by a lever-operated punch containing two pins and fixed as an extension to the cutting table. The nibbed and holed slabs are then stacked on curved pallets, cambered and dried.

Plain tiles are moulded by the pressure process as explained for bricks (p. 3, Vol. II), the die-boxes being, of course, of the appropriate shape and size. The nibs are formed by the plunger as it descends and presses each slab. Holes are formed automatically when the plunger is released.

3. *Drying*.—The drying of bricks is described on pp. 5-6, Vol. II, and much of this may be applied to tiles. Artificial drying is chiefly employed, although hand-made tiles are often allowed to dry gradually on racks by the natural process. There are several methods of stacking the tiles when artificially dried. In one, the tiles are placed upon pallets (see p. 104), each of which holds four tiles. The pallets are stacked in rows one above the other in the drying shed or chamber to a height of at least 5-ft. Moisture is gradually eliminated from the tiles as the heated air circulates round them. Natural drying (p. 5, Vol. II) is still adopted, but on a comparatively small scale.

4. *Burning*.—After being properly conditioned the tiles are stacked and burnt in kilns of the intermittent, continuous and tunnel types (see pp. 6-11, Vol. II). The form of setting varies, depending upon the type of kiln. If it is continuous, it is usual to set the tiles in *cupboards* one above the other. A cupboard consists of four fireclay slabs, one at the bottom and two vertical side slabs which support that at the top. Each holds about twelve tiles placed on edge at nib distance apart to permit of the circulation of the hot gases.

General.—Tiles should be well burnt throughout, free from firecracks, dense and tough, and should show a clean fracture when broken. A well-burnt tile is generally indicated by a clear ring when it is struck with a metal bar; a dull note suggests an underburnt or cracked tile.

Although machine-made tiles from reputable firms are of excellent quality, it is generally considered that hand-made plain tiles are tougher and more durable. Machine-made tiles are more liable to lamination, a defect described on p. 14, Vol. II.

The appearance of sand-moulded hand-made tiles, due to the slight irregularities in shape and a rough textured surface, is superior to that of the regular shaped and smoother surfaced tiles made by machinery. In this respect they also resemble bricks (see pp. 3 and 13, Vol. II). This texture is imparted to the tiles by the coarse sand used to cover the mould and bats; the sand is impressed when moulded, and during the burning process particles drop out, leaving the characteristic and much-desired roughness of surface. Some machine-made tiles are sand-faced by the several methods described on p. 13, Vol. II. Like bricks, tiles are now produced in a wide range of colours (see pp. 12 and 13, Vol. II).

TESTS.—In accordance with the British Standard Specification for "Clay or Marl Plain Roofing Tiles," No. 402—1930, tiles must comply with three tests, *i.e.*, transverse, freezing and permeability.

The transverse test consists of applying the load from the machine along the centre line at right angles to the length of the tile which has been immersed in water for twenty-four hours and which is supported on the rounded edges of wood bearers placed at 7½-in. centres. Six tiles are tested, and the average breaking load shall not be less than 175-lb. for hand-made tiles and 125-lb. for machine-made tiles.

The freezing test is applied in the following manner in an apparatus similar to that described on p. 15, Vol. II: Four tiles are immersed in water for twenty-four hours, wrapped in a wet cloth and suspended in the freezing solution, consisting of 4 parts ice to 1 part salt (by volume) for twenty-four hours. The tiles are removed, thawed in water for twenty-four hours and again immersed in the freezing mixture for twenty-four hours. This process is repeated ten times, after which the tiles shall not show signs of cracking, laminations and pitting.

The permeability test is determined in an apparatus similar to that described on pp. 14 and 15, Vol. II. Three tiles are tested in the manner there stated, and the average rate of flow through the specimens at the end of twenty-four hours shall not exceed that indicated by a rate of flow of 4-in. per min. along the glass capillary tube of 1-mm. bore under a head of 8-in.

PLAIN TILING DETAILS

The terms used in slating are also applicable to tiling. Students are therefore referred to Chapter V (pp. 132-141), Vol. I, for definitions of these terms, for a description of the groundwork and for the introduction to the subject of plain tiling.

The various tiles used in plain tiling are illustrated in Fig. 41. According to the B.S.S., No. 402—1930, the standard size of plain tiles is 10½-in. by 6½-in. (see E and K) by a minimum thickness of ½-in. when hand-made and ⅝-in. when machine-made. Some tile manufacturers make 11-in. by 7-in. and 10-in. by 6-in. tiles, and the thickness of hand-made tiles may be as much as ⅝-in. Normally, each tile has two or three short nibs or stubs (see E and L) or a continuous nib as shown at K; tiles without nibs can be obtained. Each tile is pierced with two holes. The object of the camber to which plain roofing tiles are shaped (see F) is to cause the tails of the tiles to closely contact those under them and thus assist in preventing the entrance of driven rain and snow. In addition to this longitudinal camber, some hand-made tiles are *hatched*, namely, are given a slight curve in their width. Whilst such hatched tiles enhance the appearance of a roof on account of the small undulations produced, rain and snow can be more readily driven up between them.

In the above-mentioned B.S.S. it is specified that the small nibs shall be at least ¾-in. wide and ⅝-in. minimum to ½-in. maximum deep. Continuous nibs must be at least ¼-in. and not more than ½-in. deep. The holes must not exceed ¼-in. diameter at 1-in. minimum to 1¾-in. maximum from the sides and not more than ⅝-in. from the underside of the nibs. The camber or set of hand-made tiles shall be $\frac{3}{16}$-in. minimum and $\frac{7}{16}$-in. maximum, and that of machine-made tiles shall be ⅛-in. minimum and ¼-in. maximum.

Special short tiles are manufactured for eaves and ridge courses and wide tiles for verges and certain hips and valleys. Thus the *eaves under tiles* (see G) are 6½ to 7-in. long by 6½-in. wide and form the bottom course of a double eaves course. The *ridge under tiles* (see H) are 9-in. long and 6½-in. wide and are