.

The fundamental factors in road construction are as follows:

The earning power of the community.

The topography and climate of the section.

The available road material at hand.

The construction of the road itself.

As to the first it can be easily seen that in a district with land worth \$20 per acre the paying capacity for road construction is much less than a country worth \$100 per acre, the value of the land of course being based on its earning capacity, and yet it may be a correct assumption that \$20 land might be worth \$100 if it had good road communication. However, in the far future, when all roads are improved, this will cease to be a factor. At present, however, the taxable value of land is potent in the cause of road construction, as it might easily be seen that a rocky farm with no possible revenue cannot be benefited by any road construction at any time. The general community must here enter and announce the plea that intercommunication by good roads is the first law of civilization. If the rocky farm cannot pay for its road, the fertile farm beyond must have it means of communication, willy nilly.

In considering the topography and climate as functions of road construction, the question of temperature first enters in, as the line of frost penetration in the ground is a vital point in construction. Methods used in road building in a warm temperature will not be found adequate for a cold climate, and coupled with this also enters the question of aridity. Where there is no water there is no frost, so the warm area can really be extended so as to include the arid area. In the frost-ridden sections, roads have to be constructed of greater depth and of harder material to insure their stability. To offset this, however, in the extreme north the wear on the road itself is shortened by three or four months on account of snow.

Outside of the arid section drainage is paramount. This must be artificial in the flat country and properly graded in the mountain districts. That is to say, water must not be allowed to stand on a flat grade or wash out the pavement on a steep grade.

As to material to be used for roads the cost of transportation is

the prime factor in the selection of material and methods of construction. Road materials must be classed under two heads, natural material to be used as found, and artificial material consisting of natural material broken up to be used. Given a natural substance of average use in an average locality, it may be considered economically preferable to an imported material of higher character, but may not give such absolute good results.

Good gravel in a well-drained country without frost, properly laid and rolled, will give ideal results if properly cared for. If used in the frost limits its period of good use in the year may be extended by putting a layer of larger stone at the bottom. In some localities there are soft limestones and gravel. The limestone makes a good foundation, but does not wear well. Use the stone for the foundation and the gravel for a wearing surface and you will find good results. If no limestone exists, then burnt clay can be made available for the foundation. If there is no gravel it would then be better to import a hard, durable stone for the wearing medium on the limestone bed.

The slates, shales and silicates are also available for good road construction. The shales are somewhat affected by frost and require renewal, so it does not pay to import them. The silicates, however, are of different character. Take noviculate for instance. It is transported 200 to 300 miles with good economic results. Flint formations are also available, but they are rare.

Take the Mississippi Valley in general, however, and what shall be done with its roads? Good material for a wearing surface is rare and unsatisfactory, and it is probably best to lay down to the people of these communities that they must face the music and build their roads in good shape in approved methods, of selected material transported from a distance and pay their bills. Traveling through the State of Illinois for instance, what should be done? No local material and poor drainage, but plenty of rich land and rich farmers; so let them pay the bills for first-class roads.

In Alabama, for instance, with better material, not first class but available, it would be better at first to make a moderate outlay and then when the farmer gets rich, let him have the best there is. If there is gravel available let him use gravel for the present; if there is good shale let it be used, so that the present difficulty of transportation in wet weather may be eliminated.

In all these improvements, however, a trained mind should be used. It need not be an engineer's mind,

*A paper read before the American Society of Municipal Improvements by Mr. James Owen, M. Am. Soc. C. E. Consulting Engineer, Newark, N. J.

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but it should be an experienced intelligent intellect, so that any improvements shall have all the up-to-date requirements and no money be wasted. A first-class pavement designed to use first-class material prepared in a first-class manner will be and always has been a failure if carelessly and improperly executed, and we have all seen such cases and know the result.

In considering the construction of roads it will not be desirable to go into great detail or lay down any hard and fast rules, as I have found that excellent results can be arrived at in extreme variations of practice, and the small final difficulties can only be determined by years of experience, and this final difference may be radically upset by special natural phenomena for which no foresight can provide.

The following rules, if generally followed, always give good results.

Grades must never be level; minimum, $\frac{1}{2}$ per cent.; maximum, fast travel, 4 per cent.; maximum, light load, 10 per cent.

Complete drainage.

Gravel roads; gravel with stones about the size of hickory nuts, with coarse sand and about 10 per cent. of loam.

Shale roads; about 4 in. spread, letting travel wear it down.

Gravel and limestone; limestone should be laid like a pavement and properly wedged, and the gravel put on and properly rolled.

Telford and macadam; telford from 8 to 12 in., with foundation 5 to 8 in. and broken stone 3 to 4 in. Macadam from 4 to 6 in. in two layers well rolled. Top stones well rolled with a final coat of screenings. Broken stone should be uniform in size from $1\frac{3}{4}$ to $1\frac{1}{2}$ in. and properly screened, all dust taken out and put on top. Character of stone; 1, trap; 2, granite; 3, hard limestone; 4, soft limestone. In the hard traps, packing must be used for proper consolidation. In the granite and limestone the binding can be done without packing. Good rolling is necessary for proper hard road construction. Steam rollers and horse rollers are equally efficacious if consistently used.

After a road is built the question of repairs immediately enters in. A road just completed may require immediate care. Under any circumstances attention will be required within a year, and so every system of road construction that is organized should be immediately supplemented by a maintenance organization, for in time the construction department will disappear, but the maintenance department will be permanent. At the International Engineering Congress an English engineer told me that he had 400 miles of road to be maintained, but he had only built a mile and a half that year. The maintenance department is the vital point in the future of the road

development of the country. If roads are built and allowed to relapse, the money is wasted and the country retrogrades. The stimulus of good roads is marvelous. The bicycle fever was its sequence, and the automobile is now with us. The automobile is growing purely under the encouragement of good road construction, and is demanding attention from engineers as to whether there should not be new means and methods for road maintenance, and I will here recite certain investigations to that end.

While the users of the present improved highways, either in carriages, wagons or automobiles, have probably not noticed a more rapid deterioration of the roadways, it has become apparent to those in charge of their construction and maintenance that more care and more money are required to keep the surface up to the proper standard. It is therefore obvious that with the probable enormous increase of travel due to the perfection of surface, either means and methods should be sought that will be more efficacious and also as economical.

Another source of trouble arising from the extended use of the highways is the dust. This is of such extent that it is not only troublesome to the traveling public, but a positive injury to abutting property, whether residential or used for farming. In fact, fruit raising near a much-used highway is almost a thing of the past. This dust nuisance has been the cause of recent investigations in Europe for means and methods for its abolition, and it will be in order to give a brief outline of experiments and results.

In congested communities, able to afford it, the past practice has been to use water by periodically sprinkling it on the surface. This has suppressed the dust, but it has the effect of rapidly rotting the roadway unless extreme care is used in the application. Of later years other material has been used, such as tar and crude oil, and in the consideration of these extraneous materials I will give a short outline of what has been done and attempted in Europe and this country.

France seems to have been the first country to consider the subject, for in 1880 the engineers at Sainte-Foy la Grande used tar, but the undertaking was not a success. In Oran, Africa, in 1898, M. Cardy had some roads oiled with aloe oil and massat oil, and the results were so favorable that other towns in Algiers adopted the process. In 1898, however, extensive experiments were begun in California, and 80 miles of road were successfully sprinkled with oil. In 1900, Engineer Rimini, of France, prepared a patent mixture of tar with a drier, the mixture being intended to hasten the drying process, but it did not give good results. In 1901, experiments were made in France

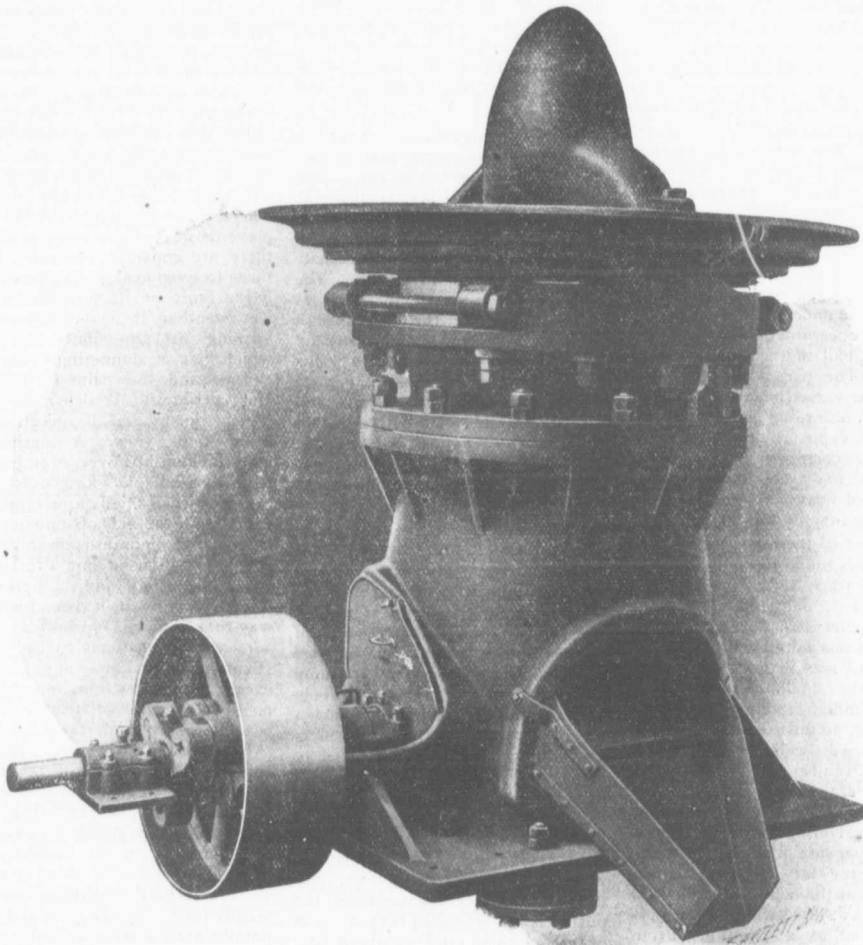
with tar and oil, and since then experiments have been conducted in various localities in that country with all kinds of material, especially tar. The tar manifested such superiority over any other material that it was used exclusively in the further experiments for its practical application. The result of the investigation of proper application of tar in France may be summarized as follows: The application must be undertaken only in dry weather. The roadway must be perfectly clean, dry and well kept. The tar will not stick if the roadway is damp but becomes loose after a short time. In cold weather the tar becomes stiff too quickly and does not spread, besides it does not penetrate the surface of the road. If the latter is not entirely clean and free from dust the tar does not cling to it, but becomes mixed with the dust when it is spread on the road.

In the application of the tar to the surface it was found that better results were achieved if the tar was heated to a sufficient temperature to enable it to flow freely, about 210° Fahr. Many devices have been originated for properly heating and distributing the hot tar. One, used at Neuilly, consists of a hearth with a tar reservoir over it, and a smokestack to increase the draught. Two kettles are used at one time, so that the tar can be warmed in one while the other is in use. The material is poured into pots with an open spout and poured on the surface. This plant is for a moderate application.

For large stretches a large plant was designed by M. Audoin, consisting of a sprinkling barrel, which consists of a cylinder about two cubic meters capacity which rests upon a two-wheeled truck and is filled by means of a pump. The tank is warmed by a portable hearth which is pulled from under the cylinder after the proper temperature has been attained. At the rear of the tank there is, as in sprinklers, a distributing pipe with a number of holes which spread the tar for a distance of 5 feet. The contents of the tank are sufficient for covering a length of 375 feet. If smaller tanks are used, or even simple sprinkling pots with open nozzles, the tar is spread over by means of broom to ensure even distribution.

In France it has been found that before a tarred roadway is given over to traffic it is necessary to sprinkle the tar with a coating of sand. The sand further hardens the tar, protects it and prevents slipping of horses. It has been found that the sand should be scattered after the tar has been allowed to harden for two or three days. Attempts have been made, however, to coat a road with tar and sprinkle it with sand, and immediately turn the street over to traffic. For

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spreading over the tar rather coarse gravelly sand was used, occasionally fine sand, and here and there the street dust which had been swept together just before tarring. It is to be noted that gravel and gravelly sand gave bad results, for the larger pieces were forced into the tar coat under the action of traffic and made holes. By the use of street sweepings better results were obtained, although this is inferior to river sand. The street sweeping dust absorbs certain lighter parts of the coating. The best sprinkling material is fine sand, which was used on a section in the proportion of about 1 cubic meter to 2,000 square meters of tarred road.

It is advisable to stop traffic entirely two or three days during the hardening of the tar. Where this is not feasible and would cause much inconvenience, first one-half and then the other half of the street may be tarred. The period of hardening for the tar varies between two and five days, according to the temperature, the exposure of the street to wind, the composition of the tar materials and the like. By the addition of heavy oils the period of hardening may be lessened.

The cost of the tar application in France was found to be as follows: Aug. 1, 1902, a section of road about 370 ft. long and 12 ft. wide at Champetery was tarred. It had lately been repaired with slag and gravel and was in good condition. Travel was small. From August to November, 1902, the coating wore well, no dust or mud, and the street dried well after storms. From November, 1902, to April, 1903, several traces of wear were discernible, the stones showing through. During a rainy period the tar layer rose in places and formed with the tar remnants which came out at the denuded spots in a thick sticky slime, which, after drying, served as a coating. From April to July, 1903, the tar disappeared in places, chiefly in the middle of the road.

In July, 1903, the Avenue de la Tourelle in Saint Mandé was tarred. This avenue, which has a very heavy bicycle and automobile traffic, had a limestone surface laid in May, 1903. The tarring was done in July, same year, in damp, cool weather, and the results were excellent. The tar disappeared in places where the surface was not entirely dry when it was applied. This road was retarred in June, 1904, and there was still tar in places, although not enough to prevent dust.

These and other experiments show that the tarring of the surface lasts about a year, and during that time there is no dust and little mud. It is, however, the unanimous view of the French experts that the amount of wear of the roadway is decreased through the tarring pro-

cess. This can readily be appreciated since there is little dust, and hence less abrasion of the stone. The tar surface is also waterproof and prevents deterioration from penetration of the water. There is also a strong claim made as to the benefit of tar as a hygienic measure, as it has a decided antiseptic action. In England exclusive use is also made of tar for the maintenance of the surface of the roads and prevention of dust.

In this country the use of tar has become a recognized practice, although at present it is not extensive. One of the first applications was made in Jackson, Tenn., where a very successful experiment was made on practically the same lines as in France. The tar was heated to a temperature of 210°, and run over the road through a 1½-in. hose with a 1-in. nozzle. The surface of the roadway was then broomed and covered with a light coating of clean sand and screenings and rolled with a steam roller. The coating lasted about seven months. A section cut through the surface showed that the tar had penetrated one or two inches.

The town of Montclair, N. J., in 1904, coated one of its streets on a steep grade with a mixture of tar and screenings, and after a year of use this showed little results of wear. At the present time patches of the original surface are now visible, showing the wear. This year the town has covered about a mile of roads, and their surface is universally satisfactory, perfectly clean and smooth with no dust or mud. The cost of the 3,400 ft. treated this year was 30 cents per lineal foot or 17 cents per square yard. This included 300 yards of cracked stone and screenings, and if this item be eliminated from the outlay it will be found that the cost of tarring alone would be about 5.66 cents per square yard, comparing favorably with the French result.

The authorities of the village of South Orange, N. J., are also extensively repairing the streets with tar, with good results, and the Borough of Queens, New York, has also treated miles of its roads in the same way.

There seems to be one radical difference between the French practice and that adopted here. In France they merely sprinkle the surface of the spread tar with sand, especially rejecting gravel, as they find the coarse material breaks up the surface of the hardened tar. In this country a coating of screenings is universally spread upon the tar with the design of incorporating as much as possible the tar with the dust.

Taking the practice in this country of using stone dust we find, of course, a large increase in cost by

the extra price of the stone. On the other hand, we have the saving of wear on the road itself by the fact that the tar and dust mixture acts as a cushion and lessens abrasion.

While undoubtedly the tar application for highway maintenance seems at present to give the best results, there are other materials now in use that are demanding favorable consideration. The most prominent is crude petroleum. While this medium is undoubtedly best for an arid region, like California or Algeria, it has great disadvantages over tar in any territory where there is ample rainfall. It prevents dust efficaciously provided there are constant renewals, from three to four weeks being seemingly the limit of its usefulness. In wet weather it is objectionable, forming an emulsion with water which has a damaging effect on clothes and the paint of wagons and carriages. It also makes the surface mushy and is objectionable from that view. A sprinkling material has, however, been invented for use on roads known as westrumite. It is chiefly a mineral tar, which with the aid of ammonia or other cheap medium is dissolved in water. It is used in a 2 to 10 per cent. solution and sprinkled from tanks in the ordinary way that water is sprinkled. The surface, however, has to be clean. It can be carried on in any weather, except very heavy rain, and requires no interruption of travel. The practice is to undertake the first two sprinklings with a 10 per cent. solution at intervals of 24 hours. After that a 5 per cent. solution is used every two weeks. The cost for sprinkling with the material for three months, when sprinkling is required, would be about 3 cents per square yard, but this expense is merely for laying the dust and does not obviate the wear as in the case of tar. There is also a material intended to lay the dust known as coudrogenit, used in the same way as westrumite, but its application is limited and correct results have not as yet been arrived at.

In this country a material has been put on the market known as tarvia, which is being extensively used as the means of allaying dust, and so far its application fills the want for immediate delivery of a tar preparation for road surfacing.

Whether in the larger uses of tar in the future its market price will make it as economical as has been the case with ordinary coal tar is a fact that remains to be proved. Tar as a medium for binding stone is no recent innovation. Years ago tar pavements were in great demand and use, and some of them are in existence to-day, but the present knowledge of its use and properties is much more intimate than it was at that period.

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Lethbridge Collieries Limited, Winnipeg, Man., incorporated, capital \$500,000. Incorporators, I. Cockburn, J. S. Hough, D. E. Adams, D. R. Dingwall, T. A. Burrows, J. Y. Griffin and others, all of Winnipeg.

A license has been granted the Lufkin Rule Company, incorporated under the laws of the State of Michigan, to do business in the Province of Ontario. A. R. Bartlet, Windsor, Ont., attorney.

A license has been granted the Butler Bros.-Hoff Company, incorporated under the laws of the State of New York, to carry on a general contracting business in the Province of Ontario, capital used not to exceed \$100,000. E. C. Kenning, Windsor, Ont., attorney.

The Big Six Silver Cobalt Mines, Limited, Cobalt, Ont., incorporated, capital \$1,750,000. Directors, W. H. Gates, W. B. Gregory, and others.

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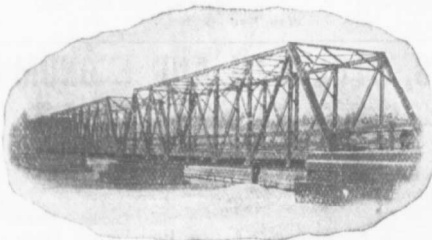
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A license has been granted the Oil Well Supply Company, incorporated under the laws of the State of Pennsylvania, to do business in the Province of Ontario. Capital used not to exceed \$40,000. W. J. Tremmer, Toronto, is attorney.

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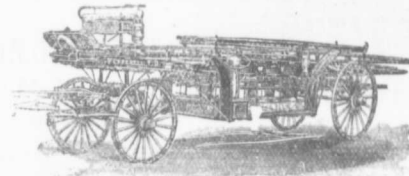
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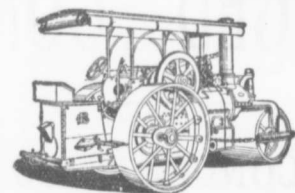
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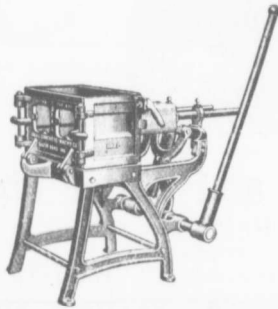
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							1 dy.	7 d.	28 d.	3 mos	1 yr.	1 dy.	7 d.	28 d.	3 mos	1 yr.
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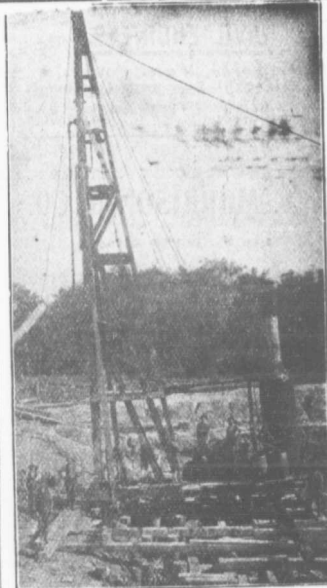
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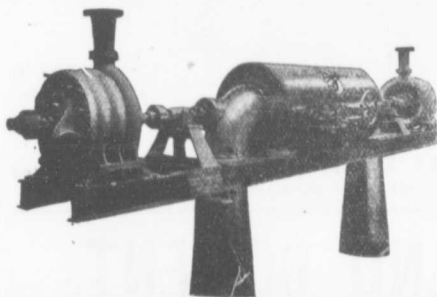
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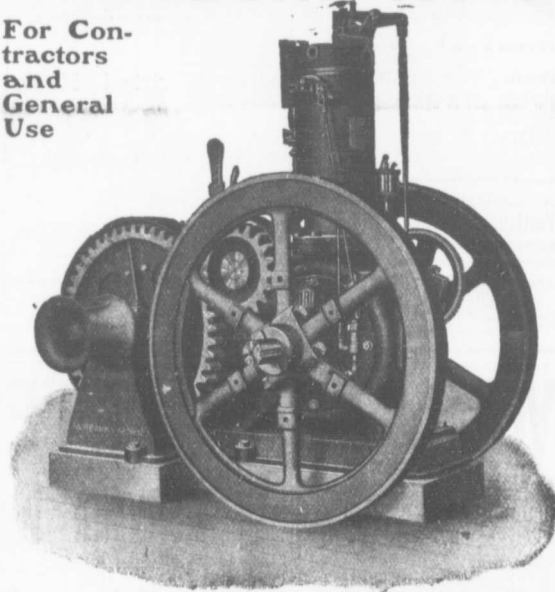
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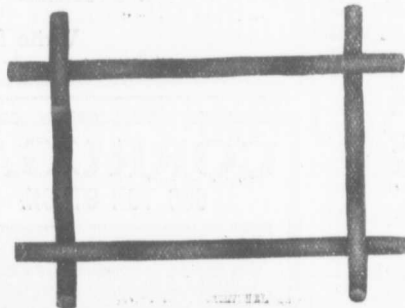
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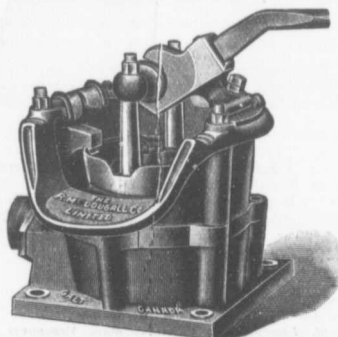


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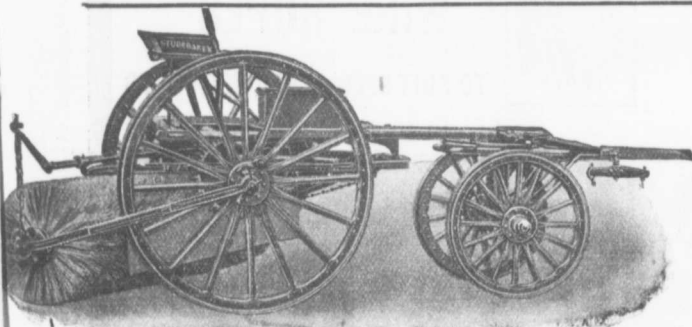
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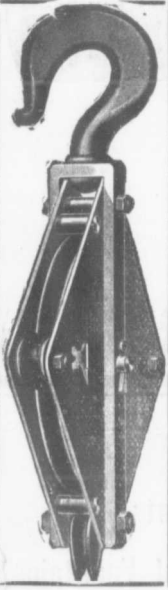
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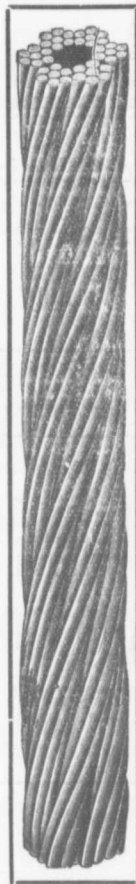
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