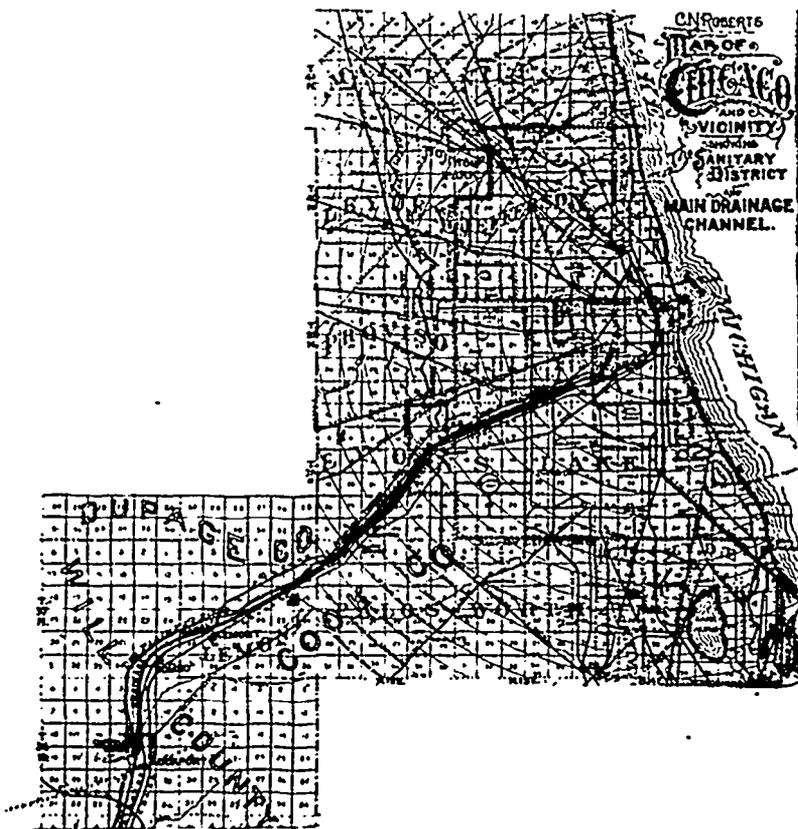


Thus, those on the Great Lakes increased in years between the census of 1880 and of 1890, as follows:— Wisconsin, 43 per cent.; Minnesota (Duluth), 38.56 per cent.; Michigan, 73 per cent.; Ohio, 40 per cent.; Pennsylvania, 46 per cent.; New York, 37 per cent.; Indiana, 46 per cent. Michigan (those on Detroit River), 83 per cent. New York State (on Niagara River), 63 per cent. Canadian side (on Detroit and Niagara Rivers), 38 per cent.

We therefore find that as municipal operations are always behind public needs, we have constantly public water supplies deficient in quantity and very often in quality. And that, in addition to this, there is invariably a pollution of even large bodies of water, which, in spite of dilution and sedimentation, in spite of oxidation and the decomposition and nitrification of the organic matters in sewage, establishes a factor of permanent pollution in the lake waters near such cities.

These two results of city building are constants, and to engineers they supply the most ample field for



the exercise of their talents in making the best use of the present methods, and of developing others for the effective dealing with the difficult problems which are constantly cropping up in regard to water supply and sewage disposal.

In a paper read before the American Public Health Association, recently, in Denver, I illustrated by these facts the need of International Rivers Conservancy Boards to prevent notably the evils arising from polluted water supplies, but also those political dangers so readily created and solved only with such great difficulty.

The directions in which we have to look for dealing effectively with these two conditions, are of necessity two—and broadly two only. Which shall we put first?

It would be largely true, that if we could supply unpolluted water to our cities, we need not be very anxious as to whether a few hundred thousand gallons, more or less, of sewage were carried into our great lakes and rivers. But even then it is found, as in Glasgow,

that tidal streams may attain to a degree of foulness which makes them sources of nuisance and positive danger for the neighborhoods through which they pass. I anticipate such will be found in the instance of the Chicago canal. But can we afford to depend upon our water supplies without any attempts to deal with sewage as well? In the instance of Chicago, artesian waters have been found available for some of the towns and cities along the Illinois River; others have, or will be forced to put in filtration works, which may or may not purify. It seems quite possible, however, to supply these towns by a common water pipe carried from Lake Michigan, but it will be expensive. We may then consider whether it would have been possible to deal with Chicago sewage in any other way than that proposed.

At Pullman, 40 miles away, the sewage has for years been purified by irrigating the land; could Chicago have done the same? There were, so it was stated by statistics, during the winter of 1894, 150,000 people unemployed. Everywhere outside of the city, and notably in the valley of the Des Plaines, great tracts of prairie land are lying uncultivated or nearly so. Is it not a practical question to discuss, whether with some of the engineering skill utilized in making the canal, a system of dealing with sewage by a sewage farm, as at Berlin, Germany, could not have been instituted, which by irrigation would have given employment and homes to many thousands of people now supported by charity, or for public safety by the municipality. The utilization of the waste organic products of cities has become the characteristic work of the great municipal engineers of Britain and Germany, and their labors have made of them philanthropists to a degree which, perhaps, has not to any other class been possible. Should we apply it to the case of Toronto, what would be possible? The utilization of land which bountiful Nature seems to have supplied especially for our needs! Hundreds of acres are lying around Ashbridge's Bay, and acres more forming every year, and demanding our

attention. Our beautiful bay is increasingly a cess-pool. Surely when we have thousands of unemployed, permanent employment to hundreds can be given by allowing them to labor at the work of cultivation on a great sewage farm. This is one amongst many of our unsolved municipal problems.

In the other work of the purification of water, we have in Ontario an equally great need, and are, perhaps, at a more doubtful stage. The principles underlying each work are the same, but the reasons urging work forward are different. Each town hopes to be able to dispose of its own sewage cheaply, by simply turning it into the nearest stream, but is often prepared to spend much to purify water polluted by another town. It seems very clear, then, with these facts before us, that as sanitary engineers our energies will be directed with the greatest effect towards designing schemes comprehensive in character, and which, like township drains and irrigation works, are instituted on the assumption that the common need, and not that of some individual, or individual town or city, has interests