The London by-laws regulating drainage are very full and are strictly enforced. They include requirements regarding the size, form, gradient and methods of construction and repair of drains, together with regulations affecting the design and fixing of traps, fittings and other apparatus connected with sanitary arrangements. Some of the headings of the different clauses of the by-laws are subjoined:—water-closets; earth-closets; drainage of subsoil; drainage of surface water; rain-water pipes; materials, &c., for drains; size of drains; drain to be laid on bed of concrete 6 in. thick; if under buildings to be encased with 6 in. of concrete; drain to be benched up with concrete to half its diameter; fall of drain; joints of drain; drain to be water-tight; thickness and weight of iron pipes; thickness of sockets and joints of stoneware pipes; drains under buildings; composition of concrete; every inlet to drain to be trapped ; drain beneath wall to be protected by arch, flagstone, or iron lintel; drain connected with sewer to be trapped and means of access to trap provided; no right-angled junctions to be formed either vertical or horizontal ; at least two untrapped openings to be provided for ventilation, each fitted with a grating or cowl with apertures for passage of air equal in area to that

of the pipe to which it is fitted; ventilating shafts to be at least 4 in. in diameter, and if possible all bends and angles to be avoided; ventilating shafts to be of the same material, construction and weight as soil-pipes; no unnecessary inlets to drains to be made within buildings; waste-pipes from sinks and lavatories to be of lead, iron or stoneware, trapped immediately beneath the fitting; bell traps, dip traps and D traps are prohibited ; waste-pipes to discharge in the open air into a properly trapped gulley; soil-pipes wherever practic­able to be situate outside the building and to be of drawn lead or heavy cast-iron; if fixed internally the pipes to be of lead with wiped joints; iron pipes to have socket joints not less than 2½ in. in depth and to be made with molten lead or flanged joints securely bolted with some suitable insertion; the soil-pipe not to be con­nected with any rain-water or waste-pipe, and no trap to be placed between the soil-pipe and the drain; the soil-pipe to be circular with an internal diameter of not less than 3½ in., and to be taken up above the building and its end left open as an outlet for foul air; methods of connecting a lead pipe with an iron one; connexion of stoneware and lead, connexion of iron and stoneware; ventilation of trap of water-closet with an anti-siphonage pipe of not less than 2 in. diameter and ventilated into the open air or into the soil-pipe at a point above the highest fitting on the soil-pipe ; construction of slop sinks and urinals.

The by-laws respecting health and building in New York City are embodied in a large number of clauses. The more detailed health regulations are found in the Sanitary Code 1903. These are by-laws framed by the Board of Health under the authority of section 1172 of the New York Charter 1897. These must be taken in conjunction with the statute bearing on plumbing in New York City which was

made by the Department of Buildings, 1896, and to which there have been several small amendments. Section 141 of the Building Code also deals with sanitation and in the Tenement House Act 1901, 1902, 1903, chap. 4, secs. 91 to 100 inclusive, deals with sanitary matters. From a general point of view the requirements of the American by-laws as to materials and methods of construction vary in a very slight degree from those in force under the London authorities. It is in the regulations affecting the execution of the work that we find a great difference, and these in New York are of a more stringent character than in any other capital. Thus no sanitary, plumbing or lighting work may be undertaken without first submitting for approval to the Department of Buildings complete and suitable drawings and particulars of the materials to be used. Such a notice is necessary even in the case of repairs and alterations to existing work. As a further guarantee of the work being satisfactory it is ordained that no such work shall be executed except under the superintendence of a registered plumber. Every master plumber in the city of New York or others working therein as such must obtain a certificate of competency from the Examination Board and be registered afresh every year during the month of March, as without such certificate or licence no work can be undertaken; any person violating such requirements shall upon con­viction be fined for each offence $250 or undergo three months’ imprisonment or both, while in the case of any certificated plumber or his employés wilfully breaking, with his knowledge, any of the rules and regulations relating to drainage and plumbing, the certifi­cate of the master is to be forfeited in addition to the aforementioned fine.

II. Conveyance of Sewage.—For small sewers, circular pipes of glazed stoneware or of moulded cement are used, from 6 in. to 18 in. and even 20 in. in diameter. The pipes are made in short lengths, and are usually jointed by passing the end or spigot of one into the socket or faucet of the next. Into the space between the spigot and faucet a ring of gasket or tarred hemp should be forced, and the rest of the space filled up with cement. Other methods of jointing have already been described and illustrated. The pipes are laid with the spigot ends pointing in the direction of the flow, with a uniform gradient, and, where practicable, in straight lines. In special positions, as under the bed of a stream, cast- iron pipes are used for the conveyance of sewage. Where the capacity of an 18-in. circular pipe would be insufficient, built sewers are used in place of stoneware pipes. These are sometimes circular or oval, but more commonly of an egg-shaped section, the invert or lower side of the sewer being a curve of shorter radius than the arch or upper side. The advantage of this form lies in the fact that great variations in the volume of flow must be expected, and the egg- section presents for the small or dry-weather flow a narrower channel than would be presented by a circular sewer of the same total capacity. Figs. 25 and 26 show two common forms

of egg-sections, with dimensions expressed in terms of the diameter of the arch. Fig. 26 is the more modern form, and has the advantage of a sharper invert. The ratio of width to height is 2 to 3.

Built sewers are most commonly made of bricks, moulded to suit the curved structure of which they are to form part. Separate invert blocks of glazed earthenware, terra-cotta or fire-clay are often used in combination with brickwork. The bricks are laid over a templet made to the section of the sewer, and are grouted with cement. The thickness of brickwork for sewers over 3 ft. in diameter should not be less than 9 in , but for smaller sewers laid in good ground at depths not exceeding 20 ft. from the surface a thickness of 4½ in. will suffice if well backed up with concrete. The thickness of brickwork for a