

THE Sanitary Review

SEWERAGE, SEWAGE DISPOSAL, WATER SUPPLY AND WATER PURIFICATION

SEWAGE DISPOSAL.

Removal of Putrescibility.

With reference to the cost of land intermittent filtration, this necessarily varies considerably, depending on many local conditions. The cost of the land, the suitability of the grade are chief factors. The Royal Commission have to say: "Assuming that really suitable land can be purchased at \$500 per acre, land treatment of sewage is probably cheaper than artificial biological filtration, but when the soil is not suitable and on which only a comparatively small volume of sewage can be treated per acre, the cost of land treatment would probably be greater than most of the artificial processes." The Commission give the following comparative figures of cost, comparing cheap suitable land filtration with percolating biological filtration: Intermittent filtration with little cropping at \$0.14 per head of population drained as against \$0.25 for percolating biological filters. In Germany the cost of land treatment varies from \$40 to \$150 per acre, viz., for preparing and laying out the land and tank construction works. The total cost for preparing the land at the Berlin and Breslau farms, however, ran to \$200 per acre. The Framingham, Mass., works cost at the rate of \$600 per acre, utilized apart from pumping plant; while the Brooklyn works cost at the rate of \$470 per acre utilized.

Referring again to the Royal Commission some instructive figures are given of the cost of land intermittent filtration, assuming a good soil and little cropping subservient to purification.

Total area of land required to treat a dry weather flow of one million gallons at the rate of an acre to each 25,000 gallons:

Forty acres of land at \$500 per acre.....	\$20,000
Five acres for sludge disposal, per acre....	2,500
Cost of laying out land, including levelling, grading, underdrains, carriers, etc....	22,445
Cost of settling tanks	11,150

Total cost \$56,095

The above figures work out at a rate of \$1,240 per acre.

It will at once be seen that no definite figures can be given for land intermittent filtration. It is possible at times to obtain just the kind of land suitable which is naturally so graded, that practically no levelling is required and very little work of any kind apart from laying the carriers. It is in cases of the latter character that it behoves the engineer to give every consideration to the question of land treatment, before adopting any of the artificial methods, which at their very best may equal land intermittent filtration in the removal of putrescibility but cannot equal it in bacterial removal efficiency. Before closing this chapter, stress may again be laid on the great importance of the removal of as great an amount of the suspended solids as possible before the liquor is applied to the land; on this depends the continued success of the filtration and freedom from land pore clogging.

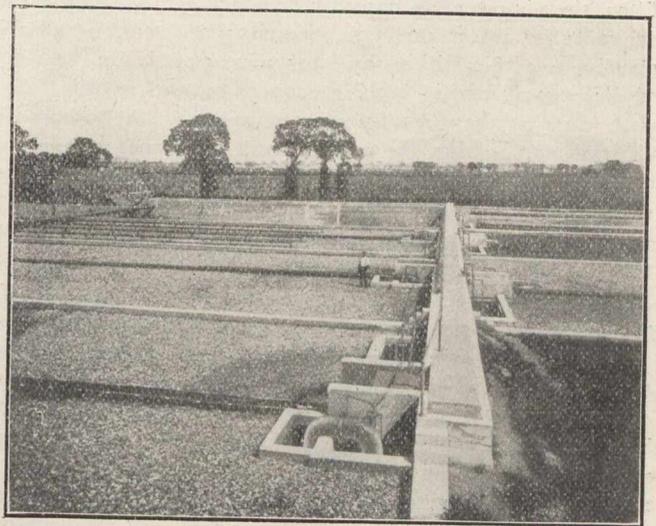
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Chapter IV.

Contact Beds.

Having reviewed the subject of the removal of putrescibility by means of land intermittent filtration; it is now our purpose to enquire more particularly into artificial structures, which are designed to carry out the same process as that of land, but occupying much less area.

We have seen, that, in order to maintain an equilibrium between the processes of absorption, retention of organic matter and its oxidation or mineralization; that even with ideal sand land, an area is required of about one acre for every 30,000 gallons of sewage treated per day. If this rate is increased, we find, that, gradually the amount of nitrites and nitrates in the effluent decreased, showing a diminution in oxidation and consequent low degree of purification. This



Croydon Bacteria Beds, Adam's & Co., (England), Automatic Syphons.

means the retention, in the soil pores, of undigested organic matter; which, by gradual accumulation, causes, what is termed sewage sickness in land. The only remedy is a long period of rest, breaking up the land by ploughing and allowing thorough oxidation. The original purifying power of land may thus be restored. Sewage sickness in land is, also, further accelerated by the inability of land, owing to its fine porosity, to pass off a characteristic product in sewage purification of colloidal character. These colloids are gelatinous in character; and, although they escape and are flushed from large grain filters, are retained by land.

We have seen, that, areas of land equal to one acre per 30,000 gallons per day, are not easily obtained of the suitable porous character required. Allowing a water supply per head per day of 60 gallons, this means an acre for each 500 of population, or 20 acres for 10,000 people.

The inability of land to treat sewage at any other but such low rates of filtration, is mainly due to the small size of the particles of material composing the soil. We have seen that soils with a suitable effective size and uniformity co-efficient value have a water retention capacity of about 18 per cent. of the volume occupied by the soil. When the water retaining capacity is deducted from the volume occu-