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CANADIAN CONTRACT RECORD

A WEEKLY JOURNAL

PUBLIC WORKS • TENDERS • ADVANCE INFORMATION • AND MUNICIPAL PROGRESS

EVERY SATURDAY

Vol. 3.

Toronto and Montreal, Canada, July 23, 1892.

No. 24

THE CANADIAN CONTRACT RECORD,

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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.



NOTICE TO BUILDERS AND CONTRACTORS.

Tenders for Isolation Hospital.

Separate and lump tenders addressed to the undersigned will be received through registered post, at the City Clerk's office, up to noon on MONDAY, AUGUST 1, 1892, for the several works required in connection with the erection of a building to be used as an Isolation Hospital on a site northwest of the Toronto Jail.

Plans and specifications may be seen and full information obtained upon application at the office of Mr. Henry Simpson, Architect, 9 1/2 Adelaide Street East, or at the City Clerk's office, City Hall, Toronto.

Tenders must be accompanied by a marked cheque made payable to the order of the City Treasurer or cash deposit equal to 5 per cent. of the amount thereof, if under \$1,000, or 2 1/2 per cent. if over that amount, which deposit will be forfeited to the city in the event of the party or parties whose tender is accepted failing to execute the necessary contract and bond.

Tenders must be enclosed in properly endorsed envelopes, which can be obtained at the office of the Architect and also at the City Clerk's office.

The deposits accompanying unsuccessful tenders will be returned.

The names and addresses of two responsible persons who are willing to become security for the proper fulfillment of the contract must be submitted.

The lowest or any tender not necessarily accepted.

R. H. GRAHAM,
Chairman Local Board of Health.
JOHN BLEVINS, Sec. L. R. H.
City Hall, July 15, 1892.

TENDERS

Wanted for building SEWERS and works connected therewith in Moore Park, Tp. York. Plans, specifications, etc., can be seen and sealed tenders received at the office of the undersigned until

5 o'clock p.m. on Saturday, 30th July, 1892.

The undersigned will be at Tp. rooms, Tremont House, Yonge St., Toronto, from 2 to 5 p.m. on Saturday, 23rd inst., with plans, etc. The lowest or any tender not necessarily accepted
PETER S. GIBSON,
Engineer York Tp.

Willowdale, July 13th, 1892.

TOWN OF BARRIE.

TENDERS FOR STEAM HEATING, ETC.

Tenders will be received by the undersigned up to 12 O'CLOCK, NOON, FRIDAY, JULY 29TH, 1892, for a system of Steam Heating and Ventilation, for the County Court House and Municipal Buildings in the Town of Barrie.

Plans and specifications can be seen at the COURT HOUSE, BARRIE, or at the office of W. J. BURROUGHS, 353 Queen St. West, Toronto.

Each Tender to be put in on the printed forms furnished and to be accompanied by the signatures of two responsible parties willing to become security for the due fulfillment of the contract. The lowest or any tender not necessarily accepted.

Plans can be seen after the 18th inst.

H. GRAHAM,
Chairman of Committee,
Court House, Barrie.

Barrie, July 15th, 1892.



Notice to Contractors

Tenders will be received by registered post addressed to the City Engineer, Toronto, up to 11 o'clock a.m. on TUESDAY, JULY 26, 1892, for the construction of the following works.

Cedar Block and Granite Tothing Pavement.

On King street, from Davies avenue to the Grand Trunk Railway track (track allowance), cedar block and granite tothing on concrete foundation.

On Spadina avenue, from Queen street to Bloor street (track allowance), cedar block and granite tothing on concrete foundation.

Specifications and forms of tender may be obtained on and after July 21st, 1892, at the office of the City Engineer.

A deposit in the form of a marked cheque, payable to the order of the City Treasurer, for the sum of 5 per cent. on the value of the work tendered for under \$1,000, and 2 1/2 per cent for the value of the work tendered for over that amount, must accompany each and every tender, otherwise it will not be entertained. All tenders must bear the bona fide signatures of the contractor and his sureties (see specifications), or they will be ruled out as informal.

The Committee do not bind themselves to accept the lowest or any tender.

JOHN SHAW,
Chairman Committee on Works,
Committee Room, Toronto, July 18th, 1892.

TO BRIDGE BUILDERS and Contractors.

Sealed tenders will be received by the undersigned up to 6 p.m. on AUGUST 15TH, 1892, for the construction of a

Wrought Iron or Steel Bridge

in the Town of Woodstock. Specifications may be seen at the office of the Town Engineer.

G. C. EDEN,
Town Clerk.

SEALED TENDERS

Will be received by the Corporations of the Counties of Perth and Middlesex, at the County Clerk's Office, London, until noon on WEDNESDAY, THE THIRD DAY OF AUGUST, 1892, for the erection of an

Iron Superstructure of a Bridge

over the River Thames, on the boundary between the Townships of Blanshard and West Nisissin, known as "The Perth Bridge." Said superstructure to consist of two spans, viz. one of 86 feet and one of 101 feet, each in the clear. The roadway is to be fourteen feet in the clear, and the superstructure is to be proportioned to a rolling load of 100 pounds on each square foot of roadway surface, with a factor of safety of four. The floor planks and joists are to be of white pine. Tenders are to be accompanied by detailed plans and specifications and straining sheets showing the strains on each part and section in square inches. Tenderers to give the names of two solvent sureties for fulfillment of contract. The lowest or any tender not necessarily accepted. The work to be completed on or before the 15th day of October next.

JOHN CORRIE, Commissioner for Perth.
F. R. TALBOT, Commissioner for Middlesex.
T. E. ROBSON, County Clerk, Middlesex.
London, July 21st, 1892.



Notice to Contractors

Tenders will be received by registered post addressed to the City Engineer, Toronto, up to Eleven o'clock a.m. on TUESDAY, JULY 26TH, 1892, for the following work

A SEWER

On Roseberry Avenue, from Bathurst Street to 325 feet easterly.

Specifications and forms of tender may be obtained on and after July 19th, 1892, at the office of the City Engineer.

A deposit in the form of a marked cheque payable to the order of the City Treasurer, for the sum of Five per cent. on the value of the work tendered for under \$1,000, and 2 1/2 per cent for the value of the work tendered for over that amount, must accompany each and every tender otherwise it will not be entertained.

All tenders must bear the bona fide signatures of the contractor and his sureties (see specifications), or they will be ruled out as informal.

The committee do not bind themselves to accept the lowest or any tender.

JOHN SHAW,
Chairman of Committee on Works,
Committee Room, Toronto, July 15, 1892.

USEFUL HINTS.

We have often noticed cracks in the plaster in ceilings of rooms the entire length or breadth, as the case may be, of the ceiling, and, on investigation have found it caused by the running of a partition directly above, and which partition is found to be two or three feet off bearing, or from a supporting partition below. Where such instances occur in framing a house, it is a very inexpensive matter to cross furr the joist at the bottom, and lath on the furring, and the cracking will not happen. This should be done also in attics, where plastered, instead of lathing directly on the rafters and collar beams.

National Builder.
Writing to the *American Machinist*, J. D. Cox, Jun., says: It is pretty generally known among master mechanics and draftsmen that you can write on blue print paper with a solution of soda and water, the writing coming out white but I believe that it is not generally known that you can write equally as well with red ink if a little caustic soda has been dropped into the red ink bottle. Enclosed is a little sample of blue-print paper, on which you will observe the clearness and distinctness of the red ink. A little piece of caustic soda, about as large as an ordinary white bean, is sufficient for a bottle of red ink, such as draftsmen use, or the ordinary desk size bottle.

LEAD LIGHT GLAZING. Dr. Gessert (an authority on stained glass) says that the lead caline, of very small dimensions, should be laid around one of the middle pieces of glass forming the painting, so as to hold the central piece of glass in the groove in one of its sides, while in the other side other pieces can be inserted. Continue this constantly over the leadance of the cartoon or paper design upon which the work is laid, working always from the centre of the picture outwards, soldering the several pieces of lead together during the process by their ends of contact, which may be interlaid in the grooves at the corner where they join. For this operation, soft or tin solder is required and a glazier's soldering iron with a copper point should be used for applying it. After this is heated in a charcoal fire it is to be rubbed with powdered hydrochlorate of ammonia and resin, and then on a piece of the solder, a portion of which will adhere to the bit, and may be so carried to the work. When the soldering is executed it is well to touch over the joints with dark oil colour, or, still better, with diluted sulphuric acid, in order to remove the bright appearance, which might otherwise damage the effect of the painting.

CONTRACTS OPEN.

HINTONBURGH, ONT.—The Roman Catholics are considering the erection of a separate school.

MILVERTON, ONT.—Mr. Reddaway will erect a grain elevator, with a capacity of 40,000 bushels.

RAT PORTAGE, ONT.—Tenders are invited for the erection of St. Alban's Church. C. Wheeler, architect, Winnipeg.

OWEN SOUND, ONT.—J. C. Forster, architect, is calling for tenders for the erection of a residence for Mr. Henry Stephens.

TORONTO JUNCTION, ONT.—Mr. J. A. Ellis, architect, has been instructed to prepare plans for the new High School building.

PETERBORO, ONT.—The Council has decided to issue debentures for the sum of \$40,000, to be expended in constructing a sewerage system.

ALLISTON, ONT.—The by-law authorizing the expenditure of \$15,000 for a system of waterworks was carried by the ratepayers on Wednesday last.

GALT, ONT.—The ratepayers will vote on a by-law on the 12th of August to raise the sum of \$10,000 to build a new bridge and extend the waterworks.

NEW WESTMINSTER, B. C.—A deputation of citizens will memorialize the Dominion Government to grant an appropriation for the erection of a new drill shed.

VICTORIA, B. C.—The Okell and Morris Fruit Preserving Company has decided to erect a factory on the large wharf now being built near Rock Bay bridge.

SEAFORTH, ONT.—A by-law will be submitted to the ratepayers at an early date to raise the sum of \$14,000 to purchase a site and erect a town hall and fire station.

DOON, ONT.—Mrs. Jamieson, proprietress of the Doon hotel, has purchased a site on which to erect a new hotel building this summer. The old hotel will be converted into a store.

ORILLIA, ONT.—The Fire and Water Committee has decided to ask the Town Council to submit a by-law to the ratepayers to grant the sum of \$25,000 for the extension of the waterworks.

KNOWLTON, QUE.—J. E. Fay, Secretary-Treasurer, will receive tenders until the 30th inst. for the construction and masonry work of abutments of three iron bridges to be erected in this village.

BROCKVILLE, ONT.—Geo. A. Allan, architect, will receive tenders until the 25th inst., for the erection of a brick and terra cotta building on the corner of King and Broad Streets, for the Durham estate.

KINGSTON, ONT.—The proposed Catholic summer school will be erected at Prospect Park. —Mr. Ellis, architect, will shortly prepare plans for a parsonage to be erected in connection with the Methodist church at Cataraqui.

BARRIE, ONT.—Tenders are wanted until the 6th of August for the construction of two bridges on concession line between the second and third concessions of Oro. Address Thos. Drury, Crown Hill, P. O., or James Ross, Reeve, Barrie, Ont.

NIAGARA FALLS SOUTH, ONT.—The High School Board have instructed Messrs. White & Roberts, of Buffalo, to prepare plans for the proposed new High School. The building will be of red pressed brick, with cut stone trimmings, and will be erected on the site of the old building.

BRANTFORD, ONT.—Mr. J. S. Hamilton will receive tenders until the 1st day of August for heating by hot water his residence at Langley Park, this city.—The by-law to grant a bonus of \$70,000 to aid in the construction of the Toronto, Hamilton and Buffalo railway, was carried by the ratepayers on Thursday last.

OTTAWA, ONT.—Plans are now being prepared by the Department of Public Works for the erection of a lighthouse on the Giant's Tomb, near the entrance of Midland harbor.—It is the intention of the French Order of Capuchins, to enlarge their monastery.—Mr. Fuller, Chief Architect Department of Public Works, is preparing plans

for the Canadian building at the World's Fair, Chicago. The cost of the building will be about \$15,000.

MONTREAL, QUE.—The City Clerk will receive tenders until Monday, the 25th inst., for the repairs to No. 3 Fire station at the corner of Wellington and Dalhousie streets.—J. J. Browne, architect, is preparing plans for additions to the cotton mills at Hochelaga.—J. R. Gardner, architect, is preparing plans for summer residences for the following persons: Mrs. Looke, at Beaconsfield; Mr. A. W. Morris, at Dorval; Mr. Slater, Mr. Black, Mr. McMaster and Mr. Kavanagh, at Thompson's Point.

WINNIPEG, MAN.—Messrs. W. McKenzie, of Toronto, and James Ross, of Montreal, have decided to at once commence the erection of a new opera house here.—The City Council has decided to construct the following works: Block pavement on 2nd street north, from 2nd avenue north to Central avenue, cost \$5,000; asphalt pavement on 4th street south, from Portage avenue to 6th avenue south, cost \$25,000; sewer on 1st avenue north from 15th street north to 17th street north, cost \$850.

STRATFORD, ONT.—H. J. Powell, architect, has prepared plans for the following works. Red brick residence at Comber, Ont., for Mr. Geo. Ainslie, cost \$1,800; residence for F. F. Jones, Comber, cost \$2,200; parsonage for Canada Methodist Church, Tilbury Centre, Ont., cost \$2,000. He is also preparing plans for a church for the Episcopalians, of this city, to take the place of the present Home Memorial Church. It will be erected in the Norman style, and will cost between \$12,000 and \$15,000.

TORONTO, ONT.—The City Engineer has recommended the construction of the following works. a sewer to drain the Convalescent Home on Bathurst street, cost \$930; cedar block pavements on Herrick street, cost \$460; on Perth avenue, cost \$9,750; on Susex avenue, cost \$2,000; on Royce avenue, cost \$6,250; on High Park avenue, cost \$18,000. on Front street, from Yonge to Fredrick street, on sand and gravel foundation, cost \$3,000; a cement walk on north side Queen street, from Yonge street to James street, cost \$1,995.—Mr. Geo. Eakin, Clerk for County of York, will receive tenders until Wednesday August 3rd, for the erection of a wooden bridge over the Humber river, between York and Etobicoke, just north of Bloor street, also for a steel bridge, the abutment and foundation to be the same in either case. The bridge and foundation to be tendered for separately.—Building permits have been granted as follows: Geo. Keith, 2-story & attic bk. add. to warehouse, 121 King st., e., cost \$2,000. Jas. H. Stokes, 3 attached two-story bk. dwellings, s. e. cor. Pape and Gerard st., cost \$8,000. Wm. McGavin, 2-story bk. dwelling, n. w. cor. Sackville and Sydenham sts., cost \$2,000; Mrs. Meredith, additional story to front dwelling and 1-story bk. addition to rear of dwelling, cost \$1,300; Church wardens St. Simon's church, Howard street, 1-story addition and alterations, cost \$8,000. Public School Board, 2-story bk. school, n. e. cor. of Shirley st. and St. Clares avenue, cost \$9,000. James Gowanlock, Chairman Committee on Waterworks, will receive tenders until Monday, 22nd August, for furnishing one ten million gallon pumping engine, with necessary boilers and foundation. Plans may be seen at the Waterworks Department, City Hall.—Mr. F. H. Herbert, architect, Yonge st. arcade, is preparing plans for alterations to 32 Queen st. east, for the City and County Loan Association.

FIRES.

Jackson & Doyle's saw mill at Tidnish, N. S., was destroyed by fire on Tuesday last. Loss, \$2,000; no insurance.—On the 18th inst. a disastrous fire broke out in the iron foundry of William Clendenning & Son on William street, Montreal, completely destroying the machine shop. The offices of A Ramsay & Son were also destroyed. Loss on machine shop \$100,000, fully covered by insurance.—On Sunday last fire was discovered in a block of stores on the south side of Main street at Stayner, Ont., destroying the following buildings. John Petric, grocery store; W. B. Henderson, harness, C. Newton, photographer; D. Gillespie, groceries; C. Livingstone, implements; A Swalls, jeweller.

CONTRACTS AWARDED.

ARNPRIOR, ONT.—Mr. R. V. Stafford has secured the contract for the erection of a new building for the Electric Light Company.

VICTORIA, B. C.—Mr. J. G. Larks, architect, has awarded the contract for the erection of Mr. F. W. Vincent's residence to Smith & Clark.

HULL, QUE.—Messrs. Black & Richards have been awarded the contract for the erection of a new mill and storehouse for the E. B. Eddy Company.

ST. JOHN, N. B.—Messrs. Lawlor & Connors, of this city, have been awarded the contract for the Woodstock and Centerville section of the Tobique railway.

OWEN SOUND, ONT.—The Owen Sound Portland Cement Company has received the contract from Mr. Hugh Ryan, contractor for the Sault Ste. Marie canal, for the supply of a quantity of Portland cement for use in the construction of the works.

MONTREAL, QUE.—The City Council has awarded the franchise for an electric street railway to the Montreal City Passenger Railway Company, who will immediately commence the construction of the road. The trolley system will be used.

WINNIPEG, MAN.—The contract for the construction of sewers, tenders for which were called for some weeks ago in the CONTRACT RECORD, has been awarded to Messrs. Lee & Keith, the lowest tenderers, Messrs. Robinson & Cross, of Owen Sound, having withdrawn their tender.—The contract for the construction of 150 catch-basins has been awarded to Messrs. Dobson & Jackson, at the price of \$7,650.

TORONTO, ONT.—The City Council has accepted the following tenders for the construction of pavements and sewers: Asphalt pavement—King street, Simcoe to Sherbourne, Trinidad Asphalt Company, \$70,966; Yonge street, King to Hayter, Warren-Scharff Company, \$51,078; Yonge street, Grenville to Bloor, Warren-Scharff Company, \$38,804; Devonshire place, Hoskin avenue to Bloor street, Trinidad Asphalt Company, \$11,111; Rose avenue, Howard to Winchester street, Warren-Scharff Company, \$16,939; St. James avenue, Ontario to Parliament street, Construction and Paving Company, \$4,020; King street, from Sherbourne street to River street, D. L. Van Vlack, \$16,457. Granite sets—Yonge street, Hayter to Grenville, John McBain, \$17,388. Cedar blocks—Lucas street, J. McElin, \$3,248; Cedar and granite—Dundas street, Sorauren to Bloor, C. Farquhar, \$17,055. Cedar, granite and cobble—Queen street, Bathurst to Gladstone avenue, W. H. Catho, \$26,257; Queen street, Brockton road to Roncesvalles avenue, W. H. Catho, \$15,818. Sewers—Clinton street, Barton avenue to Yarmouth road, John Farley, \$1,976; Barton avenue, Manning avenue to Christie street, J. J. Booth, \$1,057; Dupont street, St. George to Huron, J. J. Booth, \$453; Monck street, Bathurst to Markham, J. J. Booth, \$421; Liberty street, Pacific avenue to Atlantic avenue, John Farley, \$519.

SIZE OF MACHINE SHOP FLOOR BEAMS.

It is a pretty mean job to be obliged to crawl under the machine shop floor and jack up old broken down floor joists that were originally put in too light for the working load they were supposed to carry. There is a safe rule for such calculations, but it seems to be seldom used outside of the architect's office, and I am sorry to say that it seems to be sometimes neglected even there. The rule is as follows: "Divide the product of breadth and square of depth in inches and the coefficient of material used by the length in feet; the quotient will give the weight in pounds which may be supported on the floor, by the beam that is being figured.

A modification of the above rule is used for finding the depth of a floor beam to carry a given load uniformly distributed. It is practically the same rule, only it is

"worked backwards." Divide the product of length and weight to be borne (in feet and pounds) by the product of breadth in inches and coefficient of material; the square root of the product will give the depth of the material in inches. Modifications of this rule will be easily made to suit almost any case that may come to the mechanic and he will find it much better than to go along "by guess," with the prospect of having the work all to do over again at a loss of reputation, to himself, and a loss of dollars to his employer.—*Northwestern Mechanic.*

The length of an inch is supposed to have been determined from three grains of barley placed end to end lengthwise.

MUNICIPAL DEPARTMENT.

APPROXIMATE COST OF CONSTRUCTING STREET PAVEMENTS.

The following estimates are given from Prof. Haupt's work on "Better Roads," published in 1891, which may serve as an approximate and relative estimate on several things. It must be remembered that prices vary considerably, both on the account of cost of labor and supplies, varying in different localities and from differences in the amount of competition among bidders:

Excavation per cubic yard	50	15	50	30
Rock excavation, per cubic yard	100	10	2	50
French drains, 3-inch tile and stone, without excavation, per lineal yard	22	10	30	
Macadam, with Telford foundation, per square yard	90	10	1	40
Concrete foundation, one of cement, three of sand and four and a half of two and a half inch stone six inches thick, per square yard	66	10	1	20
Granite blocks, supplied only, per square yard	150	10	1	90
Granite blocks, supplied and laid, Scotch per square yard	294	10	3	25
Sydnite blocks from locality, supplied and laid, per square yard	275	10	3	10
Wooden blocks, supplied and laid per square yard	95	10	1	25
Granite blocks on sand, including sand and laying per square yard	300	10	3	00
Granite blocks, including concrete foundation and laying per square yard	310	10	4	50
Asphalt, per square yard including concrete foundation	275	10	2	75
Red cedar on sand, including sand, per square yard	200	10	2	40
Cedar and pine blocks, on concrete included, per square yard	230	10	3	10
Wooden blocks including concrete foundation and excavating old roadway, per square yard	235	10	3	25
Brick on concrete, including concrete, per square yard	203	10	2	50
Brick on sand, including sand, per square yard	160	10	1	05
Brick, two layers on sand, including the sand, per square yard	125	10	2	00
Repairs to wooden blocks per annum, per square yard	06	10	10	
Repairs to macadam and cleaning, per annum, per square yard	06	10	12	
Repairs to macadam and cleaning, per square yard, for heavy traffic	20	10	40	

LEGAL DECISIONS AFFECTING MUNICIPALITIES.

The question was recently raised in the Massachusetts legislature as to the constitutionality of legislation establishing municipal coal yards, and the Supreme Court of the state was asked for an opinion on the question. Five out of seven justices held that such legislations would be unconstitutional, saying: "We are not aware of any necessity why cities and towns should undertake this form of business any more than many others which have always been conducted by private enterprise, and we are not called upon to consider what extraordinary power the commonwealth may exercise or may authorize cities and towns to exercise in

MUNICIPAL ENGINEERS, CONTRACTORS, AND MATERIALS.

extraordinary exigencies for the safety of the state of the welfare of the inhabitants. If there be any advantage to the inhabitants in buying and selling coal and wood for fuel at the risk of the community on a large scale, and on what has been called the co-operative plan, we are of the opinion that the constitution does not contemplate this as one of the ends for which the government was established or as a public service for which cities and towns may be authorized to tax their inhabitants. We, therefore, answer the question in the negative."

TESTING BRIDGES.

Speaking of the value of test loads for iron and steel bridges the *Centralblatt der Bauverwaltung* points out that, in general, far too much importance is attached to this method, and that, accordingly, erroneous deductions as to the safety of bridges tested by applying loads and noting the resulting deflections are abundant. The case is cited of an iron bridge in which a recent careful inspection revealed alarming local corrosion. Still a test load, applied only a few days before, had produced a deflection well within permissible limits, and the railway company owning a bridge was therefore satisfied of its safe condition. The writer of the article maintains that the application of test loads to bridges has never yet led to the detection of defects which could not have been found by circulation and inspection. Satisfactory behavior under a test load, it is held, is no guarantee whatever of safety, and may, in fact, be conducive of disaster by engendering a feeling of security which is only imaginary.

INDIA-RUBBER PAVEMENT.

A German engineer has paved a bridge with india rubber, and the result has been so satisfactory that it is to be applied on a larger scale. It is found to be more durable than asphalt, and not slippery. "A section of roadway," says the *Railway Review*, "under the gate leading to the departure platform of the St. Pancras terminus, London, has for some years past been paved with india rubber, and many people must have been pleasantly surprised at the deadening of sound when passing over it on wheels, and at the grateful elasticity to the tread when traversing it on foot."

Books of hundreds of pages are written on road making, yet the principles of successful road construction are very simple. It is water that injures roads more than any other element. The water freezes and expands, and when the thaw comes all is loose. Any one may have observed ruts to come in roads more readily after a thaw than at any other time. If attention were given to draining water from roadbeds, macadamized roads would last double the length of time they generally do.—*Mechan's Monthly*.

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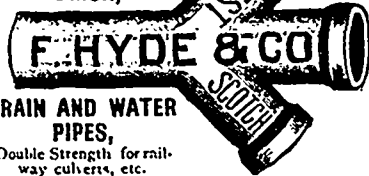
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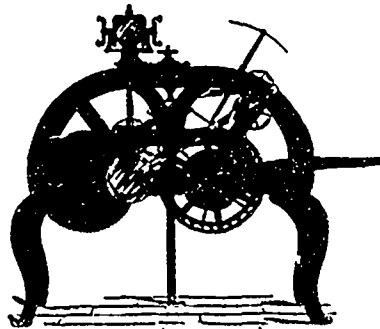
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