

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 \$6,000. 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 St. Brigid has requested the Separate School Commissioners to construct a school house for boys, and has offered a piece of ground situated on Maisonneuve, 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 Incorporation 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 Virden, Man., recently destroyed Koester & 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 Pim 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. Holton will rebuild.

CONTRACTS AWARDED.

SAGUENAY, ONT.—The contract for the erection of Schwass' bridge has been let to Mr. Keys, of Kincairdine, 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 \$10,650. 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, 6-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. Kernot, 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. Kernot 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 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.

(Concluded.)

LOADS ON BRIDGES.

Dead Load.—A part 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. (ENGLISH).

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.	Area in sq. ft. covered by one ton.	Weight per sq. yd.
4 in. x 4 in. x 4 in. (Threefold) granite	3.27	3.75
6 in. x 3 in. (End-rivly) granite	3.60	3.71
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	3.00

Live Load.—The distributed live loads usually allowed for bridges are 112 lb. per super foot for footbridges, and from 20 wt. to 30 wt. 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 "

The average weight of boilers is from 13 to 15 tons, and in very exceptional cases 20; 25; these are conveyed on trolleys having a distance of from 13 ft. to 15 ft. between the centres of the wheel.

Very exceptional loads should not be allowed for in the calculation of strengths, as it will incur great waste of material; should the traffic at rare intervals be unusually heavy no ill-effects are likely to result, as the limit of elasticity (which for steel is 16 tons and wrought iron 9.5 tons per square inch) is not likely to be reached.

When bridges are constructed of a strength which is not sufficient to bear ordinary loads such fact should be notified upon the approaches.—*Contract Journal.*

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