more fresh water than exists in Britain and the adjacent countries of Europe, and that it is purer than the ordinary British supplies can be made by filtration, he will be quite as much surprised that Toronto is about to filter her supply of water.

RESOLUTION PASSED BY PROVINCIAL BOARD OF ALBERTA.

July 15th, 1910.

For unavoidable reasons it is not possible to proceed with the construction and installation of the sewage demonstration plant for the purification of sewage until after the meeting of the Legislature, when it will be taken up.

Before undertaking construction of any other system the Board would strongly advise all municipalities contemplating the installation or extension of sewage plants to await the session of the Legislature, when the Board hopes to have money voted for the live earth bed system advocated by Mr. Owens, the Provincial Sanitary Engineer.

The question of sewage purification is passing through a period of transition, all the old systems now in use being regarded by sanitary authorities as falling short of giving anything like a safe standard of purification, and are practically condemned, and it is the all-absorbing question engaging the attention of sanitary experts.

The Board has had the opinion of a consulting engineer from New York (a high authority) as to Mr. Owens' system. He has stated to the members of the Board that he believes it will give results that for all practical purposes will be satisfactory, and he expresses the opinion that it will be a success.

In view of the unavoidable delay in the installation of the demonstration plant and the great importance of this subject, the Board is of the opinion that it will be justifiable to extend the period for the installation of sewage plants beyond the period of the present notification, viz., the 31st of December, 1910, until a practical demonstration has been made of Mr. Owens' system.

THE STERILIZATION OF WATER BY CHLORINE AND OZONE.*

By Prof. C. Sims Woodhead.

In consequence of a suspected relation between an outbreak of typhoid and the water supply at the Fulbourn Asylum, a Local Government Board inquiry was set on foot, and the inspectors, Dr. Theodore Thomson and Mr. Crossfield reported that although there was no evidence of present contamination or "surface relations," they thought it was possible that, at some time or other, these "surface relations" might be set up; there was, they thought, a "potential danger" which ought to be anticipated. They mentioned certain forms of treatment of the water, but pointed out that they had not sufficient experience of the efficacy of these methods to enable them to give a definite opinion as to their value in actual practice. They suggested, therefore, in the absence of such experience, that it might be necessary to go further afield for a water supply.

It was evident to those in authority in the water company that the inspectors had two lines of action in mind, and they determined in deference to their view to investigate both. With the latter it is not necessary to deal to-day, but as regards the former I take the opportunity of laying before you the results of some of our experiments, as I think they have an interest far wider than that bearing merely on the Cambridge water supply. With the other experiments I hope to deal elsewhere.

All the methods of sterilization now under consideration are essentially oxidation methods, and apply specially to clear, bright water, and especially to water containing a small amount of organic matter.

(1) Treatment with Small Quantities of Bleaching Powder (Chloro-Hypochloride of Lime).

Following Prof. Delépine, I have always had a strong belief in the disinfectant and bactericidal properties of bleaching powder, and when Dr. Thresh called my attention to the excellent work that was being done in the treatment with this material of sewage and water in the United States, and recalling Dr. Houston's work at Lincoln and my own at Maidstone, I determined to carry out a fresh series of oxy-chlorine experiments with the Cambridge water.

For nearly a year we worked with small quantities of water containing comparatively large numbers of bacilli (B. coli) with and without additional organic matter, and it was found that even large numbers of bacilli (several hundred per c.c. of water) could be rendered inactive by three parts of "chlorinated lime" (bleaching powder) in 2,000,000 parts of water—i.e., one part of available chlorine in 2,000,000 parts of water. Having thus obtained a basis for further operations, it was deemed expedient to carry out an experiment on a large scale. This, of course, had to be done without interfering in any way with the main supply to the town. Until we knew what would happen we could not allow any of the treated water to get into the main supply. It was obviously out of the question, therefore, to carry out any of our operations on the water that was being pumped into the mains or up to the reservoir. Some method had to be devised by which a certain proportion of the water could be short circuited, as it were. Here I was greatly assisted by Dr. Thresh and Mr. Hawksley, the former of whom indicated a method of doing this, the latter carrying out the details and getting over the engineering difficulties of the developed scheme. Many of these difficulties were, of course, unforeseen, as they could arise only as the delicacy and efficiency of the process became manifest.

The apparatus consists of a vertical steel cylinder, capable of holding 7,000 gallons. The water enters by a rising main, leading into the dome of the cylinder, and leaves at the base. The "bleach" solution, of moderate strength, is pumped in measured quantities into the water as it travels in the rising main at the rate of 7,000 gallons per hour, so that, theoretically, it should remain in the cylinder for one hour. (As a matter of fact, before a series of perforated baffle plates had been inserted, some of the water passed through the cylinder in about eighteen minutes. After the insertion of the baffle plates the flow was more equable.) In the earlier experiments, neutralization of the chlorine was effected by the addition of small quantities of bisulphite of soda, which was introduced by means of a pump at the bottom of a cylinder—i.e., as the water was leaving the sterilization chamber. It was found, however, that when the chlorination was properly carried out, i.e., when sufficient, but no excess of, the "bleach" was added, this addition of bisulphite of soda was not only unnecessary, but was actually disconcerting. In the first place, it is very

*Paper read before the Royal Sanitary Institute at Cambridge, Eng.