

asked that the \$10,000 appropriation for the improvement of No. 13 station, Hochelaga ward be applied to the building of a new station in the district between No. 8 and No. 13 station and the Council will be asked to change this appropriation accordingly. It was also recommended that the new station in the west ward be built at once.—Ald. Conroy, Savignac and Thompson have been appointed to look into the question of cementing the St. Louis square basin. This work is recommended by the Superintendent of waterworks, and is estimated to cost \$4,000.

TORONTO, ONT.—Mr. Edward Hanlan contemplates erecting a large summer hotel at Centre Island, just east of St. Andrew's church, to cost between \$30,000 and \$40,000. The plans have been prepared by Mr. E. B. Jarvis, of the Traders' Bank Building.—At the meeting of the Toronto Sunday School Association held last week, the Lord Bishop suggested that the association should provide an Anglican home, containing reading rooms, parlors, and a hall for meetings. The suggestion was approved of, and it was resolved to appeal to the different churches for subscriptions.—Mr. Edmund Wragge, Local Manager Grand Trunk Railway, invites tenders until Saturday next, the 16th inst., for the steel girder work, steel flooring, and steel rolled beams required in the erection of the Front street block and the bridge block of the new Union Station in this city. Plans may be seen at the office of the architects, Messrs Strickland & Symons, 18 Toronto street.—The Olive Typewriter Co., of Dubuque, Ia., has written to the Secretary of the Board of Trade asking what encouragement the city would offer to induce them to establish their works in this city.—In the last semi-monthly report to the Board of Works, the City Engineer again requests the Committee to consider his report upon the proposed enlargement and improvement in the waterworks system, submitted some two months ago, in which he recommended the construction of a tunnel under the harbor, coupled with a new conduit across Toronto Island and into the lake to a new intake. The cost of the work, including new mains, is estimated at \$710,000. The Committee is also asked to decide the manner in which the Rosedale ravine drive will be dealt with at Severn street. Owing to the raising of the said street at Park-road it will prevent the drive being carried through on the level. The construction of a bridge or a subway would therefore be necessary.—The C. P. R. have been granted permission to erect wooden workshops on their land between John and Lorne streets, south of the Esplanade.

FIRES.

A house at Kingston, Ont., owned by Robert Stevenson, was burned last week. Loss, \$2,000.—The St. Nicholas hotel on Main street, Winnipeg, was gutted by fire on Saturday morning last.—A residence at Moncton, N. B., owned by John Whalen, was burned last week.—A brick block at Emerson, Man., occupied by R. A. Whitman as a general store, was burned on the 6th inst. Loss, \$10,000.—The North Hastings Review office and plant at Madoc, Ont., were destroyed by fire last week. Loss, \$3,000. The building was owned by J. R. Orr.—The residence of Mrs. McGeorgen, at Portage la Prairie, Man., was destroyed by fire on Monday last.—The Globe Chemical Works at Todmorden, Ont., owned by J. J. Harvey, were burned on Thursday last. Loss, \$5,000; no insurance.—The dwelling house of Wm. Armstrong at Thornbury, Ont., was destroyed by fire on the 12th inst. Loss, \$1,300; insurance, \$500.

CONTRACTS AWARDED.

OTTAWA, ONT.—The contract for the erection of protection works at Grand Etang, Inverness county, N. S., has been let to Mr. Frederick Toms, of this city. The contract price is said to be in the neighborhood of \$18,000.

HAMILTON, ONT.—The contract for 25,000 ties for the Hamilton, Grimsby and Beamsville railway has been given to John McGann, contractor, of Toronto.

TORONTO, ONT.—The Board of Works on Saturday last awarded the following contracts: Galloway, Taylor & Co., iron-work castings, \$1.50 per 100 lbs., wrought iron \$2.50 per 100 lbs.; Aikenhead Hardware Company, wire nails \$2.80 per 100 lbs. and 15 cents each for empty boxes; Bryce & Co., lumber, 2-inch, \$13.87 per thousand feet, scantlings, \$13.87; D. L. Van Vlack, cedar posts, \$5.25 and \$4.40; Richard Golding, lake gravel, per cubic yard, 74 and 79 cents; sewer pipe, all kinds, Mimico Sewer Pipe Company; 60-inch steel riveted pipe, Central Bridge & Engineering Company, Peterboro, \$7.85 per lineal foot; sand, 87½c cubic yard, John Bourne; gravel, clean, east end, 87c, John Bourne; screened, L. Ashton & Son; west of Yonge, both kinds, Robert Whillans; excavating, piling and laying 60-inch pipe, Yonge street sewer extension, \$3 per foot, Toronto Construction and Paving Company; Moutray street sewer, \$9245, Robert Grant.

BIDS.

VICTORIA, B. C.—Some 250 tenders have been received for the erection of the British Columbia Government buildings. The contractor's have not as yet been awarded, but it is rumored that local contractors will receive a large portion of the work.

USEFUL HINTS.

In repainting on surfaces, from which old paint has been burnt off, an excess of oil is likely to cause blistering, and the best results will be obtained if the priming coat is used with three-quarters of turpentine to one quarter of oil.

AN INDIAN METHOD OF TESTING LIME FOR MORTAR.—Erect a pillar about a foot high, just for convenience sake, as a basis for a practical test, and having a hollow about ¼ in. deep in its proper surface in which two bricks will fit tightly. Then have the mortar prepared from the lime at hand, say, 1 of lime and 3 of soor-kee, or fine sand; then after soaking about six or eight bricks, build them in the hollow in the pillar, two headers over two stretchers, etc., keeping them moist with water for a few hours till set, after which, if this masonry is struck vertically with a wooden mallet and it is found that the mortar is hard and brittle and that the bricks break before the mortar (though the bricks are well burned), it may be taken for a certainty that the lime used is good; after which it might be locked up and kept from being tampered with.

ABSORPTION OF HEAT.—The eagerness and rapidity with which water will absorb heat is in direct proportion to the difference in temperature between the water and the fire. That is to say, the cooler the water the more intense its heat-absorbing quality. With cold water, circulation begins rapidly, even from a small fire; as soon therefore as the particles of water become heated they naturally strive to move up and out of the boiler and so make way for cooler and more heat-receptive particles. This, we repeat, is the natural way for heated water to move and in this way heated water will always move if it is not hindered and checked by a forced movement horizontally. The only direction in which heat will move water is a vertical direction. Heated water will rise and cooler water descends naturally, in vertical lines. Water in horizontal spaces will hardly move away from the fire at all, except as it is forced out by the movement of neighboring currents in vertical spaces.

A GOOD WHITEWASH AND HOW TO USE IT.—The whitewash used by the United States Government for covering light houses is made by mixing with fresh water, in the most thorough manner, three parts Rosendale cement and one part of fine clean sand, this giving a gray or granite color, dark or light according to the color of the cement. If a very light color is desired, lime is used with the cement and

sand; if brick color is sought, enough Venetian red is added to the original mixture to insure that result. Care is exercised to have the various ingredients well mixed together; also, in applying the wash, to have the wall wet with clean fresh water; following immediately with the cement wash. This method prevents the bricks from absorbing the water from the wash too rapidly, and it also gives time for the cement to properly set. The mixture is made as thick as can be conveniently applied with a whitewash brush in the usual manner, and the wash is well stirred during the process of its application. It is stated, however, that though this mixture is so admirably suited for the purpose in question, it cannot be used to advantage over paint or whitewash.

In reply to a correspondent who complains about pipes leaking, owing to the dissolving of the iron *Scientific American* says: The water of condensation is to a considerable degree a solvent of iron of the quality used for making pipe. Such iron is not pure, containing slag and particles of some unknown substance that seems to have a galvanic action, producing pock holes that sometimes eat through pipes in from three to five years. Again, where the water runs along the bottom of wrought iron pipes, channels are cut partly by solution and partly by attrition, which are known to cut through a pipe in four or five years; while, on the other hand, the vast bulk of steam-heating pipes are in use all the way up to 25 years with only an occasional leak from internal causes. The cause is largely in the quality of the iron of which the pipe is made. The use of homogeneous or steel pipe is probably the only remedy. The same pitting is known to affect iron boiler tubes, and is a source of much trouble with vertical tubes with internal circulation although the water is not pure and soft as from condensed steam.

MUNICIPAL DEPARTMENT.

THE MANUFACTURE AND USE OF PAVING BRICK.

(Concluded.)

In making tests for relative qualities of brick nothing will take the place of experience. A few general suggestions, however, for making ready tests, such as are now in use, are offered with the hope that they may prove serviceable. The test for crushing strength is believed by the writer to be of little or no value unless in comparison of the values of high-grade paving brick. The test is difficult of application, requiring expensive machinery; and unless carefully made by skilled observers under definite given conditions the results are very uncertain and unreliable. The transverse strength can be determined with greater accuracy than the crushing strength; it also represents both the compressive and tensile strength of the material, and is, therefore, a better test of the qualities of the brick. In testing for ratio of absorption the brick should be placed in a drying oven and kept at a temperature of about 121 deg Fahr. for ten hours or more if they have previously been saturated. They should then be weighed, and after the weight is carefully determined placed in a vessel of water and kept for twenty-four hours at a temperature of about 60 deg. Fahr., after which they should be taken out, the surface water carefully removed and again carefully weighed. The gain in weight, divided by the original weight, will give the ratio of absorption. The presence of caustic lime is easily told by immersing the brick from one to four days in water. If caustic lime be present it will make its appearance by breaking or cracking the brick, or by "poppers" showing on the surface. The specific gravity can be readily determined. The tests for toughness or abrasive strength is usually made in an ordinary foundry tumbler. The bricks should be tested a few at a time with about 200 lbs. of "foundry shot," weighing not more than ½ lb. to the piece. Heavy pieces of iron should not be used in this test, as they break the brick to pieces instead of wearing it. The different shapes of the brick are apt to make a material difference in their wear during the first half-hour. This is caused by some brick being manufactured with rounded edges and some with square edges; the latter being more easily broken or abraded, cause a greater loss in the material so made. For this reason they should be weighed after the first half-hour, and the results of the second or third half-hour used for comparison. The large majority of specifications for paving brick are entirely inadequate. They are vague and often meaningless. It should be remembered that each additional requirement cuts out certain classes of brick, lessens the competition, and in

that way and by reason of the extra cost in the manufacture of a higher grade article, increases the price of the finished pavement. It must also be observed that with the present demand for paving brick and the state of manufacture in many places where factories have been recently established, it will often be impossible to obtain brick which will fall within the higher limit herein named. Hence the engineer should assure himself of the best quality of brick which can be obtained in sufficient quantities for his use before adopting specifications calling for any particular grades of paving brick.

A discussion of the principles that underlie brick paving would be a discussion of the principles of all paving. The material simply offers a surface covering, smooth and even, but not slippery, durable, economical, and highly sanitary. It must be laid on a foundation drained and prepared as for all pavements. Beyond this the success of the pavement depends on the proper selection of the material. With poor material it will prove a failure. With proper material it is an established success, and is destined, with the improvement in manufacture and the bettering and cheapening of the product thereby, to rank first in economy and availability of all paving material. In the majority of places it offers a possible local industry, when the availability of the local geological resources are better known and appreciated and the different methods of utilizing them in manufacturing are more thoroughly understood.

In first cost the pavement depends on the nearness of the manufactories and the local resources suitable for foundations. For light traffic the fragmentary materials (rubble, gravel, sand, &c.), or sand with layer of brick laid on then side, or 6 inches of concrete make good foundations, the selection depending on the local resources. For medium traffic, 9 inches of stone or gravel, or 6 inches of gravel or stone, with a layer of brick laid on other sides, bedded in sand, or 6 inches of concrete, will give good results. For heavy traffic the stone or gravel should be at least 1 foot in thickness or the concrete at least 9 inches. All sub-foundations which are retentive of water should be properly and thoroughly drained.

In the average city the network of pipes and conduits laid below the street surface is the cause of frequent disturbances of the pavement which is often the leading factor in its destruction. The facility with which pavements can be taken up and replaced becomes, under such circumstances, quite important. In this brick pavement is second to none. The brick, being uniform in size and shape, can be returned to their place by unskilled labour, an important point in smaller towns and cities. This is especially true if the fragmentary foundations are used, and if sand only is used in the joints. Where either coal tar or cement grout is used in the joints, the brick taken up are difficult and often impossible to clean, and new material has to be substituted. With sand in the joints the old material is readily cleaned, and the sand, in two weeks' time after laying, renders the pavement as impervious to the seepage of surface waters as the tar or cement.

The durability of brick pavements is a subject open to inquiry, for the limited time they have been in extensive use has been too short to answer this from practical experience. The destruction of a pavement results from (1) the crushing by the wheel load; (2) the abrasion by friction of passing vehicles and the slipping of horses' shoes; (3) the impact due to the passage of the loads over a rough surface, and the impact from the shoes of horses. The smoothness of the brick will, in the opinion of the writer, more than overcome the difference in abrasive resistance of the granite. The writer estimates the life of first-class brick pavements to be:—For light traffic, 35 to 50 years; for medium traffic, 20 to 25 years; for heavy traffic, 10 to 15 years. The smoothness of brick renders it free from much of the objectionable noise of the rougher pavements. Its freedom from decay and its non-absorption of water are sanitary qualities of considerable value. It produces little dust of its own, and as it is not retentive of mud and dust it can be readily cleaned. Being smooth without being slippery it offers comparatively little resistance to traction, while affording a fair foothold for horses.

The city of Vancouver, B. C., is looking for a city engineer. The salary is \$150 per month.

A very curious result from gas leakage is described by Dehnhardt in the *Centralblatt für Bauverwall.* It appears that an asphalt pavement had been laid down, and in spite of the fact of the material having been carefully mixed and applied, in about two years afterwards faulty places were observed to appear. These were duly repaired, and in the course of a time became again faulty; the asphalt at these places was soft and tarry and exhibited upon the surface a number of tiny radiating fissures. The asphalt was broken up and the cause of the trouble investigated. Beneath the faulty places it was discovered that there was an escape of gas from pipes laid beneath the pavement. On analyzing samples of the impaired asphalt it was observed that it had absorbed the