after shaving, the bright ends are smeared with grease or tallow to prevent them re-tarnishing and to act as a flux (to assist fusion between the solder and lead). The pipes are now ready for soldering. The solder is applied either by pouring or splashing it on from the ladle (M, Fig. 76) or by using the blowlamp (A, Fig. 76) and a strip of solder (see p. 143). The former method is only adopted in certain districts for joints made on the bench and the latter for joints made on the job. Incidentally, the City and Guilds of London Institute do not permit the use of the blowlamp in connection with their practical examinations in Plumbing. When the "ladle" method is adopted, the solder is melted in the pot (U, Fig. 76) to the required temperature (denoted when the solder ignites a piece of paper), and after the pipes have been accurately adjusted the solder is poured from the ladle on to the prepared ends until the temperature of the pipes at the ends is approximately that of the solder; the latter is then wiped round the joint with a wiping cloth (Z, Fig. 76), the surface of which has been greased to prevent the solder adhering to it; additional solder is splashed on and quickly worked with the cloth until the desired shape is obtained, when the joint is left undisturbed and allowed to cool. On large joints, and especially if awkwardly placed, the blowlamp may be used to heat the solder if this has partially set before the joint has been completed. When the "blowlamp" method is adopted, the prepared ends of the pipes are fitted together and heated by the flame of the lamp; solder is applied by melting one end of a strip, and is gradually brought to the required shape by use of the cloth; during the wiping operation, the heat is applied intermittently until sufficient of the plastic solder is being manipulated, when a final sweep is made with the cloth and the joint is left to cool.

Proportions of a Soldered Joint.—The thickness of the solder at the widest part of the joint need not exceed one and a half times the *thickness* of the pipe (see A'). An excess of solder, besides being uneconomical, does not necessarily increase the strength of the joint, and a short bulging joint does not look well. The length of the joint varies with the size of the pipe and the following is considered to be satisfactory: 3-in. long for pipes up to $\frac{3}{4}$-in. internal diameter, $3\frac{1}{4}$-in. long for 1 to $1\frac{1}{2}$-in. diameter, $3\frac{1}{2}$-in. long for 2 to 3-in. diameter and $3\frac{3}{4}$-in. long for pipes up to 4-in. diameter.

Taft or Copper-bit Joint (see B', Fig. 75).—This is only used for inferior work and where the pipes are not required to withstand much pressure, as for overflow and gas pipes.

The preparation of the ends of the pipes is similar to that for wiped joints, except that the lower pipe is opened wider, the amount of shaving is reduced and the soil is often omitted. A little powdered resin is applied to the scraped surfaces after the ends are fitted together, and this acts as a flux for the "ordinary" solder (consisting of equal parts of lead and tin) which is in the form of a thin narrow strip. The solder is melted by the heated copper-bit (N, Fig. 76) or other means until sufficient is run to fill the space between the two pipes, as shown. Alternatively, the solder may be melted by a small blowlamp (the flame of which is blown on to the solder held over the joint by the plumber applying his mouth to a small tube the open end of which terminates at the flame) or the type of blowlamp illustrated at A', Fig. 76, the latter being especially useful for larger pipes; the joint is then known as a *blown joint*.

RAIN-WATER GOODS

Rain-water goods include eaves gutters (or spouts) and rain-water pipes (or down-pipes, fall-pipes, down-comers, down-spouts or stack-pipes). They are made of cast iron, lead, asbestos-cement and enamelled iron.

Details of cast iron gutters and pipes are shown in Fig. 75 and an application is shown in the perspective sketch.

EAVES GUTTERS

Eaves gutters are provided with a *socket* (or *faucet* or *flange*) which receives the *spigot* end of the adjacent length. These are generally "outside" sockets (see A, B, D and Y), although "inside" sockets are also provided (see Y). As shown at B, the maximum length is 6-ft., *excluding* the flange which is from $1\frac{1}{2}$ to 2-in. wide; shorter lengths can be obtained, and where necessary pipes are reduced in length by means of the saw. They are made of various shaped sections, *i.e.*, half-round, deep half-round, ogee, etc. A deep half-round gutter is shown in section at E and in oblique projection at A, B and D; this is a very good form, being simple and of satisfactory appearance, and it can be readily painted both inside and out and so preserved; it is sometimes provided with a bead along its outer edge similar to that shown in the middle section at H. Other moulded forms are shown at H; the disadvantage of these is the backs are inaccessible for painting if and after they have been fixed to the wood fascia boards. They are moulded in numerous stock sizes, thus the half-round gutter is obtainable in sizes varying from 4-in. by 2-in. to 12-in. by 6-in. Note that these sizes are *external* sizes (see E and H). The thickness is $\frac{1}{4}$-in. ("extra heavy grade"), $\frac{3}{16}$-in. ("heavy grade"), $\frac{3}{16}$-in. ("medium grade") and $\frac{1}{8}$-in. ("ordinary" or "light castings"); the latter is used for cheap work, the medium grade is used for average good work, and the two heavier castings are only specified for special work.

Special Fittings.—These include external and internal angles (see A), stop ends for sockets (C), stop ends for spigots, outlets with nozzles or drops cast on (D) and union clips (G), the latter being used to connect two spigot ends.

Supports.—Eaves gutters are supported by wrought iron brackets, generally two being required per 6-ft. length. That shown at M, Fig. 75, is twice screwed or nailed to the backs of spars (see also W and Y, Fig. 36, A and D, Fig. 38, and D and H, Fig. 69). That at O, Fig. 75, is twice screwed to the sides of spars (suitable for the type of eaves shown at X, Fig. 36). The two shown at N, Fig. 75, are screwed to wood fascias and are called "fascia brackets" (see Q, Fig. 36, and L, Fig. 69), and that shown at Q, Fig. 75, is suitable for fixing direct to stone walls where the pointed end of the bar is driven into the bed joint and the curved bracket is adjusted to the required height by means of the nut and back or lock-nut which are screwed to the rod fixed to the bracket. Whilst these are suitable for half-round sections, similar brackets curved to the sections shown at H are also obtainable.

Joints.—A section through an outside joint is shown at Y, Fig. 75. The jointing material is red lead mastic or putty (powered red lead mixed with linseed oil) and is applied to the inside of the socket after the gutter is placed in position on the brackets; the spigot end of the adjacent pipe is placed into the socket, the wrought iron *gutter bolt* is inserted and the nut is tightened by applying a screwdriver at the countersunk head of the bolt until the head is flush with the inside of the gutter; this squeezes out any excess of mastic and this excess is