

THE METHODS AND WORK OF THE EMSCHER-GENOSSENSCHAFT.

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THE Emscher River is a tributary of the Rhine, the confluence being 12 miles below Essen, famous as the headquarters of the Krupp steel industries. The stream has an average discharge at its mouth of 300 cubic feet per second, a volume equivalent to one-seventh of that of the Canadian Trent at low water. It drains an area of 300 square miles which supports a population upwards of 2,000,000 people; so that the number of persons to the square mile is over 6,600. If the entire population of Canada were placed on the province of Prince Edward Island, the congestion would be less than half that obtaining in the Emscher valley. Predominantly industrial is the district owing to the prevalence of coal deposits and mines and the stimulus which these give to the manufacture of iron, steel and steel products. The larger centres are Oberhausen, Essen, Gelsenkirchen, Bochum, Recklinghausen and Dortmund. The seriousness and complexity of the problems involved in the satisfactory drainage of such a district will readily be appreciated, but here, as elsewhere, the situation seems to have developed both the men and the method.

In 1906 an act of parliament passed by the Prussian government created the so-called Emschergenossenschaft or Emscher Federation and conferred upon it wide powers and much authority. On this board are represented the government, the municipalities, the mines, the industries and the farmers. Its work comprises the regulation of the Emscher River and its tributaries and the design and construction of bridges, sewers and sewage disposal works. It has authority to levy rates for these undertakings and to that end, to make assessments in which the responsibility for nuisance and the benefit to be derived from its amelioration are the determining factors in the award. Dr. Karl Imhoff is the chief engineer of the sewage division of the federation's work, and it was under his direction that the work of perfecting that type of clarification tank which bears his name and which has come to be regarded as the feature of the Emscher method of sewage treatment, was carried out. The Emscher Federation is a splendid example of effective organization and efficient management and is successfully executing a work which could not have been carried out by independent effort except at enormous waste of energy and money. It has expert service to apply to the solution of each individual problem; it eliminates the too-often costly experimenting of the novice; it secures economy; avoids unnecessary duplication, and is a happy compromise between public and private control. So pronounced are its advantages that one often wonders whether some of its methods and organization could not with great advantage be copied in this country. If our Provincial government with much acceptance can supply our municipalities with electrical energy, why can it not at least design our sewage disposal works? The latter undoubtedly touch the well-being of the community in at least as vital a way as the former.

The Emscher River is not generally a source of public water supply. In consequence the necessity for carrying the purification of sewage to the limit of excellence there, does not exist. In all cases, except in the upper reaches of the valley, the sedimentation of the sewage in Imhoff tanks combined with the subsequent treatment of the sludge constitutes practically the whole process. This

makes for economy and simplicity of method and represents the general practice of the Board.

The first of the large Emscher plants was constructed at Recklinghausen in 1907. The Emscher year-book for the fiscal year ending March 31, 1913, states that at the time of its publication there were 19 separate plants within the jurisdiction of the Emschergenossenschaft comprising 123 Emscher tanks and serving in the aggregate 870,000 people. During the year then closing four urban communities, aggregating in population 210,000, had been supplied with clarification plants. This involved the construction of 34 Imhoff tanks exclusive of the doubling of the capacity of the old plant at Essen-Nordwest, also completed during the year. Mr. Leslie Frank, now with the Baltimore Sewerage Commission, who spent last year as a member of Dr. Imhoff's staff in Essen, states that in the German Empire there are probably 100 plants using the system. It has thus been tried out for seven years on a scale of great magnitude in Germany and so successful has it proved that a federation similar in its organization to the Emschergenossenschaft has recently been formed for the watershed of the Rhur, adjacent to the Emscher valley. This stream is another tributary of the Rhine with a flow ten times that of the Emscher and a drainage area six times as large. Of this, Dr. Imhoff is the chief engineer. Construction was begun there a year ago.

A visit to the works under Dr. Imhoff's care confirms all that has been said from time to time regarding the results which are attained there. The Imhoff tank is primarily a device for the inoffensive treatment of sludge and it is to that device that the visitor's attention is naturally directed. An attendant opens one of the sludge valves allowing the liquid sludge to escape. In color it is always black. Although its water content is less than that of fresh sludge by 20%, it is more mobile than the latter and flows freely. Its odor is that of hot asphalt or scorched rubber. So distinctive is this, that by the smell, properly rotted sludge may be readily identified. The smell of sour milk so characteristic of insufficiently decomposed sludge is here entirely absent. Especially noticeable is the rapidity with which the sludge separates from its water. This is one of the most important, and from the engineer's standpoint, one of the most fortunate of its characteristics. On the sludge-drying bed the sludge floats to the top and the water sinks to the bottom and drains away through the sand or cinder layers below. It is interesting to observe that while the sludge-drying area is in Germany $\frac{1}{3}$ sq. ft. per inhabitant, in Birmingham it is 2 sq. ft.

The visitor's attention is attracted to the active and constant ebullition taking place in the gas vents to the digestion chambers. The liquor there is inky black and the escape of gas is most vigorous though not offensive to the sense of smell. It is commonly stated that this gas is roughly $\frac{3}{4}$ methane and $\frac{1}{4}$ carbonic acid gas, but the writer has not seen any analyses that could be considered the results of precise work, though doubtless such are available. Over one of the rectangular vents at the plant at Essen-Nord, a metallic hood terminating in a gas-pipe has been erected. The escaping gas, if ignited, will burn continuously. This plant, by the way, is the largest controlled by the Emscher Board, serving as it does a population approximately three-eighths that of Toronto. The sewage is a mixture of domestic and industrial since the Krupp steel works and other large industries are located there. There are eighteen Emscher tanks in all, twelve of the longitudinal flow and six of the radial