

Albert and many of the smaller towns are at present engaged in installing up-to-date systems of sewage disposal which are in accordance with the standard methods, but which have, in addition, the plant necessary for thorough disinfection.

Modern features of sewage disposal may be summed up as follows:

(a) The removal of a large proportion of the solid matter by screening and sedimentation in tanks.

(b) The removal of the tendency to putrefaction by bringing the liquid sewage into contact with oxygen, generally by use of aerated filters, or when occasion will allow it, by dilution with large quantities of water containing the necessary dissolved oxygen required to oxidize the organic matter in the sewage.

(c) The removal of the tendency of the sewage to spread certain diseases if it comes in contact with food supply, or in other words the disinfection of sewage by the elimination of disease germs.

Apart from the discharge of sewage into tidal basins, it is generally necessary that the processes under (a) be followed. With efficient screening and attention much of the matter connected with nuisance production can be retained, and with the further application of sedimentation practically all the solids apart from very fine particles can be retained. Such an effluent, after screening and sedimentation, is amenable to disinfection by use of about 7 parts in 1,000,000 of chlorine. The question of leaving out the process of oxidation by means of aerated filters and relying upon oxidation by the body of water receiving the effluent depends as follows:

(a) Upon local conditions—such as, the extent, freshness, flow or circulation of the body of water, and whether used as water supply or otherwise.

(b) Or if disinfection be necessary, a careful study of the capitalized annual cost of the extra chlorine treatment required as against the capital cost necessary to install aerated filters requiring less chlorine.

In connection with inland streams and bodies of water which are required as sources of domestic water supply, it will generally be found that the whole three processes are necessary, both from point of view of efficiency and ultimate economy. No cut and dried method of sewage disposal can, however, be laid down which will fit in with all conditions. Within certain limits the whole subject, like most other subjects, is subject to common sense and the results of experience.

### CORROSION OF RAILS IN TUNNELS.

The corrosion of steel rails in different localities of a railway is an interesting and important subject, bearing directly as it does on road expenses. Some particulars given in the Engineering Record of the wasting of steel rails in the tunnel at Land Patch, Pa., on the Baltimore and Ohio Railroad, U.S.A., which it 4,775 yards long, and which is operated with double-track traffic on a single-track line, show that the dampness and tunnel gases greatly reduce the life of the rails. Plain Bessemer rails have a life of about eighteen months, and the deterioration proceeds in the flaking of the scale from the rail until the edges of the base become quite sharp, and the rail has to be removed. At the last renewal chrome-alloy rails were substituted for Bessemer rails, and have now been in service for nearly three years. Not only have these chrome-alloy rails been found to resist corrosion much better than the Bessemer rails, but they also show fewer breakages, the number being less than one-fourth of those in the plain rails.

### SUCTION-GAS ENGINES.

A paper on "Suction-Gas Engines and Producers" was contributed by Mr. W. A. Tookey to the Engineering Section of the British Association for the Advancement of Science at their annual meeting, in which he remarked that although during the last ten years or so a very large number of suction-gas plants had been installed in all quarters of the globe, it was difficult to obtain figures recording the actual performances with regard to fuel consumption, cost of maintenance, and cost of repair. Yet it was necessary that such records should be available so that comparisons might be made with competing types of motive-power generators, and more particularly with those which, according to test figures, would appear to compete very keenly with, if not, indeed, to surpass, gas power-plants in trustworthy and economical working.

The author had collected from his own tests and those available from various sources representative performances of suction-gas plants of various sizes when under test, not only when the power could be determined by means of some form of brake dynamometer, but when generating electric current—so taking into account the efficiency of the combined gas-electric set—and also when raising water under different "heads," indicating the comparison between fuel consumed and foot-pounds of work performed in such circumstances.

However, inasmuch as "test" figures were usually obtained under what must be admitted to be abnormal conditions—no account being taken of standby losses, wastage of coal in charging, in removal of ashes, &c., the engine and producer being worked at a constant and regular output for but a limited number of hours—further figures were presented which enabled the average performances of suction-gas plants of moderate power to be noted. These figures had been compiled from the statements of factory owners in Great Britain and in European countries. They took into account the variations of consumption due to the different grades of fuel used; they reflected the influence of variations of output, of load fluctuation, of length of standby periods, as well as the effect of the variation in the human element in maintaining or otherwise those conditions which made for the best gas-making and lowest consumption of fuel per unit of power delivered. Figures representing the consumption of lubricating oil were also given, as being of special interest in view of the criticisms that had sometimes been made in this respect. The experiences of users with regard to the cost of maintenance and repairs were referred to, and the question of capital outlay was considered for engines and producers.

The comparative costs of operation of liquid-fuel engines of the Diesel type were discussed. Although such engines were more efficient as regards utilization of heat units available in the fuel for conversion to power, yet they required several conditions to be fulfilled before the higher economy became apparent in the pocket of the manufacturer. Similarly, some points were suggested with regard to the relative performances of steam engines of the high-pressure, superheated, compound, condensing, semi-stationary type, in order to direct attention to the fact that although according to test results it would appear that suction-gas plants were threatened by a competitor which offered equal economy of operation, there were claims of a negative kind which must incline the balance of advantages in favor of the gas power-plant, at all events for moderate powers.