

(c) *Axed Brick Flat Arch*.—This is similar to (b) except that its appearance is not so satisfactory as the voussoirs are ordinary bricks cut to a wedge shape as described on p. 24. This type of arch is now used only for common work.

It should be noted that if no cross joints are to be used, the depth of the arch will be less than 9-in., *i.e.*, 6 $\frac{3}{4}$ -in.—see W at A, Fig. 15, where the first voussoir of an axed arch is shown shaded and the 9-in. by 3-in. face of the brick prior to cutting is indicated by broken lines.

SEGMENTAL ARCH.—Half elevations of two varieties of this arch are shown at D, Fig. 15, and an elevation of a third example is shown at C. The geometrical construction for determining the centre for the curved extrados and intrados and from which the bed joints of the voussoirs radiate is shown. There are four varieties of this type of arch, *i.e.* :

(a) *Gauged Segmental Arch* (see F, Fig. 15).—It is constructed of rubbers upon a temporary wood support called a *centre* (see F, Fig. 43). Cross joints may be omitted if desired.

(b) *Purpose-made Brick Segmental Arch* (see E, Fig. 15).—This is similar to the above, except that purpose-made bricks and not rubbers are employed and the thickness of the joints is the same as that of the adjoining brickwork.

(c) *Axed Brick Segmental Arch*.—Whilst this arch resembles (b) its appearance is not so good, as it is constructed of ordinary bricks which have been cut to the required wedge shape.

(d) *Rough Brick Segmental Arch*.—This type consists of one or more half-brick rings which are constructed of ordinary stock *uncut* bricks. An elevation of a two half-brick ringed rough arch is shown at C, Fig. 15. It will be noted that, as the bricks are not cut, the joints are wedge-shaped. Such arches are usually adopted when the appearance is not of primary importance (as for openings in walls which are to be plastered) because of their relative cheapness.

In the example shown, the arch is used to relieve the wood lintel of the weight of the superincumbent brickwork, the lintel being introduced essentially to provide a square head to the opening and, incidentally, a rigid member to which the head of the window may be secured. Such are called *Rough Relieving or Discharging Arches*¹; they are also sometimes referred to as *Jack Arches*. Another form of this arch, known as a *trimmer arch*, is shown at G, Fig. 34.

Attention is drawn to the springing points of the arch, which are at the *ends* of the lintel. It is common to find that students, especially in examinations, make the mistake of springing the arch from points on top of the lintel which are vertically above the reveals of the opening; this error is indicated by broken lines at U (C, Fig. 15). In the event of the wood lintel rotting or being destroyed by fire, the arch and the brickwork above it would collapse if the arch does not spring from the ends of the lintel.

¹ *Rough relieving arches are almost obsolete*. They were formerly employed when openings exceeding 4-ft. spans were provided with comparatively thin wood lintels. Reinforced concrete lintels, designed to support the brickwork, etc. above them, are now preferred to wood lintels, especially for large spans, and thus rough relieving arches are rendered unnecessary.

It is customary to make each springer a stretcher (on face), as shown at P, as it is more effective in transmitting the thrust from the arch to the abutments than if headers are used, as shown at O.

Wide joints at the extrados are avoided when the arch is constructed of half-brick rings as shown. Some idea may be obtained of the very wide joints which would be formed at the extrados if 9-in. rings were used by reference to the shaded voussoirs Q and R.

The arch shown at C is built upon a turning piece supported upon wedges which rest upon the lintel (see p. 85). After this temporary support is removed, the space—known as the *core*—is filled in with brickwork, the bottom course being bedded in mortar on the lintel, and the bricks cut to the curve of the intrados.

The geometrical construction of the arch is shown. The 3-in. measurements for the voussoirs in the lower ring are set off along the *intrados*, and those for the upper ring are set off along the *middle* curve. A 3-in. diameter circle is described at the centre (it being equal to the thickness of the bricks). Each voussoir is drawn by placing a set-square against the division on the intrados (for the lower ring) and alternately tangential to the right and left of the small circle, thus forming the wedge-shaped joints.

SEMICIRCULAR ARCH (see K, Fig. 15, which shows half elevations of two varieties).—The impost may be omitted. It is constructed on a centre (see p. 85, and J, Fig. 43). There are four varieties of semicircular arches, *i.e.*, (a) gauged semicircular arches, (b) purpose-made brick semicircular arches, (c) axed brick semicircular arches, and (d) rough brick semicircular arches. Excepting for the shape, they are similar to the four classes of segmental arches. An example of a gauged semicircular arch is shown at M; this may have cross joints to give a "bonded face." The purpose-made brick type is shown at L and the axed brick arch is similar; the number of rings may be increased if desired. The rough brick class, like the segmental arch, has V-shaped joints.

The arches illustrated in Fig. 15 have been related to the small building shown in part in Fig. 14 which is an example of a typical working drawing, it being fully dimensioned to enable the bricklayer to set out the work accurately.¹

Stone heads and arches are described on p. 47.

WINDOW SILLS

A sill provides a suitable finish to the window opening and it affords a protection to the wall below. Sills may be of brick, brick with one or more courses of tiles, tiles, stone, concrete, terra-cotta and wood. The top of a sill should have a slight fall outwards to prevent the lodgment of water; this slope is called the *weathering* of a sill.

Fig. 16 shows three forms of external sills.

That at A shows a section and part elevation of a brick sill upon two courses of tiles. Standard bricks are placed on edge and are slightly tilted. The tiles

¹ Although the thickness of the joints of the brickwork (including those of the arches) has been shown in Fig. 15, it is usual for students when preparing homework sheets to show the joints by single lines only.