The Problem of Sewage Purification in Indiana.

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CONDITIONS.

As the population of a city increases, the difficulties of obtaining a sufficient water supply which is free from contamination by sewage becomes more and more difficult. It is now a well established fact that sewage-contaminated waters are to a considerable extent the cause of summer complaint and other bowel troubles, besides the more dangerous disease, typhoid fever. The extensive death rate among children is in some measure chargeable to impure water.

There are very few large cities that are able to obtain a ground water of satisfactory quality and quantity. We are therefore driven to the use of surface water.

OBJECT OF SEWAGE PURIFICATION.

Large volumes of sewage are discharged into the White, the Wabash and Ohio rivers and their branches, also into Lake Michigan, by the cities situated near them. In order to maintain a stream in a condition approaching normal purity, methods for the purification of sewage are applied, so that the resulting effluent discharged into a stream is purer. This purification is obtained by some method of oxidation which will remove the putrefactive material or highly organized food on which pathogenic bacteria live.

Sewage purification is a relative matter, and absolute purity of the effluent is practically impossible and generally is unnecessary. The problem, then, is to adapt available means to the conditions in order to economically defend the people against water-born diseases.

Dilution may be considered a process of purification, and therefore the larger the volume of pure water available in a stream the lower the percentage of purification required, for wherever there is running water not already contaminated, oxygen is present and some purification takes place; vegetation and sedimentation also assist.

The old theory that a stream would purify itself in a flow of ten miles was a dangerous one, because it depended distinctly on conditions.

In many instances no doubt typhoid has been carried thirty miles by a river, and then has caused a serious epidemic.

PROCESS OF PURIFICATION.

While a certain amount of purification takes place in a septic tank, its office is rather that of changing the organic matter from the condition of suspension to one of solution. Hence it is now more frequently called a hydrolytic tank. It is, however, important in that it makes the succeeding processes of nitrification easier and permits of much more rapid treatment than would otherwise be possible.

The second step is one of several types of filtration. First, we might place the slow sand filter, which was usually some 3 or 4 feet deep; over the surface sewage flowed either continuously or intermittently, the latter being the more efficient method.

A second form was the contact filter, which was a tight tank filled with broken stone, coal or hard clinker. This tank was filled with sewage from the bottom, and after a time was emptied automatically.

The third and most successful type of filter is formed of stone, about one-half inch in diameter. Over the surface sewage is sprayed or sprinkled periodically by automatic syphons.

After filtration there is still left some organic matter, but, if the process is successful, it does not cause putrification. It is quite probable that some bacteria pass through the filter and thus gain access to the stream. Hence it has been proposed that where a high degree of purification is necessary the effluent from the filters should be sterilized.

PURIFICATION PLANTS IN INDIANA.

Two or three tanks were installed in Indiana some ten years ago, and a set of four small sand filters was at one time (about 1900) in operation at Indiana Harbor, but has since been abandoned.

The oldest plant still in operation is at the Eastern Indiana Hospital for the Insane near Richmond. It consists of a concrete tank and intermittent sand filters. It treats the sewage of about 1,000 people and leaves the stream into which the effluent flows in a very satisfactory condition. It was built in 1901 at an expense of $9,000. The cost of operation has been negligible.

The second plant of any size was built at the Southern Hospital near Evansville. It was a chemical precipitation plant using lime or soda ash. After precipitation in large concrete tanks the sludge was pumped to a press; the resulting cake of organic matter was dumped into a cistern made for the purpose. The cost of the plant was originally $18,000, and the cost of operation about $1,200 per year.

It was replaced in 1905 by a three-step process which included tanks, stone filters and finally intermittent sand filters.

The conditions here required a high degree of purification. The population is approximately 1,000, and the cost of operation is probably less than $200 per year. The cost of reconstructing the plant was $10,000.

In 1908 the city of Bloomington constructed a system of sanitary sewers and installed a purification plant consisting of a central concrete tank and two series of stone filters, the latter being sprinkling filters.

Angola, a city of about three thousand population, is now constructing a system of sewers and a sewage purification plant consisting of sedimentation tanks, stone filters for the first treatment and sand filters for the final. The city will build a second plant next year. The cost of the two plants will be about $20,000. The cost of operation of these small municipal plants will be watched with interest, as it will determine in some measure the details of future designs.

The city of Laporte, with a population of 12,000 and rapidly growing, is completing plans for a system of sewers and is providing for sewage purification.

The city of Shelbyville is also constructing a system of sanitary sewers, and the entire town looks forward to sewage purification at some time.

There is no question but that the educational propaganda which the State Board of Health has been pursuing is bearing fruit. The state institutions themselves are with a few exceptions well provided with a good water supply and sewage purification plants where they would otherwise prove a danger to neighboring communities.

There can be no doubt but that this movement toward pure water will have a measurable effect upon the morbidity and mortality of the State.

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