wise gases from the drain will ascend and gain access into the building at the eaves. Some prefer the fall pipes to be discharged below the gratings of gullies for the reason that overflowing does not result if the former are choked with leaves, etc.; many authorities will not permit of this practice and insist upon the pipes discharging *over* gullies. As traps may become unsealed by evaporation during hot weather, it is advisable that water be poured down them occasionally during such prolonged periods.

All gullies must be fixed outside a house. In order to comply with this requirement in connection with a basement, it may be necessary to construct a small area (at least 2-ft. 6-in. wide for access) adjacent to an external wall, in the concrete floor of which the gully is fixed.

Applications of gullies are illustrated in Figs. 30, 31 and 32.

Intercepting Traps or Disconnecting Traps or Interceptors.—One of several types of this ware trap is shown at M and P, Fig. 28, and a similar trap is shown at B, Fig. 30. The seal increases from 2½-in. for a 4-in. interceptor to 3-in. for 6-in. and 9-in. traps. The trap is fixed in an intercepting chamber (see Fig. 30), and its object is to intercept the sewer gases from the drainage system. Its adoption is becoming less frequent, and its merits and demerits are discussed on p. 82.

MANUFACTURE OF DRAIN PIPES AND TRAPS.—The processes vary according to the class of clay and the plant available, but, as in brick manufacture, they are divided into the preparation of the clay, moulding, drying and burning.

The clay is finely ground and screened as described on pp. 2 and 3. Grog (or powdered burnt clay—see p. 3—or crushed burnt and damaged pipes) is added to the clay to reduce the shrinkage, some clays requiring 25 per cent. of this material.

Straight Pipes are moulded by machinery, which is of both the vertical and horizontal type. The former consists of a long fixed vertical metal outer cylinder having its lower end enlarged and shaped to the reverse of the exterior of a pipe socket, an inner fixed core with an annular space between it and the cylinder, and a disc or socket head (at the bottom of the core within the enlarged cylinder base) attached to a table which can be raised and lowered. The diameters of the cylinder, core and socket head are equal to the size of the pipe (see C, Fig. 28), plus shrinkage allowance.

After the base of the outer cylinder has been clamped to the table, the prepared clay of required stiffness is forced down the annular space by means of a steam ram until it has been sufficiently consolidated. It is thus the shape of a pipe, having a socket and an elongated barrel. The clamp is released, the table with socket head is lowered, and, assisted by the downward pressure of the ram, the hollow cylindrical shaft of clay is extruded and cut to the required length by means of a wire.

The pipe is removed from the socket head (which is then sprayed with oil before the table is raised ready for moulding the next pipe) and placed, with its socket uppermost, over a vertical core or mandrel fixed to a revolving table. The socket is trimmed and the grooves are formed either by a machine which is lowered into the socket, or by a comb held in place by hand, as the pipe revolves. It is then placed over a horizontal core where it is cut to correct length and the spigot grooved, the latter operation being performed by a small pivoted arm which is impressed into the clay as the core rotates.

After moulding, the pipes are wheeled and placed vertically on the drying floor and gradually dried in a temperature of 80° F. for one or two days.

They are then taken to the kiln, which is generally of the circular down-draught type (see p. 6). The pipes are carefully stacked vertically upon their sockets, one above the other, to a height of from 8 to 12-ft. The heat is gradually applied until a maximum temperature of about 250° C. is reached; this is known as the vitrification stage. The pipes are now glazed, the operation being called *salting*, as common salt (chloride of sodium) is used for this purpose. The amount of salt added varies, but a shovelful of salt thrown through each firebox four times during the salting period is usual. The heat volatilizes the salt, and the sodium combines with the silica of the clay to form the characteristic brown glazed surface coating. The inside of the sockets and the outside of the spigots are unglazed (except the spigots of the top pipes) as these are covered in the stacks, and thus a better key for the jointing material is obtained. Burning may occupy from three or four days, and cooling, which must be carefully controlled, takes the same time.

Junctions are made from straight pipes moulded as described in the preceding column. Thus, a small socketed piece required for an arm of a junction is cut from a freshly moulded pipe, its end is shaped by hand (or by a special machine), the cut edge is covered with liquid clay and fitted on to a recently moulded pipe. On the following day the required hole in the latter pipe is cut at the joining of the arm, trimmed with a knife and smoothed over with the fingers.

Bends are formed either by a machine, to which various dies can be fitted, or by hand. If the latter, a straight pipe as it emerges from the machine, is bent to the approximate radius, and then fitted over a core of the correct shape and trued up by hand.

Channels.—Two half-round channels are obtained from a whole green pipe. The latter is placed in a plaster-of-Paris mould which is half-round in section and the length of a pipe, and it is divided longitudinally by a piece of wire drawn along the top edges of the mould. The cut edges are then trimmed.

A three-quarter channel bend, such as is shown at G, H and J, Fig. 31, consists of a half-round channel bend (obtained by dividing a green radius bend) together with a length cut by hand to the required shape. These are stuck together with liquid clay and the joint neatly trimmed off.

Traps are moulded by hand in moulds made of plaster of Paris. Two moulds are required per trap. Each mould is shaped with its internal surface the reverse of the exterior of the trap to be moulded. Thus, for a gully such as that at T, Fig. 28, the moulds would be shaped to the exterior shown in section Q. A clot of prepared clay is flattened to the required thickness, and this is taken by the moulder who works it into the mould to the desired shape. When the two pieces have been moulded in this manner, the two moulds are brought together and clamped by bands of hoop iron. When the clay has sufficiently set, the moulds are removed and the junction is neatly trimmed and smoothed off. Interceptors are hand-moulded in a similar manner.

Junctions, bends, channels, traps, etc., are dried, burnt and salt-glazed as above described.

Whilst most channels are salt-glazed, they are sometimes required to be *white glazed* or *enamelled*. Enamel consists of powdered flint, china clay, powdered zinc, etc., well mixed together and water added to form a slurry. Glaze is a somewhat similar mixture with the addition of whiting, felspar and soda. The channels must be thoroughly dry before the enamel is applied. In best work three or four coats of enamel are first brushed on the internal surface and edges of each channel, and this is followed by two coats of glaze. This film is fused when the channels are heated in the kiln and forms a hard, durable, impervious and white coloured surface.

CHARACTERISTICS OF WARE PIPES.—A sound pipe should be well glazed and burnt throughout, straight in the barrel (twisted or warped pipes cannot be properly jointed), truly cylindrical, smooth, and free from cracks and blisters. It should ring sound when struck with a hammer. Requirements of the British Standard Specification, No. 65—1937, include: (1) the variation in thickness of the barrels and sockets of 4 and 6-in. pipes shall not exceed $\frac{1}{16}$-in., (2) the deviation from straightness of a 2-ft. long barrel shall not exceed $\frac{11}{16}$-in., and (3) the deviation of the internal diameter of 4 and 6-in. pipes shall not exceed $\frac{1}{8}$ and $\frac{11}{16}$-in. respectively.