districts, the usual backing is rubble (see D, Fig. 25), otherwise the backing is generally of brickwork (see Fig. 24).

It is essential that the facing shall be effectively bonded with the backing, and if the latter is of brickwork, unnecessary cutting of the bricks must be avoided. Effective bonding results and wastage of bricks and labour in cutting avoided when: (*a*) the ashlar courses are alternately 4½ and 9-in. thick on bed, (*b*) the thickness of the backing is a multiple of half-bricks and (*c*) the height of each course of ashlar conforms with the combined height of the brick courses and the thickness of the bed joints.

On account of the thin mortar joints of the ashlar and the larger number of bed joints of the backing, it is necessary that the latter joints shall be as thin as possible so as to guard against unequal settlement. Cement mortar is frequently used for the backing; if the facing is of Portland stone, care must be taken to prevent the cement from working through and discolouring the face of the ashlar, and it is for this reason that the back of each ashlar block is covered with lime mortar (consisting of 1 part *grey* lime and 2 parts sand). Black mortar should not be used for the backing as this has been known to stain Portland-stone facing.

So as to ensure the ashlar vertical joints being completely filled with mortar, a vee-shaped notch is usually formed in each vertical joint surface so as to form a square hole between each pair of adjacent blocks. In constructing ashlar, mortar is spread on the front edge of the vertical surface (about 2-in. wide) of the last fixed stone; the adjacent stone is then placed in position, the back of the vertical joint is pointed with the mortar, and liquid mortar (grout) is poured down the hole to form a *joggle* so as to fill completely the space between each pair of stones (see Plan AA, Fig. 24, and N, Fig. 26).

The complete beds of the ashlar blocks shall be square with the face. If a bed is "worked hollow" (*i.e.*, the surface is brought below the outer edge of the stone to form an equivalent to a frog of a brick) there is a danger of the pressure being concentrated on the outer edge, causing the stone to crack and splinter off or spall (see p. 52 and X, Fig. 27).

Fig. 24 shows a portion of a building which is faced with ashlar backed with brickwork. Most of the ashlar courses are of uniform height and (excepting where the work is interrupted by windows) are alternately 9 and 4½-in. thick on bed. This permits of a brick backing consisting of alternate sections which are 9 and 13½-in. thick respectively. The plan at AA shows the special bonding in alternate courses owing to the presence of the door and window openings. The splaying of the back of the outband (see below) at O is often done to avoid continuous vertical joints.

The bonding of the quoins (sometimes called *scuntions* or *scontions*) should be noted, where the 9-in. thick courses are continued to the return face. An unsatisfactory appearance, indicating weakness, would result if the 4½-in. thick courses were to show on the return face.

The diagonal lines and the ringed figures shown in the elevation indicate the extent and amount of bed respectively of each stone. This conforms with the usual practice, the diagonals being especially necessary when cornices, etc., comprise two or more stones in height.

The plan at B and the sketch D, Fig. 25, show the wall faced with ashlar with a backing of rubble.

Door and Window Openings.—As shown in the plan AA, Fig. 24, the jambs are bonded by using alternate headers (called *inbands*) and stretchers (termed *outbands*), the former being rebated to receive the door or window frames. Sometimes the outer edges of these stones are splayed or *chamfered* which may be stopped (see broken lines at R) or may be continued round the head to form intersections called *mason's mitres* (see Fig. 22).

The head of an opening is finished with either a lintel or an arch, and the bottom is completed with a sill.

Lintels or Heads.—These have been described on p. 21.

Arches.—Brick arches have been described on pp. 22-26, and the terms, geometrical construction, etc., there detailed are also applicable to stone arches. The temporary supports used in the construction of stone arches are shown in Fig. 43.

Flat Arches (see H, Q and P, Fig. 24, and A, B, C and D, Fig. 25).—Alternatives of that at H are shown at Q (partly indicated by broken lines and showing the arch equal to two courses in depth) and P, which shows a *stepped extrados*.

The alternatives at A and B, Fig. 25, are called *joggled* or *rebated* arches. That at A shows the keystone with small (about 1-in.) projections at the joints which fit into corresponding sinkings worked on the adjacent voussoirs; the object of these rebates or joggles is to prevent sliding taking place and dropping of the voussoirs. An isometric sketch of one of the voussoirs, with a portion of a reinforced concrete lintel behind it, is given at C. An alternative to arch A is shown at B; this shows *secret joggles* or rebates as they are not seen on the face; the construction is more clearly shown in the sketch at D.

Semicircular Arches (see N, Fig. 24, and J and K, Fig. 25).—That at N shows a stepped extrados. The best appearance is obtained if an elliptical constructional line is drawn and the top of the vertical portion of each joint made to conform with the ellipse. An alternative arch is shown at J where each voussoir has an elongated horizontal portion (called an ear or crossette) which courses in with the wall.

That at K has a semicircular intrados and extrados. This type usually necessitates the cutting of some of the adjacent walling stones to an awkward shape (see W).

Segmental Arches, having either curved or stepped extradoses, are also built of stone. The geometrical construction of these is similar to that required for brick arches (see Fig. 15).

Window Sills.—Reference should be made to the brick sills described on p. 26 as the terms are applicable to stone sills (see Figs. 22, 24 and 25). The sill shown in Fig. 22 is weathered, twice rebated and chamfered; that shown in section L and part elevation M, Fig. 25, would be specified as a "14-in. by 7-in. sunk weathered [1] and throated sill, grooved for water bar," and that at O and P, Fig. 25, is sunk-weathered, moulded and grooved, the upper portion of the mould forming a throat to prevent water trickling down the face of the masonry below. See p. 108 regarding the bedding of the water bar. The level seatings or stools formed at the ends of the sills to support the jambs may be finished

[1] Note that *sunk* weathering begins with a vertical sinking.