sometimes cracked (which cracks may not open until later) by careless nailing, owing to the space between the middle of centre-nailed slates and the battens or boarding below, and especially over the intersection between sprockets and spars (see L, Fig. 69). Centre nailing is more common than head nailing.

DIMINISHING COURSED WORK.—The roof consists of randoms which are laid in diminishing courses from a maximum at the eaves to a minimum at the ridge. The slates are sorted to give carefully graded courses, those in each course being of the same size ; thus a large roof may have 24-in. or longer slates at the eaves and peggies at the ridge. The gauge varies with each course or every second course, but the *lap is uniform throughout*. A very pleasing appearance results, and as shown at G, Fig. 69, the bond is irregular. The method of determining the gauge is explained on p. 140 (see also M, Fig. 69).

Margin is the exposed portion of a slate and equals the gauge multiplied by the width (see A and K, Fig. 69).

Boarding or *Close Sheeting* (see p. 70).—The usual thickness is 1-in. (nominal) ; it should be tongued and grooved although shot or butt jointing is used for cheap speculative work. As described below, the boarding should be covered with felt before the slates are fixed. Boarding is sometimes referred to as *sarking*, although this term is more often applied to felting.

Slating Battens or Laths.—These should be of sound, sawn redwood and of the following sizes : 1½-in. by ¾-in. for small slates 16-in. long and downwards, 2-in. by ¾-in. for light slates 18-in. long and upwards, and 2-in. by 1-in. for heavy slates 18-in. long and upwards. They are fixed to the boarding or directly to the spars, to the required gauge apart by galvanized wrought iron nails which are usually 1¾-in. long. They should be creosoted to preserve them. *Counter-battens* as shown at H and K, Fig. 69 are also used ; these are generally 2-in. by ¾-in., spaced at 16-in. centres (or equal to the distance apart of the spars) and secured with 1½-in. galvanized wrought iron nails.

Tilting Fillets or Springing Pieces.—These are triangular or tapered pieces of wood, from 3 to 6-in. wide and up to 3-in. thick, used at the eaves (see Fig. 69) to tilt the lower courses of slates in order to assist in excluding rain and snow by ensuring close joints at the tails. These are often dispensed with when fascia boards are used (see Y, Fig. 36). They are also used at chimney stacks, etc., which penetrate a roof, to cause water to fall away quickly from the vertical surfaces.

DAMP PROOFING.—Provision must be made to exclude rain and snow which may be blown up between the slates and to prevent the entrance of water by capillary attraction. Such includes either (*a*) covering the boarding or spars with felt or similar material, or (*b*) torching the underside of the slates.

(*a*) *Roofing Felt*.—This is similar to but thinner than the fibrous asphalt or bituminous felt described on p. 18 and is obtainable in 32 or 36-in. wide rolls. It is either laid upon the boarding with the joints running from eaves to ridge or parallel to the ridge, or, for cheaper work, the boarding is omitted and the felt (called *untearable felt*, because of its toughness, due to an extra layer of hessian cloth being embodied in the material) is laid transversely over and fixed with flat-headed 1⅛-in. galvanized wrought iron nails (" clout nails ") direct to the spars. The former is shown at K, Fig. 69, and the latter at D and E. The joints are lapped 2 to 3-in. in each case, and, as shown at K, it should be lapped over the ridge. The edge of the felt is clout-nailed to the boarding every 3-in. or to each spar when laid directly over them.

(*b*) *Torching or Pointing or Tiering*.—Good lime mortar, to which clean long ox-hair has been added to increase its adhesive quality, is applied to the underside of the slates along the upper edge of each cross batten ; this material should be well pressed in between the slates and the mortar fillets splayed off (see D, Fig. 38).

Comparing the two methods : Felting allows air to enter and circulate under the slates and round the battens, it reduces " heat losses " (the transmission of heat and cold through the roof), it is easily fixed, but is more expensive than torching. Torching prevents ventilation, and in prolonged wet weather it retains moisture which may be transmitted to the adjacent battens and roof members and set up decay ; in course of time inferior material deteriorates and drops off leaving gaps through which rain and snow may enter ; if however best materials and workmanship are applied, this method ensures a " drop-dry " roof, as is evidenced by the thousands of roofs that have been dealt with in this manner and have remained watertight and in good condition for a long period of years.

Terms such as eaves, ridge, hip, valley and verge have been defined on pp. 69-70.

SPECIAL SLATES.—Slates other than those of normal size and shape are required in order to maintain correct bond and conform to shapes which are more or less irregular. They include those necessary to form the bottom course at the eaves, the top course at the ridge, verges, hips and valleys.

Double Eaves Course Slates (see Fig. 69).—A double course of slates is laid at the eaves, otherwise rain would enter between the edge joints. The first layer of slates (or " doubling course ") is comparatively short and equals in length to the *gauge plus lap* (when centre-nailed—see D) and *gauge plus lap plus 1-in.* (when head-nailed—see J). The practice which is sometimes adopted, of laying the normal sized slates lengthwise to form this course, is not advocated as there is a risk of some of the end joints coinciding with the edge joints of the course above.

Top Ridge Course Slates.—These are about 2-in. longer than the bottom doubling eaves course slates in order to leave a suitable margin below the wing of the ridge tile (see D, Fig. 69).

Verge Slates.—As mentioned on p. 135, either a special slate called a " slate and a half " or a half slate is used at each alternate course in order to give correct bond. A slate and a half, as is implied, is one and a half times the normal width, thus its size will be 20-in. by 15-in. if 20-in. by 10-in. slates are being used. A verge is a vulnerable part of a roof, and these wide slates, when each