

special class of diseases, it would hardly have been tolerated for two centuries on so vast a scale near Edinburgh.

It is necessary not to mistake instances of abuse for defects in the system of sewage irrigation. Sewage, if fresh, and in the open air, is scarcely perceptible to the smell. If sewage be pent up in sewers and discharged on the land in a state of active putrescence; or if, as took place once at Norwood, the depositing tank is allowed to get out of order; or if, as at Edinburgh, the carriers are so rudely constructed and so neglected as to become reservoirs of stagnant sewage deposit, unpleasant, if not mischievous, consequences must be expected; but these are cases of abuse, preventible by common care.

Sewage water, if passed over a sufficient area of Grass land, passes off bright, tasteless, and without smell. At Croydon, ever since the town was sewered (about the year 1852), the sewage of about 17,000 of the inhabitants has been discharged into the River Wandle, a clear trout stream which breaks out from the chalk above the town, and flows, as ornamental water, through residential properties. For fouling this stream the Local Board of Health, so long as they resorted to chemicals to purify their sewage, were exposed to continual litigation. They then commenced the irrigation process upon land at Beddington, and discharged the effluent water from their irrigated fields into the Wandle. Mr. Gurney, finding a dearth of water at his mills, applied to the Local Board for leave to bring the effluent water from the sewaged fields into the Wandle at a point above his mills, and having obtained leave, formed at his own expense a conduit of considerable length, whereby the effluent water is now conducted through his grounds by the side of his carriage drive into the river as it flows through his estate. It appears from the evidence both of Mr. Gurney and of his agent, Mr. Reynolds, who resides upon the estate, close to the onfall at Beddington, that there is still occasional cause to complain of the condition of the effluent water, as it sometimes comes off the land either turbid or so imperfectly cleansed from sewage that it pollutes both the River Wandle and the atmosphere in the vicinity. These evils, so far as they exist, we are satisfied admit of explanation. When the water is turbid (as distinct from being foul from sewage), the cause probably is, as suggested by Mr. Gurney, that cattle sent in to graze upon the irrigated fields (a very large number in proportion to the acreage) have trodden the surface and fouled it with their dung. When the effluent water flows off, carrying both to sight and smell unmistakable signs of sewage, it has not been applied to a sufficient area of land. The smell has been found most

objectionable on Sunday evenings, probably because the men on those days have neglected to do the amount of work necessary to effect a proper distribution of the sewage. Mr. Reynolds expressly states that the grievance is only occasional; that at other times the water comes down as pure to look at as he could desire—as pure as the river water; that he has no fault to find with sewage irrigation if properly managed; that, on the contrary, he believes it to be a great principle, and thinks it a pity that it should be called in question through the neglect of those who conduct the works. If at any time Mr. Gurney finds the effluent water objectionable, he has only to close his conduit and keep the water out. This hitherto he has not done.

Sewage irrigation requires to be undertaken and conducted with strict attention; the site must not be too near to dwellings; adjoining wells should be watched, and if the soil be very porous, disused; the sewage must be applied fresh, and over a sufficient area of land. If these conditions are observed, irrigation will be found to be the mode of dealing with sewage which results in the largest amount of good to the land and the smallest amount of harm to flowing water.

There may be difficulty in some cases in finding land available for sewage irrigation, but, with the exception of lands liable to be flooded, there seems to be no soil that will not serve the purpose. Between the light and blowing sands of Edinburgh and the stiff clay of South Norwood are included all the mechanical differences of soil which can be met with in this country, but at both extremes we find the application of sewage attended with success. In some respects, indeed, a heavy clay is even more suitable than lighter soils; from its very nature it is more productive of healthy vegetation, and from its well-known chemical properties, it is more effective in the purification of sewage.

The same land will serve the purpose of sewage irrigation continuously. The process to the soil is one not of exhaustion, but of constant renovation. Part of the Craigentimny meadows has been continuously irrigated for two centuries.—Sewage can be purged any height and carried any distance. Its conveyance, therefore, to a given point is merely a matter of cost. There is no real difficulty in dealing with sewage, whether the volume be, as at Norwood, a few gallons per head, or, as we are informed that it is at Croydon, from two to four times as great as the water supply of that town.\* On a clay soil (or wherever pumping is necessary) it is desirable to restrict the

\* The supply of water at Croydon is about 30 gallons for each person per day. Subsoil water and rain bring this volume occasionally up to 150 gallons per head of the population.

dilution. On a gravelly porous soil, on the contrary, as shown by Mr. Marriage, it is an advantage that the sewage should be largely diluted, since it is then much more readily distributed over the surface.

If a farm be large enough, there is no time when some portion of the land may not be capable of receiving the sewage. The process of irrigation may go on day and night, in the wet and drought, in summer and in winter. At Croydon, where advantage is taken of gravitation, the sewage (though varying in volume at different hours) does run upon the land unremittently, "continuous as time itself." This is a matter of first importance, regard being had to the necessity that sewage, as soon as produced, should be removed from the town and be applied whilst fresh.

The powers which towns now possess for the purposes of applying their sewage to land are contained in—

Public Health Act, 1848, 11 & 12 Vict. c. 63, ss. 45, 46, 84.

Local Government Act, 1858, 21 & 22 Vict. c. 98, ss. 30, 68-75.

Local Government amendment Act, 1861, 24 & 25 Vict. c. 61, ss. 4-7.

Sewage Utilisation Act, 1865, 28 & 29 Vict. c. 75.

Land Improvement Act, 1864, 27 & 28 Vict. c. 114.

At present there is no power of taking land for sewage irrigation except by agreement. If, however, the application to land of town-sewage be no longer optional, it will be necessary that towns should be furnished with adequate powers to take land compulsorily for irrigation; the exercise of such powers might be made subject to proper restrictions to prevent abuse.

The cost to a town of sewage irrigation depends upon the balance of expenditure and profit. This must vary in different places.

In the selection of a site for irrigation, due regard should be had to economical considerations. The cost of conveying the sewage depends partly upon the distance, but still more upon the height to which it is to be pumped, the volume to be pumped, and the price of coal. Laying main pipes an additional length of a mile or two through open country involves an outlay, the interest of which may be trifling as compared with the annual expense of pumping. Unless, therefore, there is much difference in the price of land, it would be cheaper to let the sewage flow by its own gravity a distance down the valley than to pump it to an adjoining upland. But saving in the first cost of land may be more than a set-off against the expense of additional piping and of pumping even to a considerable height. If all the land in the immediate neighbourhood of a town is building land, and none is to be had except for an inordinate price, the circumstance need create no difficulty; it will only be necessary to go further for a site where land is to be