

of sludge has accumulated, most of which is in active decomposition and none of which, or practically none of which, is as yet decomposed and inert. Insufficient scum area or gas vent area will intensify the trouble.

Excessive depths should not be permitted, and need never occur if the scum is persistently broken up from time to time as it forms. A garden rake, or better still, a pressure hose will accomplish this satisfactorily, and since much of the entrapped gases are permitted thereby to escape, the bulk of the material will sink to the bottom. It has been observed also that the occasional discharge of water under pressure through the flushing pipes in the sludge digesting room will mitigate the scum evil. Materials which defy all attempts to settle should be skimmed off and buried or burnt. This last statement applies also to floating materials which are always observable near the baffles and along the walls of the sedimentation chamber. It should not be forgotten that if sewage fresh on its arrival at the works is to be found still fresh on its discharge from the sedimentation tank, its contained solids with their ready capacity for decay must not be permitted to lodge or remain in the upper chamber.

4. In tanks designed for the purpose, reversal of flow should be made monthly.

5. Determinations of the depth of sludge in the lower chamber should be made weekly. This is very conveniently done by lowering through the gas vents by a gradual cord, a disk of No. 20 B. & S. sheet steel, of diameter 15 inches, suspended at three points, so that its plane is horizontal. Its weight in air is about two pounds. The surface of the sludge can be rather closely ascertained through the support which it affords to the disk. The surface should not be permitted to rise higher than 18 inches below the slots at the bottom of the sedimentation chamber. It is observed that when this rule has been disregarded ebullition of gas is often observable in the upper chamber. This phenomenon is doubtless due to the fact that the stratum of mobile and gas-charged liquid overlying the sludge proper has been sufficiently thick to submerge the slots and thus permit some of the escaping gas to enter the settling chamber.

6. If the tank be supplied by pumps whose capacity exceeds the inflow of sewage and which in consequence must operate intermittently, the quantity pumped at each operation should not exceed, and preferably should be less than the volume of the sedimentation chamber.

7. Care must be exercised in the drawing off of sludge that neither fresh sludge nor the overlying sewage be permitted to escape. Thoroughly rotted sludge can always be detected by its color and smell, especially the latter. When a sludge gate is opened, there is always a tendency for the sludge in the immediate vicinity of the lower end of the discharge pipe and whatever overlies it, to be forced out by the weight of the water above. This results from the fact that the semi-liquid mass moves vertically in the centre of the sludge pit with less friction than it can move in the inclined direction along the sloping floor. In consequence, the sludge occupying the figure of an inverted cone lying over and above the lower extremity of the pipe is first forced out, and if care be not taken the liquid above this will soon follow. To avoid this, only small quantities of sludge should be drawn at a time. After the gate is closed the sludge mass will find its level again, especially if the flushing pipes previously referred to be brought into service. The water escaping from these has the effect of assisting and lubricating the movement of the rotted sludge down the slope of the

chamber floor toward the extremity of the sludge outlet pipe. Sufficient of the contents of the sludge digestion chamber should be left to insure continuity of the rotting process.

8. To prevent the sludge pipe becoming filled with solidified sludge, after each drawing off, the pipe should be filled from its upper end with water. Similarly if all sludge chambers are cleansed after use with water under pressure or otherwise, both appearance and operation of the plant will be improved. Water under pressure is a great convenience for operating pressure rings in the sludge room, for backfilling sludge discharge pipes after use and for cleansing sludge channels. In cases where secondary sedimentation tank sludge is to be pumped back to the primary sedimentation tank, the pumping unit may be arranged to handle clarified effluent which may then be utilized for the various purposes for which water under pressure may not be available.

9. The depth of sludge run on to drying beds should not exceed 12 inches. After drying, its depth is reduced to about 6 inches. To facilitate the passage of water downward, care should be taken that the surface of these beds has not become clogged through too constant and continuous use.

A description of the Kremer apparatus, providing a method to remove the grease which the sewage to be treated contains, is also given.

Prof. Gillespie gives some very interesting descriptions of typical plants, including Bergedorf, near Hamburg; Essen-Nord; Atlanta, Ga.; Schenectady, and others. A section of the paper is devoted to a discussion of Dr. Imhoff's patents in the United States and Canada, and another to the reception in America of clarification tanks of the Emscher type. In concluding his remarks thereon, the writer states:—

"When it is considered that the Emscher tank has been tried out for seven years in Europe and for three years in America, it is safe to say that it is well past the experimental stage. The history of its operation on these two continents, and the testimony of engineers who have studied it at close range, constitute its vindication. The list of municipalities which have either installed or propose to install it in America, furnishes additional evidence as to its reception on this side of the Atlantic. While it does not represent a method of disposal complete in itself except in special instances; while it is not easy to construct, is not fool-proof in its operation, and is not either initially or afterwards the least expensive of the appliances from which the engineer may choose, it offers, in the opinion of the writer, the most satisfactory solution for the troublesome sludge problem which up to the present has been proposed."

His paper closes with a list of places in America in which the 2-story sedimentation tank has been or is to be installed. From his list we extract the following as a list of installations in Ontario: Barry Tannery, Bowmanville, Carleton Place, Copper Cliff, Cornwall, Dundas, Guelph Prison Farm, Hamilton, Leaside, New Liskeard, North Toronto, Oakville, Peterborough, Port Arthur, Rockwood Asylum (Kingston), Simcoe, Stratford, Toronto, Vankleek Hill, Vineland Canning Co. (Vineland), Weston, Whitby, Whitby Hospital for the Insane.

The other Canadian installations are: in Saskatchewan, Battleford, Canora, Humboldt, Regina Jail, Saskatoon, Kamsack, Estevan and Battleford hospital; in Alberta, Calgary and Edmonton; in British Columbia, Kelowna and Vernon.