are typical of those required in the construction of bay windows. The number of joints could be reduced, and greater strength therefore obtained, if purpose-mades were used instead of cut standard bricks.

An example of a *detached octagonal pier* is shown by plans of alternative courses at L, and an *attached octagonal pier* is detailed at M. Other polygonal forms, especially the hexagonal, are sometimes preferred. These may be constructed of standard bricks, cut to shape as required, but a better appearance is, of course, obtained if purpose-made bricks are used. Two further examples of detached piers are shown at R, Fig. 24 (see p. 64).

## CAVITY OR HOLLOW WALLS

This type of construction is now very common and, for the reasons stated on pp. 43 and 44, is generally preferred to solid wall construction for many types of buildings, especially houses. Cavity walls are detailed in Figs. 13 and 14.

A cavity wall is usually an external wall, although it is sometimes adopted internally because of its good sound-resisting quality (see p. 49, Vol. III). It consists of two separate walls, known as *leaves* or *skins*, of brickwork, having a cavity between, and connected together by metal ties. This double wall is generally 11-in. thick, consisting of 4½-in. inner and outer leaves and a 2-in. cavity (see A, Q and P, Fig. 13). Such a wall is adequate for a two-storied building of the domestic type. The *inner* leaf is increased to 9-in. or more in thickness when heavier floor, etc., loads have to be supported (see J, Fig. 13 [1]). For stone-faced buildings, the double wall may consist of a cavity between a 4½ to 9-in. stone outer leaf and a 4½-in. or thicker brick inner leaf (see p. 44).

The width of the cavity varies from 2 to 3-in., the latter being the maximum width specified in the Model Byelaws, 1939.

TIES.—These must be sufficiently strong for the purpose, be non-corrodible and so shaped that water from the outer leaf will not pass along them to the inner leaf. The metal ties are usually of wrought iron or mild steel, and these should be thoroughly galvanized or dipped in hot tar and sanded to protect them from rust. Either copper or bronze or similar durable and highly corrosive-resistant metal ties should be selected for important buildings and those near the sea.

Three types of cavity ties which are made of any of these metals are shown at F, G and H, Fig. 13. The wire tie at F is commonly used, and, provided it is of sufficient gauge, is a useful type ; the ends, which are twisted together and turned downwards, cause any water travelling along the tie from the outer leaf to drip into the cavity (see J) clear of the inner leaf ; in addition, large accumulations of mortar droppings, which are a frequent cause of dampness (see p. 42), do not readily lodge on the ties as the wire is comparatively thin. The wire should not be less than 10 Birmingham Wire Gauge (known as " tens " and equivalent to 0·134-in. diameter) ; lighter gauge ties (of 12 B.W.G., termed

[1] *See also* J, N *and* R, *Fig. 7, Vol. III.*

" twelves " and equivalent to 0·109-in. diameter) are used for cheap work only. A similar pattern, of narrow flat bar section with twisted ends, is shown at H, and is a good type. The flat bar tie shown at G, having forked ends and twisted in the middle, has been used for many years, and affords a stiff and durable connection. Cast-iron ties and hollow glazed stoneware block ties are now very rarely employed.

According to the Model Bye-laws, 1939, these ties must be placed at distances apart not exceeding 3-ft. horizontally and 1-ft. 6-in. vertically, which is equivalent to two per square yard. The ties are staggered and the distribution is as shown at E. Ties should be placed at 1-ft. 6-in. vertical intervals at all angles and door and window jambs to increase stability (see Q and L, Fig. 13 ; E, Fig. 11 ; and D, Fig. 15).

CONSTRUCTION.—A cavity wall is often built with the outer leaf of facing bricks and the inner leaf of commons. No difficulty arises if the facings are thinner than the commons, as the ties are placed at vertical intervals (not exceeding 1-ft. 6-in.) where the bed joints of both leaves approximately coincide. The 4½-in. leaves are commonly constructed in stretching bond. As this has a very unattractive appearance, the monotony is sometimes relieved by constructing the external leaf with a row of snap headers (half bricks) to three or five rows of stretchers (known as *English Garden Wall Bond*, see A, Fig. 18). Alternatively, the outer leaf may be built in Flemish bond or *Flemish Garden Wall Bond*, shown at B, Fig. 18, and A, Fig. 44, snap headers and not whole bricks being used as required. The cut surfaces of these snap headers should be flush with the internal face of the outer leaf.

Two methods of constructing the base of the wall are shown at A and P, Fig. 13. Brick footings are rarely employed. Method A, showing the cavity extending down to the concrete foundation, is common. This has one possible defect, namely, if the brickwork below the ground level is not soundly constructed, especially if the site is water-logged, water may pass through any open joints, collect in the cavity and escape through open joints in the inner leaf, to cause dampness below the floor by spreading over the site concrete. A sounder method, and one which is advocated, is that shown at J and P, where the bottom of the cavity is 3 to 12-in. below the damp proof course. Rain-water gaining access to the cavity through the outer leaf will stream down the inner face of this leaf. This should be prevented from accumulating at the base by providing narrow outlets or *weep-holes* in the course immediately below the damp proof course in the outer leaf, each third or fourth vertical joint between the stretchers being left open and not filled with mortar, otherwise the water may penetrate the brickwork above the damp proof course and cause dampness on the internal face of the wall. See note at J, which shows the detail at the foot of a 15½ or 16-in. cavity wall. The lower portion of the cavity when continued to the concrete bed is sometimes filled with 1 : 2 : 4 concrete, the coarse aggregate being not more than ¾-in. gauge. The top of this concrete should be at least 3-in. below the damp proof course and *not* as shown at F, Fig. 14, otherwise