MUNICIPAL DEPARTMENT

THE OXYGEN SEWAGE - PURIFICATION SYSTEM.

The town of Halifax has had the honour of being the first community in England to give a trial to the oxygen system of dealing with sewage, which has hitherto, says the Contract Journal, only been in active operation in certain public buildings in Ireland. The principle of the process, which is the joint invention of Mr. W. E. Adeney, F. I. C., curator in the Royal University of Ireland, and Mr. W. Kaye Parry, M.A., A.M.I.C.E., M.I.C.E.I., lies in the utilisation of the action of specific micro-organisms. The theory of the authors of the scheme is shortly this. These saprophytic organisms are those which live on dead organic matters, the germs of which occur practically everywhere—in air, in water, and in ordinary soil. They will quickly grow and multiply in water-carried sewage, and these micro-organisms will bring about the oxidation of sewage matters and change them into harmless forms, provided that two conditions essential to their healthy life process are maintained in the liquid sewage during their activity. These conditions are—a continuous and ample supply of air to all parts of the said liquid, to afford the necessary oxygen to the organisms during their life processes, and also the preservation of the liquid in a neutral or slightly alkaline condition during the activity of the organisms. These conditions being maintained, the organic matters contained in water-carried sewage undergo two distinct stages of chemical change. During the first of these stages the organic matters suffer a complete alteration, and are mostly entirely converted into carbonic acid, ammonia, and water, only a small quantity of organic matter remains in solution at the completion of this stage, and it has been oxidised and so much changed in character from that of the matters originally present in the sewage that it is no longer of danger to health; it is, in fact, similar in character to peat and to the humus of ordinary soil. The next stage of change which follows proceeds much more slowly. During its progress, the ammonia originally present in the sewage, and that formed during the first stage of change, is gradually converted into nitric acid. Such is the theory of the inventors as it is proposed to put it into permanent practice in Halifax. Up to a certain stage the purifying process runs on the lines of the ordinary sewage-farm system, but, instead of the liquid sewage being filtered over land, it is conveyed to another tank and treated with nitrate of soda, the third and last of the chemical processes. This tank is cylindrical in shape, and built on the Dortmund principle. In its center is a pipe, down which the liquid passes, the object being to allow of the subsidence of any solids in the water as it again rises to the surface. The use of the nitrate of soda is, it is stated, to supply oxygen to these micro-organisms in the liquid which will enable them to exist until they finally complete their work of destroying by the process of oxidation and reduction to simple, harmless substances of whatever sewage may remain in the water after its treatment. Briefly set forth, the advantages claimed for the oxygen system are—a perfectly harmless effluent, obtained without the expense of land treatment or filtration; less sewage sludge, and a better and more portable manure; great economy with regard to chemicals employed; simplicity and inexpensiveness of the purification process; smallness of the space occupied by the works, and absence of filter-beds; the dispensing with, in many cases, the pumping required by any other process; comparatively favorable capital outlay on works; facilities for dealing with flood water, the liquid accommodating itself automatically to the great variation in the rate of flow; the facility for future development to meet the demands of increasing population; an entire absence of offensive odors; and the adaptability of the system to the purification of the sewage of large and small centers of population no less than to institutions and isolated buildings.

STORM WEATHER.

In a recent paper Mr. Arthur N. Talbot impressed upon the Illinois Society of Engineers and Surveyors the necessity of more careful and systematic study of storm-water difficulty in connection with sewerage schemes. The amount of storm water depends upon four principal conditions—amount of rainfall, character of surface and sub-soil, slope of surface and general inclination of whole drainage area, and position of the streams and shape of the district. Data as regards rainfall is most inadequate. As a rule it is deemed sufficient to record the monthly average, and probably the daily maximum. A rainfall of 6 inches in a day may give 3 inches in one hour, or even two inches in twenty minutes. In either case most sewers would be severely taxed. A heavy yearly average may be made up by a constant drizzle, while a very low yearly average may be made up by two or three tremendous downpours. Therefore a self registering rain gauge is a necessity to municipal engineers. After considerable study and observation the reader of the paper compiled all the rainfall records available, and drew up two curves, one being of rare and the second of ordinary rainfalls. He briefly summarises the results as follows: The equation of a rare rainfall is $y=\frac{6.0}{x\times 0.5}$, where y is the rate of rainfall in inches per hour for the duration of storm x expressed in hours. This rate is probably not exceeded once in fifty years. The equation of ordinary maximum is $y=\frac{1.75}{x\times .25}$, using the same nomenclature as before. Storms reaching values given by this equation will occur at a given point two or three times in ten years, and so the equation is of great value for use in proportioning sewers. The whole rainfall does not reach the watercourses or sewers. Moreover as a rule, 60 per cent. of a downfall finally reaches the watercourse, only 40 per cent. will reach it in the time which it took to fall. It is safe to assume that in cities the flow will be 1 for roofs and 50 to ·40 for streets, courts, etc. Suburban districts will give ·30 to ·40 of the rainfall if paved and sewered, but if only sewered and not paved probably not more than ·20. The actual rate of rainfall causing the maximum discharge from a given district will be the rate of rainfall which may be expected for a time equal to that necessary for the storm water from the remotest part of the drainage area to flow to, and through the sewer to the point under consideration. The intensity of the maximum storm will be considerably less for a long area than for a square one, though topographical features may modify this. For an average district the ratio of the length in feet to the square root of the number of acres is from 300 to 360, for a compact district from 200 to 250, for a long district about 500. The formula of Mr. Math for determining the flow of storm water is much used in America. It is as follows: storm water in cubic feet per second per acre $=fr\left(\frac{S}{R}\right)$ 1/5. S is the mean surface grade through the drainage area in feet per 1,000; R is the drainage area in acres; r the rate of rainfall in inches per hour "*during the period of greatest intensity*"; f a co-efficient ranging from ·31 in rural districts and suburbs to ·75 in well-built cities, with ·62 as the mean value. But this formula, and those employed in Europe, do not take into account the shape of the area, which may often lead to mistakes.

THE DISPOSAL OF REFUSE IN BIRMINGHAM.

A very excellent example is given by the sanitary authorities of the city of Birmingham in the well systematized way in *which the garbage of that great city is* disposed of in such a way as least to endanger the public health. Mr. Shaw, in dealing with the subject in his "Municipal Government in Great Britain," gives a full description of the plan adopted in Birmingham. Here an especially designed ash-tub is supplied to each house for the reception of kitchen and other solid refuse, as well as ashes. The contents of these are removed periodically, and taken to one of the receiving stations, of which there are several, to all being assigned a position on one of the canal wharves. Here the coarser refuse is committed to furnaces, which number some fifty in all. Of the rest, of some a mixture is made, constituting a fertilizer which is promptly removed by means of the canal boats and sold to farmers, while for the most part it is turned into a dry-powdered fertilizer in special evaporating machines, worked by the heat generated by the burning of the coarse refuse. Of the latter, what remains after the action of the incinerators is a quantity of "clinkers," used for road mending and making and for concrete and mortar. The extensive canal system of Birmingham naturally is a great aid in the establishment of so complete an organization by the Health Department. Many boats are possessed by the sanitary authorities for the constant removal of the manufactured fertilizers.