aid of organisms, during which process oxygen was used up, and fresh oxygen drawn into the filter. This latter fact has been proved with the aid of capillary tubes inserted into the beds and connected with monometers. If a contact bed is filled with sewage, and air is blown in at the bottom, the free, unabsorbed oxygen is unable to carry out the necessary oxidizing action, and the sewage is not rendered non-putrescible. The oxygen thus absorbed during intervals of rest seems to be condensed on the surface of the gelatinous film, into some more active form, possibly as ozone, by the high pressure which we know to exist in such gelatinous films.

In the contact method, it was thought formerly that during the time of contact the bacteria were eating up the sewage.

In 1897, Dunbar, in Hamburg, demonstrated in a most convincing manner the fact that the process did not occur gradually during the contact period. He prepared several mature contact beds, and allowed sewage to remain in the first for five minutes; in the second for thirty minutes, and so on. In five minutes the oxygen consumed in the first bed was reduced by 83 per cent., showing, as in the sand filter, that the action took place quite suddenly, and that the time in which the sewage remained in the contact bed was practically wasted. The work, in fact, was done when the bed was exposed to the action of the air, which was exactly the reverse of the conception formerly entertained.

In the trickling filter, the principle of oxidation has been carried to its logical conclusion. In such beds, the sewage is continuously sprayed over the surface by one of the innumerable devices for the purpose. The bed itself is composed of some hard material, preferably of slag, which does not readily weather, and is so arranged that the filling material becomes smaller towards the top and larger towards the bottom, so that humus-like substances formed may be readily washed away.

A sand layer on the surface is advised, since it retains a considerable quantity of organic matter, which is gradually loosened and broken up by the organisms present. The drops of the sewage flow over the surface of the lumps of material, drop on to others, and so on until they reach the bottom. The organic matter as before is absorbed and decomposed by the combined action of micro-organisms, of which the gelatinous films are largely composed, and the oxygen which can penetrate to the interior of the bed at all times.

The effluent contains particles of humus-like material, which is non-putrescible, and being comparatively heavy, is readily sedimented out. The clear effluent is non-putrescible and contains much nitrates. Such beds are able to handle from 150 to 250 gallons of sewage per cubic yard of filling material per day.

Sewages which could not be treated satisfactorily in contact beds were handled satisfactorily by simply trenching the surface of the bed, placing a layer of sand along the bottom of the trench, and allowing the sewage to flow along these trenches, the raised parts allowing free access of oxygen. The contact beds were thus converted into trickling filters, and the results were eminently satisfactory.

The septic tank, which is wrong in principle, except in so far as it may prove useful as a liquefying agent, is already doomed as an integral essential to any method of sewage disposal.

The contact bed, which is on a right principle, wrongly carried out, will also probably soon disappear. The intermittent sand filtration method, which is satisfactory in principle, is very expensive to construct and maintain for a given unit of sewage treated.

Based on purely theoretical principles, and with the experience already gained, in point of economy and efficiency, there is no doubt but that the trickling filter has come to stay, and is bound to displace all present forms.

The sedimentation of the humus-like material from a trickling filter is readily accomplished, and should constitute part of the system in order to obtain a clear effluent suitable for disinfection with chlorine, as well as to remove an obvious physical objection.

The disinfection of raw sewage by chlorine may prove a valuable compromise in some rare instances when other methods of treatment are not possible, but is said to be not working out as well as was expected. It should prove of great value in rendering a clear effluent from biological sewage disposal systems absolutely safe.

In conclusion, I would like to give an almost perfect illustration of nature's method of disposing of sewage, in which the principles of the septic tank, the contact bed, the sedimentation tank, and the trickling filter were involved.

Berlin, Ontario, has a so-called sewage farm. After passing through a septic tank, the sewage passed on to ten acres of heavy clay soil. This became plugged, and the putrefying sewage, after standing for various lengths of time, was allowed to flow into a small creek by making convenient holes in the banks of the sewage basins. The volume of sewage flowing away was sometimes almost as large as the volume of the creek. Consequently, little oxidation took place, and the creek became a foul stream of black putrefying liquid, which flowed from pool to pool, and ultimately into a mill pond about a mile or so below the farm. The pond acted as a second septic tank and sedimentation basin, after the oxidation, which must have occurred to a certain extent during its flow to the pond. The decomposition in the pond was clearly shown by the bubbles rising to the surface and by the odors given off.

The water from the pond fell over a mill wheel, and was churned into foam. The gases present were dissipated by the process, and rising on the outside blackened the white lead paint owing to the hydrogen sulphide present, and causing a marked taint to the flour on the inside.

Below the mill the creek tumbled over a rocky bed for a hundred yards or so. These rocks were covered with a brownish black mat of vegetable matter, which on microscopical examination seemed to be chiefly composed of millions of protozoa, such as paramecium, vorticella, etc., and of bacteria. At the end of this rocky bed, the water was clear, and one mile below, where the road crossed it again the creek was perfectly clear, of a slight yellow color, and contained only traces of free and albuminoid ammonia. The natural action taking place in the creek during its extraordinary flow of one mile accomplished what the sewage works had failed to accomplish.

This process of Nature illustrates the typical methods which we have tried in one way and another to harness. There was the septic tank and sedimentation process going on in the pools and pond; the aeration process taking place in the mill wheel, and the adsorption and oxidation processes in the rocky river bed by the gelatinous growth, analagous to that of the trickling filter.

MEXICAN TRAMWAY COMPANY.

The Mexican Light and Power Company has not been disturbed by political unrest. It is the intention of the company to begin extensions on the tramway lines this year, which, when completed, will mean an expenditure of $5,000,000 gold, while $1,000,000 gold is being expended on extensions to the property of the Light & Power Company.

Dr. F. S. Pearson, New York, is interested in these works.