He proposes in the first place briefly to refer to the systems in use in some of the principal English and American towns. A few years ago information was kindly furnished to him by the municipal engineers of upwards of sixty of the principal towns in the United Kingdom, and of several important towns in Canada and the United States, from which it appears that the methods adopted in various towns differ considerably, even in cases where the local conditions are somewhat similar.

For example, we find that Belfast adopted a system of ventilation at the surface of the streets somewhat similar to that already described in relation to the city of London, Birmingham a combination of surface grids and high ventilating shafts, Bristol practically unventilated sewers, and Leicester ventilation by openings at the street surface, superseded by high shaft ventilation.

The cities of Buffalo, Chicago, Detroit, Minneapolis, Philadelphia, Washington, Boston (U.S.), and Toronto adopted surface ventilation with—it is alleged—fairly satisfactory results, the house drains being cut off from the sewers by intercepting taps in seven out of the eight cities named.

Of the sixty towns in England from which information has been derived, we find that eight towns adopted ventilation by surface grids only; five, a complete system of trapped house drains; four, untrapped street gullies; twenty, surface ventilation supplemented by high shafts; twenty-three, a combination of surface inlets and high shaft outlets; four, trapped drains, and sewers ventilated by high shafts only. The sizes given of the ventilating pipes and shafts vary from 4 in. to 12 in. in diameter, according to the size of the sewer. These are usually placed about 150 yds. apart, and in the majority of cases they are fixed against buildings.

In one town the ventilating shafts are supplemented by brick structures 42 ft. in height, with a sectional area of 9 sup. ft.

Bristol.—The method adopted at Bristol is of special interest, as that city is an exception to the rule prevailing elsewhere, being the only large town in England in which no attempt has been made to ventilate the sewers systematically, but the author is informed that the sewer workmen in that city have met with no accident due to poisoning, suffocation, or explosion for many years, although the sewage is combined with trade refuse from breweries, soapworks, tobacco manufactories, cocoa works, tanneries, and so on. The death-rate also compares favorably with that of other towns of similar size and character, being 12.71 per 1,000 in 1911.

In one town, where the brewing industry forms a large proportion of the trade, the sewers are ventilated by connections with tall chimneys. Surface ventilators are not used owing to the objectionable smell arising from the brewery refuse, and the sewers in the residential portions of the town are not directly connected with the main drainage system; sewers in the residential areas are ventilated by high shafts. In another town situated on the South Coast of England the sewage is practically free from trade refuse, but considerable difficulties have been experienced in dealing with the emanations from sewer ventilators, and many methods, such as open gratings, tall shafts, specially devised surface grids and cremation by lamp ventilation, have been tried to obviate the nuisance, but these systems have been found unsatisfactory and discarded, either wholly or partially.

Taking as another example a fashionable residential town in the South-West of England, where the sewage is mainly of a domestic character, there are no surface ventilators, only a comparatively few ventilating shafts being in use; all modern house drains are trapped, and complaints of nuisance are seldom made. Another example will be found in a residential town of about 50,000 inhabitants not far removed from the place last referred to. There is no system of sewer ventilation, the sewage is of a domestic character, the house drains are trapped. Some of the sewers have flat gradients and flushing is resorted to. The public health and death-rate compare favorably with other towns of the same size and character.

In forty-seven of the towns previously referred to the flushing and cleansing of the sewers is systematically carried out. In eleven the sewers have little fall; in four the falls are considerable; in thirty-two the gradients vary; in seven the sewers that have flat gradients are flushed. In six (some of the latter being of considerable size) the sewers are not flushed.

In most of the American towns from which information has been received flushing is systematically carried out.

From the foregoing remarks it will be seen that the modern practice regarding sewer ventilation in England varies greatly, and where ventilation on a uniform system has been attempted the methods adopted have in most cases been subsequently modified to meet the difficulties that have arisen. When nuisance has been experienced by smell from ventilators terminating at the street surface, the remedy most generally adopted by English engineers has been the substitution of vertical shafts fixed in suitable positions and supported by buildings or independently. This arrangement affords a better diffusion of the gases emanating from the sewers, and frequently obviates the complaints by transferring the nuisance from the surface of the streets to a higher point, but it cannot be accepted as a satisfactory solution of the problem. In the city of Manchester the tramway standards have for some years past been utilized as sewer ventilators, and the results have been fairly satisfactory.

Air Currents in Sewers.—The direction and velocity of the flow of air in sewers have been carefully investigated for a period of upwards of sixty years in several towns in England, commencing with the well-known series of experiments conducted in the city of London under the direction of Lieut.-Colonel Haywood about the middle of the last century.

Temperature observations conducted by the author in London and in Manchester show that the conditions in winter and in summer are reversed, the air in the sewers being warmer than the external air in winter and cooler in summer. These conditions, however, vary largely with climate and the character of the sewage, and the latter varies materially in different parts of some large towns where manufactories predominate. Some twenty-five years ago the author made an investigation of air currents in sewers and in pipe ventilators. A number of metal and earthenware pipes varying in diameter and in height were erected; some were placed vertically, both with and without bends, others were erected at different angles for the purpose of experiment. It was found that each pair of right-angle bends diminished the efficiency of an ordinary 4-in. metal pipe in calm weather by from 7 to 10 per cent., but this was largely varied when there was wind. The experiments were carried on continuously for eight months, and the pipes were afterwards used for ascertaining the extracting value of different kinds of cowls. Some of the cowls tested were found useful under certain conditions in preventing down draught, and some of them increased the up current in windy weather.

In experiments on two 30-ft. lengths of 4-in. cast-iron ventilating pipe of heavy section is was found that under favorable conditions the heat of the sun's rays was sufficient to alter the direction of the air currents in a length of 76 ft. of 6-in. diameter house drain, laid with a fall of 1 in 45. One pipe experimented upon was exposed to the southeast and the other to the northwest. With three exceptions the pipe exposed on the southeast was the upcast shaft in the earlier part of the day and the downcast shaft shortly after