tation justly associated with the name of Glasgow harbor of years ago will not be got rid of for many years to come."

In 1894 a comprehensive system of main drainage was put into effect by which Glasgow was divided into three sections leading to treatment plants from which the sludge is carried away to points down stream, where it is diluted by a large proportion of pure water. The undertaking has removed from the Clyde the solid matters of the sewage of Glasgow and adjacent boroughs and has restored what has been termed a, dead river at certain periods of the year to a live and satisfactory condition.

#### Sheffield, England

The sewage of Sheffield, England, was discharged, untreated, into the rivers and watercourses in the vicinity of the city 'until 1866, at which time the main drainage works were completed and a sewage disposal plant was built to work on the principle of precipitation by means of time and aeration over weirs, followed by continuous filtration through coke. A few years ago it was decided to construct the works so as to operate in accordance with the principles of sedimentation and subsequent oxidation in contact beds.

#### Copenhagen, Denmark

From ancient times the sewage of Copenhagen was led to the harbor in open channels along the streets, and it was not until the middle of the past century that a project for main drainage was taken under consideration.

At first a combined system of sewers was built, and the connections with water closets was prohibited. Nevertheless, the harbor became grossly polluted and a general nuisance resulted.

A system of intercepting sewers and pumping stations was completed in 1901 in order to intercept the sewage and pump it to an outfall in the Sound.

There are three pumping stations, one main station and two substations.

The outfall is situated nearly one English mile from the shore, at a point where there is 33 ft. of water at mean sea level.

# Dresden, Germany

Dresden, with a population of 560,000, is situated on the Elbe at a good elevation above the river. The sewers are of the combined type, discharging the excess of storm water to the river by overflows, and carrying the dry-weather flow, and four or five times this volume of water at periods of storm, to treatment works.

The disposal works consist of a grit chamber, screens and pumps, the latter being used only at high stages of the river.

#### New York City

The condition of the waters in New York harbor led to many investigations, and finally a comprehensive system of main drainage was advocated to do away with nuisances and to protect the health of the people.

The system recommended by the Metropolitan Sewerage Commission in the 1914 report consists largely of intercepting sewers, running approximately parallel to the water front, to collect the sewage from the local sewerage systems to a number of centrally located disposal plants where sufficient of the impurities can be removed to permit the effluent to be discharged into the waters without danger or offense. It was recommended that outlets be placed at the bottom of the deep and swiftly-flowing channels in order to facilitate the diffusion and assimilation of the sewage materials by water. The commission was of the opinion that it would not be necessary to keep all the sewage out of the harbor, for these waters can absorb a large amount of sewage in a harmless and inoffensive manner.

### Chicago, Ill.

Chicago is situated upon the comparatively low-lying land near the south end of Lake Michigan. The natural drainage is toward the lake, which is the only source of water supply for Chicago and vicinities.

In order to protect the water supply, a canal has been built whose effect is to reverse the direction of natural drainage and provide means for carrying away the sewage of the city.

The works include the construction of the canal, the improvement of the Chicago River, the construction of intercepting and collecting sewers, the building of intakes from the lake, and pumps to provide the large supply of water needed to maintain suitable currents in the canal.

## North Shore Drainage Channel at Chicago

This channel takes the sewage of Evanston and other residence towns north of the city of Chicago which was formerly discharged into Lake Michigan and discharges it into the Chicago River, through which it flows to the main drainage canal.

The current from the canal serves also to flush out the north branch of the Chicago River, which had long been in an extremely foul condition.

The new channel commences at the lake shore at Wilmette, Ill., and extends west and south to the north branch of the Chicago River at Lawrence Avenue.

# Philadelphia, Pa.

A careful study of conditions here was made by the Department of Public Works, Bureau of Surveys, which says in its report for 1914:—

"To maintain the reputation of this port and to utilize the improvements to the fullest extent, it is necessary that a high sanitary standard be established, and that the channels and banks of the navigable streams shall be kept in decently clean condition."

At that time (1914) great sewers discharged their foul contents into the docks, where there is not sufficient current to carry the sewage away.

To remedy this it was proposed to intercept the sewage from sewers emptying into the Delaware River and its tributaries by means of collecting sewers and carry it to the treatment works, and dispose of the effluent by diffusion in the waters of the Delaware River.

Large sums of money had been expended upon the development of the harbor and of the great commercial avenue along the river front, and in order to utilize these improvements it was required that channels and banks of the navigable streams be kept in decently clean condition.

## Boston, Mass.

The improvement of the Boston harbor, Charles River and adjoining lands was accomplished by the construction of the Boston and Metropolitan sewerage system. Further improvements of the Charles River Basin resulted in the reclamation of low and marshy lands, in the building of parks and boulevards along the river banks, and in the elimination of flooding of cellars in Boston and Cambridge.

In Boston, like in New York, various protective measures were first adopted, such as extending the sewers further from shore, and, while these improve-