

### Cincinnati, O.

The extension and growth of Cincinnati forced the city authorities to plan and construct a system of main drainage which would answer the present and future needs of the city for a number of years.

The sewage of Cincinnati was discharged untreated into the nearest available watercourses, namely, Mill Creek, Duck Creek and Ohio River, through several outlets.

About 65 per cent. of the sewage was discharged into Mill Creek and Duck Creek, the remainder finding its way into the Ohio River. As a rule, the outlets into the Ohio River had not resulted in any offensive condition. Along Mill Creek and Duck Creek a system of intercepting sewers in the valleys of these streams was planned, and construction was started in 1912 and 1913.

Plans for an interceptor following the Ohio River banks, as well as a comprehensive system of sewerage considering the future extension of the city, were also laid out.

Through the construction of two intercepting sewers, sewage was to be removed from Duck Creek and Mill Creek, and thereby eliminate odors and offensive unsanitary conditions.

A section of Duck Creek was to be eliminated through the construction of the Duck Creek interceptor, thus allowing the reclaiming of the creek bed for park or transportation purposes. Mill Creek was to be confined between masonry walls, thus permitting the reclamation of bottom lands for industrial purposes.

### Waterbury, Conn.

The sewerage system of Waterbury, Conn., a city of 74,000 in 1910, consisted of a considerable number of relatively small drainage districts, the sewers of which were designed to discharge into Nangatuck River or its nearby tributaries.

While special conditions of the river near the city prevented any putrefaction and resulting nuisances, putrefaction was active at a point about three miles from the city, and marked nuisances resulted from these conditions.

As a remedy for these unfavorable conditions, the construction of an intercepting sewer and sewage purification works was planned and carried to conclusion.

There were many interesting features governing the design of the sewer section.

The sewer line for a distance of a third of a mile is located either along the precipitous slope of the river bank or in the bed of the stream, and throughout this distance the sewer structure has been so located, designed and constructed as to form a foundation for the lower portion of a retaining wall to be subsequently built for the reclamation of a considerable area of the low level lands now subject to flood inundation. The governing conditions were most favorable for the adoption of a design for a dual purpose structure, and the lands to be reclaimed are of great value for manufacturing purposes.

The saving in total expense effected through this design is estimated to be, at the completion of the river wall, fully two-thirds the cost of the present sewer structure.

For three-quarters of a mile through the site of the proposed sewage purification works, the main intercepting sewer has been built in conjunction with a filter effluent conduit and two pressure mains.

The main outlet sewer running along the bank of Nangatuck River was given permanent protection against

the erosive action of the stream through the construction of slope paving.

This work shows how the main drainage problem of a comparatively small city can be handled efficiently in connection with river front improvement.

### Harrisburgh, Pa.

The discharge of crude sewage through a number of outfalls along the Susquehanna River front at Harrisburgh, Pa., had resulted in the creation of objectionable conditions along the shore, for in most cases the outfall lines were not carried out to deep water and were often above the water level in the river.

The sewage, therefore, instead of being carried out away quickly by the current, tended to pool and stagnate close to the shore line, and, as the city's streets extend almost down to the water front, there were many complaints from residents whom the unsanitary state of the river affected, especially during the summer months. To remedy these conditions the city has built an intercepting sewer to collect the flow from the old outfalls at the end of each street and deliver it through a single submerged outfall into deep water downstream from the city where the current is swift enough to assure a good degree of dispersion.

Ultimately, all the sewage from this interceptor and others to be built will be conveyed to an island in the river and will be treated there at a sewage disposal plant.

### The Boundary Waters Problem

Many other examples could be cited of cities where the improvement of the water front was largely dependent upon improvement of the sewerage system.

The lesson to be drawn from this is obviously that, even in the younger and smaller communities, where nuisance do not yet exist from the discharge of raw sewage into the adjacent waters, foresight requires that sanitary sewer systems be designed with a view to ultimate interception to remove offensive material from the water fronts.

In recent years those cities located upon the boundary waters of the United States and Canada have had to face the possibility of sewage treatment before discharge into the rivers. Extensive investigations have been made by the International Joint Commission and their results published, but no decision has been promulgated. If, as seems likely, standards of maximum pollution are established, it will be necessary for nearly all the cities so situated to treat their sewage before it enters the boundary waters.

### Essex Border Interceptor

Detroit and Buffalo have given consideration to this question and have had extensive engineering investigations made to determine the best method of treatment, and the writers had the opportunity of studying this question for the group of municipalities on the Canadian side of the Detroit River opposite Detroit.

This work was carried out under the jurisdiction of the Essex Border Utilities Commission and our conclusions were presented to them in March, 1917, from which may be deduced the following:—

"That the best method of abating the nuisances due to flotation, deposition, putrefaction and infection from the sewage of the Essex border municipalities is the collection of the sewage in an interceptor and its delivery to one or more centrally-located points, where additional treatment may be applied under proper supervision. The works to accomplish this result are planned to consist