

damage to the holes and ultimate cracking of the slates. The following gives suitable lengths and weights of nails :—

TABLE VIII

Quality of Slates (see p. 133).	Length.	Copper or Zinc (per 1,000).	Composition (per 1,000).	Galvanized Wrought Iron (Gauge).
Best or mediums . . .	1½-in.	5-lb.	6½-lb.	11's
Seconds	1¼ " "	7 " "	9 " "	10's
Randoms	2 " "	10 " "	12 " "	9's

Sometimes 1¼-in. nails weighing 4-lb. (copper) or 5-lb. (compo) per 1,000 are used for thin small slates.

TERMS.—Various terms used in slating are :

Back.—The upper and rough surface of a slate (see o, Fig. 68).

Bed.—The under and smooth surface.

Head.—The upper edge (see o).

Tail.—The lower edge (see o).

Course.—A row or layer of slates (see A, Fig. 69); the courses are equal when the slates are of uniform size but vary from a maximum at the eaves to a minimum at the ridge when randoms are used to form *diminishing courses* (see p. 140, and M, Fig. 69).

Bond.—The arrangement of slates whereby the edge joints between the slates in any one course are in or near to the centre of the slates immediately above and below them. When the slates are of uniform size the edge joints should run in straight lines from eaves to ridge—"keeping the perpend"—(see A, Fig. 69). This is accomplished by using a wide slate, called a *slate and a half*, or a half slate (in inferior work only) at the beginning of every alternate course. But such mechanical neatness is not always desirable, especially if Westmorland or Cornish randoms or peggies are laid with diminishing courses, when a slight deviation from straight lines results in a more pleasing appearance (see G and M, Fig. 69).

Pitch has been referred to on p. 69, and the minimum pitch for "large," "ordinary" and "small" sizes of slates is stated. Comparatively large slates should be used on roofs of about 30° pitch. On steeply pitched roofs most of the weight of the slates is carried by the nails and therefore the slates should be small and these should be secured with stout nails. Hence the steeper the pitch the smaller the slates.

Lap is the amount which the tail of one slate covers the head of that in the course next but one to it; this applies to centre-nailed slates (see below). When the slates are head-nailed (see below) the lap is measured from the centre of the nail hole instead of the head. As shown in the various details in Fig. 69, there are THREE thicknesses of slates at the lap. The amount of lap varies with the

pitch and degree of exposure of the roof; thus for roofs with 30° to 45° pitch, the lap should be 3-in.; for steeper pitches the lap may be reduced to 2½-in.; for flatter pitches than 30° the lap should be increased to 3½ to 4-in., and in exposed positions (such as on the coast) a lap of 6-in. may be necessary.

Gauge is the distance between the nails measured up the slope of the roof (which is the same as the distance between the tails of each successive course). The gauge depends upon (1) the length of slate, (2) the amount of lap, and (3) the method of nailing, *i.e.*, centre nailing or head nailing.

CENTRE-NAILED SLATES (see D and L, Fig. 69).—The gauge equals $\frac{\text{length of slate} - \text{lap}}{2}$, thus for a roof covered with 18-in. by 9-in. slates and laid

with a 3-in. lap, the gauge = $\frac{18 - 3\text{-in.}}{2} = 7\frac{1}{2}\text{-in.}$ The position of the nail holes

measured from the tail of the slate is shown at P, Fig. 68, and equals the gauge, plus the lap, plus a clearance of ½-in.; the clearance is necessary to allow the nails when being driven to clear the heads of the slates in the course below.

HEAD-NAILED SLATES (see H, J and M, Fig. 69).—The holes are pierced 1-in. from the head (see o, Fig. 68) and, as mentioned above, the lap is measured from the centre of the hole. Hence the gauge equals $\frac{\text{length of slate} - (\text{lap} + 1\text{-in.})}{2}$;

thus the gauge for 18-in. by 9-in. slates with a 3-in. lap = $\frac{18\text{-in.} - (3 + 1\text{-in.})}{2} = 7\text{-in.}$

In both centre and head nailing the holes are approximately 1¼-in. from the edges.

COMPARISON BETWEEN HEAD AND CENTRE NAILED SLATES.—Head-nailed slates offer a better protection to the holes as there are two thicknesses of slates over each. They are not readily damaged or strained when being nailed as they have a solid bearing in the form of battens or boards. Their tails are more readily lifted by a high wind owing to their big leverage; this allows rain and snow to blow between them and the excessive movement of the slates may gradually damage and increase the size of the holes until the slates are ultimately displaced and blown off; hence large slates should not be head-nailed, especially in exposed positions. More head-nailed slates are required to cover a roof on account of the reduced gauge and therefore this method is more expensive than centre nailing.

Centre-nailed slates are less likely to be stripped because of the reduced leverage, and for the same reason, there is less likelihood of drifting snow and rain finding access. Large slates should always be centre-nailed to give greater rigidity. Less slates are required and the method is therefore more economical than head nailing. Defective slates are more readily removed. There is greater likelihood of rain entering the nail holes if any of the slates above them are cracked and if the roof has a flat pitch, as there is only one thickness of slates over the nail holes. There is a risk of the slates being strained and