is undoubtedly the most attractive of the several types adopted, its effective appearance being due to the irregularly shaped units so arranged as to link up the courses of the intersecting slopes by a series of easy curves. When formed by a skilled craftsman, a swept valley is watertight and lead is not required. It is expensive because of the large amount of tile-cutting involved. As much as possible of the dihedral angle is blocked out by the use of a 9 or 11-in. by 1-in. valley board fixed up the valley to the boarding, and the battens are brought over it, as shown. The tiles are cut to the required shape, tile-and-a-half tiles being employed whenever necessary; in this process the head corners with the nail holes should not be removed in order that the tiles may be adequately nailed. The radii of the curved courses gradually increase from the eaves until a satisfactory curve is obtained at about the fourth or fifth course, after which the radius is more or less constant. Valleys in roofs covered with ordinary slates or stone slates (see Fig. 48) are also swept in good work.

The *laced valley* is another very satisfactory form in the construction of which a valley board is used to pack out the angle (see K and P). No lead is required. Apart from its appearance, a laced valley differs from a swept valley inasmuch as none of the tiles is cut, and the only tile-and-a-half tiles used are those immediately over the valley board; hence less skill is required in its construction and its cost is much reduced. The battens and tiles are given a gradual sweep upwards so that each pair of courses intersects at a tile-and-a-half tile laid diagonally and alternately right and left handed as shown. As indicated at K, the lower corners of these tile-and-a-half tiles are exposed to form a continuous row of diapers up the valley.

Purpose-made or angular valley tiles (see N), like those for hips, are specially shaped to suit the required dihedral angle, the geometrical development of which is explained at M. Allowance is made for any warping that may occur by moulding the tiles at an angle which is approximately 5° greater than that developed. The plan and section at L and Q show a portion of this valley, which is comparatively inexpensive but much less pleasing in appearance, because of its mechanical neatness, than either the swept or laced valleys. Lead is not used. These tiles are often underburnt to prevent twisting, and they thus tend to darken more quickly than the adjacent tiling. The strength of such underburnt tiles is reduced, and they are therefore liable to become damaged by anyone walking on them when carrying out repairs, etc. Leaks may thereby develop and cause dampness.

Lead valley gutters, despite their incongruity, are often adopted for plain tiled roofs, chiefly because of their relative cheapness. These include the open and secret valley gutters and those formed with cut and mitred tiles with soakers. They are formed as described for slated roofs (see p. 148, Vol. I). All three are unsuitable because of the uniformity of the hard angles presenting at the intersecting surfaces. Finally, the inappropriate colour and texture of this covering material render the relatively wide open valley gutter type particularly objectionable when associated with plain tile roofs.

VERTICAL PLAIN TILING

Vertical tiling, also known as *weather tiling* and *tile hanging*, is applied to walls as a protection against rain penetration and for æsthetic reasons. It is especially suited to walls subjected to severe exposure, as it affords a very effective protection, and plain tiles, particularly if they are hand-made and skilfully handled, can produce a pleasing contrast to brickwork when used to cover vertical surfaces.

Details of vertical tiling are illustrated in Fig. 43. The key elevation of a gable wall of a house, finished with facing bricks up to the head of the ground-floor window and plain tiles above, is shown at A. The nails are nailed to either (*a*) battens as for roof tiling, (*b*) coke breeze concrete bricks or slabs built in courses at gauge intervals, (*c*) direct to the mortar joints of the brickwork or (*d*) battens fixed to studs.

(*a*) The detail at Q shows the tiles fixed to $1\frac{1}{2}$-in. by $\frac{3}{4}$-in. battens which are plugged to the brickwork. It will be observed that, like roof tiling, *there are three thicknesses of tiles at the lap*. The latter is much reduced, a $1\frac{1}{2}$-in. lap being common and all that is necessary. The gauge therefore equals

$$\frac{\text{length of tile} - \text{lap}}{2} = \frac{10\frac{1}{2} - 1\frac{1}{2}\text{-in.}}{2} = 4\tfrac{1}{2}\text{-in.}$$

Every tile in each course is fixed with $1\frac{1}{2}$-in. copper or composition nails. The sawn laths should be of sound well-seasoned redwood and well creosoted, otherwise when fixed in this position they are liable to decay. Sometimes 2-in. by 1-in. counter-battens are provided; these are, of course, fixed vertically, being plugged to the wall at 15-in. centres, and the tiling battens are nailed to them.

As in roofing, a double eaves course is provided, the first course consisting of eaves under tiles. That shown at Q is tilted out by the top course of tile creasing. This creasing consists of six courses of $\frac{1}{2}$-in. thick tiles with $\frac{3}{8}$-in. bed joints, or three courses of tiles per course of brickwork. The three top courses project with an equal oversail. After bedding, the edges of these tiles should be well cleaned to remove any mortar stains. A part elevation of this finish is shown at P. A more pronounced bell-cast, and one which is usually preferred, is obtained by fixing the tiles in *both* of the courses comprising the double eaves course with the camber uppermost, as shown at R. The latter detail shows a tilting fillet or sprocket and is an alternative to that at Q for providing the required tilt. Another alternative, which serves the same purpose, is a projecting brick course.

(*b*) The section at R shows the tiles nailed to coke breeze concrete bricks or slabs bonded in between alternate heading and stretching brick courses. These so-called *fixing bricks* are made of concrete composed of cement and an aggregate of coke breeze (a product of coke ovens and gas retorts, see p. 29, Vol. II) in the proportion of 1 part cement to 6-10 parts breeze. The size is 9-in. by $4\frac{1}{4}$ to 5-in. by $1\frac{1}{4}$ to $1\frac{1}{2}$-in. These bricks may project to afford a ledge for the