

To comply with this requirement for 9-in. walls it is necessary to resort to either offsets (for ground floors) or corbels (for upper walls) to provide support for the wall plates, as shown in Fig. 11. Alternatively metal bars, called *corbel brackets* (see T, Fig. 32), may be used. These are of mild steel or wrought iron, from 3 to 4-in. wide by $\frac{3}{8}$ -in. thick by about 1-ft. 6-in. long with ends turned 2-in. in opposite directions. They should be painted and built 9-in. into the wall at from 2-ft. 6-in. to 3-ft. apart.

An alternative form of wall plate is shown at S, Fig. 32. This is a 2 or 3-in. by $\frac{3}{8}$ -in. mild steel or wrought iron plate of any suitable length. It is rarely adopted.

Whilst joists may be placed in any direction, it is usual to fix them across the shortest span. A space of about 2-in. should be left between the wall and the first joist which is parallel to it. When joists forming floors of adjacent rooms run in the same direction, the overlapping ends on the division walls are nailed to each other and to the wall-plates (see Y' at A, Fig. 32).

The plan of the room shown in Fig. 32 includes a fireplace. The construction of fireplaces is described in Vol. II. as it is outside the scope of the syllabus of a First Year Course. In order however to make a description of ground floors complete it is necessary to make a brief reference to certain portions of a fireplace. A wall is built round the fireplace to retain the concrete hearth (and the material supporting it) and to support a portion of the floor. This is called a *fender wall* and its thickness may be 4½ or 9-in., depending upon its height and the load which it has to support. The internal dimensions of this wall correspond to those of the front hearth which is usually 1-ft. 6-in.¹ wide with a length extending to at least 6-in. beyond each side of the fireplace opening. The hearth may be of 6-in. concrete prepared for glazed tiles or other finish, and the material supporting it should be well packed broken brick or stone, called dry filling or hard core, although it often consists of well rammed earth.² The arrangement of the joists should be noted; see also the enlarged plan and section at J.

The site concrete should be well brushed, and all debris below the floor removed, before the floor boards are fixed. Dry rot may be caused by small pieces of wood, shavings, etc., left below a floor becoming affected (probably on account of dampness) and spreading to the members of the floor. After the joists have been levelled, with their upper edges in the same plane, they are now ready to receive the floor boards.

FLOOR BOARDS.—Some of the timbers used for floor boards are stated in Table I. (p. 60). Redwood is used for ordinary good class work, whitewood and spruce for cheaper work, and pitch pine and the hardwoods (such as oak and maple) are employed for first class floors.

¹ Under the Model Bye-laws (1952) the minimum width of hearth is 1-ft. 4-in.

² Ground floor joists are often trimmed as described on p. 66 for upper floors. This is in lieu of the fender wall construction, and is to be preferred as moisture (especially if the site is a damp one) may be transmitted from the filling to the wall plates and ends of the joists and may cause dry rot.

The sizes of floor boards vary from 3½ to 11-in. wide and from 1 to 1½-in. thick; the narrower the boards the better, for then the shrinkage of each will be reduced to a minimum, the joints will not appreciably open, and there will be less tendency for the boards to cup (see p. 59). Hence 3½-in. wide boards (specified as being "in narrow widths") are used for first class work, 4½-in. wide boards for average good work and 7-in. wide boards for commoner work. Boards of 1-in. nominal (see below) thickness are used when the joists do not exceed 15-in. centres, and when the distance is increased to 16-in. centres the boards should have a nominal thickness of 1¼-in. These sizes are those after the boards have left the saw and are known as the *nominal* or *stuff* sizes, but after the boards have been shaped as required and dressed (or *wrought*) the sizes are reduced and are known as *net* or *finished* sizes. Thus a floor board has one side (which is of course laid uppermost) and both edges planed, and a 7-in. by 1-in. (nominal size) board is reduced to 6¾-in. by $\frac{7}{8}$ -in. net, and a 1¼-in. (nominal) board has a finished thickness of 1½-in.; the net width includes the tongue (see Q, R, V and W, Fig. 34). Boards are usually obtained in either 16 or 18-ft. lengths, although boards which are from 20 to 22-ft. long are obtainable.

The boards may be converted by sawing from the log, as shown in Fig. 30, or from battens; thus six 3½-in. by 1-in. (approximately) boards may be obtained from one 7-in. by 3-in. batten by two saw cuts down its depth ("deep cuts") and one cut down its thickness ("flat cut").

The labours such as rebating, tonguing, grooving and planing floor boards (see Fig. 34) are carried out in one operation by a machine called a Planing and Matching Machine. Thus boards which are tongued and grooved (see R and U, Fig. 34) are made as follows: The sawn board as it passes horizontally through the machine is first smooth finished on the lower surface. As it proceeds it is planed and grooved on one edge, tongued on the other as the board is reduced to the correct width, and just before it leaves the machine the board is reduced to the required thickness. The latest type of this machine, when fed automatically, can produce 500 lineal ft. of tongued and grooved boarding per minute.

JOINTS.—Various *edge* or longitudinal joints between floor boards are shown in Fig. 34. These are described below.

Square or Plain Joint (see P).—The edges are cut and planed at right angles to the face or side, when they are said to be either *shot*, *butt jointed* or *straight edged*. This joint is never used for good work unless the boards are to be covered by another layer of boards to form what is called a *double boarded floor* (p. 65).

Rebated Joint (see Q).—A $\frac{3}{8}$ -in. wide tongue, one-third the thickness of the board, is formed along the lower edge of one board and fits into a slightly wider rebate formed on that adjacent. This joint is rarely used for edge joints, but is sometimes adopted in good work for heading joints (see p. 64).

Tongued and Grooved or Feathered and Grooved Joint (abbreviated to "t. & g." or "f. & g.") (see R and U). This is used more frequently than any other for good work. A narrow projecting tongue or feather is formed just below the middle along one edge and a groove along the other. The tongue is slightly smaller than the groove (thus for a $\frac{3}{8}$ -in. wide tongue the groove is