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whole trend of thought and attention of those pursuing the development of the art of sewage disposal was directed towards the accelerated processes of oxidation.

In carrying out these processes all the authorities persistently advised the preliminary removal of sludge as an indispensable element of sewage purification, and that, too, while in a fresh condition and before putrefaction had set in.

Rafter & Baker's book, 1894, provides, as one of the conditions essential for success, "that the arrangements for removing the sludge be such as to ensure its frequent removal, for if left in the tanks until putrefaction sets in, the sludge is likely to rise to the surface, giving off foul odors."

Santo Crimp's book, 1890, says: "The first and absolutely essential preliminary to the adoption of any method of treatment by precipitation is to arrange for the systematic removal of the sludge from the works. To begin sewage treatment without this is to end in the creation of a gigantic nuisance and become involved in an almost hopeless struggle to suppress it."

Waring's book, 1894, and later edition of 1896, always and everywhere carefully enunciated the principle that sewage must be purified by means which are put into operation before decomposition had set in. He says: "In practical work two cardinal principles should be kept in view and should control our action.

"A .- Organic wastes must be discharged at the sewer outlet in their fresh condition before putrefaction has set in.

maceration, they were so diluted or comminuted as to flow with ease into the main sewer. In 1887, however, foecal matter was admitted to the Paris sewers for the first time, doing away with the necessity for the "automatic scavenger," and it was consequently abandoned.

In ordinary practice if a sewer is available for connection with the house-drain, the question of disposal is settled, but as often happens in the case of isolated residences, country homes and the like, no sewer is available and the question of disposal becomes one of vital importance. For use in such cases Col. Waring advocated the construction of a tank similar in some respects to Mouras' automatic scavenger, with a flush tank in connection with sub-surface irrigation whenever practicable. In practice, however, he found the flow of house-wastes into the tank had at times sufficient force to so disturb the deposits as to cause a considerable amount of semi-solid matter to pass over into the flush tank and thence into the irrigation channels, resulting in their becoming clogged. In order to reduce this disturbance, Col. Waring introduced a dividing wall so as to confine this excessive agitation to the first compartment. This arrangement he found practically inoffensive and safe, and although he had to admit that a certain amount of putrefaction was inevitable, he relied on the frequent renewals of the small volume of sewage it contained to reduce the amount of putrefaction to a minimum.



"B.-They must be reduced to a state of complete oxidation without the introduction of dangerous or offensive decomposition."

The tendency to putrefaction had been the cause of all the great difficulties of sewage disposal, and putrefactive germs were looked upon as enemies by sanitary engineers just as typhoid germs are looked upon as the enemies of physicians. So deeply rooted was this non-putrefactive idea in connection with all known methods of sewage disposal, that Santo Crimp in his 1890 edition expressed as his fondest hope that some chemical might be discovered that would kill the putrefactive germs without injury to the nitrifying organism. He says: "The chemist should and probably will be able to indicate what re-agent is inimical to putrefactive germs yet not destructive of those ferments which complete the destruction of dead organic matters by resolving them into innocuous gases and minerals." He adds: "It is not too much to hope that its solution is within measurable distance."

Disposal of House-Wastes.-The disposal of house-wastes as distinguished from sewage disposal must of course be considered separately, because they are so largely charged with oxygen.

Louis Mouras in 1881 introduced in Paris his "automatic scavenger" to prepare the house-wastes for the sewer, foecal matter not being admitted into the sewers until some time later; this he did by arresting the solids in a cesspool or catch basin until by dilution with an abundance of water, and

Gehrhard, in referring to this device says: "It should be remembered that the liquid sewage in the intercepting chamber is constantly changed; a large volume of sewage passing through it every day, and that although it retains organic waste matter partially putrefied, the amount is not to be compared with that in a cesspool." He adds: "that by cleansing the intercepting chamber once a month the amount of liquid putrid matter may be kept down to a minimum."

In both Mouras' automatic scavenger and Waring's improvement thereon, whatever decomposition of solids took place was the result of dilution and maceration; whatever bacterial action existed was aerobic, and must not be confounded with the anaerobic, putrefactive or liquifying action which takes place in a septic tank. Naturally there was some putrefaction in the stagnant recesses of these chambers, but this putrefaction, although unavoidable, was always considered highly objectionable, and both Mouras and Waring depended on frequent flushing and the consequent introduction of oxygen, to remove it and prevent its becoming a nuisance. This is evidenced by their own writings.

In Mouras' French patent, he says: "But we must carefully note that the discharge pipe never passes anything but turbid water holding in dissolution a certain quantity of matter coming from the decomposition and disaggregation of matter going on at the bottom of the tank.

"For the proper working of the apparatus it is expedient to discharge into the receiving pipe, as much as possible, rain