CHAPTER I

INTRODUCTION

Early sewers intended solely for surface water. The early sewers in towns were intended for use as surface water sewers only, their use as foul water sewers being prohibited. Later, however, after the introduction of water closets, about 1810, they were utilised to take the overflow from cesspools in addition to surface water whilst continuing to discharge into rivers or streams as formerly. Further, the pollution of rivers became legalised by the Towns Improvement Clauses Act of 1847.

As a natural sequence of events, certain rivers in thickly populated districts not unnaturally became foul, and complaints followed. As a result of the investigations and reports of various Royal Commissions appointed from time to time to deal with the subject, the Public Health Act of 1875 came into force, and the discharge of sewage into rivers and streams was prohibited.

To go back a few years prior to the year 1870, with the exception of a few towns which dealt with their sewage by land treatment, sewage purification, as understood at the present day, may be said to have been practically non-existent, and instances of sewage disposal not over numerous.

The Rivers Pollution Commission, 1868. The Rivers Pollution Commission appointed in 1868, marked the advent of fresh activity in matters relating to sewage treatment, and as a result of this Commission's reports, the purification of sewage by land treatment was put on a sounder basis.

Acting upon the findings of the 1868 Commission, the Local Government Board insisted that land should form the final part of the treatment adopted for sewage purification.

The practice, however, of invariable insistence on the use of land (whether light sandy loam, or dense boulder clay) for sewage purification led to difficulties in many cases, and tentative experiments were made in the direction of artificial processes, having for their ultimate aim the attainment of such a degree of purity in the effluent as would justify dispensing with land in cases where it was either unsuitable or its price prohibitive.

About the year 1896, several of these artificial processes had been adopted, either wholly or in part, by various local authorities, and applications were made to the Local Government Board by many authorities for loans to construct artificial plants.

The Rivers Pollution Commission of 1868 had already put forward reliable chemical data as to land treatment, and it fell to the lot of the Sewage Disposal Commission appointed in 1898 to place the artificial processes of sewage treatment on a scientific basis, whilst land treatment of sewage was also dealt with, special regard being given to the bacteriological point of view, as this side of the question had not been discussed by the 1868 Commission.

In former days it gradually came to be recognised that it was inconvenient and unhealthy to retain waste filth in the house or on the premises, and so it was promptly turned into the nearest ditch, stream, or river.

Modern ideas of sanitation do not, however, admit of the passing on of waste products to people dwelling further down the river, unless local conditions as regards volume of river, velocity, etc., are such as to ensure the adequate oxidation of the polluting matter before a fresh pollution occurs. In the case of certain inland towns, these conditions sometimes exist, but they are somewhat rare; and in the vast majority of cases, the authorities concerned have very wisely gone to some expense in providing sewage disposal or purification schemes by which effluents of varying degrees of purity are obtained; and at the present day it is somewhat exceptional to find even a small town without sewers and sewage disposal or purification works.

As regards large villages, there are difficulties in way of sewers and sewage purification, owing to the initial cost of such undertakings, the low rateable value of such districts, and the consequent heavy rate involved, together with the fact that long lengths of sewers are often needed to connect up comparatively few houses.

It is frequently found to be the case that the cesspool system answers fairly well for villages (when the cesspools are watertight, and rain and bath water are excluded) if they are properly supervised. Then a public water supply is installed, and the cesspool system naturally goes to pieces. Cesspools in connection with an unrestricted water supply, and receiving bath and rain water, are worse than useless.

It would, therefore, seem eminently desirable that when a practically unlimited water supply is brought into a village, it should be thoroughly well understood that sooner or later it means sewers, and in the vast majority of cases a purification works. This must not be taken to mean that a public water supply is a thing to be avoided, but that water supply, sewerage and sewage purification should go hand in hand.

Mortality statistics sometimes misleading. Of recent years there has been a gradual awakening of the public to the fact that insanitary surroundings are to be regarded as a menace to health; although even at the present day, villages can be found with wretched sanitation, whose inhabitants proudly point to the fact that their death rate is one of the lowest for the rural districts of the county.

All that can be said of such cases is that so far they have been remarkably lucky in escaping. With regard to mortality statistics generally, it may be remarked that no statistical table yet devised gives what is really needed, *viz.* the general standard of health in a particular district. For example, the population of a district may be for a time in a poor state of health, or "sore throat" may be recurrently prevalent; but unless the persons affected actually die, this general state of bad health is not brought out in the statistics for the period.

Again, continued bad health, ascribed to insanitary surroundings, often means that those who are able to do so, leave

the district. Further, an outbreak, say, of typhoid fever, though very soon over, is apt to discount indefinitely a reputation for healthiness previously acquired by the district, though that condition of healthiness has, since the fever outbreak, been fully maintained.

It needs to be remembered that, in a rural district, the majority of the workers are in the open air during the greater part of the day, and this doubtless acts as a set-off against an insanitary home life. Moreover, it is probably quite possible to become more or less inured to insanitary conditions, but the visitor, who is not immune, often suffers.

In some instances, indifference of local authorities to sanitary improvements is put forward as an excuse by individuals, who are often themselves the chief stumbling blocks to reform. Granted that occasionally the authority is at fault: a community generally gets the type of council it deserves. The remedy is to see that those who are elected to positions of trust are men who will do their duty. When this is the case, the hope expressed by the Archbishop of York at the Congress of the Royal Sanitary Institute, held in that city in 1912, may be realised:—"There is now, I hope no need of the trenchant eloquence of that noble-hearted pioneer of sanitary science, Charles Kingsley, to insist that it is not religion, but something more nearly approaching blasphemy, to say that an outbreak of disease is God's will being done, when patently it is man's duty which is being left undone."

CHAPTER II

CONSERVANCY METHODS, COMPOSITION OF SEWAGES, ETC.

By "conservancy" is meant the conserving or keeping of refuse matter in privies, pails, earth closets, etc., for its periodical removal.

The system is not one to be recommended when other methods are economically practicable, although with certain methods, on a small scale, given cleanliness and attention,

palpable nuisance may be absent, or at any rate minimised. Unfortunately, flies of many kinds haunt refuse matter, and risk of infection from enteric fever by their agency is a very grave matter.

It has without exception been found to be the case where water closets have superseded conservancy systems, that the rate of mortality has become very noticeably lower as a result.

Dr Parsons, in his evidence before the Sewage Disposal Commission, gave the following statistics with reference to the average annual number of cases of enteric fever in Nottingham: *viz.*

1	in every	45	houses	provided with	midden privies.
1	,,	217	,,	,,	pail closets.
1	,,	376	,,	,,	waste water closets.
1	,,	861	,,	,,	water closets.

Such figures as these speak for themselves.

All conservancy methods are expensive as regards maintenance and working cost if properly carried out.

Privies. Privies may be dismissed very shortly; they are as a general rule insanitary; in hot weather they attract hosts of flies of various kinds, and should not be tolerated.

A system which has for its aim and object the accumulation of several weeks' filth in the immediate neighbourhood of houses, stands self-condemned.

Pail closets. The ordinary form of pail closet, *i.e.* where no earth is employed, is not much better than the privy, except that the emptying of the pail *must* be more frequent than the emptying of the privy.

Pail closets where earth is properly used as an absorbent and deodorant—and in what follows, the term "pail closet" must be taken to refer to the pail closet used in conjunction with earth—stand on a different footing altogether.

A large and strong galvanised iron or zinc pail, costing 2*s.* or 2*s.* 6*d.*, or a tub formed from a small cask cut in halves, well charred and tarred and provided with a drop handle makes a suitable receptacle, and when an ample supply of fresh soil is available, and applied after using the closet, this system may

be made to answer well enough in a district where the cottages are scattered, always provided that proper supervision is forthcoming to ensure regular emptying of the pails.

Very much depends upon the extent of garden land attached to the houses or cottages, and also upon the type of tenant, and unfortunately many cottages in villages possess no gardens at all. An intelligent labourer, possessing a small garden, will attend to the emptying and digging in of the contents of the pails in quite a satisfactory manner. Moreover, such a man will, usually for a small consideration, attend to premises where the tenants, by reason of age or other disabilities, are unable to do the work themselves.

There are, however, nearly always certain premises in every village where the tenants are not intelligent, and where the sanitary conditions are correspondingly unsatisfactory: consequently, one finds many villages or portions of villages where the work is done by contract in a more or less desultory manner.

The pail closet system where earth is employed is especially useful in rural areas immediately outside a special drainage district, where the lie of the land and other matters would render its treatment as a contributory place inadvisable. In some districts the normal level of the subsoil water lies within a few feet of the surface of the ground, and in such cases pail closets are to be preferred to cesspools, which, under these conditions, are seldom made watertight.

The main points to be kept in mind in dealing with pail closets, may be summed up as follows.

(1) See that a box containing an ample supply of fresh[1] garden soil[2] is available in the closet and a shovel for handling it.

[1] Ashes *can* be used if no garden soil is available, sand is useless, baked brick earth is said to be good, also peat dust. It is not essential that the soil should be absolutely dry when used, although it should be so when used with the automatic earth closets. So long as the soil does not "cling" together when squeezed in the hand it will not be too damp, and if stored in a garden shed for a week or so in a layer about three or four inches deep it will be sufficiently dry for use.

[2] It would seem advisable not to use the same soil over again without baking and exposure to the weather, to become repeopled with suitable microbes.

(2) See that at least a shovelful of soil is thrown into the pail *before* use as well as after.

(3) See that the pail is in its proper position under the seat, and this is easily done by making a recess for the bottom of the pail about one inch deep. The floor of the closet should, of course, be formed of impervious material and preferably of concrete, brought to a smooth surface, or rendered (plastered) with a mixture of portland cement and sand in the proportion of 1 to 1.

(4) See that the pail is *frequently* emptied—daily in hot weather.

(5) See that the pail is rapped quite empty, scraped inside when needed, and *well* dusted internally with fine soil before replacing.

(6) See that flies are rigidly excluded from the pail when in position in the closet: (*a*) by a movable cover to the seat, and (*b*) by other suitable means as regards vent, door and window.

(7) See that a small metal plate is fixed to the underside of the seat to deflect the urine to the centre of the pail.

Disposal of solids from pail closets. Next as regards the disposal of the contents of the pail in cases where good garden land is available: the quantity of garden land necessary for this purpose is given on p. 18. The faeces should be lightly covered with earth in a very shallow trench—say, 3 to 4 inches deep. The faeces and urine are now disposed of, but there still remains the "washup" water, and water used for washing clothes, together with a small quantity of urine. This liquid should be disposed of on a separate area of garden land to that in which the solid matter is trenched. It may be said that the manufacture of the various liquids is sometimes spread over a matter of a couple of hours daily, and that it would mean many journeys to the garden. That need present no serious difficulty; a pail under the sink pipe will obviate this. If it is raining there are usually intervals when it rains less heavily, and advantage can be taken of these. The liquid should not be dumped down day after day on the same spot, but systematically distributed, beginning at one end of the plot

and using a fresh area daily until the whole plot has been treated, when the process can be repeated. It is the waste water from household operations which causes difficulty in treatment, especially when the garden land is clay. In such cases, if there is no other outlet, the soil can be lightened with fine ashes and road grit to the great benefit of the garden from the gardener's point of view.

Another method of dealing with slop water, etc., by means of rough filtration and absorption will be found in the sections dealing with Dr Poore's system.

Laundry waste. When, as is often the case, certain cottages take in much laundry work from larger houses in the neighbourhood, a great difficulty is often experienced in disposing of the laundry water satisfactorily in the absence of a large garden with suitable soil and subsoil.

Sometimes, however, the cottages where this work is done lie fairly close together, and in such cases, the laundry and slop water from a series of cottages could in most cases be drained to a common storage tank from which it could be pumped at intervals into an iron tumbler cart (covered) and finally distributed upon land. The question of who should pay for the cost of pumping, etc., would arise, but it would not be a large matter, as solids should not enter the pipes, which could be formed of iron tubing.

Cesspools. Cesspools came into general use after water closets had been introduced and their discharge to surface water drains prohibited, the discharge from the water closets being conveyed by a drain to the cesspool.

The earth pail system just described, is of no use where w.c.'s are used: in the latter case if ditches and watercourses are to be kept clean, it is a question—in the absence of sewers—of cesspools or nothing, except, of course, in the case of large isolated houses, which may have their own private sewage plant; and even in quite small villages, where the pail system is in general use, it is usual to find one or two houses provided with w.c.'s, the water flushing them being pumped daily to a cistern at the top of the house by means of a force pump.

In such cases the well from which drinking water is obtained

is generally not too far off from the cesspool, and it is of vital importance that this should be constructed in an absolutely watertight fashion, and bath and drain water excluded.

It is not in the interests of public health to have a leaky cesspool 10 feet distant from the drinking water well, and to find that when the surface water level of the well is lowered—say, 3 inches by pumping—that there is also a fall of about three inches in the water level of the cesspool: yet such cases occur. In the first place, the cesspool must be absolutely watertight, and this is not impracticable. If sewer manholes can be constructed in a watertight manner in a water-bearing gravel, there is no reason why cesspools should not be made equally watertight, even if this increases the cost.

There are persons who say that where there are no wells, cesspools should be purposely made leaky—(and they are frequently made so after having been passed by the sanitary authorities)—so that the liquid can percolate away into the subsoil, since no cost in emptying them is involved. Now with regard to this point, it may be that in the case of isolated houses on the outskirts of a village standing on a suitable geological formation, such leaky cesspools may do little or no harm, but a good deal depends upon the depth below the surface in the cesspool at which leakage takes place, and in most soils it may be taken that the purification of the cesspool leakage will be very slight for some considerable zone from the cesspool, and this zone must in course of time become saturated with filth in the absence of underground water containing an adequate supply of dissolved oxygen to assist in its purification. Further, the absence of wells—failing a rainwater drinking supply—sometimes means a copious public water supply, and there is risk, even if somewhat remote, of polluted water being drawn in to the water mains during breakages, alterations, etc. Again, if there is a public water supply to the village close by, it may be taken for granted that in the more thickly populated parts, the subsoil is in a chronic state of pollution from leaking cesspools, and it is unfortunately a common experience that the owners of large isolated houses possessing leaky cesspools, whilst professing to be extremely

concerned about the insanitary state of the cottages in their village, not infrequently do their utmost to frustrate any scheme for bettering the conditions under which the poorer inhabitants live, which is likely to cause a material increase in the rates.

In large villages, *where there is ample garden land attached to each house*, however small the house, and where the water supply is small, watertight cesspools can be made to answer fairly well when properly attended to, but even in small villages with a water supply derived wholly from wells, the trouble, already mentioned under the heading of pail closets, arises when laundry work is taken in by cottagers, and large volumes of water are used for this purpose.

Where the public water supply is a large one for a rural district—say 15 to 20 gallons per head per day—and bath water, sink water, and water used for flushing w.c.'s, etc., are admitted to a watertight cesspool, it must be obvious that either (1) heavy expenditure will be incurred in emptying a properly constructed cesspool at frequent intervals, or (2) that steps will very soon be taken to evade this burden by rendering the cesspool leaky, or constructing surreptitious overflows, should the subsoil be of a nature to favour such evasion.

A simple case will illustrate the futility of using cesspools when they receive all bath and rain water.

A large cesspool contains, say, 2000 gallons. Assume a small house with a bath (the chief offender so far as the cesspool is concerned) and two water closets, and occupied by four persons.

Say the w.c.'s are used four times daily with a two gallon flush each time	= 8 gallons × 365 =	2920 gallons.
Washing up, etc., say,	6 gallons × 365 =	2190 gallons.
One bath daily, say,	40 gallons × 365 =	14600 gallons.
	Total ..	19710 gallons.

On this basis—a fairly low one—the above cesspool would require emptying (disregarding rainwater) every five weeks or so, and taking the cost of emptying at 25*s.* a time, the total annual cost would come to about £12. Cesspools are utterly