

School building for the Methodist church, St. Marys, to cost \$7,000, tenders for which will be called shortly, also for a Presbyterian church at Avonbank, to be erected in 1894, cost \$5,000. It will be of red brick, with slate roof.

RICHMOND QUE.—A scheme is on foot to dam the St. Francis river at the site of the old bridge. The council of the village of Melbourne have agreed to grant \$3,000 for the purpose and a by-law is to be submitted to the ratepayers of Richmond authorizing a grant of \$5,000. Mr. S. Cleveland, of Coaticook, is at the head of the project.

HAMILTON ONT.—Mr. Patterson of the Radial Electric Railway Company expects that the work of construction will be commenced in about two weeks, as the company are only waiting for the charter, which they expect to receive in a few days. The Hospital Committee will advertise for tenders for painting and repairing the city hospital.

VANCOUVER, B. C.—It is proposed to expend \$60,000 in improvements to the Court House in this city.—The Hudson's Bay Company will shortly call for tenders for the erection of a new warehouse on Water street. Mr. J. Thomson is manager of the company.—Mr. R. M. Fipp has prepared plans for a fine new boarding house. It will contain about a dozen bed-rooms and be fitted up in first class style.

GALT, ONT.—The Galt & Preston Street Railway Company are busily engaged making the necessary arrangements to commence the construction of their line at an early date. Mr. Jennings, C. E., has had the necessary survey made, and the profile and plans prepared. The road will be operated for a time by steam, but it is probable that eventually electricity will be used. Mr. Thomas Todd is president of the company.

OTTAWA, ONT.—A scheme is on foot to build an electric railway between Deschene Mills and Aylmer, a distance of three miles. Mr. R. H. Conroy, warden of the County of Ottawa, is the principal promoter.—E. F. E. Roy, Secretary Department of Public Works, invites tenders until Monday, 5th June, for the construction of post office fittings at St. Hyacinthe, Que. Plans may be seen at above department in this city and at the office of the Clerk of Works, St. Hyacinthe.

LONDON, ONT.—A subscription list to secure funds for the dredging of the Thames at the Forks is being circulated.—The General Electric Company will erect its power house at the foot of York street, adjoining the river and the G. T. R. tracks. New plans therefor are now being prepared.—The members of St. Matthew's church propose building a new edifice on Quebec street, at the end of Queens avenue.—The City Engineer has issued the following building permits: H. Pope, Albert street, brick addition to residence; Adam Beck, brick engine and boiler house to factory, Albert street, F. A. Fitzgerald, brick addition to Dundas street store.—Mr. J. D. Wilson will erect a handsome brick office on Queen's avenue.

WINNIPEG, MAN.—The members of Westminster church have decided on the erection of a new edifice.—The City Council will shortly advertise for tenders for the supply of hardware, also for the construction of two wells.—In a recent interview Mr. Van Horne stated that it was decided to build a large elevator here this season, as the plans were already prepared.—Plans have been prepared by Mr. C. Burgess for additions to the police station. The cost will be about \$4,500.—Hon. Robert Watson has gone to Ottawa to endeavor to secure from the Dominion Government a site adjoining the Winnipeg court house, on which the Manitoba Government desires to erect a normal school.—Engineers are surveying for a line of railway to be constructed from Calgary to the Red Deer coal mines.

MONTREAL, QUE.—Messrs. Robin & Sadler, leather belting manufacturers, will build a new belting factory this season.—A sewer is to be constructed on Pine avenue, from St. Denis to Drolet street.—The Road Committee invites tenders until noon to-morrow (Friday) for the supply of curbstone, flagstone, granite, porphyry and scoria blocks, and for the laying of same, also for each kind of asphalt and composition sidewalk required during the present year.—The Park Commissioners will ask the City Council for an appropriation of \$5,000 for permanent roads in Mount Royal Park.—The Light Committee has drawn up specifications for inviting tenders for the supply of gas for public lighting, which will be presented to the Council at its next meeting, and if approved, tenders will be asked for at an early date.—Regarding the Chambly enterprise, Hon. J. R. Thibeaudeau has stated that engineers were now preparing plans, which would be ready by the beginning of next week, and as soon as these were ready, tenders for the construction work would be asked for. The work will be carried on under the supervision of eminent Canadian and American engineers.—Tenders will be asked in a few days for the construction of the Brock street subway.

TORONTO, ONT.—Mr. Richard McDonell, who endeavored to secure possession of the Parkdale pumping house property as a site for a rolling mill, has decided to erect the building on his own property a short distance west of his residence, near the Sunnyside Orphanage. The contract for grading has been let, and the work will be proceeded with immediately.—A movement has been commenced by the medical men of this city to

establish a hospital for the treatment of special cases and where the patients could receive personal attention from their doctor. The cost of erecting and equipping a suitable building would be in the neighborhood of \$100,000. The scheme seems to be meeting with approval by the medical profession, and will probably be carried out. Dr. Naitness is acting secretary.—The City Engineer is of the opinion that the intake pipe should be run further out into the lake, and surveyors are taking soundings for the purpose of preparing an estimate of the cost.—Building permits have been granted as follows: D. Hayes, 2 story bk. store and dwelling, 134-6 Ontario st., cost \$2,500; Susan Kennedy, 41 Melbourne ave., det. 2 story and attic bk. dwelling 99-101 Cowan ave., cost \$5,000; Robb Jones, Eglinton, alterations to dwelling, 16-20 Alexander st., cost \$2,000; John H. King, 105 Orange ave., pr. s. d. 2 story and attic bk. dwellings, n. e. cor. King st. and Wilson ave., cost \$2,100; J. Dill, 1 Harbord st., additions to 230-232 Simcoe street., cost \$1,300; and 2 story and attic bk. dwelling, 438 Simcoe st., cost \$3,200; George Sheard, Gure, Toronto, 3 att. 2 story and attic bk. dwellings, 20 McGill st., cost \$9,500.

FIRES.

A large mill at Blenheim, Ont., owned by Mr. J. B. Coates, was completely destroyed by fire on Sunday morning last. The mill was used for the manufacture of staves and hoops, and contained considerable machinery, which was mostly destroyed. The loss will be heavy, being partly covered by an insurance of \$5,500. Mr. Coates will rebuild at once.—A three-story brick building on Princess street, Winnipeg, owned by H. S. Holt, railroad contractor, was gutted by fire a few days ago. The upper storey was occupied as a printing establishment, the plant being owned by Miller & Richards, of Toronto. It was worth about \$5,000 and insured for \$4,000. Anderson & Calvert, agricultural implements, suffered a loss of about \$3,000. The printing plants of the Icelandic newspaper and the Manitoban, a monthly magazine, were destroyed. Total loss about \$16,000.—The main building of the Breithaupt sole-leather tannery, at Listowel, Ont., has been burned. The engine house and one wing were saved. The loss will be about \$30,000.—The residence of Capt. James Mitchell, at Sandy Cove, N. S., has been destroyed by fire.—Mr. James Stark's saw mills at Paisley, Ont., were burned on Saturday morning last. Loss \$3,000; insurance, \$1,000. Mr. Stark intends to rebuild at once.—The residence of Mrs. Grantham, situated on Mary street, Clinton, Ont., was destroyed by fire a few days ago.—The residence of Mr. Robert Marshall, Camilla, Ont., was burned on the 23rd inst. Insurance \$500.—A serious fire occurred a few days ago at Boucherville, Que., about a dozen houses being destroyed.—Fire at Winnipeg, Man., on the 22nd inst., started in Buckle Bros. printing office and caused the following losses: Buckie & Appleton, plant, \$10,000 to \$15,000; James O'Brien & Co., stock, \$4,000; N. Bawl, building, \$2,000; Anderson & Calvert, stock, \$3,000; H. S. Holt building, \$15,000 to \$17,000; Dr. Henderson, building, \$2,500; Heimskringla Printing Co., stock and plant, \$4,000 to \$5,000.

CONTRACTS AWARDED.

WINNIPEG, MAN.—The tender of Messrs. Doidge & Co. has been accepted by the City Council for the construction of a sewer on River avenue. The contract price is \$21,450.

TORONTO, ONT.—The Board of Works has accepted the tender of Mr. A. J. Brown for repairing and relaying the intake pipe at the price of \$8,669. Two other tenders were received, the amounts being \$13,500 and \$11,939.

HUNTINGDON, QUE.—The contract for the steel bridge to be erected at Brims, near Athelstan by the municipal council of the county of Huntingdon, has been awarded to A. Rosseau, of the Imperial Bridge and Iron Works, Hochelaga, for the sum of \$545.00. The building of the abutments was secured by John Elder, jr. at the sum of \$875.94.

KINGSTON, ONT.—The Board of Governors of the Kingston hospital have awarded contracts as follows for the erection of the new woman's building. Masonry, W. McCartney, \$7,700; carpentry, Hunter & Harold, \$4,735; heating and plumbing, Joseph Jameson, \$3,110; metal work, Nugent & Taylor, \$959; painting, J. McMahon, \$614. The extras for grates, electric wiring, light fixtures, etc., not included in the contracts, are estimated at \$703.

MONTREAL, QUE.—At a recent meeting of the Road Committee, tenders were awarded as follows: James Shearer, white pine boards, torqued and grooved, 16, spruce 19, Jos. Brosseau, yellow pine, \$33.90; J. Grier, white pine boards, \$13; J. N. B. Grier, tamarac floats, 8 1/2 cents; Dominion Wire Mfg. Co. wire spikes, \$2.91; Chas. Sheppard, bricks, \$8.50 and \$10.50. Sewers—Chagnon & Co., Beaudry street, \$6.23 and \$3.80 for rock excavation; Visitation street, \$6.15 and \$3.80, Montcalm street, \$5.95 and \$3.80; Cyriaq Belhumeur, Champlain street, \$5.46 and \$3.80; Nap. Laporte, Prince Arthur street, Charrier & Robin, Boyer street, Hefferman & Downey, St. Urbain street; Crescent cement, Morgan & Co., 5 1/2 cents per hundred pounds; drain pipes, Standard Drain Pipe Co.

It is the common practice upon engineering works where large amounts of cement mortar are used, to temper the mortar after it has acquired its initial set. Very frequently a large bed of mortar is mixed in the morning and kept stirred up all day. Contractors and some cement men claim that this does not injure the strength of the cement, and brick masons much prefer this tempered mortar to that freshly made, on account of its greater ease of working. Engineers and inspectors claim that the strength is very much reduced by the process. Sets of experiments were made with a view of determining whether the strength was impaired by the resetting of the cement. Six brands, four Portland and two Rosendale, were selected as representative brands sold upon the market. These cements were bought from retail dealers, and hence are the same quality as those sold to customers. The conclusions must not be considered absolute on account of the small number of cements used. Had a larger number of cements been used, more absolute conclusions could have been reached. In all cases the strength of the cements is decreased by resetting. The Rosendales are affected to a greater extent than the Portland. The former appear to regain their strengths in a faster ratio than the latter.—Engineering News.

MUNICIPAL DEPARTMENT.

HOW TO DESIGN A SEWERAGE SYSTEM.

(Concluded.)

It is customary to take gauging and plot the curve, using the Burkli-Zeigler formula, which is  $Q = c r \sqrt{A_3 S}$ , or McMath's, a later one, which is  $Q = c r \sqrt{A_2 S}$ .

In these formulas Q is quantity of discharge, c is a constant depending upon the nature of the ground, and r is the maximum rate of rainfall. A is area, and S average slope, r is from 2 to 5 inches per hour in this country. It is from 2 to 2 1/2 in Northern New York, and 3 1/2 to 5 inches in the Southern States. C is from 0.20 to 0.75 depending upon the nature of the soil—i. e., whether rural, paved, etc. Many observations for the value of c are badly needed.

We must next proceed to find the size of the sewer in feet and inches, and must for this purpose know the velocity. First find slope and make a profile, and allow a certain minimum velocity that will not allow for deposits. Two feet per second is generally taken as a minimum, but it is too low. This is all upon the basis of running full. I never like to use a velocity as small as 2 feet unless it is absolutely unavoidable. Sometimes 3 feet per second costs too much. When the flow is intermittent we really cannot do with a 2-foot velocity, for the deposits cake and pack at night and cannot be removed by the ordinary flow during the next day. Therefore 2 feet for small sizes is really too small. The maximum value of the velocity is only limited by the durability of the material. Having first-class material we can use very steep grades, but even with the best 6 feet per second should not, as a rule, be exceeded. If the sewage contains much grit, even 6 feet will greatly wear the pipes. In case of storms it sometimes becomes as high as 12 feet per second.

In considering the hydraulic grades, we should make a distinction between the grades of the ordinary flow and that when the sewer is flowing full. First draw in the hydraulic grade so that it just misses the cellars, etc., or the line to which water is allowed to rise, and plot from this downward. The shapes of the sewers are best circular if small, the material giving the best results being vitrified pipes. The circular shapes are very much cheaper, as the vitrified pipes cannot be easily made and burnt in other shapes. When we build brick sewers it is customary to make them egg-shaped, because it concentrates a small flow into a deep one. Four centered ellipses are used where there is a greater ordinary flow than in the egg-shapes. When we are limited in height we can use the horseshoe shape. Some of these forms have a small sub-channel, either in the centre of the bottom or to one side to take the ordinary flow.

We are now ready to determine the sizes. For this purpose we use Kutter's formula, which is the most reliable. Considering that the slope has no effect upon velocity on slopes over a feet per mile, Kutter's formula reduces to

$v = AR \sqrt{S} \div (B + \sqrt{R})$

A and B are determined by the interior surface of the sewer. For ordinary practice A=188 and B=0.64. R is equal to the mean radius of the section. This formula can be reduced to  $v^2 = 2px$  and therefore is parabolic in form. We can thus plot a table graphically, giving all necessary information respecting the size of sewers. Considering  $v^2$  as a square root, we have only to calculate the locus of one point in each parabola, and as it thus reduces to a straight line it can be at once drawn in. The largest sizes of sewers built are from 20 to 22 feet in diameter. In America the smallest sewer allowed is 8 inches, and in England 9 inches. This has been taken as a minimum because it has been found that ordinary pieces of solid matter likely to get into a sewer occasionally will not turn over in a 6-inch sewer, but strike, causing obstruction. This seldom occurs in the 8-inch pipe.

Junctions should be carefully constructed so as to cause no retardation or deposit. They should not form eddies nor cause any diminution in velocity. The best form of intersection is that in which the sewers take their real theoretical form of junction inside. The use of the tongue, in intersections, has been one of the elements of success in remedying foul conditions in modern sewerage systems.

Manholes are for the purpose of inspection and cleaning. Their covers should be perforated with 1 to 1 1/2-inch holes to allow for ventilation. Their distance apart varies with the design; should not be more than from 200 to 500 feet apart on straight lines. Sufficient inlets for the admission of water should be provided at corners of streets, etc. These openings are either catch-basins for retaining the solid matter which would otherwise find its way into the sewer or ordinary openings, called inlets, without any provision of this kind. Flush tanks are very necessary for cleaning and should be placed at every dead end. Their supply may be taken from the city water supply or from carts. For cleaning larger sewers gates are necessary. These are arranged for closing the sewer temporarily so that it is dammed up, and after a large quantity of water has collected they are opened, and the sudden rush of water flushes the sewer. There is one other point to consider, and that is ventilation. We should first relieve the pressure, and secondly get rapid change of air. Artificial ventilation is not a successful method, and natural methods are the only good ones, therefore see that ample opportunity is left for the ingress and egress of air. Lastly, to make the whole thing plain to the average councilman make your drawings very clear and in colors, and write a report describing the design in detail and giving reasons for all recommendations. The report if required should embody also an estimate of cost.

CARRYING CAPACITY OF SEWER PIPE.

Table with columns: Size of pipe (3 inch, 4 inch, 6 inch, 8 inch, 10 inch, 12 inch, 15 inch, 18 inch, 24 inch, 30 inch), Gallons per minute (1 inch fall, 2 inch fall, 3 inch fall, 4 inch fall, 6 inch fall, 8 inch fall, 10 inch fall, 12 inch fall, 15 inch fall, 18 inch fall, 24 inch fall, 30 inch fall).

When the area to be drained and the fall of the sewer per 100 feet are known, the above table will show the number of gallons per minute the respective sizes of pipes will accommodate.

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