

in sewage purification, predicts that it will probably do so in the near future.

Here it may be remarked, that engineers in laying out any system of sewage disposal, would be well advised to provide space for the eventual disinfection of sewage if ever required as he will see further on, this can easily be done at any time if space and levels will permit, and the operating expenses are not so great as was at one time thought.

Phelps points out the position taken up in Great Britain with reference to bacterial removal, which lays the onus of bacterial purification upon the community using the water and not on the community bacterially contaminating it. We think, however, much may be said in favor of the English position relative to this matter. Streams are liable to other sources of contamination apart from community sewage; and it is generally admitted, that apart from direct town sewage contamination, it is necessary to purify ordinary river water, passing through populated country, when used for domestic purposes. On the other hand, it is pointed out, "in the fight against infectious diseases, sound tactics demand an attack on the enemy as near as possible to the initial source of infection." The statement is made that the germs of typhoid should never be allowed to wander at large, and it is impossible to quarrel with such a conclusion, if practical preventive measures are at hand.

The great danger to the shell-fish industries, which is at present threatened, on account of sewage pollution and spread of typhoid from oyster and clam beds is pointed to. The demand for shell-fish in England has greatly decreased. Shell-fish areas are generally near large cities, and are, therefore, peculiarly subject to sewage infection. It certainly would appear that such industries can only be protected or saved in the future by the adoption of some method of sewage disinfection.

G. W. Fuller states that the annual crop of oysters and clams from the Atlantic and Gulf coasts exceeds \$15,000,000; one-half of this total production comes from New Jersey, Maryland, and Virginia, and the shell-fish are grown mainly in the waters of the Delaware and Chesapeake Bays, which receive the sewage of many large cities.

It appears that the question of the treatment of the Baltimore sewage had a material effect in leading up to the enquiries which have resulted in the report now under consideration.

The Board of Advisory Engineers at Baltimore recommended sewage treatment consisting not only of settlement of solids and the production of a non-putrescible effluent, but also supplementary treatment by sand filtration. The cost of complete works with 75,000,000 gallons of sewage per day was estimated at \$3,283,250, of which sum \$1,040,750 was for supplementary sand filtration, an increase of over 31 per cent. over the cost of producing a non-putrescible effluent. The cost of operating the plant was over 48 per cent. of the whole cost of the supplementary treatment. The advisory board held for the supplementary treatment. The advisory board held then, that to remove bacteria by disinfection in lieu of sand filtration was prohibitively expensive. No American data at the time existed as to the cost or efficiency of disinfection. "It was, therefore, desirable to learn just how effective disinfection processes could be made under conditions in America, how much they would cost, and what after-effects, objectionable or otherwise, might follow their introduction."

Methods of Disinfection.

Under this heading a classification is given of the various methods which have been from time to time used or experimented with in sterilization processes. The classification is

that adopted by Rideal, and Phelps is indebted to the same authority for many of the facts noted.

The different methods and substances are considered in the following order:—

- (1) Heat.
- (2) Lime.
- (3) Acids.
- (4) Ozone.
- (5) Chlorine and its compounds.
 - (a) Chlorine gas.
 - (b) Hypochlorites or oxychlorides.
 - (c) Electrolytic chlorine processes.
- (6) Copper and its compounds.
- (7) Miscellaneous.
 - (a) Permanganates.
 - (b) "Amines" process.
 - (c) Sodium benzoate and other organic compounds.

Twenty pages of the report are devoted to classifying all the existing important data with reference to the above processes. It is not proposed to go over the data. The main point is that Phelps concludes after exhausting all the data available that of all the above disinfectants investigated, chlorine compounds and copper salts alone appear to be applicable to the sewage problem; and, that further a detailed study of cost relative to results leaves little doubt as to the greater efficiency of chlorine as compared with copper.

Chlorine appears, however, to be better suited as a sewage disinfectant even if the cost of both chlorine and copper processes were equal. Copper precipitates the organic matter in sewage, while chlorine unites with it by oxidizing the organic matter and rendering it less putrescible.

Chlorine, it is pointed out, is to some extent a by-product in the form of bleaching powder, while copper is a staple, and its price is, therefore, likely to increase. Phelps concludes after a careful examination of the available data that, "chlorine compounds are to-day by far the most economical and the most efficient disinfectant available in sewage works."

The experimental investigations will be further reviewed.

(To be Continued.)

RELATION OF THE SURVEYOR AND THE ENGINEER.*

R. E. Young, D.L.S.

There is a good deal of similarity in many respects between the work of Civil Engineers and Surveyors. We use the same field instruments, many of the same field books, to some extent the same methods of computation, and in both professions work in the field forms a large part of the duties. Many Engineers are Dominion Land Surveyors—many Dominion Land Surveyors are Engineers, and some of our members are also members of this society. I think it would be almost correct to say that all Dominion Land Surveyors should belong to the Canadian Society of Civil Engineers.

In considering the engineering profession one cannot but be impressed with the extraordinary opportunities that have been opened out and are now awaiting engineers through the great prosperity which has been the good fortune of Canada to enjoy in recent years. One is perhaps most impressed with the expansion of the mining industry,

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* Abridged from Mr. Young's address delivered at the Canadian Society of Civil Engineers dinner, Ottawa, in reply to the toast "Our Guests."