

in the direction of its length and in another form (called *cup* or *cupping*) the timber is curved in cross-section.

Wane is the original splayed or rounded surface of the tree which remains at the edge or edges of a piece of timber after conversion; sometimes known as *waney edges*. A baulk with two waney edges is shown at F. They appear at the upper end of the baulk, the lower end being sufficiently large to give a square cross-section. Wane is due to converting too large a baulk from a tree; not considered to be detrimental if used for shoring, piling, etc., and in positions where the appearance and large amount of sapwood are unimportant considerations.

Chipped or Torn Grain is a slight defect caused by the planing machine or tool removing a portion below the surface of the wood as it is being dressed.

CLASSIFICATION

Timbers used for building purposes are divided into two groups called (a) *softwoods* and (b) *hardwoods*. This division has been established by long usage and is not in accordance with the relative hardness of the woods (as certain softwoods are harder than some hardwoods) but is concerned with the specific species of the trees. Thus softwoods are a group which is confined to *conifers* which are evergreen (having leaves throughout the year) trees having needle-like leaves and which bear cones (seeds contained in conical sheaths), whilst hardwoods form a class of *broad leaf* trees which cast their leaves in the autumn.

Softwoods are in general characterised by (1) distinct annual rings, (2) indistinct medullary rays, (3) comparatively light colour and (4) the heartwood and sapwood are not readily distinguished.

Hardwoods are characterised by (1) less distinct annual rings, which are closer together than in softwoods, (2) distinct medullary rays, (3) richer colour and (4) darker coloured heartwood which is readily distinguished from the sapwood.

The thickness of the annual rings varies, thus in redwood (see Table I.) the number of rings varies from five to thirty per inch. This variation is due to the difference in the length of the summer. Where the summer is short, as in North Russia, there is comparatively little growth each year, and therefore the number of rings per inch is large. Generally, the annual rings of hardwoods are closer together than in softwoods on account of hardwood trees being slower in growth.

Particulars of certain softwoods and hardwoods are given in Table I.

CARPENTRY embraces those forms of construction in wood which are subjected to stresses on account of the loads which they support or the pressures which they resist. Such construction may be permanent in character, as floors, roofs, partitions and lintels, or it may be of a temporary nature, e.g., timbering for trenches or similar excavations, centering for arches and formwork to support reinforced concrete floors, etc., during construction. The following is a description of some of these structures :—

FLOORS

Wood covered floors¹ may be divided into two classes, i.e., (1) floors consisting of bearing timbers, called *joists*, in addition to the *boards* which are used to cover them, and (2) floors which consist of either wood boards or blocks upon a concrete foundation.

(1) **BOARDED AND JOISTED FLOORS.**—Such are usually classified into :

- (a) *Single Floors.*—This class consists of only one set of joists, called *common joists* or *bridging joists*.
- (b) *Double Floors.*—In this class, additional and larger joists, called *binders*, are introduced to support the bridging joists.
- (c) *Triple or Framed Floors.*—Such a floor comprises three sets of joists, i.e., bridging joists which transmit the load to binders, which are in turn framed into and supported at intervals by larger joists called *girders*.

Double and triple floors are required for buildings of large area. Whereas formerly the binders and girders were of wood, this material is now rarely used for this purpose. If wood joists are to be used in conjunction with binders, the latter are now usually of mild steel, when they are called *steel beams* or *girders*—or *rolled steel joists*, abbreviated to “R.S.J.’s” (see H, Fig. 77). Floors of large span are now usually constructed of fire resisting materials, such as (i) reinforced concrete beams and slabs, or (ii) main steel beams to which are fixed secondary steel beams that support floors consisting of either small steel beams encased in concrete, concrete floors with expanded metal or similar reinforcement, or patent fire resisting terracotta or concrete blocks. The construction of such floors is detailed in Vol. II.

SINGLE FLOORS.—The floors of domestic buildings, e.g., houses, are generally of this type, and the following description is applicable to the construction of a typical ground floor and an upper floor of such a building.

GROUND FLOOR

Fig. 32 shows the plan, sections and various details of a ground floor which is of the single floor class.

Sizes of Joists.—The sizes of joists depend upon (a) the span, (b) the distance between each joist, (c) the load on each square foot of floor and (d) the timber used. With reference to :

(a), Intermediate supports to ground floors are usually provided in the form of 4½-in. thick walls, called *sleeper walls* (see p. 61), which are built at a maximum distance apart of 6-ft. and therefore only small joists are required for ground floors. As upper floors of this class have not such intermediate supports, the joists span from wall to wall (usually across the shortest span) and therefore they are relatively large.

(b), The spacing of joists varies from 12 to 16-in. centres (the distance between the centre of one joist and that next to it). If 1-in. thick boards are used, this

¹ Cork, rubber, mosaic, fireclay and marble tiles are also adopted to cover floors.