for the foundations and under drains. The silt sludge is discharged by means of hand valves to a channel running a'ongside the beds, and is turned into the beds in turn by means of hand penstocks, where it is allowed to drain and dry. The dried sludge being dug out and dug into land as tillage. The amount of sludge made is extremely small by this process and gives little or no trouble. The liquid draining from the sludge should be led back to a well, and from thence pumped by a small hand pump back to the liquefying tanks for treatment.

This then completes a small bacterial filtration scheme which is well within the reach of any small municipality, and should not cost more than \$5 per head of population when



SECTION

completed. The proportions and data above given are practically the same for a less or greater population. It, however, should be borne in mind that the characteristics of all sewage are not the same, and before any settled scheme is adopted, consideration should be given to the particular sewage to be dealt with, especially with regard to manufacturing wastes, if any.

### Administrative Suggestions.

No matter how necessary a scheme of sewerage or sewage disposal may be, no matter how carefully such a scheme may be thought out, no matter how well the engineering plans may be made and specification carefully drawn, it must be granted that in the administration of such a scheme its success greatly depends. This practically applies to all affairs. The ideal may be in our mind, but how to approach it in practice is always the difficulty.

It is our purpose, therefore, to tabulate a few suggestions which may be of use to communities who have matters of public works in contemplation.

#### Obtaining a By-law.

The first effort of a corporation in connection with a sewerage or sewage disposal scheme, (this, of course, applies to almost all schemes of public works in which loans are required), is to obtain the consent of the citizens. How often does it happen that the people are asked to vote upon a scheme, which is only put before them in the vaguest possible manner?

The author has in mind a by-law only recently submitted by a corporation in Canada for extensive main sewerage and sewage disposal, upon the details of which it was impossible for any citizen to obtain any information whatever, beyond the fact that the scheme contemplated lengths of collecting sewers, and some form or another of sewage disposal in a certain vague locality, no other information was forthcoming.

Is it remarkable that by-laws are often defeated when the -citizens are not taken into confidence? Or it may even be that no proper matured scheme has even been settled upon by the authorities upon which the people may vote.

It is suggested that before a by-law is asked for, that complete plans of any scheme should be first drawn out. That -such plans should be on exhibit at the City Hall, so that everyone who takes an interest in the matter should have the -opportunity of knowing exactly on what proposal his vote is asked.

In Great Britain such plans must be on exhibit for at least three weeks previous to a public enquiry, at which any objections raised may be heard.

The cost of such plans is small. And the fact that they provide every member of a corporation with the ability to answer any question that may arise, inspires the public with confidence.

In the case of main sewerage, the plan should show every line of sewer with the names of the streets proposed to be sewered. In the case of sewage disposal the land to be oc upied and the character and extent of the scheme should be shown. It is well also that the corporation, (if it is necessary to purchase any land), should have a provisional agreement of purchase, so that no after difficulty may arise in obtaining the land.

# The Appointment of an Engineer.

An engineer may be either appointed to act simply as a consulting engineer along with the permanent engineer of the municipality, or he may be given separate and full control over the work from commencement to finish. The arrangement greatly depends upon the ability and skill of the permanent official, and whether his ordinary duties will allow of him attending to extra work over and above the usual routine.

In all cases, however, a proper agreement should be drawn up between the municipality and the engineer, defining both his duties and method of payment. This is satisfactory to both parties and prevents disputes upon what may or may not be the custom, tends to smooth working, and mutual understanding.

The appointment of an engineer to have full charge over the works he has designed, generally proves the most satisfactory solution. It throws the responsibility on to one person's shoulders, on to that person who knows his own scheme best, and is most anxious of all others that it be a success.

The old saying that too many cooks spoil the broth is very applicable to engineering work.

Payment to engineers may either be made by a commission sum being a per centage on the cost of the works, or in the form of a lump sum by arrangement, based upon the amount of his own estimate cf the total cost. The latter method of payment is the best. The engineer having no interest in the amounts to, may have from time to time, to certify due to the contractors. His efforts are engaged in keeping the cost within the limits of his own estimate. Further, an engineer is not tempted to underestimate the work in the first instance, which may be done in order to get work commenced at any cost. The eventual cost amounting to much more than the preliminary estimate. A denouement requiring careful explanation, as a rule.

# The Duties of the Engineer.

The engineer should engage to make all preliminary plans, profiles, specifications, etc., to the satisfaction of the "Board of Health" or other authority having jurisdiction.

He should be prepared to attend all meetings of the council, to discuss and advise with the corporation in arranging for carrying out the work and obtaining contracts.

He, or his representative, should test and examine all work carried cut, and be able from time to time to certify that such work is done satisfactorily.

The number of working visits an engineer should put in, is an open question, depending upon whether there is a resident engineer fully employed on the work or not. However, whether there is a resident engineer or not, it is the duty of the engineer to see personally all lines of sewers and other work tested before certifying.

Sewers can be and should be tested after they are covered up by means of the hydraulic test.

No extra work or any alterations to the work should in any case be made without the written authority of the engineer. The engineer should in all cases obtain the consent of the corporation before ordering alterations causing excess of expenditure.

#### The Duties of the Corporation

Are not to unduly interfere with the engineer and make his life a burden. If an engineer cannot be trusted with work in which he is a specialist, he should be got rid of. It is better for both parties and better for the work in hand.

Members of a corporation should not act singly. They should remember as individuals they have no locus standi.