SANITATION AND HEATING

HOUSE DRAINS.

We can remember, says the *Contract Journal*, when it was customary for architects to specify nothing less than 9 in. for the internal diameter of the main drain to an ordinary house, and sometimes a 12 in. pipe was thought necessary for a large mansion or warehouse. We are glad to think that smaller pipes are more generally adopted now. Yet we occasionally meet with architects who still cling to the prejudice in favor of large pipes, and some two years ago we knew a vestry surveyor who insisted upon a 9 in. main drain being laid to a common lodging-house containing some half-a-dozen water-closets, all discharging into a single 6 in. trough. To those who reflect upon the rapidity with which water finds its level, the danger of deposits being left in a 9 in. pipe is obvious. A 9 in. circular pipe, half filled with water, holds one gallon in every 4 in. of length, so that the orthodox two gallon flush from a single closet soon distributes itself in such a shallow stream as is totally insufficient to carry away the soil. A 6 in. pipe, half full, carries a gallon of water in 1 ft. 8 in. of length and a 3 in. pipe, half full, carries the same quantity in 3ft. 4 in. Of courseit is advantageous for the soil to flow in narrow, deep channel. This is a reason in favor of pipes of an egg-shaped section, though the care required in setting the axis of the oval section vertical increases the cost of laying the pipes. The danger of small pipes becoming choked through an excessive flow of soil has been exaggerated. Prof. Corfield has found that even in large country mansions, with large areas and outbuildings, no main soil drain need ever be more than 6 in in diameter; and in Gwilt's "Encyclopæa of Architecture." (1888) there is instanced the case of a 10-roomed villa where a 3 in. main drain was used without inconvenience for many years.

The choking of a drain is caused not so much by an excessive flow of soil through the pipe, as by an insufficient or badly regulated flow, which causes deposits to accumulate. It has been observed that when a water-closet is situated low down, near the head of the drain, the latter is liable to become choked. This occurs through the gradual accumulation of solid matter. It certainly is preferable when the water-closet is situated at some height above the head of the drain. The advantage of this consists less in the velocity acquired by the soil in travelling down the soil-pipe, than in the breaking of the soil matter into small fragments, which are held suspended in the water. The velocity is useful to carry the soil through the trap, and after that a slight fall suffices to ensure a sufficiently rapid flow.

An insufficient fall to a drain allows time for solid matter to settle, because the water does not flow rapidly enough. On the other hand, it has been found that if the fall is too great the water runs away, leaving deposits of soil. According to Hurst, a velocity of 2ft. per second is the smallest that will keep a drain clear, but 3 ft. per second is required for a house drain. It has been calculated that this velocity can be obtained in a 4 in. pipe half full, with a fall of 1 in 100; in a 6 in. pipe, with a fall of 1 in 150; and in a 9 in. pipe, with a fall of 1 in 225. But there is great divergence of practice in arranging the falls of drains. Some architects favor falls of 1 in 60, some 1 in 40, and others 1 in 30. The regulations made by vestries exhibit differences of opinion on this subject. One London vestry states the minimum fall for drains at 1 in 60, another at 1 in 48, and a third at 1 in 40. We rarely find measures taken to guard against an excessive fall. We know one London vestry that requires the fall to be not less than 1 in 40, and provides that the whole of the available fall is to be made use of. The maximum fall may, therefore, be anything, and it may easily be such as to allow the water to flow away, leaving deposits of solid matter in the sides of the pipes. A plentiful flow of water is far more effective in cleansing a drain than a rapid fall, and the two-gallon flush, to which we are limited by law for each water-closet, ought to be supplemented by a further supply. A rain-water drain may advantageously be turned to account in flushing soil drain, especially if connected near the head of the latter.

A report obtained currency two or three weeks since that an association of manufacturers of plumbing supplies was to be formed to restrict credit, and in other ways to place the trade on a more satisfactory basis. Enquiries of leading manufacturers elicited the reply that they know nothing about such a movement.

MANUFACTURES AND MATERIALS

EFFECT OF TIME ON STRENGTH OF CEMENTS.

Baron de Rochmont, engineer of the Port of Havre, gives figures to show that the strongest briquettes, at two days, having a breaking strain of 147 pounds to the square inch, had a breaking strain of 318 pounds per square inch, after a period of 30 days. Other cements which had breaking strains of 157 pounds at two days increase to 661 pounds in thirty days. The weight or tensil strength of cements diminish when they have been kept in stock for some time. In the case of 15 cargoes of cement which came under his notice the weights, on delivery, were between 111 and 121 pounds per bushel, and the breaking strains were from 75 to 160 pounds per square inch in two days, 160 to 289 pounds in five days, and 339 to 460 pounds in thirty days. After being six months in store their weights were from 101 to 108 pounds, and their breaking strains from 38 to 114 pounds in two days, 112 to 195 pounds in five days, and 234 to 340 pounds in thirty days. The fall in weight and strength when the cement has been kept in store for a year is still greater. One cargo weighed on delivery 111 pounds per bushel, and its breaking strains at two, five and thirty days were 96, 236 and 271 pounds respectively. After the cement had been in store six months its weight was 106 pounds per bushel, and the briquettes made from it had breaking strains at two, five and thirty days of 109, 178 and 332 pounds respectively. After being in store a year the cement weighed 106 pounds per bushel, and the briquettes made from it had breaking strains at five and thirty days of 73 and 250 pounds respectively.

NOTE ON THE COMPRESSIVE RESISTANCE OF BRICK.

The writer has previously called attention to the fact that the flatness of the pressed surfaces greatly affect the crushing strength of cubes of brick or stone. The present note is written to present the results of some experiments made to determine the effects of different methods of preparing the pressed surfaces to the test specimens.

In testing some paving brick, the writer made some preliminary experiments by preparing the surfaces in five ways, viz.: 1, grinding as nearly flat as possible upon the convex side of an emery stone, and crushing between self adjusting, parallel, cast iron plates; , removing the irregularities of the surface, and crushing between blotting paper; 3, removing the irregularities of the surface, and crushing between straw boards; 4, removing the irregularities of the surface, coating with plaster-of-paris and placing under slight pressure until set (12 to 24 hours), and then crushing; 5, coating with plaster-of-paris which was afterwards ground down on a sand-paper disk, to the surface of the brick, so as to leave a minimum thickness with a perfectly flat surface, and then crushing.

After a considerable number of experiments, it was decided that there was no great difference between the first three methods, while the difficulties in applying the last two were so great as to render them worthless. With a grade of brick which was quite uniform in quality, the first three methods gave 7,000 to 9,000 pounds per square inch as the crushing strength of cubes. The fairly close agreement of the results was considered satisfactory evidence that the method employed secured the full strength of the brick. Subsequently the writer decided to determine the strength of cubes when pressed surfaces were prepared with the greatest care. The samples were prepared on a rubbing bed at a marble dressing establishment, by the ordinary workmen, with instructions to secure perfectly flat surfaces. The brick were of the same grade as those referred to above, and many of the samples were the second halves of the brick used in the first experiments. The strength of the carefully prepared cubes ranged from 16,000 to 21,000 pounds per square inch, and averaged a trifle over 18,000.

The conclusion derived from the two series of experiments is that an almost imperceptible difference in the flatness of the test specimens makes a very great difference in the strength. Obviously this difference is greater the harder and more brittle the brick or stone. It is perhaps well to repeat that tests of compressive resistance of blocks of stone or brick are useful only in comparing different samples, and gives no idea of the strength of masonry constructed of these materials.

It is interesting to note that Rankine and Trautwine, standard British and American authorities, in editions of their engineers' manual published a few years ago, give the crushing strength of the best brick at 1,100 and 4,000 pounds per square inch respectively, while there has recently been tested in the university testing laboratory three lots of brick which averaged from 15,000 to 18,500 per square inch. The difference is probably due mainly to improvemeats in the manufacture of brick. The crushing strength of granite, when tested under similar conditions, is from 12,000 to 20,000.—IRA O. BAKER, Professor of Civil Engineering, University of Illinois, in the *Technography*.

The Central Bridge Works, of Peterborough, has been succeeded by the Central Bridge and Engineering Co., incorporated, with a capital stock of $200,000. The company will manufacture steel and iron bridges and structural iron and steel for all purposes.

Messrs. Merchant & Co. are calling the attention of their customers to the fact that they have ceased to handle "Gilbertson's old method" brand of roofing plates, the quality of which, in the opinion of many of their customers, has deteriorated of late. They are now offering a heavier and better plate manufactured in their own works in Philadelphia.