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PRINCIPAL CONTENTS

WATER WORKS BIOLOGY

POSSIBLY the last place in which the average engineer would seek information concerning directly technical problems, would be a museum of natural history. But in the museum at South Kensington, England, there is a small exhibit that is of very great interest to water works engineers and officials.

For those unable to visit Kensington, a 58-page illustrated pamphlet, forming No. 7 of the Museum Economic Series, and procurable post free for thirty cents (address Cromwell Road, London, S.W., 7), gives an explanatory account of the exhibit. The monograph, which should interest an even wider circle of readers than those immediately concerned in water works problems, is from the pen of R. Kirkpatrick, assistant in the Department of Zoology.

Water supply problems divide neatly into halves. Collection, storage, treatment and distribution are not solely engineering in character. The determination of suitable quality is more properly within the province of the chemist, biologist and bacteriologist. The engineer co-ordinates and uses many departments of knowledge and is indebted to many expert quarters, but it is his privilege to design apparatus for the special treatment demanded by the research undertaken by other scientists.

No natural water supply is absolutely sterile when it reaches the consumers' taps, unless it has been treated. All raw water is more or less contaminated before or after collection. The selection of a good water supply means the limiting of deleterious organisms to the lowest practicable amount; and upon the elimination of disease-producing bacteria by filtration and chlorination, depends the public health to a greater extent than is generally realized.

The available evidence points to the fact that all life begins in water, and this may account for one of the great difficulties in water supply,—the ease with which undesirable organic aliens breed and multiply in so convenient a medium. A suggestion of what London's water supply was like when distributed untreated, is given in a short appendix to the above-mentioned monograph. A pamphlet published in 1827 stated that the author had sent Grand Junction water to several eminent doctors. One of these, a Dr. Hooper, in his reply described the tap water in his own house:—"Scarcely a week passes that I am not presented with a leech; a shrimp-like skipping insect near an inch in length; a small red delicate worm, which I believe is lumbricus fluveatelis; or some other animalcule; and the water is mostly opaline, muddy or otherwise impure."

Sand filtration, invented by James Simpson, was introduced in 1829. "At the present time, after due storage or disinfection, four-fifths of the water supply of the seven million inhabitants of water London, passes through a thin living film of diatoms and bacteria spread over 10.7 acres. This supply is derived from and traverses areas that are admittedly sewage polluted. Despite this fact, the general health of the metropolis has for long been a source of pride to Londoners, and almost of wonder to the world. This is true, not only as regards sickness and death from all causes but also as regards the incidence of those diseases which are liable to be water-borne."

The interest of the biologist in the surface film of the sand filter is unquestioned, and great emphasis is quite properly laid upon this living organic carpet which affords protection from pestilence. The author of the monograph states that "the subject of the biology of water works is vast and has manifold aspects," and quotes G. C. Whipple, who in the "Microscopy of Drinking Water," a book dealing with only one branch of the biology of water supply, states that a bibliography of works relating to the subject would occupy at least a hundred pages.

The aim of the Kensington exhibit and also of the pamphlet, is to show broadly the relation of natural history to water supply, the animals and plants which may be associated therewith, and biology in relation to water purification. The collection includes diagrams and models of sand filters, filter surface carpets, corroded and blocked pipe sections, blocked water meter strainers and pressure filter nozzles.

The monograph is a complete guide to the exhibits. The account of the biological investigations into the Hamburg water supply, during an outbreak of cholera in 1892, is particularly graphic. As an instance of the very worst possible conditions of water supply, it must surely be unparalleled. The water pipes supplying Hamburg were an animal Eldorado. Sand filtration, undertaken in 1894, remedied the whole matter. The pipe population died,—perhaps of starvation.

Mr. Kirkpatrick also tells of troubles at Torquay in 1910, and at Cardiff in 1913. In the former case, no trouble had been experienced for 50 years; in the latter, a 36-in. main was encrusted with a luxuriant growth of sponges, some with finger-like processes 8 ins. long. An enormous accumulation of mussels at Hampton-on-Thames reduced the diameter of a 36-in. main to 9 ins., 90 tons of shells being removed at one cleaning. The town of Ypres before the war had water troubles. Whenever a street hydrant was opened, masses of shells, Polyzoa, worms, etc., were blown out.

A plant named crenothrix, classified with bacteria, is possibly the most dreaded water supply pest. It thrives where iron and organic matter are present in solution. Whether the presence of iron in this "iron bacteria" is a chemical precipitate, or due to the vital activity of the protoplasm, has been the subject of much controversy, but it is certain, says Mr. Kirkpatrick, that it spreads with great rapidity, blocks mains and causes endless trouble and anxiety. Some further light is thrown upon the subject of Crenothrix in the article, "Chloramine and Crenothrix," on page 374 of this issue.

The city of Winnipeg is now said to be having difficulty with animal growths in its new water supply, and investigations being made there may be of considerable interest.