CHAPTER II.

CHARACTER AND DEFECTS OF THE OLD SEWERAGE SYSTEM.

Such changes have taken place in the contours of the city, through operations for reclaiming and filling tidal areas bordering the old limits, that, from being a site easy to sewer, Boston became one presenting many obstacles to the construction of an efficient sewerage system.

This will be understood from an examination of the plan of the city proper, Plate V. On this plan the shaded portion represents the original area of the city, and very nearly its limits in 1823. The unshaded portion of the plan, indicating present limits, consists entirely of reclaimed land filled to level planes little above mean high water, the streets traversing such districts being seldom more than seven feet above that elevation. A large proportion of the house basements and cellars in these regions are lower than high water, and many of them are but from five to seven feet above low-water mark, the mean rise and fall of the tide being ten feet. This lowness of land surface and of house cellars necessitates the placing of house-drains and sewers at still lower elevations. Most house-drains are under the cellar floors, and fall in reaching the street sewers; the latter must be still lower, and in their turn fall towards their outlets, which were rarely much, if at all, above low water.

Moreover, as filling progressed on the borders of the city, it became necessary to extend the old sewers whose outlets would have been cut off. The old outlets being generally at a low elevation, even where the sewers themselves were sufficiently high, the extensions had to be built still lower, and when of considerable length could have but little fall towards the new mouths.

As a consequence, the contents of the sewers were dammed back by the tide during the greater part of each twelve hours.
CHARACTER AND DEFECTS OF THE OLD SEWERAGE SYSTEM.

To prevent the salt water flowing into them many of them were provided with tide-gates, which closed as the sea rose, and excluded it. These tide-gates also shut in the sewage, which accumulated behind them along the whole length of the sewer, as in a cesspool; and, there being no current, deposits occurred. The sewers were, in general, inadequately ventilated, and the rise of sewage in them compressed the foul air which they contained and tended to force it into the house connections. To afford storage room for the accumulated sewage many of the sewers were built very much larger than would otherwise have been necessary, or than was conducive to a proper flow of the sewage; and, as there would have been little advantage in curved inverts where there was to be no current, flat-bottomed and rectangular shapes were frequently adopted.

Although at about the time of low water the tide-gates opened and the sewage escaped, the latter almost immediately met the incoming tide, and was brought back by it to form deposits upon the flats and shores about the city. Of the large amount of sewage which flowed into Stony Brook and the Back Bay, and especially that which went into South Bay, between Boston proper and South Boston, hardly any was carried away from the vicinity of a dense population.

The position of the principal sewer outlets and of the areas on which the sewage which caused most offence used to accumulate, is indicated on Plate V. From these places foul-smelling gases and vapors emanated, which were diffused to a greater or less distance, according to the state of the temperature of the atmosphere. Under certain conditions of the atmosphere, especially on summer evenings, a well-defined sewage odor would extend over the whole South and West Ends of the city proper.

This evil was thus described by the City Board of Health in one of their annual reports:

Complaints of bad odors have been made more frequently during the past year than ever before.

They have come from nearly all parts of the city, but especially and seriously from the South and West Ends.
Large territories have been at once, and frequently, enveloped in an atmosphere of stench so strong as to arouse the sleeping, terrify the weak, and nauseate and exasperate everybody.

It has been noticed more in the evening and by night than during the day; although there is no time in the whole day when it may not come.

It visits the rich and the poor alike. It fills the sick-chamber and the office. Distance seems to lend but little protection. It travels in a belt half-way across the city, and at that distance seems to have lost none of its potency, and, although its source is miles away, you feel sure it is directly at your feet.

The sewers and sewage flats in and about the city furnish nine-tenths of all the stenches complained of.

They are much worse each succeeding year; they will be much worse next year than this.

The accumulation of sewage upon the flats and about the city has been, and is, rapidly increasing, until there is not probably a foot of mud in the river, in the basins, in the docks, or elsewhere in close proximity to the city, that is not fouled with sewage.

Various palliative measures were adopted. The Back Bay, into which the waters of Stony Brook, and with them most of the sewage of Roxbury and Jamaica Plain, used to empty, was lately partly filled with gravel, forming the present Back-Bay Park. The brook was carried in a covered channel to Charles River, which somewhat lessened the nuisance caused by it, or at least transferred it to another locality. Owing to complaints from the physicians of the City Hospital and other residents in that neighborhood the city purchased and filled the upper portion of Old Roxbury Canal at the head of South Bay. The sewers emptying into it were extended, and the position of the nuisance caused by them was thus altered by a few hundred feet. In general terms it may be said that none of the old sewer outlets were in unobjectionable locations.

There are no plans in detail of the sewers of Boston. Many of the older ones have no man-holes. In some streets several sewers exist side by side. Occasionally a sewer is found built directly above an older one. Probably one-half of the larger main sewers are wholly or partly built of wood and have flat bottoms. An unwise provision was inserted in the charters of some of the private corporations organized for the purpose of reclaiming and filling areas of flats, by which it was stipulated.
that the corporations should themselves extend all sewers whose discharge would be obstructed by the filling. Such extensions were made without system, by building flat-bottomed wooden scow sewers, which were laid upon the soft surface of the flats before the filling was done. Cross-sections of various common forms of existing city sewers are shown on Plate II., Figs. 1 to 22. Fig. 22 shows Stony-Brook culvert, which constitutes the lower mile of Stony Brook, and is that part of it which is covered and used as a sewer.

One fact which increased the danger arising from the damming up of the sewers, and the consequent compression of their gaseous contents, was that the house-drains connecting with these sewers were ill adapted to resisting this pressure. Most of them were built of brick or of wood, before the rise of modern ideas in regard to sanitary drainage; and, as they were usually leaky, the gases forced into them found ready egress into the houses. Figs. 23 to 29 on Plate II. show common forms of these house-drains.

The drains differ greatly in size. Of 113 which were observed while building the intercepting sewers in 1878,—

11 were about 4 inches in diameter.

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or more.

113

Of these 113 drains, 9 were level and 14 pitched the wrong way; 45 had flat bottoms and 68 curved ones; 38 were wholly or partly clogged with sludge, and 75 were reasonably clean. At about the same time examinations made with peppermint, by the City Board of Health, of 351 house-drains in various sections of the city, showed that 193 of them, or 55 per cent., were defective in regard to tightness.