

ments relieved the objectionable conditions for a time, the nuisances soon recurred. It was not until comprehensive works were carried out that substantial and lasting improvement was obtained.

Baltimore, Md.

Before the present system of main drainage was put into effect, Jones' Fall River, which traverses the centre of the city in a general direction south by east, afforded the most available means of draining the districts tributary to it. The collection of offensive matter in its open channel had been for many years a source of continued nuisance and expense. The winds were the most powerful agency affecting the regimen of the harbor. A heavy south-east wind raised the water six feet above mean tide, while, on the other hand, a strong northwester would drive the water out of the river, leaving it some five feet below the mean.

Under these conditions, whatever solid matter was permitted to enter the harbor remained there, sinking to the bottom or floating on the surface, but never getting far away from the point of entrance, so that sewage and other filth allowed to enter the harbor with storm water were not finally disposed of, but continued as a source of nuisance, and, after befouling the harbor and silting up the channels, the accumulating matter had to be removed by dredging.

The pollution of the harbor waters was also a matter of concern to the great oyster interests of Baltimore. This led to many investigations as to the best methods of disposal and treatment.

The system finally adopted and built after the fire which destroyed a large part of the city was that recommended by the Sewerage Commissions of the city of Baltimore in its 1897, 1899 and 1906 reports.

The separate system was adopted, collecting the domestic sewage of the city into a high and low interceptor, the sewage being pumped from the lower to the higher at a suitable point. The works are situated about $4\frac{1}{2}$ miles east of the city boundary on the shore of the Back River. The process of disposal comprises sedimentation, screening, sprinkling filters and subsequent settling basins.

New Bedford, Mass.

With few exceptions the sewer outlets were located near the shore line, often at the end of docks, where the current movement of the water was slight.

The pollution of Acushnet River and Clark's Cove by the sewerage had given rise to such nuisances along the city's water front that plans for an intercepting sewer system and pumping stations to care for the entire flow of the municipality were prepared in 1910 and the work completed in 1913.

The intercepting sewer was built with an outlet into the harbor at a point far from shore where the rate of dilution is great enough to avoid nuisances.

Cleveland, O.

The city of Cleveland is ideally located for drainage by a gravity system of sewers and for sewage disposal by dilution, since the Cuyahoga River and its tributaries on the one hand and Lake Erie on the other afford convenient outlets for all the sewers of the city. But on account of the very low velocity of the river the bottom is covered with a heavy sewage deposit, much of which, at the time of the spring freshets, was washed out into the lake, where, at times, it was possible for it to contaminate the water supply. An intercepting sewer system was, therefore, designed for the purpose of intercepting

the dry-weather flow of all sewers emptying into the river, its tributaries and the lake, and conveying this flow to an outlet located on the shore of Lake Erie at a safe distance to the east of the new water intake, where it is proposed to treat it before final dispersion in the lake.

Toronto, Ont.

Toronto offers us a good example of the relationship of main drainage to water front development and improvement.

The sewage of Toronto, before the new system was built, was collected by the combined system and discharged at various points in Toronto Bay without treatment of any kind, with the result that nuisances had been created along the water front, especially during the warmer months of the year. This also constituted a danger to the source of water supply of the city.

The sewage disposal problem of Toronto is important from the aesthetic as well as from the sanitary standpoint, the bay being used to a large extent for sailing and bathing. At the outer boundary of the bay, known as the Toronto Island, a great number of residents of the city have established summer homes, and the pollution of waters by sewage tended to destroy the value of this property as a site for summer cottages. A number of amusement parks on the water front also suffered from pollution of the bay by sewage.

The main drainage system comprises high and low level intercepting sewers, an electrically operated pumping station for the low level flow, a screening and sedimentation plant and a submerged outfall line extending into Lake Ontario.

Syracuse, N.Y.

The city of Syracuse, New York, is drained by two streams, which flow in a northerly direction through the city and discharge into Onondaga Lake.

Two streams, Onondaga Creek and Harbor Brook, served as carriers for the entire storm water and sewage of the city, which are collected on the combined system.

When the loading of the streams with an excessive amount of sewage exhausted the supply of dissolved oxygen in the water and the odor from the putrefaction of the organic matter became objectionable, a system of main drainage was designed to do away with the nuisances caused by these conditions. The main intercepting sewer, built in 1910 and 1911, ran along Onondaga Creek, carrying the flow from the combined system of sewers to a temporary point of discharge into the creek in the northern outskirts of the city.

Another interceptor was built along Harbor Brook on the same principle of design of the main interceptor, but much smaller.

Washington, D.C.

The sewerage of Washington, D.C., may be said to date from 1871. In course of time various defects developed, and there were complaints from odors due to lack of ventilation and from pollution of the watercourses.

In 1890 storm drains were constructed in the low-lying sections, the polluted canals were filled, and intercepting sewers were built to deliver the sewage to a central pumping station on the Anacosta River. From this station the sewage was carried by three siphons for a distance of 2,680 feet under the river, and thence by an outfall sewer 15,483 feet long along the Potomac to an outlet discharging at the bottom of the river, about 500 feet from shore.