at each end.[1] Provided the walls are sufficiently strong, folding wedges are driven in between the wall and the adjacent joist, and in line with the strutting, as shown; these are allowed to remain as they increase the efficiency of the strutting. This form of strutting is still effective even if the joists shrink in the direction of their depth and thickness, for the depth shrinkage especially tends to reduce the inclination of the struts, with a corresponding increase in compression.

Solid Strutting (see P and S, Fig. 33).—The simplest form (and one which is frequently adopted for cheap work) merely consists of nailing short lengths of floor board in a continuous row between the joists. *This is quite ineffective*, and it is practically a waste of material and labour forming it on account of the shrinkage which occurs in the thickness of the joists and causes the struts to become loose as their length is then less than the clear distance between the joists.

To make the strutting effective it is necessary to fix a long circular steel or wrought iron rod (varying from $\frac{1}{2}$ to 1-in. in diameter) through the whole of the joists and near to the strutting, as shown. The rod is threaded through the holes which have been augured through the neutral axis of the joists. The nut is tightened after the struts have been fixed and again tightened by means of a spanner before the floor boards are laid. This form of strutting (with rod) is now seldom adopted.

HEARTHS.—Bye-laws stipulate that the hearth in front of a fireplace shall be at least 1-ft. 4-in. wide, have a minimum thickness of 6-in. and shall extend at least 6-in. beyond each side of the opening.

Two methods of forming hearths are shown in Fig. 34. That at F shows a concrete hearth, and the hearth detailed at G is supported by a brick arch.[2]

The section at F includes a 6-in. thick concrete hearth which is finished with tiles to give an overall thickness of 7-in. The hearth is formed *in situ* (or permanent position) and a temporary support must be provided for the front hearth. This support is shown to consist of boards which are secured to two 2-in. by $1\frac{1}{2}$-in. bearers, one of which is nailed to the trimming joist and the other is plugged to the wall. These bearers are shown by broken lines in the plan at A, Fig. 34. Sometimes large roofing slates are used instead of boards. The concrete is then placed in position. Two short joists are provided to afford a support for the floor boards at the ends of the hearth, and between the fireplace jamb and the trimming joist. One of these, called a *cradling piece*, is housed at one end into the trimming joist, and the other end rests upon a short brick corbel (as shown at P, Fig. 33), as it must not enter the wall owing to the proximity of the flue from the ground floor fireplace. The second piece (Z), to which the ends of the floorboards are nailed, is housed into the trimmer and the cradling piece. In the alternative plan at P, Fig. 33, a cradling piece only is required.

[1] It is a common practice to make short saw cuts at the ends of the pieces to receive the nails (see J) to avoid (so it is claimed) the nails splitting the timber. This should not be done as the holding power of the nails is thus reduced.

[2] Because of its relatively high cost, this trimmer arch construction is now practically obsolete—see next column.

This may be a 2-in. by 2-in. fillet coinciding with the edge of the hearth and supported by it, or it may be an independent short piece of 9-in. by 2-in. joist supported by the trimmer and corbel as shown.

In districts where stone is readily available, a 3-in. thick stone *flag* is sometimes used instead of concrete to form the front hearth. This flag is supported by a brick corbel course along one edge (or it may be built into the brickwork), and the other edge rests upon a wood fillet which is well nailed to the trimming joist or trimmer as the case may be. Concrete is placed upon this stone to bring the thickness up to that required by the bye-laws, and this is generally covered with tiles. Concrete is used to form the back hearth which is brought up to the level of the front hearth.

The hearth shown at G is now seldom used as the above types are more readily formed. The *trimmer arch* is of the rough relieving arch type shown at C, Fig. 15, and extends across the width of the fireplace opening to about 9-in. beyond it at each side.

> The splayed course of brickwork forms a skewback along one edge, and the other edge abuts against the trimming joist and is further supported by a 2-in. by $1\frac{1}{2}$-in. fillet which is spiked to the joist. Concrete is used as shown to form the back hearth and to level up the front hearth which may be finished with tiles. Two cradling pieces, shaped on the underside to the back of the arch, rest upon the arch at 6-in. from the fireplace opening to receive the floorboards, as already described.

CEILINGS.—Although plastering does not appear in the syllabus, short reference may be made to plastered ceilings in order to make this section more complete. Either wood *laths* (which are approximately $\frac{7}{8}$-in. wide, $\frac{1}{4}$-in. thick and 3-ft. long) are nailed to the underside of the joists at $\frac{3}{8}$-in. apart, or metal lathing (cut sheets of galvanised steel) may be fixed to the joists. Two or three coats of plaster are then applied to give a finished thickness of about $\frac{3}{4}$-in. A bearer must be provided next to the wall under the front hearth to provide a means of fixing the ends of the laths. As shown at F, Fig. 34, the bearer used to support the boarding for the concrete also serves this purpose, and at G a 3-in. by 2-in. scantling is notched at each end over a small fillet which is nailed to the side of each trimmer.

ROOFS

TERMS.—Most of the following terms used in connection with roof construction are illustrated in Fig. 35 and subsequent drawings.

Covering.—The external material laid or fixed on a roof to protect the building. The materials used for this purpose are: Slates and plain tiles (see Chapter Five), pantiles (burnt slabs of clay, shaped to a flat **S** in cross-section, 14-in. by 10-in. by $\frac{5}{8}$-in.), asphalt (as described on p. 17, laid on concrete in two or three layers to a finished thickness of $\frac{3}{4}$ or $1\frac{1}{8}$-in.), asphalt felt (see p. 18 and Q, Fig. 36), lead (see Chapter Six), zinc (thin sheets laid somewhat like lead to form a cheaper and inferior covering), copper (an excellent but costly material laid in sheets), corrugated sheets of asbestos-cement or galvanised wrought iron,