

recently read a report of experiments made by himself with several kinds of filters on the waters of the river Spree. The general conclusion at which he arrived is that no reliance can be placed in the spongy iron, sand, and cellulose filters for the removal of bacteria, whatever effect they may exert on suspended and even on dissolved matters; that carbon filters for the most part actually add to the number of bacteria in water, but that earthen ware filters constructed on Pasteur's principal and the asbestos filters of Dr. Hesse give a filtrate in nearly every instance practically free from germs.

Except in very unusual circumstances, natural filtration through a deposit of sand or gravel, as was attempted on the Island at Toronto in connection with the water works there, is worse than useless. Science must be brought into requisition, and proper filtering materials must be used, these depending largely on the nature of the water to be filtered. The filter too must be repeatedly, even daily, thoroughly washed.

Within the last few years extensive use has been made of certain substances which are known to act upon the dissolved impurities in water, rendering them insoluble, and thus capable of removal by precipitation and filtration.

The substance most suitable in any particular case depends upon the nature of the impurities present, the use to be made of the water, etc. Alum, lime and iron have been most used. Exhaustive experiments have been made with alum by eminent chemists, and it has been found that when present in almost infinitesimal quantities it possesses a wonderful effect in the clarification and purification of waters. If a solution of alum be injected into

ordinary river or lake water in the proportion of from one-fifth of a grain to one grain to the gallon, and the water then thoroughly filtered, the result will be a much brighter, clearer, and purer than could be obtained without its use. No trace of the alum can afterwards be detected in the filtered water, it having united chemically with the impurities and been left behind in the interstices of the filtering material, and may be entirely removed by washing.

Immense filters, with mechanism for washing the contained filtering material are now manufactured. The "Hyatt" filters, manufactured by the "Newark Filtering Company," of New Jersey, are made as large as thirty feet in diameter and seventeen feet high. The filter consists of a cylinder of steel and is divided by a steel diaphragm into two parts. The lower one, eight feet ten inches high, being entirely inclosed and capable of sustaining all the hydrostatic pressure which is required in the operation of filtering. The upper compartment is eight feet two inches high and is open to the air at top. In the lower compartment is the filtering material and here the operation of filtering is carried on. The upper compartment is used for the washing of the filtering material, which is all transferred to it in a state of violent agitation by hydraulic currents, and can be cleansed in from fifteen to twenty minutes. This apparatus would probably filter 2,500,000 gallons of water every twenty-four hours, or enough to furnish a fair supply for a city of 25,000 people. The price of a filter of this sort, ten feet in diameter is about \$3,000. We do not know the cost of the larger ones. One of the Hyatt filters is used in the Asylum for the Insane at Kingston.