THE
Sanitary Review
SEWERAGE, SEWAGE DISPOSAL, WATER SUPPLY AND WATER PURIFICATION

SEWAGE DISPOSAL.

Removal of Putrescibility.

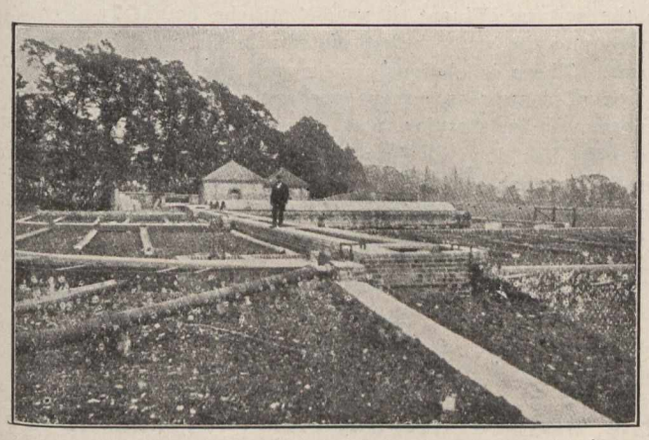
Chapter I.

(Introduction.)

In previous articles the subject of removal of solids has been treated; it is now proposed to give some attention to methods calculated to remove the putrescible characteristics in sewage.

Fresh sewage as mixed with water and delivered at outfall works has very little smell, it presents a dirty grey appearance, and has a general resemblance to water used for scouring purposes. On the surface of the sewage may be observed floating particles of vegetable matter, matches, corks, fruit skins, etc., and lumps of fæcal matter. If the sewage has travelled any distance, fæcal matter and paper will be broken up by the friction on the sides of the sewers.

A glass of fresh sewage on being allowed to stand for an hour will settle out a thin layer of sediment, the liquor remaining of a dull dirty grey appearance, the amount of turbidity as far as the eye can tell being constant. The amount of sediment which settles at the base of the glass in about an hour represents approximately 70 per cent. of the suspended solids in the sewage, the amount of settlement



First Bacteria Beds, Sutton, England.

depends, however upon the character and specific gravity of the solids. If the sewage is allowed to stand for a longer period practically no further settlement occurs, the remaining 30 per cent. of the solids being of a specific gravity either equal to rr lighter than water. It has been demonstrated, as far as the removal of solids is concerned, that a 70 per cent. removal is all that is practically necessary for preliminary treatment, if the future aim be the ultimate purification of the sewage.

If there is added to the above glass of sewage a certain amount of alumina or other coagulants the amount of natural settlement can be artificially increased, in fact the amount of sediment may represent from 80 to 90 per cent of the original suspended matter. The remaining liquid will, however, remain of the same dull grey dirty colour, although the amount of turbidity will have slightly decreased. This method of sewage treatment is called "chemical precipitation."

If in the first instance, after one hour of natural quiescent settlement, the turbid liquid is drained off and treated by mechanical filtration by passing it through fine filter paper, turbidity can be practically removed. One passage through fine filter paper will probably produce no difference as far as the eye can tell. Repeating the process several times through the same filter paper, clarification is gradually obtained as the pores of the paper become smaller by the retention of the fine suspended matter. This process may be continued until there is no residue left on a clean filter paper. There is now produced as far as the eye can tell a glass of absolutely clear water. This method of sewage treatment is called "mechanical filtration" or "clarification. ....

If the glass of mechanically filtered sewage which appears to be absolutely clear water, be allowed to stand for some time, it again becomes turbid, and commences to give off a putrid odour, if allowed to stand for a considerable length of time, the odour gradually disappears, the liquid clears itself, and a floculent thready film forms at the base of the glass which if examined under the microscope is found to consist entirely of micro-organisms. This method is called "biological treatment," and if combined with mechanical filtration it is then called "biological filtration."

The glass of clarified liquid produced by the exacting process of successive passages through fine filter papers, still remains sewage. All that has been done by the process is to practically remove the whole of the suspended matter. Solids remain in the sewage in solution. These remaining solids in solution form the greatest proportion of the total solids in the raw sewage. A chemist by the aid of analysis would not have the slightest difficulty in describing this glass of apparently clear water as absolute sewage. He would pronounce the sample as putrescible and say, that, it was capable of absorbing a certain amount of oxygen from the atmosphere. The oxygen being attracted by the organic compounds in the liquid, the measure the amount of oxygen which can so be attracted would be the measure of the amount of organic impurity, and the amount of putrescibility which the liquid must undergo in order that the necessary chemical changes take place which will render the liquid no longer sewage.

Only an exact appreciation of the above phenomena can make clear what is now meant by sewage purification. The whole process of chemical precipitation was built on the hypothesis, and a clarified sewage liquid was no longer sewage, and was rendered incapable of producing further nuisance on discharge into a stream. How erroneous this hypothesis has proved itself, has been made evident both by practical experience and scientific enquiry. At Sheffield, England, about eighteen years ago, over $5,000,000 was spent in putting down a complete chemical precipitation plant. The object here was to remove an acknowledged nuisance caused by discharging raw sewage into the River Don, which seriously affected the town of Rotherham situated below on the same river. At Sheffield the sewage was treated by both primary and secondary quiescent tanks and lime as a precipitent added. The liquor passing into the Don had all the appearance of clear water. At first so great was the faith of those interested in the installation, that occasionally a glass of the clarified liquid was drunk as an illustration of confidence. Two years ago, however, an injunction was obtained