The growing season in this country is from April to September. During this period new wood is produced by a thin layer of cells called the *cambium* and situated between the bark and the outer growth ring. These cambial cells divide and subdivide, forming new cells on the inner and outer sides. The new inner cells gradually grow into the new wood (*xylem*) and the new outer cells develop into new bark (*bast*) which conducts the food converted by the leaves to the growing parts of the tree. The wood produced at the beginning of the growing season, known as the *spring wood*, is generally of an open nature owing to the relatively large size of the cells and the thinness of their walls ; that formed towards the end of the season, called the *summer wood*, is usually denser on account of the cells being smaller and their walls thicker (see B, C and E, Fig. 1). Hence the contrasting alternate lighter and darker layers which clearly define the growth rings in many timbers. Some woods, as shown at K, do not show a sharp contrast between spring wood and summer wood.

A cross-section through a fully developed tree will, as a rule, show a comparatively dark coloured central portion or *heartwood* surrounded by a lighter coloured zone called *sapwood*. The heartwood content of a tree increases with age. Thus, the log of an immature tree is chiefly composed of sapwood, the cells of which are actively engaged in conducting mineral salt solutions from the soil to the leaves and the sap or foodstuff manufactured from them. In course of time this work is performed by the more recently formed growth rings and the cells in the inner core become inactive, the heartwood acting as a mechanical support of the tree only. Each year the inner ring of sapwood is converted into heartwood, and as an additional outer growth ring has been formed during this period, it follows that the proportion of sapwood remains practically constant. Various substances, such as gum, resin and tannin, are formed and deposited in the heartwood cells. These substances influence the colour and increase the durability of heartwood. There is no appreciable difference in strength between sapwood and heartwood.

The structure of (*a*) softwood timbers is simple compared with that of (*b*) hardwoods.

(a) *Structure of Softwoods*.—Approximately 90 per cent. of the wood consists of comparatively long, vertical (when forming the trunk) tubular cells called *tracheids*. A cross-section through a portion of a growth ring is shown at B, Fig. 1. This shows the honeycombed nature of the structure, with the tracheids arranged in rows and separated at intervals by *rays* (see next column). The tracheids are seen to be polygonal shaped when examined under the microscope. Most of them are not visible to the naked eye, and as an example the tracheid shown greatly enlarged at P is only 0·004-in. in diameter (see H). Those in the spring-wood zone have thin walls and relatively large cavities (see E, H and P), whereas the summer-wood cells have gradually diminishing cavities and thicker walls (see C and G). The function of the spring-wood cells is to conduct water to the leaves and the chief function of the summer-wood tracheids is to strengthen the tree. The cells are approximately 3-mm. (about $\frac{1}{8}$-in.) long, as shown at P ; the ends of the spring-wood cells are more rounded than those of the summer-wood cells (compare C and E). The cells communicate with each other through *pits*, of which there are many modifications. One form, known as a *bordered pit*, is shown at C and E. Pits in adjacent cells are opposite to each other and permit of the conduction of water, etc., from one tracheid to another. As shown, a pit consists of a circular area of unthickened cell wall from the border of which the wall projects to form a domical-shaped covering having a hole in the middle. The continuous thin membrane is called the *middle lamella*, and this is thickened at the centre to form the *torus* (see D). Another form of pit, called a *single pit*, is shown at N and P.

The *medullary rays*, or simply *rays*, referred to in the preceding column appear as straight, narrow, radial bands across the grain (see A and P). In softwoods they are hardly visible to the naked eye ; thus, those of redwood vary from 0·005 to 0·012-in. high. A ray consists of cellular tissue, called *parenchyma*. The cells are thin-walled and rectangular in shape. The rays are irregularly distributed, and each is usually only one cell wide and several cells high, as shown in the *tangential* section at L where the rays can be seen in section. They serve as storage accommodation for food which is transmitted through *simple ray pits* to the adjacent vertical tracheids for distribution. As shown at P, these ray pits are thin membranes which are either circular, rectangular or slit-like in shape.

Resin ducts are present in certain softwoods, such as pitch pine, redwood, spruce, yellow pine and Douglas fir (see B and L). These canals are present in comparatively small numbers in the summer wood and in the rays. They receive the resin (waste product) secreted by the cells immediately surrounding them.

(b) *Structure of Hardwoods*.—This is more complicated than the structure of softwoods. It chiefly comprises vessels, fibres, parenchyma and rays.

Vessels or Pores.—These are long vertical tubes composed of pipe-like open-ended cells which extend down the trunk. Their function is similar to that of the spring-wood tracheids of softwoods in that they conduct water from the roots to the crown of the tree. The size of the pores varies in different woods, thus a cross-section through a log of oak will show comparatively large pores which are conspicuous to the naked eye, the pores of beech are barely visible to the naked eye, and those of box are difficult to distinguish even with the aid of a magnifying glass. A pore is shown in section at M. The pits are smaller than those in softwood tracheids.

Some hardwoods, such as oak, elm and ash, have the larger pores concentrated within the spring wood and the smaller pores distributed throughout the summer wood ; these are called *ring-porous* woods, and an example is shown at J. Hardwoods in which the pores are fairly uniformly diffused (scattered) over the whole growth ring are said to be *diffuse-porous*, examples being mahogany, beech and birch (see K) ; as shown, the pores gradually decrease in size with a maximum in the spring wood.