

CHAPTER THREE

CARPENTRY

Syllabus.—Brief description of the structure, growth, seasoning, preservation, sizes, conversion, defects, classification, characteristics and uses of softwoods and hardwoods. Ground floors, sizes and spacing of joists in accordance with bye-laws, boarding, joints, ventilation. Single upper floors up to 12-ft. span, strutting, trimming to fireplaces and voids. Pitch, span and evolution of roofs; single roofs including flat, lean-to, double lean-to, couple, close couple and collar types; double roofs, purlins, hips, valleys, trimming to voids, treatment of eaves; simple principles of framing, framed roofs including king post truss with box and tapered gutters; connections and metal fastenings. Timbering to shallow trenches, lintels, turning pieces and centres up to 6-ft. span.

STRUCTURE OF TIMBER.—A cut section through a portion of a tree which produces timber used for building purposes is shown at A, Fig. 29. This shows that the structure (or arrangement of the various parts) comprises (a) a central core of fibrous (thread-like) woody tissue (woven particles) called the *pith* or *medulla* which disappears in time, (b) inner concentric rings of woody tissue called *heartwood* or *duramen* (durability), (c) outer and lighter coloured concentric rings of woody tissue called *sapwood*, (d) radial narrow bands of tissue called *medullary rays* or *transverse septa* (partitions) which contain cells and radiate from the centre and (e) the *bark*.

The irregular concentric rings of tissue, forming the heartwood and sapwood, are called *annual rings* or *growth rings* as in temperate climates one ring is generally formed annually. A diagrammatic view of a portion of an annual ring of a softwood (see p. 59) is shown in cross-section at B, Fig. 29; this is much enlarged, for the number of rings may vary from three to forty per inch. A ring, consisting of rows of cells of variable size which run longitudinally (parallel to the trunk), is divided into an inner portion called the *spring wood* and an outer and darker portion known as the *summer wood*. The cells diminish in size from a maximum forming the spring layer to a minimum at the outer layer; in addition, the cell walls of the summer wood are thicker than those of the spring wood. Hence summer wood is more compact and darker coloured than spring wood. The cells communicate with each other through holes in their sides, and the narrow cells in the medullary rays also communicate with the annual ring cells.

Certain timbers have annual rings which are very distinct and the spring wood and summer wood are easily distinguished; other timbers have rings which are indistinct and there is no contrast between the spring wood and summer wood. The medullary rays are well defined in certain woods but in most timbers they are only perceptible through the microscope (see p. 60).

GROWTH.—Moisture, salts, etc., are absorbed from the soil by the roots of the tree, and in the early spring these ascend through the cells (see B) to the branches to develop the leaves which convert the absorbed material, called *sap*,

into liquid food suitable for the tree. Meanwhile the *cambium*—a thin covering of cells between the bark and the last-formed annual ring (see A)—produces new cells which form the spring wood of the next annual ring. In the late summer and early autumn the food descends between the spring layer and the bark to form the denser summer wood of the annual ring. Thus trees which produce timber used for building purposes grow outwards immediately under the bark and are called *exogens*, as distinct from *endogens* which mainly increase in size by growth at their ends. The cells in the medullary rays act as reservoirs for tree food.

In course of time the layers next the pith become stronger and the cells cease to convey sap; this is the *heartwood*. The outer part of the tree, or *sapwood*, contains much more sap and is softer and lighter in colour than the more mature heartwood. Sapwood is also known as *alburnum* on account of its relatively light colour.

Building timbers are divided into softwoods and hardwoods (see p. 59).

FELLING.—Trees used for building purposes should be felled as soon as possible after reaching maturity. If felled prematurely, the wood is not so durable and contains an excess of sapwood; if cut after its prime, the tree produces timber which is brittle and the central portion especially may show evidence of decay. The time taken before trees reach their prime may vary from fifty years (*e.g.*, ash) to a hundred years (*e.g.*, oak). The best time for felling trees is in the autumn just before the fall of the leaf (when the sap is still thin) or during winter after the fall of the leaf (when the trees contain little sap), as during these periods the evaporation of moisture and the resulting shrinkage are comparatively small.

SEASONING.—Timber cannot be used for either carpenters' or joiners' work immediately it has been felled because of the large amount of sap which it contains. Most of this moisture must be removed, otherwise the timber will shrink (contract) excessively, causing defects in the work and a tendency to decay. Elimination of the moisture increases the strength, durability and