Small bars of circular section (usually ¼-in. dia.) are sometimes used at the bed joints of walls in lieu of hoop iron or meshed reinforcement. Thin steel plates, ¼-in. thick and ½-in. less in width than the thickness of the walls, may be embedded at every fourth course to provide heavy reinforcement. Such should be well tarred and sanded.

A patent type of reinforced partition is described on p. 45, Vol. III.

(b) *Reinforced Brick Pillars.*—Detached piers are reinforced by providing a 2½-in. wide strip of Bricktor or Exmet set back 1-in. from the external face at every second or third course or as required. Alternatively, ¼-in. diameter rods may be embedded at the bed joints, each rod being bent to the shape of the pier, about 1-in. from the face, with each end overlapping about 6-in. at one corner. An excellent type of reinforced pillar [1] is shown at S, T, U, V and W. This 9-in. square pillar is reinforced with four steel rods, well anchored into the concrete bed, and steel plates (see V) or wire ties (see W) embedded at every fourth course. The purpose-made bricks are shown at Q, T and U. Note that the bars are well protected against corrosion by the mortar. Details of an 18-in. square pillar are shown at X and Y, including a sketch of the special bricks at R; holed steel plates may be adopted in lieu of the wire ties when a heavier reinforcement is required. Perforated bricks may be used, but as these have to be threaded over the rods they are not so convenient as the grooved bricks.

Attached piers are reinforced by 2½-in. wide strips of Exmet or Bricktor, placed 1-in. from the face and lapped over the continuous outer strips on the wall bed joints. Alternatively, two vertical bars with special bricks, similar to that shown at R, may be preferred.

(c) *Reinforced Brick Lintels or "Soldier Arches."*—These lintels must be provided with additional support when the span exceeds 3-ft. Omission of adequate reinforcement has been responsible for many failures. Two methods of reinforcement are shown at Z and Z′, Fig. 16 (see also Fig. 12, Vol. I). That at Z shows the lintel reinforced with two ½-in. diameter mild steel bars embedded in the longitudinal joints and extending to 6-in. beyond the jambs. The alternative form at Z′ shows two ¼-in. diameter bars or tension reinforcement embedded in the continuous longitudinal joint, together with ¼-in. diameter bent steel bars, called *stirrups*, bedded in every third vertical joint. The object of the stirrups is to resist shear stresses.

In constructing the lintel at Z′, two small wood fillets are nailed to the top of the turning piece (used as a temporary support) at a clear distance apart equal to the thickness of the lintel. Pieces of thin wire are placed transversely across and nailed to the fillets at a spacing equivalent to the centre of every third vertical joint. The bottom bar is placed centrally on the wires and built in at the ends. The bricks of the lintel are laid (working from each end towards the centre), and at the same time the stirrups, supported by the bottom bar, are bedded in position at every third joint, care being taken that the continuous longitudinal joint is filled with mortar for the lower 2-in. only. The top rod is inserted and pressed down to the stirrups or to a level slightly above them. The continuous vertical joint is then filled with grout from the top. Prior to the removal of the turning piece, the pieces of thin wire are cut flush with the two faces and the ends turned into the joints. Pointing completes the lintel. A 1-in. by ½-in. wood fillet may be used as a temporary support for the lower tension bar in lieu of the pieces of wire. This must be oiled before being built in to permit of its removal after the turning piece has been removed. The continuous joint is filled in with cement mortar and the soffit pointed after this fillet has been removed.

The size and number of bars vary with the span and loading. That shown at Z′ is typical for a lintel having a maximum span of 8-ft.

Flat and segmental arches may be strengthened by embedding meshed reinforcement in the bed joints of the walling which they support.

Reinforced brickwork has been adopted in the construction of fire-resisting floors. These slabs are reinforced with bars between the joints of the bricks placed on edge, both transversely and longitudinally, and these slabs are supported by steel beams at a maximum distance apart of 7-ft. Reinforced slab construction is necessary for large brick canopies over doorways, etc.

Raking Bonds.—A characteristic defect in a thick wall built in English bond is a deficiency in the longitudinal bond due to the absence of stretchers in the heart of the wall. As stated on p. 46, this tie may be improved by the provision of metal reinforcement. An older method, and one which is now only occasionally adopted, is the introduction of courses of bricks set at a rake (or inclination) at intervals up the wall. These are known as raking bond courses and are of two forms, *i.e.*, (*a*) diagonal bond, and (*b*) herring-bone bond.

(a) *Diagonal Bond* (see plan A, Fig. 17).—This is best suited for walls which are from 3 to 4-bricks thick, and is applied between the *stretching* [1] faces at every fifth or seventh course. Alternate raking courses should be inclined in the opposite direction to that shown. The method of setting-out is indicated on the figure. The triangular spaces formed near the stretching faces should be filled in with cut pieces of brick and not mortar only.

(b) *Herring-bone Bond.*—This form (so-called because of its slight resemblance to the spine of a herring) is shown at plan B, Fig. 17, and may be applied to walls which are at least 4-bricks thick at five to seven course vertical intervals. The bricks are laid at an angle of 45° in both directions from the centre. Like diagonal bond, alternate herring-bone courses are reversed. The setting-out is shown in the figure. Note (1) the construction lines F and G are drawn parallel to and equidistant from the centre line, with the 45° distance between (as 3-5) equal to 4½-in. or the width of a brick, and (2) the long raking joint 1-2 is drawn from the centre and inclined at 45°, followed in sequence by the long raking joints 3-4, 5-6, 7-8, etc.

An alternative to raking bonds for increasing the longitudinal tie in thick walls is known as *longitudinal bond*. A course built in this bond consists entirely

[1] By courtesy of the patentees, Messrs B. Morton & Sons, Manchester.

[1] Raking bond courses in brick footings should be between the normal *heading* faces.