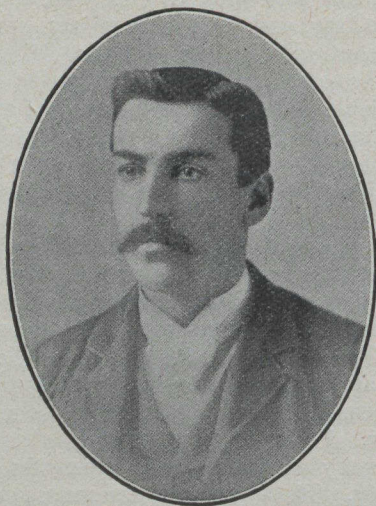


Suburban House Drainage

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Health authorities, physicians, builders and occupiers of suburban and country residences not located within reach of sewers find themselves confronted with a serious and all-important problem. The question is what method should be adopted by architects or householders to get rid of the liquid wastes from the household in a manner calculated to avoid at once all nuisance to sight or smell, all danger to health arising from the pollution of the soil, the water and the air, and all causes of contamination of water courses, whether flowing streams or ponds, lakes, estuaries and harbors. The problem is not at all a novel one, for nearly two thousand years ago Hippocrates discussed the same subject of the relation existing between health and soil, air and water; yet if one contemplates for a moment the numberless filth-recking and disease-breeding privies and barbarous leeching, cesspools which we still encounter everywhere, and which apparently are accepted as necessary adjuncts to farm houses, summer residences, mechanics' dwellings, etc., one is justified in calling attention to the evil results of improper methods of sewage disposal and in discussing briefly the proper remedies.

If the human body is to be maintained in health and vigor it is essential to dispose of all those matters eliminated from the animal system whether in health or disease, as well as all other animal and vegetable refuse in the vicinity of inhabited buildings as speedily as possible before decay begins, as in the early stages of putrefaction the matters evolved are highly injurious to health and dangerous to life. Fresh sewage is generally comparatively free from smell, but when it has lain about for any length of time it often becomes exceedingly offensive. In other words, it begins to decompose.

The most simple and most objectionable form of disposal frequently found in country districts and not unknown in the City is by an open ditch or trench. No sane man in these enlightened and progressive times professes to believe that his health is safe in the vicinity of such a nuisance and disease breeder. Sometimes these trenches are walled up and covered over, shutting out the rain, light and air and cutting off all purifying agencies without any resultant benefit except that it is out of sight.

Cesspits are scarcely less objectionable. Where, for financial or other weighty reasons, their immediate abolition is impracticable, they should be made large enough

to contain all the drainage emptied into them between periodical cleanings.

These cleanings should be made frequently, and means of deodorization should be provided when the pit is emptied. Sulphate of iron seems well adapted for use with cesspits. They should be placed as far as possible from any dwelling, cut off by a disconnecting trap and properly ventilated with inlet and outlet shafts provided with suitable cowls.

House sewage is made up of excremental matter, bedroom and kitchen slops and soapsuds. This sewage contains the organisms necessary for its own destruction, and under favorable conditions these may be so cultivated as to effect the purpose. The all-important work of breaking down the polluting matter of sewage and converting it into the various products of decomposition is performed by myriads of unpaid scavengers whose existence was not even suspected until late in the seventeenth century. They are so tiny that it required the powerful microscopes of the present day to make them visible at all. They are known as "bacteria" or more familiarly as "microbes."

The workshop of bacteria is found everywhere. Some live, move and have their being in the upper layers of the soil. The droppings of animals are for the most part purified by the bacteria on the surface of the earth and this is aimed at in a sewage farm.

The bacteriological process of sewage purification may be classified in two systems, viz.: the septic tank and the open bacteria bed system. It is proposed in this paper to explain the action of the septic tank.

The septic tank system is so called because the purification of the sewage is begun by a process of putrefaction. It is a process of removing most of the suspended organic matter and some which is in solution and giving an effluent which, although not chemically pure, is inoffensive to the sight or smell, and is pure enough to be turned into large streams or bodies of pure water without doing any appreciable harm. This system differs from the other processes in that it attempts to bring an entirely new and different class of bacteria into operation—the anaerobic. Anaerobic bacteria live without air—that is without free oxygen. Exposure to air kills the anaerobes, and all bacteria are destroyed if allowed to remain too long in contact with their own products. In the absence of water, or at least moisture, they are unable to multiply, and remain dormant. The work that bacteria do in the purification of sewage is to oxidize the foul matters of which it is partly composed.

The septic tank itself is merely a receptacle designed to favor the multiplication of these micro-organisms and bring the whole of the sewage under their influence.

The sewage is turned without any screening or preliminary treatment into the septic tank. The incoming sewage is delivered below the water level. The object of this is three-fold:—In the first place, it avoids disturbing the upper and lower portion of the contents of the tank, and especially the scum, which will be referred to again presently; in the second place, no air can make its way down with the sewage; and lastly, the gases from the tank cannot escape back into the drain.

On entering the still water of the tank the solids suspended in the sewage are to a great extent disengaged going either to the bottom or to the surface according to their specific gravity. Soon, however, a fermentation of the deposited solids takes place and a large volume of gaseous products is evolved. In the absence of light and air the organisms originally present in the sewage increase enormously and rapidly attack all the organic matter. By their action the more complex organic sub-