

nibs, or they may be built flush. Both are shown. Nibless tiles, which can be obtained from some manufacturers (otherwise the nibs are removed), are used if the concrete bricks do not project.

Although coke breeze concrete bricks are often preferred to wood battens on account of the tendency for the latter to decay, the bricks do not afford such a secure nail hold and a preference is therefore given for wood battens for tiling walls in exposed situations. Further, the sulphur present in breeze corrodes the nails, and whilst the rust is claimed to increase their holding power, it is also responsible for their comparatively rapid destruction, especially when in damp localities the corrosion is accelerated.

(c) Nailing tiles direct to the mortar joints was formerly a common practice, but it is one which has fallen into disfavour because of the uncertain nail hold provided. As the bed joints of the brickwork must be at the required gauge apart, it is usual for it to consist of bricks-on-edge, the rat-trap bond illustrated at F, Fig. 18, Vol. II, being useful for this purpose, as an approximate gauge of  $4\frac{1}{2}$ -in. is thereby obtained. The thickness of the bed joints is commonly  $\frac{1}{2}$ -in. Stout galvanized wrought iron or composition nails, 2-in. long, are used for such direct fixing, copper nails being too soft for this purpose. Tiles without nibs are used, otherwise the length of nail must be increased. The rigidity of the tiles is increased if they are bedded in mortar. The nails are apt to work loose in the mortar, and direct nailing is therefore particularly unsuited for work which is likely to be subjected to the effect of high winds.

(d) The fixing of vertical tiling to studs is the traditional method, as such covering was originally associated with timber-framed buildings. A typical wall of such a building consists of a frame having a head, sill and two outer posts with intermediate posts or studs. The spaces between the vertical members may be filled with brickwork, but this is dispensed with when vertical tiling is resorted to. The plain tiles are hung and nailed to  $1\frac{1}{2}$ -in. by  $\frac{3}{4}$ -in. battens fixed horizontally at the gauge apart to the studs. The battens may be of redwood, although oak battens, being less liable to split by the nails, are sometimes used. In order to exclude draughts and to provide adequate insulation, it is necessary for bituminous felt to be nailed to the studs before the battens are fixed. Such construction is very commonly applied between the head of a bay window and the sill of that above it.

In the example shown in Fig. 43, the whole of the tiled area may be studded and constructed in this manner. Alternatively, the brickwork of the gable, covered as shown, may extend to the level of the bedroom ceiling joists, and the upper triangular space completed by 4-in. by 2 or 3-in. studs at 15-in. centres, fixed to a sill bedded on the wall and to the outer pair of spars, battened and tiled.

Because of the protection afforded by the tiles, the normal thickness of external brick walls can be reduced when covered with vertical tiling. Thus, at R the  $13\frac{1}{2}$ -in. brick wall is reduced to 9-in. at the bedroom floor level. In the alternative detail at Q, the lower portion, not being tile-hung, consists of an

11-in. cavity wall. As there is no need for the cavity to extend beyond the tiling, it is dispensed with as soon as practicable, namely, at the bedroom floor level, and the wall is continued as a 9-in. thick solid structure. Incidentally, this increases slightly the internal dimensions of the upper storey of the house.

ANGLES.—The treatment of external angles is shown at P, where special angle tiles are employed which course in with the adjacent tiling. These are purpose-made right and left-handed for alternate courses, as shown at N. The size varies according to the tile; thus, if a greater bell-cast is required at the eaves, the tilt of the angle tiles would have to be correspondingly increased. In lieu of these special angle tiles, the plain tiles at the angles are cut and mitred; in addition, lead soakers are provided underneath at the intersections for adequate protection. Such construction is similar to that adopted for hips and described on p. 137, Vol. I. Internal angles of wall tiling may also be finished with either purpose-made angle tiles or cut and mitred tiles with lead soakers.

VERGES.—The roofing tiles at a verge should project 2 to 3-in. beyond the face of the wall, the overhang increasing with the height of the building. The thickness of the verge should also vary according to this height. The tiles should be given an upward tilt to prevent the roof water from running down the gable. This also improves the appearance. An undercloak, consisting of one or more courses of projecting plain tiles, butt-jointed, is necessary to provide a satisfactory finish. These tiles are placed transversely and bedded on the wall in cement mortar, the straight ends (and not the cambered edges) being therefore exposed to view. Two verge details are shown at H and J. That at H shows the end pair of spars at a slightly higher level than the rest of the rafters in order to impart the required tilt. The battens are brought over the single tile undercloak to within 1-in. from the face of the wall. The space between the undercloak and the tiles above is filled in and pointed with cement mortar either flush or cut back  $\frac{1}{2}$ -in.; the tiles are also pointed (see H, K and O). The tile edges should be free from mortar stains. The end roofing tiles in alternate courses must be tile-and-a-half tiles and *not half tiles*, as the latter cannot be securely fixed. To prevent the warping of the comparatively large tile-and-a-half tiles, some manufacturers purposely underburn them. Such should not be used, because of their colour differing from the rest of the tiles (which difference is increased on exposure) and because of their liability to disintegration. The end rafters are shown in the detail at H to be approximately  $4\frac{1}{2}$ -in. from the outer face of the wall in order to reduce the projection of the battens, although the usual practice is to fix the rafters close to the inside face as shown at J.

An alternative method of obtaining the necessary tilt is to arrange the end pair of rafters level with the top of the wall; the undercloak tiles are then bedded and the battens are bent over them.

The detail at J, showing a cavity wall untiled, is suitable when only a slight tilt, provided by the mortar bedding, is required. The thickness of the verge is increased if a cement fillet between the wall and undercloak (shown by a short