

clip. Zinc or heavily galvanized wrought iron nails must be used for fixing the rolls. Copper or plain wrought iron nails must not be used for this purpose, as electrolytic action may be set up and result in decay of the metal. A clip before and after being turned up is shown at G.

The sheets, with their long edges turned up  $1\frac{1}{2}$ -in., are then placed in position and the clips are hooked over the edges as shown at J and the enlarged section H. It will be observed that adequate space is provided to permit of expansion.

The rolls and the turned up edges of the sheets are now covered with zinc cappings. A capping is shown in the section at M. This shows the edges of the capping turned in slightly. The cappings, not exceeding 6-ft. in length, are secured by *holding-down clips*. Such a clip is illustrated at L and is formed from a piece of zinc set out as indicated at K; the lower edge is turned back  $1\frac{1}{2}$ -in. and the sides are bent down. A clip is secured by two or three nails to the roll over the top end of the lower length of capping, and the bottom end of the upper length of capping is slipped into the fold or turn-back of the clip. A watertight joint, which permits of expansion, is thus assured. A portion of completed roll, including a clip, is shown at N.

In a flat roof, divided by drips as explained below, each roll will be covered with two lengths of cappings secured by a holding-down clip at the centre.

(b) *Drips*.—The spacing of these transverse joints is 6-in. less than the length of sheet employed; thus, for 8-ft. long sheets the drips will be at 7-ft. 6-in. intervals. There are two forms of drips, (i) *welted* and (ii) *beaded*.

(i) *Welted Drips* (see O).—The depth must be at least sufficient to allow the welt to clear the cappings of the rolls below, 2-in. being a minimum but  $2\frac{1}{2}$ -in. is common. The top edge of the lower sheet is turned up and then turned out 1-in. in line with the top of the drip. A welt is formed along the bottom edge of the upper sheet by first of all bending the edge back  $\frac{1}{2}$ -in. (which stiffens the welt) and then folding this bent edge back 1-in. The joint is then completed by engaging the turned out edge on the lower sheet within the fold of the upper sheet.

(ii) *Beaded Drips* (see P).—The depth must be at least  $2\frac{1}{2}$ -in. to allow of adequate clearance between the bead and the cappings below. The edge of the lower sheet is turned up and out, as described above. A  $\frac{3}{4}$ -in. bead is formed on the bottom edge of the upper sheet by first bending the edge back slightly for  $\frac{1}{2}$ -in., followed by turning the edge down  $1\frac{1}{2}$ -in. at right angles and then dressing it over a  $\frac{5}{8}$ -in. diameter rod (called a *beading rod*). This beaded edge is finally fitted over the turned out edge of the lower sheet.

Beads, welts, etc., are formed by the use of a dresser similar to that used for lead and shown at A, Fig. 76, Vol. I.

**STEEPLY PITCHED ROOFS.**—Drips are dispensed with if the pitch of a roof exceeds 1 in 8. The transverse joints are then of the *single lock cross welt* type as used in copper roofing (see p. 132). The welts occur at 7-ft. 9-in. centres when the sheets are 8-ft. long (or 3-in. less than the length of sheets employed) and they are not staggered. They are formed in the following manner: The top

edge of the lower sheet is folded over  $1\frac{1}{4}$ -in. This sheet is secured by two 4-in. by 3-in. zinc clips spaced along its upper edge, each being twice nailed to the boarding after its lower edge has been bent and engaged in the fold of the sheet. The bottom edge of the upper sheet is then folded under 1-in.; this turn-back is engaged in the fold of the lower sheet and the welt is then completed by applying the dresser. The rolls are, of course, continuous from eaves to ridge, the cappings being in approximately 6-ft. lengths and secured by holding-down clips, as described in the preceding column.

**FLASHINGS** are somewhat similar to those described for leadwork in Vol. I. The lower edge of a cover flashing is stiffened by forming a  $\frac{1}{2}$ -in. bead or fold along its lower edge. Similar beads are sometimes formed on the edges of the up-turns of the gutter or roofing sheets.

## THATCH

This roof covering consists of bundles of reeds or straw secured to battens and spars. The thickness of the thatch varies from 9 to 16-in., according to its quality and the pitch of roof. The latter should not be less than  $45^\circ$ . Thatch affords a watertight cover when skilfully applied and undoubtedly the appearance of thatched buildings can be delightfully picturesque. It has, however, several serious demerits, chief of which are its liability to destruction by fire and its tendency to become infested with vermin. It is claimed that reed thatch will last at least sixty years if properly attended to, and many old roofs produce evidence of this. The life of straw thatch is not more than about twenty years. On the other hand, comparatively new thatched buildings have been totally destroyed by fire. The plumber's blowlamp, used to free frozen water pipes and cisterns situated in thatched roofs, has been responsible for many fires. It is significant that many local authorities will not permit the use of thatch (not even when treated with so-called fireproof solution), that there are few skilled thatchers available, and that when thatched roofs on existing buildings become defective the covering is often replaced by materials other than thatch.

**THATCHING.**—Reeds, such as are obtained from the Norfolk Broads, are best used for thatching. They are much longer (up to 9-ft.) than wheat or rye straw, which latter is also used. The material is formed into bundles and tied with tarred twine. The spars are spaced at from 2 to  $2\frac{1}{2}$ -ft. centres, and 2-in. by 1-in. battens are nailed to them at 8 to 12-in. gauge.

There are several different methods of fixing the thatch, varying with local practice. The reeds or straw must be well soaked with water or fire-resisting solution to facilitate packing, and the bundles are laid with their butt ends pointing towards the eaves. A slope of a roof is thatched in a series of *beds* or strips, the width of a ladder, and extending from eaves to ridge. The thatcher, working on a ladder from right to left, commences at the eaves and packs the bundles tightly sideways and downwards from the right across to the side of the ladder to complete the width of bed. The next course of bundles is packed in a similar manner at 8 to 12-in. above the first (depending upon the length of reed or straw), and this is continued until the ridge is reached. *Withies* (twisted rods of pliable willow twigs, sometimes called *osiers*) are interlaced through and over the bundles at about 2-ft. apart as the thatching proceeds, and these are secured to the spars with tarred twine. In some districts tarred twine is used instead