MUNICIPAL DEPARTMENT

SEWAGE SYSTEMS.*

I know that in mentioning here the danger of polluting by the sewage of the cities the streams which generally supply drinkable water to the same cities or their neighbors, the case I am advocating is already won ; for, to Great Britain belongs the honor of having first submitted to her scientists the study of this great question, which has brought on, in 1878, the vote by the British Parliament of the "Rivers Pollution Protection Act," obliging the municipalities to practically eliminate the noxious principles of the sewage water before emptying them in the streams.

England's example was followed in the whole of Europe, especially in Paris, where the "Roads and Bridges Engineer's Corps," to which I had the honor to belong, has made the most marvelous progress in the establishment of purification fields at Gennevilliers and Acheres.

I am sorry to say that in this country we do not follow the march of progress, and that, boasting of the ampleness and copiousness of our rivers, our municipalities seem to court epidemics, in spite of the advice of their provincial board of health, and empty their impure sewage in the streams, at the bottom of which generally lie deposits or banks of sawdust from the numerous mills lining the shores. I can mention particularly two cases : one at St. Hyacinthe, where the sewage is emptied in the river from above the waterworks—this very city has been this year afflicted by a serious epidemic of typhoid fever; and another case in Montreal, where one-half of the total sewage of the city pollutes the standing water of the pond situated between the wharves and the guard pier.

Thus, I intend to renew a prudent advice to my fellow citizens, rather than teach you anything you are not familiar with, when I mention here that all hygienists unanimously condemn the emptying into streams of impure sewage which, according to the latest experiments made, for example, by Muntz, analyst to the "National Agricultural Institute of Paris," have revealed in one cubic centimeter of this water the presence of 120,000 to 320,000 microgerms, most of which are pathogenic.

It may be added, from another standpoint, that the pouring of the organic substances contained in these sewage waters naturally deprives the river water of a considerable quantity of their oxygen. I have no doubt but that you are perfectly aware of this special danger, and if I can illustrate before you one of the best means to obviate it, I hope that amongst other benefits of your visit to this country an era of progress in municipal hygienic condition will open to the great metropolis of Montreal.

Mr. Janin classified the methods in use as follows . Processes of separation, mechanical processes, chemical processes, soil purification processes.

After showing why the first three were unsatisfactory, he went on to say :—Soil purification of sewage is the method now in favor in England, Germany and France. In the last named country I had the honor of co-operating in the installation of the system with the learned engineer, Durand Claye, and his emulator, M. Masson, inspector of the drainage of the city of Paris. To this process I beg leave to call your attention. It consists in the filtration of the sewage through a permeable soil affording a sufficient thickness and all facilities for the outflow of the purified water, either by a sufficient slope of the previous stratum, or by artificial drainage

That the soil is the most perfect purifier of waters charged with organic matters is proved, first, by the organic purity of spring waters ; second, by careful experiments with impure waters, which are subjected to analysis before and after percolation through the soil.

The first eight to twelve inches of earth act as a mechanical filter of a most efficient type. In the next stratum occurs an oxidation of the organic matter by the oxygen in the soil, aided by a living organism normally present in it. A column of three feet of arable soil suffices to completely purify the most objectionable sewage water and to render it quite free from germs of disease, although they may have been plentifully present in it initially.

Finally the soil is itself highly enriched by the organic matter which it takes from the sewage, and thus an economical value is given to the method of soil purification. Many analyses of vegetables grown on such soil have been made, and in no case has any diseased or unsafe food product resulted from the use of these fields as market gardens.

Notwithstanding the evident superiority of the soil purification system, I think proper, considering the prejudices still existing, to set forth briefly the rules regulating the establishment and working of the purification fields—the violation of which rules has caused the few failures of the system.

To sum up, the rules which govern a good and complete purification are as follows :—

(1) To select ground porous enough to allow water to easily permeate and to give free access to a sufficient quantity of air for the working out of combustion. This degree of porousness of purifying power is determined by direct experiments, the best known being that of Dr. Frankland, which gives the quotation used as a basis for the next rule.

(2) To regulate the time of pouring and the quantity of sewage water poured each time, so that the water may take to run through the filtering soil all the time necessary for its purification.

(3) To underdrain, if necessary, in order to give the purified water a regular issue.

In a word, the object is to obtain as near as possible a continuous and regular distribution after purification—a phenomenon of slow combustion and aeration—a mechanical fact—are both regular and continuous.

Those are, gentlemen, as briefly annunciated as possible, the laws of operation of the purification of arable soil.

It follows, from this expose, that high-dosed pouring alone has caused partial failure ; not because the system is bad in itself, but because the rules of purification by the soil imply certain absolute conditions, such as selection of the ground, apportionment of sewage waters, and underdraining, which are sometimes neglected on account of difficulties of ascertainment and of the great expense they entail.

On the other hand, in all cases where irrigation has been moderately practiced, and where vegetation has helped purification by returning to the atmosphere a portion of the purified water, success has been attained. To recall only a few of the successful experiments, I will quote the purification field of Gennevilliers (Paris), where the annual dose of irrigation amounts from one to four million gallons per acre ; of Rheims (France), where the dose is about the same, and of Dantzig (northern Prussia), where the average annual dose is three million gallons.

Those purification fields do not only fill the hygienic programme of complete purification, harmlessness, absence of perceptible emanation in the neighborhood, but also fill the economical programme as in Gennevilliers, where the value of land has increased four-fold since it is irrigated ; in Rheims, where a company has rented the purification field for a period of thirty-six years, and after paying a heavy annual rental to the city, still realizes large benefits, and in Dantzig, where one of your countrymen, Mr. Aird, rents the purification field and makes large profits.

* Abstract of a paper by Mr. Geo. Janin, C. E., of Montreal, read before the British Medical Association, in Montreal, August, 1897.