THE ENGINEERS' CLUB, TORONTO.

During the last three months several meetings of the civil engineers, architects and surveyors resident in Toronto, have been held for the purpose of organizing an engineers' club, on the same basis as similar organizations in Detroit, Cleveland, St. Paul, Denver, Rochester and many other cities in the United States. At the last meeting, held at the Rossin House on the evening of May 5th, the organization was fully launched, and the following officers were elected for the current year: President, Kivas Tully; vice-president, C. J. Crowley; directors, C. H. Rust, E. B. Temple and A. L. Hertzberg; secretary, Willis Chipman; treasurer, T. B. Speight. Regular meetings will be held on the first Tuesday in each month, except the months of July and August, and the annual meeting on the first Tuesday in February. All classes of engineers, civil, mechanical, sanitary, hydraulic, electrical, mining and military, professors in engineering and architecture, architects and land surveyors are eligible for membership. The club starts with about forty members. It is proposed to arrange for a down town club room next year. It is not the intention to permit the club to usurp the functions of any of the existing professional or technical societies, the principal object being of a social character.

ARTIFICIAL SAND STONE.

An effort is being made to introduce the manufacture of artificial sand stone into Canada under a process invented by William Owen. Owen-stone, as it is called, is a hard and handsome stone. Quartzose sand is first dried by heat, it is then mixed dry with hydraulic lime in proportion of about 12% of the latter. The mixture, still dry, is packed into moulds of any desired shape, the filled moulds being built up in a steel frame. The latter is conveyed by tramway to a steel cylinder, inside of which it is placed, and the cylinder being closed water near the boiling point is admitted and a pressure of from 60 lbs. to 70 lbs. maintained. The water is kept heated by steam coils. The resulting stone is claimed to be very hard and durable, and to be cheaper than natural of the same grade.

SAND FILTRATION OF PUBLIC WATER SUPPLIES.*

BY R. S. LEA, ASSOC. M. CAN. SOC. C. E.

In thickly populated districts and in the neighborhood of cities and towns the wastes of human life and human industry are a continual menace to the health of the inhabitants. Nature's method of preserving the balance between growth and decay, by utilizing animal waste as plant food, is no longer effectual. The lakes and streams begin to serve the double purpose of sources of water supply and receptacles for sewage. Hence it is evident that among the most urgent of the questions with which the municipal engineer may have to deal are these connected with the securing and maintaining of the degree of purity necessary in water intended for domestic use. The proper methods to be employed in the accomplishment of this object depend as much upon biological as upon mechanical principles, so that a certain degree of familiarity with these principles and with the methods of the chemist and biologist will be necessary to the engineer engaged in such work, in order that he may be able to avail himself intelligently of their assistance. European cities, having earlier felt the necessity, have devoted much more attention to these matters, and are consequently further advanced in their methods of dealing with them than is the case with the cities in America. Nevertheless, by far the most important series of investigations into the subject of the purification of water and sewage are those known as the "Lawrence" experiments, carried on under the direction of the Board of Health of the State of Massachusetts. This board, from its foundation in 1869, always devoted a great deal of attention to the condition of the water supplies of the State. In 1886, the time being particularly appropriate, it appointed a body of experts to the exclusive duty of conducting a series of observations and experiments, with the object of finding the best methods for purifying both water and sewage. These experiments are still in progress, and the annual reports of the department, giving the results of their investigations, are exceedingly valuable to engineers and others interested in such questions. In Berlin and in a few other large European cities having waterworks departments provided with the necessary scientific equipment and management, many careful experiments have been made on the working of the large water-filter beds of the systems. The results of such experiments as these have an especial value from the fact that they are conducted on a large scale, and under conditions which exist in actual practice. On the other hand, these same circumstances render them less reliable as a means of determining the true principles upon which the process of filtration depends.

The object of this paper is to describe, as fully as reasonable limits will permit, first, the circumstances under which water supplies become polluted, and the nature of this pollution; and second, the process of purifying it again in large quantities by sand filtration. Of course pure water is preferable to purified water; or, as has been said, with water "innocence is better than repentance." Unfortunately, however, water whose natural state is above suspicion is often exceedingly difficult to procure, except at a cost which is practically prohibitive. Consequently, many cities and towns, especially the larger ones, are forced to use such waters as may be practically available, and to make the best of them. But this best is by no means to be held lightly. By the methods to be described later it is possible to so change the nature and characteristics of polluted water as to convert it to the appearance, taste, and probably absolute wholesomeness of the most innocent of mountain torrents. Water has the unfortunate capacity of readily dissolving many of the substances with which it may come in contact; so that outside of the laboratory, chemically pure water is practically unknown. Some of these foreign elements may not only be quite harmless, but may actually improve the quality of the water. It is, however, with the others, which make the water containing them unsightly in appearance, disagreeable to taste or smell, or dangerous to health—in other words, with the substances which constitute pollution—that we are especially concerned.

If we divide all waters according to their source, into ground waters and surface waters, the general statement may be made, that it is only in the latter class that are found what may be properly termed polluted supplies. The former are subjected to such a rigorous process of natural purification as to place them beyond the need of any artificial treatment.

Surface waters, or the waters of lakes, ponds, rivers, streams, etc., are liable to receive more or less serious pollution from the following sources: 1. They may be colored by the drainage of swamps. 2. The waters of many streams become turbid with clay and other suspended matters after heavy rains. 3. The waters of lakes, ponds and storage reservoirs are liable, at certain seasons of the year, to contain large growths of algae and other minute water-plants which float about, barely visible to the eye, but which are capable of imparting to the water disagreeable tastes and odors. 4. Any of these classes of surface waters may have discharged into them a greater or less quantity of human sewage; leading, under certain circumstances, to very grave consequences.

In determining the quality of a given water supply, the proper method of procedure is as follows: 1. To make a local examination of the water shed, in order that all probable sources of pollution may be discovered. 2. Then, if necessary, to have chemical analyses made of samples of the water, by which the nature of the contamination, and to a certain extent its amount and origin, may be ascertained. 3. To make a biological examination giving the number and species of the living organisms that may be present. This will be of assistance in interpreting the chemical analysis: and also in detecting the possible presence of organisms which in themselves might constitute an element of danger.

Before discussing the results of these analyses, it may be stated in advance, that it is in connection with the organic matter in water, dissolved or suspended, visible or invisible, that serious pollution from a sanitary standpoint is to be apprehended. And it is in the information which they furnish on this point that the chief value of the analyses consists. But in order to interpret them properly it will be necessary to allude briefly to the constitution of organic matter and to the changes it is liable to undergo.

*From a paper read before the Canadian Society of Civil Engineers.