AN INTRODUCTION TO THE PHILOSOPHY OF SEWAGE IRRIGATION*

By James Craig

THE application to land of liquid sewage in a sufficiently mobile condition to gravitate is commonly known as sewage irrigation, and from the time of the introduction of sewers for conveying the sewage away from populated areas down to almost the close of the last century, irrigation of land was the system of disposal chiefly in vogue. But as our cities and towns cannot all comply with the idea of the worthy countryman who, after his first visit to London, being asked what he thought of it, replied, "That it was a fine place if it was out in the country," it is obvious that other considerations attract these congregations of the people, and the question of whether suitable land can be obtained for sewage irrigation comes as an afterthought and often debars the acquisition of sufficient or suitable land for sewage irrigation.

It is regrettable that many of the old sewage irrigation farms caused serious disappointment, and the regret has been emphasized greatly since the country has been at war and fertilizers have become almost unobtainable. The matter is further aggravated by the fact that in many cases the old sewage farm was looked at through financial spectacles rather than from a sanitary point of view, and the gulf was so great between the status of the man in charge and other officials with probably not more responsibility that failure was the natural corollary.

Choice of Site

In choosing a site for sewage irrigation the nature of the surface and subsoil is of great importance. An ideal formation would be a gravelly loam overlapping a coarse, gravelly subsoil; indeed, unless a sufficient area with means for extension of something approaching this type of land can be secured within reasonable distance of and altitude to the town and stream, other methods should be considered. Any land having impervious strata or clay formations within 3 feet 6 inches of the surface should be completely avoided for irrigation purposes.

As regards the contour, the nearer the site can resemble a slightly inclined plane, the better; but while an undulating surface is more costly to lay out and requires greater cost and skill to irrigate, the general principle of avoiding the path of least resistance in actually applying the sewage to the land holds good on most treatment areas.

The sewage should be delivered at a point of the irrigation area from which it can diverge by gravitation to the whole area and prospective extension areas. It will be found most convenient to have the system of distribution arranged so that the rate of flow per acre can be varied, enabling large or small sections of the area to be irrigated or rested as desired.

The conveying channels may be made of a variety of materials such as wooden or metal troughs, concrete channels, earthen channels, stoneware pipes, concrete tubes, cast-iron pipes, etc. These may be laid above or below ground, but the author considers that glazed stoneware pipes or concrete tubes thoroughly jointed and sufficiently underground to be protected from climatic influences answers the purpose admirably. Of course other carriers than main arteries may be advantageously formed in the soil itself unless a valley has to be crossed, when pipes laid on the syphonage principle would have to be resorted to in preference to carrying the liquor overhead in open or closed channels.

*Paper read before the Association of Managers of Sewage Disposal Works.

Distribution

The distribution of the sewage on to the land requires careful attention. With arable land the ordinary ridge and furrow method of distribution gives very good results as long as the sewage is allowed a fair velocity for 4 feet or 5 feet after entering the furrow. Then the velocity should be checked by means of small stanks made from the soil at distances apart to suit the gradient of the section being irrigated. These baffles can be made by spade or shovel, or an arrangement can be fixed on the ordinary horse hoe to do the work more expeditiously. Five-feet baulks are also suitable for arable land. Grass land and other broadcast-sown crops may be laid out with slight furrows further apart, but at distances and altitudes to ensure quick and thorough saturation of the surface. In most grades of irrigation land it will be found beneficial to the production and maintenance of a good effluent to have the underground drains laid parallel in preference to what is known as the "herring-bone" or lateral principle, and in the application of the sewage to the surface it should be conveyed, so far as is practicable, in a direction parallel to the underground system of drainage. Crossing over the line of an underground drain with furrows conveying sewage should be avoided, as this often causes percolation of polluted water directly to the drains and the polluting of an otherwise good effluent. Distribution is greatly aided by regular loosening of the surface of the ground; if it is allowed to form a crust, absorption is retarded, the sewage takes the path of least resistance and ponds in the lower places with often disastrous results as well as aerial and aqueous pollution.

Drains

For the purpose of laying underground drains for drawing off effluent the author is of opinion that these should be of an average depth of 4 feet 6 inches with a gradient of at least 1 in 1,000, and glazed socketed stoneware pipe drains laid parallel to each other and discharging into an intercepting drain which should be cement jointed with an effluent inspection chamber for each independent section of the land. The individual pipes of the collecting drains should be laid so that the spigot end only enters about half way into the socket—not forced tight up, as is done by many drainers with the back of the spade.

The trenches should be excavated sufficiently wide at the bottom to admit of 4 inches to 5 inches width of screened gravel or other clean, hard media being placed along each side of the pipes and over the top of the pipes to a depth of 12 inches, then placing new-cut turf inverted over the gravel or a thin layer of straw or fine brushwood to arrest the fine particles before getting to the pipes. The trenches require to be carefully filled and rammed. In running sand it would be found advisable to supplement this by placing a layer of fine brushwood in the trench before laying the pipes to prevent the fine particles getting into the pipes from underneath and filling them up.

The sewage should be subjected to sedimentation in tanks prior to being irrigated and the sludge removed from the tanks into storage lagoons until such time as the land is void of crops, when it can be carted, spread, and ploughed under preparatory to planting subsequent crops.

In conclusion it is only fair to say that an irrigation scheme with a sufficiency of good land carefully chosen, laid out and carefully managed, will give results which