MUNICIPAL DEPARTMENT

DISPOSAL OF SEWAGE.*

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As you are aware, sewage varies notably in its composition according to its amount, depending upon whether the separate or continued system of sewerage exists. With the first, we deal practically only with sewage of an amount and composition definitely known; while in the combined, the amount of storm water becomes an important additional factor to be dealt with. Nowadays, when storm water is allowed to go into the sewers, it is common to arrange storm water overflows at the mouths of the local and main sewers, which will, when the sewage has reached a certain amount of dilution, allow an overflow to run into some water-course, where it may be considered a practically harmless pollution. By such methods, it at once becomes possible to arrange filtration plants for handling a definitely known amount of sewage.

Further, however, since in manufacturing towns different industries are carried on, each polluting with its wastes, as tannery refuse, pulp factory refuse, woolen factory refuse, gas liquors, chemical works, etc., it is apparent that if it hoped to have natural processes of organic decomposition carried on, and where it is found that certain wastes contain germicidal chemicals, it is apparent that such must either not be allowed entrance into the general sewerage system, or that they must be neutralized (as acids, for instance) before being allowed to be carried therein.

We therefore see that no rule of thumb method will suffice, if efficient sewage filtration is to be carried on, and hence the town or city engineer has need of a very notable range of scientific knowledge if he is going to do definitely good work.

With these preliminary remarks, we may now refer to some of the working details. In every case it is desirable by strainers to remove as much suspended matter as possible from the sewage, especially if sewage receives any organic or mineral matters. It is sometimes found quite practical, as in the sewage from private houses, institutions, or small towns, with the separate system, to allow paper or other suspended matters to pass directly on the receiving tank, or even the filters. As, however, a receiving tank of considerable capacity allows of a very notable sedimentation, and since it is always very easily ventilated, it is a notable economy to have it in any system arranged, if possible, at the end of the main sewer, thereby preventing the filter beds from being clogged by solid matters.

A method which has merit is, that where the sewage is turned on to beds of graded quicksand, coke, polarite, or granular hematite, as carbonate of iron, or of burnt clay, such as red brick dust (coarse). Some of the results of such beds as affording a rapid means of nitrification of organic matter are now well known.

In the last number of the Journal of the Sanitary Institute, England, a description is given of the method whereby 54,000 gallons of sewage is daily disposed of. The quantity dealt with was 371 times the contents of the tank; without removal the amount of sewage solids left on the beds was only 66½ cubic yards, of which but four per cent. was organic matter. Had this been dealt with as sewage before nitrification, there would have been 556 cubic yards to dispose of. In this case the filters were formed of cinders and coke breeze, of size which would pass through a half-inch mesh of the sieve.

Again, at the Lawrence Experimental Station, Massachusetts, a filter of twenty-six feet of sand was laid over ground with the usual under drains, and treated with tannery sewage 120,000 gallons per acre daily. This became soon clogged, owing to the amount of sludge accumulated on the filter. The matter was gelatinous and wet, but cracked when dry; when, however, the same sewage was treated on a coke filter two feet in depth, with 100,000 gallons daily, and flooded for two hours daily, much of the organic matter was removed, together with all the arsenic of the chemicals used, which had proved poisonous to the micro-organisms in the sand filter. This then was allowed to flow into the sand filter, and gave continuously a satisfactory effluent.

With the sewage from the pulp mills, it was similarly found that the chemicals prevented the nitrification organisms from breaking up the sewage. With, however, the use of the coke strainer, it was found that 100,000 gallons per acre daily could be filtered satisfactorily. Three hours in the sedimentary tank before application to the filter was further found to remove 30 per cent. with the addition of alum.

To account for the action of filters with different kinds of sewage, it must be remembered that the microbic life present in water, soil and air consists of a number of different micro-organisms. Thus as many as 35 different organisms were obtained from manufacturing sewages, while those mingled with city sewage had even more than others.

From what has been said in illustrating the methods of sewage filtration, it is apparent that while the methods must be varied to suit circumstances, yet the principles underlying efficient filtration, viz., that of the aeration of the materials of the filter, to the end of promoting nitrification, is the same in all cases. Taking advantage of this fact, the principle has been still further applied to sand or coke filtration, in which the natural provisions are supplemented by forced aeration. The following particulars are given from a pamphlet published by Col. George E. Waring, C.E., on "The Purification of Sewage by Forced Aeration." Described briefly, the mode of operations is as follows:

1. The sewage, after passing through suitable screens, which withhold large solids, as rags, paper, etc., flows slowly, horizontally, over a shallow bed (say six inches deep) of coarse broken stone, which serves to catch and retain the coarse floating particles. Three sets of such stones should be supplied, each with a capacity to receive the flow of a certain period, thereby allowing twice the time for recuperation that they are in use. When not in use, these filters drained expose the filter to oxidation, which speedily results in decomposition and cleansing of the filter.

2. The sewage leaving these stones, freed from coarser matters, passes to a straining tank filled with pure broken stone, coarse gravel, cinders or coke.

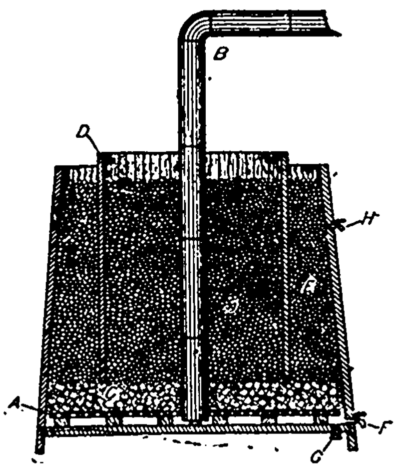

FIG. 1.
A—False bottom.
B—Pipe from blower.
C—Broken stone.
D—Diaphragm.
E—Coarse gravel.

This tank (Fig. 1) has two compartments, divided by a diaphragm extending nearly to the bottom. The sewage passes down one and up through the other, overflowing at its top. The rate of flow must be slow enough for the sediment to deposit on the surface of the filter. From this tank, properly managed, the sewage goes as a clear opalescent fluid with a perceptible odor.

3. When such tank has been operated for a considerable time, its pores tend to become clogged at the surface especially, and filtration is slower. Then the sewage is turned to another tank similar; the emptied tank now is treated by air driven into the false bottom of the tank by a blower. Under these conditions bacterial oxidation is rapidly set up and the filter becomes clean. It is best to provide four of these tanks, each resting three times as long as in use. At Newport such filters run five months without renewal of materials, and were practically as clean and effective as at first.

(To be Continued)

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