

Precipitation liquor treated on single contact beds. . . . .	up to 11,000
Precipitation liquor treated on double contact beds. . . . .	6,000—7,000
Precipitation liquor treated on percolating filters:—	
(a) Filters of coarse material . . . . .	up to 8,000
(b) Filters of fine material. . . . .	up to 18,000

Par. 190.—Taking into account the gradual loss of capacity of contact beds, a cube yard of material in the form of a percolating filter will generally treat satisfactorily nearly twice as much tank liquor as a cube yard of material in a contact bed.

Percolating filters are better adapted to variations of flow than contact beds.

Par. 191 contains numerous results of experiments showing the strengths of various sewages, and effluents from settlement tanks and septic tanks. The results are condensed further on in paragraph 283. It will be interesting here to compare the effluent liquors from continuous flow settlement and septic tanks, as these will in the majority of cases be the form of liquor usually dealt with.

#### Parts in 100,000:

##### Strong Sewage.

Continuous flow settlement for 15 hours	Septic Tanks. 24 hours continuous flow.
Ammoniacal nitrogen 7.5	Oxygen absorbed in 4 hours 20
	Suspended solids 40

Continuous flow settlement for 15 hours	Septic Tanks. 24 hours continuous flow.
Settled Sewage Liquor	Septic Tank Liquor
Ammoniacal nitrogen 7.0—7.5	Ammoniacal nitrogen 8.0 to 8.5
Oxygen absorbed in 4 hrs. 12.0	Oxygen absorbed 4 hours 13.0
Suspended solids 15—20	Suspended solids 15.0 to 20.0

##### Average Sewage.

Continuous flow settlement for 15 hours	Septic Tanks. 24 hours continuous flow.
Ammoniacal nitrogen 4.0	Oxygen absorbed in 4 hours 10—12
	Suspended solids 28-30

Continuous flow settlement for 15 hours	Septic Tanks. 24 hours continuous flow.
Settled Sewage Liquor	Septic Tank Liquor.
Ammoniacal nitrogen 3.8	Ammoniacal nitrogen 4.5—5.0
Oxygen absorbed in 4 hrs. 7.5	Oxygen absorbed in 4 hrs. 7.5
Suspended solids 10—15	Suspended solids 10—15

##### Weak Sewage.

Continuous flow settlement for 15 hours	Septic Tanks. 24 hours continuous flow.
Ammoniacal nitrogen 2	Oxygen absorbed in 4 hours 7—8
	Suspended solids 20

Continuous flow settlement for 15 hours	Septic Tanks. 24 hours continuous flow.
Settled Sewage Liquor	Septic Tank Liquor.
Ammoniacal nitrogen 2.3	Ammoniacal nitrogen 2.5
Oxygen absorbed in 4 hrs. 4.0	Oxygen absorbed in 4 hrs. 4.0
Suspended solids 7-8	Suspended solids 7-8

It will be noted that there is very little to choose between the two liquors as far as sewage strength is concerned, if anything the liquor from the ordinary settlement tanks is the weaker.

The reduction of oxygen consumed in every case in the liquors is not the result of any oxidation of the sewage in the tanks nor does it point to any degree of purity attained with regard to the total bulk of sewage. The retention of a portion of the solids in the sewage naturally produces a liquor of less organic strength than would be the case with the whole

mixture. This point is worthy considerable notice, as the reduction of oxygen consumed in tank liquors such as above has led inexperienced persons to the belief that absolute purification or oxidation of sewage takes place in such tanks. This fallacy is often put forward in behalf of septic tank liquors and the apparent degree of purity shown in amount of oxygen consumed, claimed as some peculiar property or characteristic appertaining to septic action. It will be seen, however, that if this claim were good, it equally and even to a greater extent applies to ordinary sedimentation tanks.

It should be noted that in connection with septic liquor the above data of strength only apply to such liquor when the tanks are regularly and frequently cleaned out, say every 4 months. After that period there is a decided rise in the strength of the sewage liquor, for instance:

	Character of sewage	Sludged	Solids in liquor parts in 100,000
Accrington. . . . .	Strong domestic	6 months	19.0
Exeter main works	Trade and domestic	frequently but only partially	12.5
Leeds . . . . .	Trade and domestic	2 years	25.7

In the case of ordinary sedimentation tanks the strength of the liquor continues constant. So also in the case of septic tanks when regularly sludged.

From the above it is apparent that the effluent liquors vary considerably, the septic tank liquor becoming stronger than that from the continuous flow tank while the amount of suspended matter has a tendency to increase. This is the penalty which has to be paid, however, for the benefit of a 25 per cent. reduction of sludge.

In the case of the above the crude sewage showed the presence of 100,000 b. coli per c.c. In the case of the septic liquor no reduction takes place, whereas, in the continuous flow settlement liquor, b. colic is reduced to 1,000 to 10,000 per c.c.

#### Purification of Sewage by Treatment on Land.

Under this head the Commissioners have very little to add to what is already known on the subject. The net results simply confirm the conclusion that suitable soil is capable of giving good results, and unsuitable soil, such as clay and peaty land is useless for the purpose.

Par. 210 lays great stress upon the management of sewage farms. The Commissioners say "we think it would be useful that farm managers should be taught some simple test or tests to enable them to follow the operations of the land; that their instructions should include a definite order to consider the farming results as quite secondary to the production of an effluent of the required standard."

Par. 194 contains the important statement: "Our investigations have not shown that there is any essential bacteriological distinction between effluents from land and effluents from artificial filters, though effluents from land usually contain fewer micro-organisms than effluents from artificial filters." "The bacteria in the filter effluents can, however, be largely reduced, if this is necessary, by some additional process, such as sand filtration or sterilization."

With reference to cost the Commissioners conclude par. 222, "Assuming that really suitable land can be purchased at \$500 per acre, land treatment of sewage is probably cheaper than artificial treatment, but when the soil is unsuitable, the cost of land treatment would probably be greater than most of the artificial processes.

#### Sludge.

Twenty-nine pages of the Report are devoted to the subject of sludge disposal. This is admittedly one of the great difficulties in dealing with sewage. It is pointed out that the processes of converting sludge into marketable manure are rapidly diminishing year by year. Kingston-on-Thames is quoted, where the corporation on termination with their contract with the "Native Guano Co." "have now arranged to pay the company so much per ton to take the sludge." The