

posed particles of various sorts. Doubtless the breathing, for any long period, of air contaminated with sewer gases alone will give rise to headache, sickness, diarrhoea, sore throat, and a deteriorated condition of the blood, and a general lowering of the health and vital resistance to more serious diseases. But the substances which give rise to the infectious diseases, the substances which convey infection from the sick to the healthy, consist doubtless of minute masses of organic particles. These are, as Dr. Burdon Sanderson expresses it, particulate. Dr. Alfred Carpenter says: "All contagia are neither ætherial nor gaseous; they are in themselves particulate." But these particles, which emanate from the body of persons suffering from infectious diseases, not unfrequently enter houses with the sewer atmosphere, especially if there is the minutest hole in the soil pipe, and then the danger to health and life becomes very great.

A valuable contribution has recently been made to Sanitary Science, by Neil Carmichael, M.D., C.M., &c., Fellow of the Faculty of Physicians and Surgeons, of Glasgow, consisting of a paper, read at the Philosophical Society of Glasgow, on the "Experimental investigation into the Trap and Water Closet System, and the relation of the same to Sewage Products, Gaseous and other", an abstract of which has been published in a late number of the Glasgow "Sanitary Journal"; to which we are indebted for the same, and which bears directly on this subject.

Dr. Carmichael has proved that thorough immersion of the contagion or disease particles in water effectually imprisons them, and that they cannot be liberated from the water surface of a properly constructed trap, and not from any water sur-

face which is not violently disturbed, as by the ebullition of bubbles of gas from decomposition of excess of putrid matter.

He has shown still further, "that a moist soiled surface, such as exists when a solid is smeared with filth, as in the trunk and tray of an ordinary w. c., or in the surface of a pultaceous mass, of which the foul mud banks of a sewage polluted river are the best illustrations, affords the physical conditions most favourable to the production of an atmosphere laden with organized particles, whether of the germs of putrefaction or of specific disease."

"Every surface in the apparatus of water carriage which is only intermittently covered with a flowing current of water, gives off dangerous particles. Therefore, the engineer and plumber ought, by adapting the capacity of the sewer, the drain, or the pipe, to the amount of fluid to be conveyed, to reduce to the utmost the tidal range of the fluid, and the area of the exposed surface, besides constantly endeavouring to provide a surface as smooth and non-adhesive as materials will permit. The origin of the fatal elements of 'sewer gas' is not the flowing sewage, but the surface of the sewer above its level. Parkes and Sanderson observed that the crown of the Liverpool sewers was covered with slime. 'On microscopic examination it was found to consist of an immense amount of fungoid growth mixed with different kinds of animal life.' This is the condition of the surfaces of all conduits of foul water, large and small, which is not constantly immersed.

"But such germ cultivating surfaces are not peculiar to the water carriage system. They are to be found in much greater perfection and aggregate extent in our ashpits and privies, in our soil pans, and all soil shoots for the conveyance of