



SEWERS AND SEWAGE DISPOSAL.*

One of the essential general questions which city officials are called upon to decide is the character of the system in respect to the admission or exclusion of rain-water. In early times the principal reason for building sewers was to remove the rain water from the streets and yards, and even now this is frequently the case; yet, owing to the general advancement of sanitary science, the necessity for the prompt removal of foul water is becoming equally apparent. In England, the mother country of public sanitation, we find the earliest examples of modern sewerage represented in its different systems,—the "combined" system, where both sewage and rain-water require underground removal, and the "separate" system, where the foul water alone requires it, and where rain-water can be left to flow away in natural channels or in less expensive artificial ones.

From a sanitary standpoint no difference between these two systems has been found. Theorists have endeavored to manufacture opinion in favor of the "separate" system in this respect, but statisticians have not sustained them. The cleanest and least odorous sewers at the present day, so far as my own observation goes, are found in the "combined" system as built in some of the European cities.

Time has demonstrated, in England and elsewhere, that choice between the two systems must be based on the questions of convenience and cost.

The "separate" system is not necessarily cheaper or simpler. When all rain-water must also be removed underground, the expense is usually greater and the double system then required is more complicated than the "combined" system. The reason why the latter is used more in Europe than here is that it is desired to promptly remove the rain-water from the streets.

In America the application of the "separate" system is more extended for two reasons: one is that our rainfall is more intense than in Europe, and therefore a "combined" system is rather expensive for a small community; the other is that in many small towns sewage removal is more imperative than underground rain-water removal.

The difference between the two systems is not a radical one, as the proportion of rain-water admitted to the sewers varies. We have cases where about one-half the entire quantity, and others where only roof and yard water, or where roof water alone, wholly or partly, is allowed to enter for flushing purposes. Finally, we have a complete exclusion of all rain-water,

where, either on account of pumping or purification works, the admission of any would materially increase the expense. The most extensive interest of this kind is found in the North Metropolitan sewerage system of Boston and vicinity.

Memphis, Tenn., was the first large city in which complete exclusion was adopted, in a system built and patented by Col. George E. Waring, Jr. In extending the system to the suburb Chelsea, the local authorities adopted the regular separate system, based upon principles laid down by English Engineers.*

The Shone system, as built in the World's Fair grounds at Chicago, likewise excluded all rain-water. The peculiar feature of this system, however, is the lifting of the sewage by compressed air at frequent points by so-called ejectors, whereby, under certain conditions, special advantages are obtained.

New Orleans is now constructing the regular separate system according to a design made jointly by Mr. George G. Earl, as chief engineer of the work, and the writer, as consulting engineer, in which a small amount of rain-water may be admitted when desired for flushing.

The selection of the particular system and the proportion of rain-water to be admitted depend therefore on local and economical, but not on sanitary requirements, and the selection should be carefully made by a competent engineer. Not only do different localities require different treatment, but in the same city or town we may have several systems working together. The upper blocks of a sewerage area necessarily exclude the street water. In a valley we may have the "combined" system and on a ridge the "separate" system. Again, an intercepting sewer may carry away the ordinary flow of sewage to a suitable place for treatment, while the storm-water and diluted sewage may run into a stream.

It is therefore evident that care should be taken to adopt the best designs and contrivances for each particular case, irrespective of opinions advanced by the promoters of patents. Further, general plans for a complete system should be made early in the life of the city, so as to prevent inconsistencies and unnecessary expense later. The execution of the work and its adaption to special requirements should keep pace with the growth of the city.

In conclusion, a few words may be said regarding the final disposal of sewage. When it can be accomplished safely by a direct discharge into a large river or the sea, this will generally be the most satisfactory mode, as, for instance, in New York, Boston, Philadelphia, New Orleans, and many other cities. When the sewage must be purified before it is discharged, we must then decide what method should be employed.

The purification can be made partial or complete, according to the requirements of the case. Complete purification can be obtained by intermittent filtration through sand of proper grain and depth.

We have a number of cases where this method has been successfully employed for some time in England, France, and Germany, and we have lately commenced to use it in America. Through the excellent work undertaken by the Massachusetts State Board of Health we have been placed in a position to design such works more intelligently and to better effect. They have ascertained the fundamental elements affecting the questions to be considered, and have given us data showing, for instance, that sand is better than soil; that the size of the grains and the quantity of sewage periodically applied stand in a definite relation to the degree of purification. We know better than before what effect a constant use of the same filter has upon its usefulness, and what means are necessary to make it permanently effective in winter and summer and from year to year. From the best filtering areas, both in Europe and America, we obtain thoroughly purified sewage,—purer than some waters furnished for domestic consumption.

There are many instances where clean sand, the most suitable material for purification, cannot be had in sufficient quantities, and then we must be content to partially purify, or merely clarify, the sewage. This is done by mixing with it certain chemicals, notably lime, salts of iron, or alumina, by which the suspended and some of the dissolved organic matters are precipitated, leaving a clear liquid to run off. But these methods still leave about one-half of the organic matter therein. Many such cases of chemical purification are found in Europe, and in our country we can name Worcester, Mass., and the World's Fair at Chicago as the best instances.

What system of disposal to select, particularly when a sufficient quantity of the proper sand cannot be had, is often a difficult question. The expense of precipitation is often a serious objection to its use, and the cost of a long outfall sewer to some large water course, where a discharge is permitted without purification works, may also be great. But, whatever may be the expense, a proper solution should be found, and it may be well to consider that the time is certainly approaching here, and has already arrived in some European countries, when sewage must be purified before it is discharged into a stream. Therefore no plans for a sewerage system should be adopted without due consideration of a future, as well as a present, proper disposal of the sewage.

An International Sanitary Exhibition was opened at Paris on June 1, and will continue until September 15. It is being held in the Palais des Arts Liberaux, Champ de Mars. Among the ten divisions of the exhibition are the hygiene of dwelling-houses, municipal hygiene, industrial and professional sanitation and demography, and sanitary statistics. One reason for holding an exhibit of this sort just at this time is said to be the fact that the whole sanitary drainage of the city of Paris is to be remodelled during the next three years, which makes it desirable to give engineers, architects and others interested an opportunity to see the modern sanitary appliances of other countries.

*Abstract from an article by Rudolph Hering in the Engineering Magazine.

*Biennial report of the Taxing District (Memphis), Shelby County, Tennessee, January 1, 1889.