

STREAM POLLUTION.

Each season brings its own problems. The wet season, drainage, the winter months, snow removal, the spring time, refuse cleaning, and the continued dry weather throughout many districts forces upon many municipalities consideration of the sewerage and sewage problem.

Streams that are usually large enough to dilute the sewage have become polluted, and in the immediate vicinity of the outlets of trunk sewers there is a considerable area of grossly polluted ground. The lake levels have dropped a foot or so, and the shore line in some localities is strewn with the waste from our sewers. In some cases our water supply has become contaminated to a dangerous degree.

All this brings our municipalities face to face with the question of installing sewage disposal works. Sooner or later it must come. Those municipalities that have the foresight and courage to undertake such works will effect great savings, for they will prevent the outbreak of epidemics in the town that cost far more than do properly installed refuse and sewage disposal works.

An outbreak of typhoid may be necessary before some people can see their whole duty—but it is a very expensive reminder.

SEWAGE DISPOSAL.

REMOVAL OF PUTRESCIBILITY*

CHAPTER V.

Contact Beds (Continued).

In the previous chapter dealing with the subject of contact beds and their power to remove putrescibility from sewage, we have demonstrated that, (a) A contact bed is something more than a mere filter, a filter being generally understood to remove undissolved matters by the mechanical action of straining, whereas a contact bed has the power of retaining and absorbing not only undissolved matters, but also organic matters in solution which are incapable of being affected by the mere process of straining; (b) The dissolved organic matters are drawn from the sewage to the surface of the filtering material of the contact bed, which becomes coated with a gelatinous film of great absorbing and suction power, and that this absorption takes place during the period when the bed is full of sewage; (c) The final process of nitrification or oxidation of the absorbed organic matters takes place, only after the liquid has been withdrawn from the bed, and a supply of air is admitted to the pores of the filter.

A certain amount (but very little) decomposition of organic matter takes place with the production of carbon dioxide, analogous to the decomposition in a septic tank, during the period of contact. This form of decomposition which is sometimes called anaerobic is not the aim in contact bed treatment.

In order to maintain contact beds at equilibrium, it is obvious that the relations between the processes (b) and (c)

*These articles are specially prepared for this Review by Mr. T. Aird Murray, Consulting Engineer, Toronto. must be closely studied. It is necessary to know the length of time necessary for contact, so that sufficient of the organic matters are absorbed to produce a non-putrescible effluent, and again it is necessary to know the length of time necessary for rest or aeration, so that ample opportunity is given for nitrification to take place with the absorption, and produce a numeralized effluent, capable of only absorbing further oxygen to the amount allowed in connection with nonputrescibility.

The above factors and their comparative relations depend largely upon the nature and strength of the sewage under treatment, and no absolute rules can be laid down. Further, the preliminary treatment adopted with reference to the renewal of solids, either by ordinary sedimentation, septic tank sedimentation, or chemical precipitation has a direct bearing upon the efficient working of contact beds.

For example, Dunbar found that with the Hamburg sewage, contact beds could be filled six times a day with fresh sewage without yielding an unsatisfactory effluent. Whereas they would only take septic sewage twice a day. (See Principals of Sewage Treatment, page 87.)

Absolute data for the proper working of contact beds can only be obtained by a close investigation of the particular plant in question. Any upsetting of the equilibrium soon makes itself evident to the works manager, caused either by over-dosing or insufficient aeration, as the bed becomes spongy and clogged and its water containing capacity falls to zero.

There exist, however, certain general data and laws, which in the above relation it will be well to give some detailed attention to.

It has been noted that during the period of contact, a septic action of decomposition takes place with the production of carbon dioxide. It is very probable that if this contact period is too prolonged, that this septic decomposition may have an inhibitive action on the nitrifying organisms contained in the absorptive film. Wollny, in relation to agricultural chemistry, demonstrates that the production of carbon dioxide is in proportion to the amount of organic compounds added to the soil, and that an accumulation of carbon dioxide has the eventual effect of stopping further decomposition even if oxygen is present. This anaerobic period of contact, which is an essential to the contact bed, is the chief objection to the process, and also provides the reason why the system is not so efficient as that of the percolating filter, which at no period provides anaerobic conditions.

With reference to the period of contact the Royal Commission state (page 54, par. 106), "The evidence shows that two hours' contact and four hours' rest have generally been found to give the best results in practical working, where the beds are filled three times a day, but no rule can be laid down which is of universal application.

Dr. Fowler with reference to his Manchester (England) experience states as follows: "The periods depend almost entirely on the age of the bed and the dilution of the sewage. In the initial stages of working, long contacts (e.g., twentyfour hours) have been found advantageous, their effect being to facilitate the formatinon of a slimy layer of colloidal matter on the medium, in which the real biological action begins. As this layer increases, the absorptive effect increases also, and less time of contact is required. Moreover, a greater