SEWAGE DISPOSAL.

REMOVAL OF SUSPENDED MATTERS.

CHAPTER II.

Continuous Flow Sedimentation.

In our last issue, dealing more particularly with the Dortmund tank and modifications of this type, we pointed out that simple or mechanical sedimentation depended upon reducing the velocity of sewage flow, causing a consequent precipitation of matter held in suspension.

In this issue it is intended to notice some of the important points relative to shallow rectangular tanks, through which there is a continuous flow maintained from inlet to outlet.

This form of tank has been practically universally adopted, because of its economy, simple construction, low maintenance cost, and practical freedom from intricate working parts.

As previously pointed out the maximum amount of removal of solids (without the use of chemicals as aids to precipitation) is obtained by absolute quiescence, by which as much as 90 per cent. of the suspended matter can be removed, the remaining 10 per cent., consisting of very fine particles, which will not deposit without the aid of a coagulant. With continuous flow sedimentation, however, from 60 to 70 per cent. of the suspended matter can be deposited, the remaining 40 or 30 per cent. being also in comparatively fine particles and sufficiently small to cause little or no trouble when further nitrification by filtration is the object.

Efficiencies of 60 and 70 per cent. solids removal depend upon several factors, which are not always taken into consideration in designing and working the tank.

The important factor in connection with working is the length of time allowed to elapse between periods of sludge removal. At Clifton (England) where the sludge is removed every five weeks the percentage deposit of solids is 51; at Halton (England) every seven weeks, the deposit is 39 per cent.; whereas, at Sheffield (England), where the tanks are thoroughly cleaned out every week, the deposit is 78 per cent. This is readily understood when consideration is given to the disturbing action of the inflowing sewage upon the already settled solids. The settled solids tend to disintegrate into finer particles, especially if septic action takes place, and the least disturbance due to current action, or putrefactive

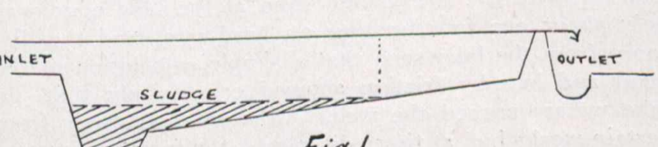


Fig. 1

effervescence, causes the solids to remix with the supernatent liquor.

It must be at once apparent from the above consideration that a continuous flow tank must provide conditions as nearly approaching quiescence as possible within certain limits.

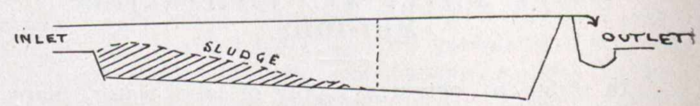
It will also be apparent that the larger the capacity of the tanks in proportion to the flow of sewage, the nearer will be the approach to quiescence. The limit of capacity, however, is ruled by the objection to permitting a sewage liquor to remain in a tank for a sufficiently long period to allow of it becoming over septicised, as in this condition nitrification is interfered with.

The main points in construction may be stated as follows:
(a) Inclination of tank floor to pump well.
(b) Velocity of flow relative to capacity.
(c) General construction relative to partial quiscence.

Inclination of Tank Floor.

Referring to Figs. 1 and 2, the right and the wrong methods of constructing the floor of a tank are well illustrated by Steurnagel, of Cologne. Steurnagel by his valuable and scientific experiments with rectangular tanks has done much to clear up the most important points bearing on the process of sedimentation.

The correct inclination of the base of a tank is towards the inlet (see Fig. 1) and not towards the outlet (see Fig. 2.). Many tanks, however, within our own knowledge have been constructed in the wrong principal, with a view to collecting the sludge at the outlet end, being nearer the sludge lagoons, or for some other possible reason. The point to observe is, that no matter whether the inclination of the flow is towards the outlet or inlet end, the sludge has a tendency to precipitate, immediately on the reduction of the flow velocity on



(Fig 2)

According to Steurnagel
(Good & Bad Construction)

entering the tanks. The consequence being that the sludge is piled up at the shallow entrance, forming not only an obstruction to incoming sewage, but also a possible redissolving of the solids. The floor of the tank may be given an inclination 1 in 15 from outlet to inlet. The sludge or pump pocket being constructed at the base of inclination. The grade (1 in 15) is empirically arrived at. There is no reason why the grade should not be greater, apart from the fact that the bottom of a tank is of a slippery nature, the slime collecting on the surface and presenting difficult footing.

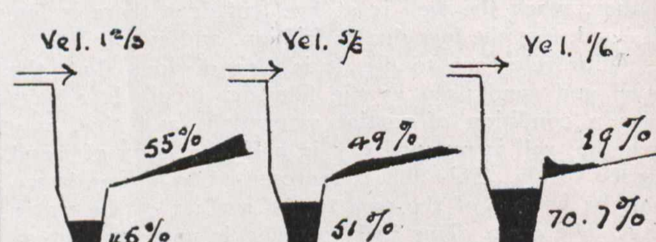
Velocity of Flow and Capacity.

The Royal Commission in sewage disposal present their general statement (paragraph 28) with reference to continuous flow sedimentation tanks. "We consider that the period of flow should be from 10 to 15 hours, and that the tanks should be cleaned out at least once a week." Nothing is stated as to velocity of flow.

The velocity of flow and capacity depend on different factors. The velocity of flow depends on the area of the cross section of the tank, while the capacity depends not only upon the cross section, but also upon the length of the tank.

This point is often not taken into consideration in designing rectangular tanks, the only consideration generally being the capacity with reference to the daily discharge.

The capacity of a tank has more value in connection with septic action than in the case of continuous flow sedi-



(Fig 3)

Cologne Experiments

mentation. In the former case it has been not only a question of sedimentation, but also of a rest period to allow of putrefaction of both solids and liquid.

With continuous flow sedimentation a period must be allowed to give effect to the lowered velocity of the sewage flow, the period, however, is relatively of short duration.

It has been held necessary to reduce the velocity current of sewage to rates of 1/8-inch and 1-12-inch per second, but the experiments made by Steurnagel at Cologne have shown