CHAPTER VII.

MATERIAL AND ACCESSORIES.

Sewer Pipes.—Salt-glazed, vitrified earthenware is the best material thus far produced for sewer pipes. It forms a smooth, impervious conduit, is not affected by the sewage, and is practically indestructible. It is manufactured in all sizes, from two inches to three feet in diameter, and in convenient forms for special purposes. It is also made of "standard" thickness and "double strength." The pieces are usually either two or three feet in length. They are either made with a "bell" at one end for holding the "spigot" end of the adjoining piece in laying, or as simple cylinders, with a separate collar for making the joint. The socket and spigot pipe is usually preferred. Pieces with Y branches should be placed wherever a house drain is to be connected with the sewer.

Tests of twelve-inch sewer pipe were made at Boston by Chief Engineer W. H. Bradley, with the following results:

"The pipes were three feet long and without sockets, except as noted.

"The crushing test was made by bedding the pipes, horizontally, half their depth in sand and crushing them by a weight applied uniformly along the length on the top; figures are pounds per foot of length (average of three pipes).

"The breaking test was made by supporting ends of pipes on two blocks two feet six inches apart and applying weight at center; figures are total weight (one test).

"The abrasion test was made by applying a section ½ inch square, loaded with 20 lbs., to a revolving grindstone three feet in diameter, kept wet and clean; figures are revolutions necessary, 1st, to remove glazing; 2nd, to grind away 1/10 of total thickness including glazing (average of two tests)."

TABLE XXI.

TEST OF SEWER PIPE TWELVE INCHES IN DIAMETER.

OWNERS AND KIND OF PIPE.	Weight in Lbs. per Foot.	Thickness in Inches.	Specific Gravity.	Crushing Weight Lbs. per Foot Length.	Breaking Weight, Lbs. on 2 ft. 6 in. Span.	Abrasion.	
						Glazing.	1-10 Thickness.
Otis & Gorsline, Rochester, N. Y..	47.7	1.16	2.26	2807	4299	25	517
D. L. King, Secretary, Akron Co., Ohio	40.3	0.99	2.25	1891	3992	30	398
D. W. Lewis, Agent, Tallmage Co., Ohio	42.0	1.03	2.48	2107	4606	33	600
Hill Sewer Pipe Co , Ohio.....	40.5	1.00	2.32	2286	4299	25	535
T. W. Carter, Agent, Buckeye Co., Ohio.........	40 5	1.01	2.31	2140	4299	......	......
Wm. Nelson, Jr., N. Y. City, Scotch Pipe........	43.0	1.12	2.19	1875	3982	9	32
Portland Stoneware Co., Salt Glazed............	41.1	1.16	......	2495	......	14	187
" " " Slip Glazed...........	40.6	1.16	2.11	4652	4913	13	35
G. W. Rader, N. Y. City, Salt Glazed	40.4	1.04	......	1880	......	75	793
" " " Slip Glazed	40.0	1.10	2.17	2052	4299	12	90
Marcellus Day, Boston, Portland Cement	63 0	......	......	2316	5836	......	......
S. Richardson, Philadelphia, Carbonized Stone, 12 by 18¾ inches...........................	81.1	1.00 to 1.75	2.32	2021	......	......	......

Tests of double strength sewer pipe, manufactured by Blackmer and Post were made by H. R. Gates, Superintendent of the Geo. J. Fritz Foundry and Machine Co., with the following results:

1 Section 24-inch Double Strength Culvert Pipe,
2 inches thick, broke at .... 27,610 pounds.

1 Section 24-inch Double Strength Culvert Pipe,
2 inches thick, broke at .... 28,715 pounds.

1 Section 27-inch Double Strength Culvert Pipe,
2¼ inches thick, broke at .... 33,133 pounds.

1 Section 27-inch Double Strength Culvert Pipe,
2¼ inches thick, broke at .... 32,763 pounds.

1 Section 30-inch Double Strength Culvert Pipe,
2½ inches thick, broke at .... 27,987 pounds.

1 Section 30-inch Double Strength Culvert Pipe,
2½ inches thick, broke at .... 24,297 pounds.

1 Section 27-inch Standard Culvert Pipe,
2⅛ inches thick, broke at .... 23,986 pounds.

1 Section 27-inch Standard Culvert Pipe,
2⅛ inches thick, broke at .... 22,530 pounds.

1 Section 30-inch Standard Culvert Pipe,
2¼ inches thick, broke at .... 27,875 pounds.

Internal pressure was applied with the following results:

24-inch Culvert Pipe burst at 100 pounds pressure to the square inch, showing a horizontal crack on the side from end to end.

27-inch Culvert Pipe showed no weakness of the material or in the joint at 100 pounds pressure, but the bulkheads leaked so much that no more pressure could be applied.

30-inch Culvert Pipe showed no weakness of material or in the joint at 100 pounds pressure, but the bulkheads leaked so much that no more pressure could be applied.

In making the tests as shown, blocks of wood were hollowed out to fit as nearly as practicable the shape of the pipe, each block covering a little less than one-fourth the circumference of the pipe, the power being supplied by a hand-pump, the pressure being registered on the guage as applied.

The capacity of vitrified salt-glazed sewer pipe to resist abrasion is very marked.

Hand-Holes.—A "hand-hole" is a piece of pipe provided with a detachable section. See Fig. 2. These hand-holes afford the means of removing obstructions without breaking the pipe. They are usually laid at intervals of about one hundred feet. Their use may be dispensed with and the sewer may be opened when necessary by removing the cap from a Y branch.

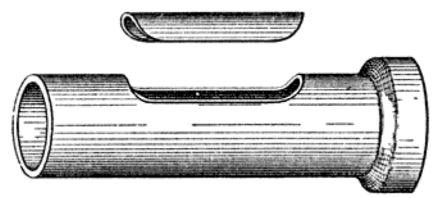


Fig. 2.

Lamp-Holes.—At intervals a T should be placed in the sewer and a stand-pipe carried to the surface, forming an opening where the action of the sewer may be observed. See Plate I. Part of them may stop just beneath the pavement and be covered with a light casting, shown in Plate I, and at longer intervals part of them may be carried to the surface and protected with a cast iron cover.

Fresh Air Inlets.—These will answer in place of manholes in some cases when the distance between the junction of two or more sewers is considerable. They afford facilities for inspection, and have the advantage of preserving the flow of sewage in its proper sectional form and precluding the possibility of deposit. They are, however, not as available as points from which cleaning tools can be inserted into the sewer. They should be covered with a perforated cast-iron cover, similar to that shown in Plate II, to assist in the ventilation of the sewer. They can be very cheaply constructed.

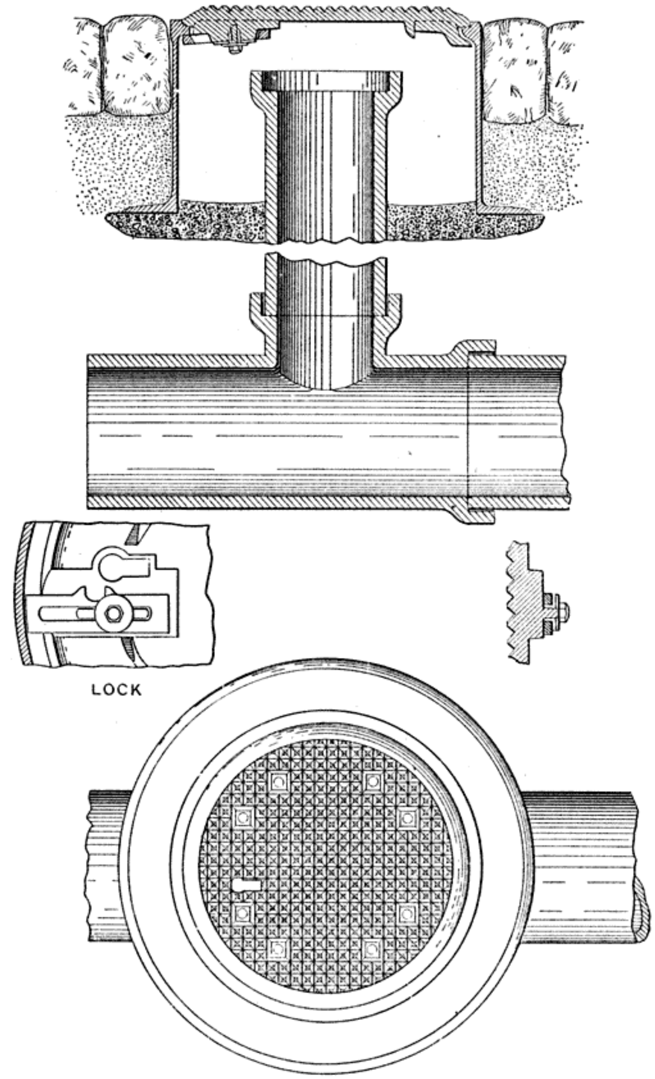
Man-Holes.—Where two or more sewers unite a man-hole should be placed. See Plates V, VI, VII, VIII. They should be built of selected, hard brick, laid in cement mortar, plastered outside, and surmounted by a heavy cast-iron cover. It is very difficult to make a proper connection between two pipe sewers of large size by the use of the ordinary Y branch. The man-holes are also required for purposes of inspection, repair, removal of obstructions, and ventilation.

The advisability of omitting man-holes has been considerably discussed of late, but in cases where they have been omitted it has usually resulted in their being built subsequently. They add largely to the cost in the Separate System and should not be used more frequently than is necessary.

Flush-Tanks.—All dead ends should be supplied with automatic flushing tanks, the size of which should be proportioned to the size of the lateral. They should be built of selected, hard brick and cement mortar, and plastered inside and outside, and surmounted by a heavy iron cover. They are usually supplied with water from the street mains through an ordinary service pipe of small size, and the admission of water is controlled by an ordinary lever handle stop-cock. They are built in various forms and will be more particularly described in the chapter on Flushing and Ventilation.

Y Branches.—The usual form of Y branch is shown in Plates I and X. It consists, essentially, of a cylinder of smaller diameter intersecting the main pipe at an angle of about thirty degrees, measured on the side of the intersection toward the socket end of the main pipe. The axis of the intersecting cylinders meet in a common point. The Y branch can, therefore, be turned to the right or left with equal facility.

PLATE II.



DETAILS

—OF—

FRESH AIR INLET.

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Another form of Y branch is shown in section in Plate I. It consists of an intersecting frustum of a cone, the diameter of whose base is equal to the diameter of the main pipe and common with it. It is claimed for this branch that it induces a more perfect ventilation by entirely withdrawing the air from the crown of the main sewer.

It is open to the objection that it does not preserve the proper cross-sectional form of the stream but allows it to spread out laterally into the branch itself, thus breaking up the continuity of the flow, decreasing the velocity, and tending to the formation of eddies and deposits.

The comparative effect of the two styles of Y branch upon the cross section of the stream when the pipes are flowing half full is shown in Plate I.