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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. JUNE 15, 1893 No. 17

THE CANADIAN CONTRACT RECORD,
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 As an Intermediate Edition of the "Canadian Architect and Builder."
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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, 1889, 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. Ferrault, 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.

TO DRAUGHTSMEN.—About 1½ quires of Whatman's Drawing Paper for sale (Imperial size), only \$3.50 for the lot. Box 151 at this office.

NOTICE TO CONTRACTORS.
 Tenders will be received addressed to the undersigned, up to 1 p. m., MONDAY, 19TH JUNE, for the construction of about
3000 sq. ft. Cement Concrete Sidewalk
 on the Court House grounds.
 Plans and specifications may be seen and other information obtained at the office of Davis & Van Buskirk, civil engineers, Woodstock.
 (Sgd.) JAMES WHITE,
 Clerk for the County of Oxford.
 Woodstock, 5th June, 1893.

TENDERS FOR PIPE SEWERS

Sealed tenders will be received by the Chairman of the Board of Works of the town of Owen Sound, up to five p. m.
WEDNESDAY, JULY 5TH,
 for the construction of the following pipe sewers in said town:
 1st—A 9 inch pipe sewer on Hill Street, 1396 feet in length.
 2nd—A 9 inch pipe sewer on Hill Street, 685 feet in length.
 3rd—A 12 inch pipe sewer on Jackson Street, 853 feet in length.
 4th—A 15 inch pipe sewer on Paynter Street, 742 feet in length.

Also at the same time sealed tenders will be received for supplying the following quantities of sewer pipe in three feet lengths, f. o. b. at the Town of Owen Sound.
 2 ½ bends 6 inch pipe.
 66 feet 6 inch pipe.
 1710 feet 9 inch pipe.
 15 feet 9x9 inch single T's.
 405 feet 6 inch x 9 inch single Y's.
 2 ½ bends 9 inch pipe.
 15 inch x 9 inch reducer.
 720 feet 12 inch pipe.
 138 feet 12 inch x 6 inch single Y s.
 933 feet 15 inch pipe.
 114 feet 15 inch x 6 inch Y s.

An accepted bank cheque payable to the order of the treasurer of the Town of Owen Sound for the sum of one hundred dollars (\$100) must accompany each tender for the construction of each separate sewer, and a like accepted bank cheque for the sum of two hundred dollars (\$200) must accompany each tender for the supply of pipe. In either case the cheque will be forfeited if the party decline the contract or fail in the performance thereof, and will be returned in case of non-acceptance of tender.
 Plans and specifications to be seen at the office of the Town Engineer. The Board of Works reserve the right to reject any or all tenders.
 THOMAS MCCLELLAND,
 Chairman Board of Works.
 R. MCDOWALL, Town Engineer.

NOTICE TO CONTRACTORS

CANADIAN CONTRACTORS' HAND-BOOK.

A new and thoroughly revised edition of the *Canadian Contractors' 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.

TENDERS
 will be received up till June 19 for the plastering of the buildings corner of Wellington and Jordan sts., Toronto. J. McBEAN, Architect, No. 1 Toronto St.

TO CONTRACTORS.
 Tenders will be received by the undersigned until 5 o'clock on FRIDAY, THE 23RD INSTANT, for the various trades required in the erection of a STONE-FRONTED ADDITION TO THE IMPERIAL BANK on Wellington Street East.
 DARLING, SPROATT & PEARSON
 Mail Building.
 The lowest or any tender not necessarily accepted.

County of Waterloo.
NOTICE TO CONTRACTORS.
 Sealed tenders will be received, addressed to the undersigned, at Berlin, up to 12 o'clock noon on TUESDAY, THE 20TH DAY OF JUNE, INSTANT, for

STEAM HEATING AND PLUMBING,
 for the proper heating of the Court House, Gaol, Registry Office and other County Buildings in connection therewith.
 Plans and specifications can be seen at the office of Mr. Jonas Knechtel, architect, Berlin, on and after Wednesday, the 7th June inst.
 Neither the lowest nor any tender necessarily accepted.
 Tenders to be sealed and marked "Steam Heating and Plumbing."
 ISRAEL D. BOWMAN,
 County Clerk.
 County Clerk's Office, Berlin, June 5th, 1893.

CONTRACTS OPEN.
MORDEN, MAN.—The C. P. R. will probably build a new station here this year.
BROCKVILLE, ONT.—G. A. Allan, architect, is preparing plans of a boat-club house to be erected here for the Athletic club, cost \$1,500.
HALIFAX, N. S.—The school commissioners will shortly advertise for sites for a new school to take the place of the Acadian and National schools.
NEW WESTMINSTER, B. C.—The City Council has voted the sum of \$250,000 to the Northern Pacific railway to assist in building a bridge across the Fraser river.
MANITOWANING, ONT.—G. A. Allan, architect, of Brockville, is preparing plans for a residence to be erected here for Dr. W. J. Christie, which will cost about \$3,000.

WALKERTON, ONT.—The town of Walkerton and the County of Bruce are having plans and specifications prepared for the erection of a steel bridge over the Saugeen river in this town. Tenders will be called next week.
CARMEN, MAN.—Mr. William Carson, of Miami, contemplates the erection of a first-class flour mill at this point, to cost about \$22,000. It is the intention to put in a 100-horse power engine and boiler.
ST. JOHN, N. B.—Mr. Fuller, chief architect of Dominion public works, is expected to arrive in this city shortly to make arrangements for the erection of a new custom house to replace the one destroyed by fire last year.
ST. ANDREWS, N. B.—Mrs. John Campbell has presented to the trustees of Greenock church

the lot of land recently purchased by her alongside the church property, with the condition that a memorial hall be erected thereon. The trustees have accepted the gift.

COBourg, ONT.—Mr. N. F. Macnachten, Counties Clerk, will receive tenders until Monday, the 26th inst., at 2 p. m., for the construction of a street bridge and swing across the river Trent, at the Narrows, in the township of Seymour. The bridge will consist of one span of 150 feet and a swing of 100 feet, to be built on four stone abutments.

BERLIN, ONT.—The Town of Berlin invites tenders until Tuesday, the 20th inst. for the erection of a new building on Court Street Square, also for the erection of a boiler house in connection with the steam heating of the County buildings. Plans may be seen at the office of James Knechtel, architect, and tenders should be addressed to Israel D. Bowman, County Clerk.

OTTAWA, ONT.—The City Clerk has given notice that it is the intention of the Council to construct the following works: An asphalt and artificial stone roadway on Sparks street, between the west side of Canal street west and east side of Back street, cost \$19,133, an asphalt and artificial stone roadway on Rideau street, between the east side of King street, on the south side of Rideau street and the east side of Sussex street, in St. George's ward, cost \$69,859.—E. F. E. Roy, Secretary Department of Public Works, will receive tenders until the 27th inst. for the construction of a new timber block and other work at Souris, P. E. I.

LONDON, ONT.—A deputation from the city and London West recently waited on the County Council to urge the building of a bridge over the Thames on the Wharncleft road. It is stated that the Salvation Army have purchased the property on the south east corner of King and Clarence streets and intend erecting at once a barracks and officers quarters.—Mr. O. Richards will erect three brick cottages on Queen's avenue to cost \$3,000.—Mr. Charles McCormick intends building a brick cottage on Richmond street, at a cost of \$1,000.—Messrs. Moore & Henry, architects, will receive tenders until Saturday next for the erection of a brick power station for the Canadian General Electric Company.

HAMILTON, ONT.—The Separate School Board is considering the erection of a new building, at a cost of \$5,000.—The following building permits have been granted: Fred Taylor, house on Main street, between Main and Jackson, cost \$1,700; W. H. Perne, two story brick house on Victoria avenue north, cost \$1,900; Charles Carpenter, four brick houses on York street, between Hess and Queen streets, cost \$3,200; W. Scarrow, Pall Mall, two brick residences and brick stables, cost \$4,000; S. Hahnaw, two story brick dwelling on Main street, between Sherman and Fairleigh avenues, cost \$4,000; Hamilton Vinegar Works Company, brick building on Jarvis street cost \$2,900, the city corporation, alterations to stores on James street, cost \$1,000, George McClement, brick dwelling on Erie avenue cost \$1,100.—The Sunday school building of the Macnab street Presbyterian church is shortly to be enlarged.

WINNIPEG, MAN.—The C. P. R. proposes to erect a new dining hall near the station here.—The Building and Loan Association, of Toronto, are negotiating to remodel the Knox hall property on Hargrave street, at a cost of about \$20,000. The structure will be pulled down and the material used in the reconstruction.—Extensive alterations are to be made shortly in Preston & Norris's building.—The plans for the normal school building to be built this summer by the Provincial Government, are well under way. It will probably face south on Broadway, occupying a site on the Old Driving park.—Plans for a handsome \$6,000 residence for Judge Killam, to be erected on Rosslyn avenue, are now being prepared by C. H. Wheeler, architect. The style of architecture is colonial. It will be built of frame, on stone foundation, three stories in height.—The Dundee block has been purchased

by Mr. J. Robinson, who contemplates making extensive improvements.—A double house in the Queen Anne style will shortly be built by Dr. Lennen, on the south-east corner of Graham and Kennedy streets. It will be three stories high, on stone foundations, and is to contain all modern improvements, hot air heating and plumbing. The estimated cost is about \$9,000. C. H. Wheeler is preparing the plans.

MONTREAL, QUE.—The Council will request the minister of railways and canals, to have the approaches to the Curran bridge constructed immediately.—The parish of Ste. Brigade has requested the Separate School Commissioners to construct a school house for boys, and has offered a piece of ground situated on Maussoneuve, Rose and Champlain streets as a site for the same.—Some time ago the sum of \$10,000 was voted by the City Council to enlarge No. 11 station, Ontario street, but it is now proposed to abandon that plan and erect a new station further east, where the steam engine would be stationed.—Tenders are invited by the Inundation Committee of the City Council until Wednesday, the 21st inst., for the steel and iron superstructure of a bridge under the Canadian Pacific Railway Co.'s tracks over the Brock street tunnel.—The City Council has voted \$5,000 to the Fire Committee for ladders and \$8,000 for the Hochelaga station.—The sum of \$20,000 will be spent for putting in watercourses on Sherbrooke street.

TORONTO, ONT.—Messrs. Langley & Langley, Canada Life Building will receive tenders until 5 p. m. to-morrow (Friday) for the erection of a residence in St. Catharines.—Bulk tenders are wanted at 4 Adelaide street east for finishing five houses on Clinton street.—The City Engineer has recommended the construction of pavements on Car street, Euclid place and Mansfield ave., and sewers on May and Hill streets.—Next month the C. P. R. will move out the Argonaut club-house at the foot of York street about 600 feet south to a new crib which has just been built. The club-house will be enlarged at the same time, and the accommodation of the balcony increased.—Mr. Edmund Wragge, local manager Grand Trunk Railway, will receive tenders until Saturday, the 17th inst., for the masonry and other foundation work required in the construction of pedestals for the train shed to be erected south of the present Union Station. Plans may be seen at the office of Messrs. Strickland & Symons, architects, Toronto street.—James Ryan, Chairman Sites and Building Committee, will receive tenders until the 24th inst. for sundry repairs to the separate schools of the city.—The erection of a diocesan building was discussed at a meeting of the Synod of the Anglican Diocese of Toronto which is being held during this week. The site proposed is on Adelaide street, where the old rectory now stands. A design of a suitable building has been prepared, estimated to cost \$4,500.—The City Engineer has been instructed to advertise for tenders for a steel lining for the crib at Hanlan's point.—Building permits have been granted as follows: 3 story bk. addition to the Haven, Seaton st., n. of Gerrard street, cost \$15,000; Wm. Davies & Co., one story bk. office cor. Front and Beachall st., cost \$3,000; Consumers Gas Co., 2 story bk. stables, rear of works, s. w. cor. Parliament and Front streets., cost \$7,500; Eby, Blain & Co., 2 story bk. stable 126 Cumberland st., cost \$1,200; J. G. Gibson, 2 story bk. additions to dwelling, Prospect st., cost \$2,500; Toronto St. Railway Co., 2 story bk. and stone motor shop, Frederick and Esplanade sts., cost \$30,000.

FIRES.

Fire at Virten, Man., recently destroyed Koster & Son's toilet mills. Nothing was saved. The loss will amount to \$10,000.—A brick block at Sault Ste Marie, Ont., owned by W. A. Quiball, and situated at the corner of Queen and Pini streets, was burned recently. Loss \$7,000. Insurance \$4,000. It was occupied by W. C. Munroe, merchant tailor.—The Winnipeg Street Railway Company's stables have been destroyed by fire. They were insured for \$19,000.—A fire on the premises of Bourgoin, Duchesneau & Co., hardware merchants on St. Paul street, Montreal, recently caused damage to the extent of \$11,000.—The skating rink at Yarmouth, N. S., together with 1,000 chairs, has been completely destroyed by fire. The insurance on the building was \$3,000, which, it is said, will not cover half the loss.—The mother house and new church of the Ladies of the Congregation, Montreal, was destroyed by fire on the 8th inst. The loss is estimated at about \$500,000. The insurance being \$102,000. It is said the work of rebuilding will be commenced immediately.—A church valued at \$15,000, and a presbytery, valued at \$8,000, located at Longue Pointe, Que., were destroyed by fire on Saturday last. The insurance on both amounts to about \$15,000.—P. Helton's saw and shingle mills, at Belleville, Ont., were totally destroyed by fire on Monday morning last. Loss \$8,000; insurance \$2,000. Mr. Helton will rebuild.

CONTRACTS AWARDED.

SARGEON, ONT.—The contract for the erection of Schwann's bridge has been let to Mr. Keys, of Kincaidine, at \$2,000.
LONDON, ONT.—The Water Commissioners have accepted the tender of Mr. S. Casey, for 130 rods of iron fencing, at \$1.15 per rod.
TORONTO JUNCTION, ONT.—The high school board has awarded the contract for heating and

ventilating the new building to the Smead-Dowd Company, at \$2,000.

NEWMARKET, ONT.—The contract for erecting the new High School building has been awarded to The Wm. Cane & Sons Mfg. Co., at the price of \$8,800, without heating and plastering.

MORRISBURG, ONT.—The contract for the erection of the new church for the St. James' Episcopal congregation, has been awarded to Messrs. Wickwire, Fetterly & Johnson, at the price of \$10,050. The architect is Mr. C. J. Gibson, of Toronto.

BROCKVILLE, ONT.—The heating by a combination of hot water and steam of two buildings on Pearl street for Mr. Newton Cossitt has been let by G. A. Allan, architect, to Barsalou & Whitehill, plumbers, of this town.—The plumbing and heating of a house on James street for Mr. Newton Cossitt has been awarded to the same firm.

KINGSTON, ONT.—Mr. Arthur Ellis architect has accepted the following tenders for additions and alterations to residence, corner Johnston and Wellington streets, for Dr. Isaac Wood: Mason, J. C. Mitchell, carpenter, A. Williamson, plumber, Joseph Jameson; tinsmith, Nugent & Taylor, painter & glazier, Robinson Bros.

WINNIPEG, MAN.—Mr. Wheeler, architect, has let the contract for the erection of a \$3,500 residence for Mr. Widmeyer, at Gretna, to Messrs. Thomson & Co., of this city. He has also awarded contracts as follows for improvements to be made in the Clarendon hotel: A. Schmidt fire escapes, W. Charlesworth, alterations to building; W. H. Smith & Co., plumbing. The whole cost will be over \$5,000.

MONTREAL, QUE.—The building committee of the Maisonneuve monument held a meeting last week to award the contract for constructing the base of the monument. The work was given to Messrs. Brunet Bros., Cote des Neiges, at \$5,000. It was decided to use grey stone.—The contract to build the Brock street tunnel under Notre Dame street has been awarded to Messrs. Lamoine & Lafontaine, at the price of \$133,000.

HAMILTON, ONT.—The City Council has awarded contracts as follows: Sewer on Atkinson avenue, John Harris, at 24 cents per foot, iron castings, Burrow, Stewart & Milne, \$2.60 per hundred pounds; sewer pipe, Joseph Kent, 9-inch, 10c; 9-inch, 12c; 12-inch, 30c; 15-inch, 38c; 18-inch, 58c; bricks, Joseph Kent, \$7.25 per thousand; Beech sand, Joseph Kent, \$1 per cub yd.; water lime, H. & J. Dow, 89 cents a barrel; Portland cement, Joseph Kent, \$2.75 per barrel.

TORONTO, ONT.—The Board of Works awarded contracts on Saturday last as follows: Asphalt pavement on Winchester street, from Parliament to Sumach street, Construction & Pavement Co., \$17,990; asphalt pavement on Mining lane, Trinidad Co., \$1,137; asphalt pavement on lane in rear of Canada Government buildings, Trinidad Co., \$997; concrete walk on Sherbourne street, east side, from Gerrard to Wellesley, Gardner & Co \$1.19 per yard. The contract for supplying sewer brick east of Yonge street was awarded to Walter Morley, at \$6.25 per 1,000, and west of Yonge to Clark B. Connolly at \$7.25 per 1,000.—The contract for the construction of the new train shed at the Union station which is to be erected at the south of the present buildings has been awarded to the Central Bridge & Engineering Co., Limited, of Peterboro', Ont. The work will be commenced at once.

The load which is produced by a dense crowd of persons is generally taken at 80 to 100 lbs. per square foot, and is considered, says *Engineering News*, to be the greatest uniformly distributed load for which a floor need be proportioned. That this value may be largely exceeded in an actual crowd was pointed out by Prof. W. C. Kermot, of Melbourne University, Australia, in a recent paper before the Victorian Institute of Engineers. In an actual trial, a class of students averaging 153.5 lbs. each in weight were crowded in a lobby containing 18.23 sq. ft., making an average floor load of 134.7 lbs. There was still room to have placed another man, which would have brought up the loading to 143.1 lbs. per sq. foot. Prof. Kermot also quoted from Stoney, who placed 58 Irish laborers, averaging 145 lbs. each in weight, in an empty ship deckhouse measuring 57 sq. ft. floor area. This was a load of 147.4 lbs. per sq. ft. In another test, with 73 laborers crowded into a hut, 9 ft. x 8 ft. 8 ins., Stoney produced a load of 142 lbs. per square foot, and estimated that two or three more men could have been squeezed in. It appears from these experiments that while the figures ordinarily assumed of 80 to 100 lbs. are sufficiently correct for spaces on which there is no cause to induce the collection of great crowds, larger figures, say 140 or 150 lbs. per square foot should be

used for railway stations and platforms, entrances and exits to places of public assemblies, or of office buildings, bridge sidewalks, pavements over vaults, and other places where dense crowds are likely to gather.

In the recent number of *Le Genie Civil* (vol. xxi., p. 189) there are some interesting particulars of a new system of utilizing cement for the construction of water-pipes and vessels. It is known as the Bordenave system, and consists of the employment of a framework of iron bars on which the cement mortar is placed. In pipe-making, bars of I section are used, and the chief novelty appears to consist in winding these in helical form, the pitch of the helix being governed by the strength required to withstand the external pressure. The working stress is taken at 9.8 tons per square inch; so that for a pipe 2 ft. 7 1/2 in. inside diameter, using a by 3/4 in. height by one-fifth in. in width the requisite pitch is 3.8 in. for a head of water of 33 ft. The weight of the bar would be 0.14 lb. per lineal foot. In the manufacture of what are described as cylindrical reservoirs, the structure is formed in the same way but has a bottom worked in by means of a framework of radial and circumferential bars. Verticals are placed at intervals all around the wall, and solidly attached to the floor. The pitch at which the spiral is wound diminishes from top to bottom, in order to give greater strength at the lower part, where there is, of course, increased pressure owing to the greater head. An experimental line of piping, four miles long, has been made to test this system, and the results have shown the calculations given as to strength to be sufficient. The iron is well protected, so that it will not rust, and, moreover, the co-efficient of expansion and contraction of iron and cement are nearly the same, so that the cement is not likely to crack off. It is said there is a saving in cost over iron pipes, either cast or wrought, of 15 to 45 per cent.

Wax painting, the admixture of wax with the color, is growing in favor for the higher grades of interior decoration, on account of the soft lustre and the harmonious character of the work. In painting, the wax is dissolved in alcohol and is then ready to be mixed with any coloring material. The mixture is not as plastic as ordinary paint and requires greater expedition in application to secure the best results.

When painting on sheet zinc, it is necessary to prepare the surface so as to prevent the paint from peeling off. The following wash will be found to be effective: To sixty-four parts of water add one part of chloride of copper, one part of nitrate of copper, one of sal-ammoniac, and one of common hydrochloric acid. Brush over the surface of the zinc and allow it to remain 24 hours before applying the first coat of paint, which, it may be added, should never be white lead.

MUNICIPAL DEPARTMENT.

STREET BRIDGES.

BY S. H. DAVIES.

(Continued.)

LOADS ON BRIDGES.

Dead Load.—Apart from the principal and cross girders, the dead load will consist of the flooring and road covering.

Flooring.—In bridges where cross-girders are employed, the flooring will consist either of buckled or curved plates, the former of which are preferable on account of their great strength and lightness. Of recent years iron and steel troughs have been largely used, and under certain circumstances they possess very substantial advantages. (a) they can be manufactured at a small cost, the price varying from £11. 10s; to £12 per ton; (b) cross-girders are dispensed with; (c) loads are more equally distributed; (d) there is a considerable gain in headroom. In the selection of form of trough attention should be given to the matter of rivetting, there being a great difference in the cost of fixing owing to the amount required. The merits of the various forms have been very exhaustively discussed in a paper on the subject of "Bridge Floors," read before the Society of Engineers by Mr. Edmund Oleander.

Road Covering.—In the choice of road covering, preference should be given to a material which is comparatively light in itself, and which at the same time requires only a shallow foundation, thus avoiding unnecessary weight.

The various weights may be gathered from the following tables:

TABLE I. (ANGLIN).

Material.	Weight in lbs. per cub. ft.
Pine	30 to 42.
Pine (creosoted)	42 to 48.
Granite	165
Limestone	160
San-stone	155
Asphalt	150
Concrete	120 to 135.
Sand	100 to 120.
Macadam (compressed).....	120

TABLE II.

Material.	Avg. in. of 3/8 in. covered by one ton.	Weight per sq. yd.
4 in. x 4 in. x 4 in. (Threefold) granite	3.20	3.75
6 in. x 3 in. (Enderly) granite	3.60	5.71
10 in. grit setts	2.10	6.52
Slag 14 in. thick	6.6	3.33
Limestone broken 14 in. thick.....	6.0	3.33
Granite.....	3.50	3.64
9 in. rubble pitching	2.75	7.47
6 in. x 3 in. x 9 in. wood blocks (creosoted red pine) 44 to a super yard.....	14.70	1.59
Concrete 6 in. thick (126 lb. per cube foot)	4	2.00

Live Load.—The distributed live loads usually allowed for bridges are 112lb. per super foot for footbridges, and from 20wt. to 30wt. for street bridges; but in addition to this, the effect of heavy concentrated loads should be ascertained, which is especially necessary with regard to the design and arrangement of cross-girders. In the construction of railway bridges these are frequently placed at a distance apart equal to that between the centres of the driving wheels of the locomotives, but as the distance between the wheels of traction engines and rollers is proportional to their weight, and as there is no standard pattern for trolleys conveying heavy boilers, no fixed distance can be given as the right one for road bridges, but each girder must be of sufficient strength to withstand the heaviest load borne by one pair of wheels. The weights upon and distances from centre to centre of wheels of rollers, etc., are as follows:

TABLE III.

Weight and description.	Distance from centre to centre of wheels.	Load on front wheels.	Load on back wheels.
25 ton roller	13.5	10 tons	15 tons
20 "	11.31	8 "	12 "
15 "	10.10	6 "	9 "
12 h. p. ploughing engine	12.10	5 "	10 "
6 h. p. agricultural engine	7.10	1 1/2 "	5 1/2 "

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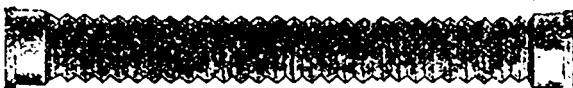
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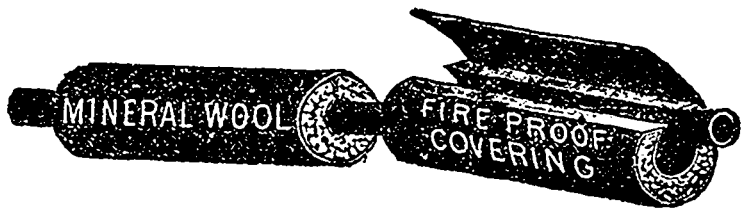
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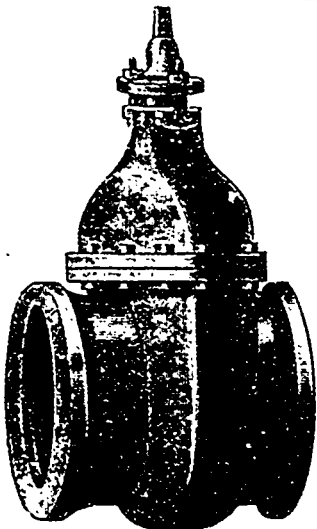
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