

extensive, is likely to be still further increased in the future, a more detailed description of its manufacture, characteristics, uses and types is given below.

PLYWOOD or RECONSTRUCTED WOOD or LAMINATED WOOD is a compound wood made up of several thin layers or plies or veneers, glued together under pressure, and usually arranged so that the grain of one layer is at right angles to the grain of an adjacent layer or layers.

A sheet or board of plywood usually consists of an odd number of plies, *i.e.*, "3-ply," "5-ply," etc. Those which have more than three layers are known as *multi-ply boards*—see C and D, Fig. 40 (5-ply) and E (7-ply); the number of layers may be increased as desired, but boards having more than nine plies have to be specially ordered.

A 3-ply board consists of two outer or *face plies* with a middle *core*. It is important to observe that these plies are *cross-grained*, *i.e.*, the grain of the core of a 3-ply board is at right angles to that of each of the face plies (see B to E, Fig. 40, and pp. 100 and 102). The thickness of the veneers varies; a $\frac{3}{8}$ -in. thick 3-ply board will consist of three $\frac{1}{8}$ -in. veneers and is an example of an *equal ply* board (see B); a $\frac{3}{8}$ -in. thick board, with the same number of plies, has a $\frac{1}{4}$ -in. core and two $\frac{1}{8}$ -in. face veneers and is known as a *stout heart* board. An example of a stout heart 5-ply board is shown at D; this $\frac{3}{4}$ -in. thick board has two 2.5-mm.¹ thick face plies, a 6-mm. central ply and two 4-mm. intermediate layers or *cross bandings*. Examples of equal ply boards are shown at C and E.

MANUFACTURE OF PLYWOOD.—The various processes are: (1) Preparation of logs, (2) conversion, (3) trimming, (4) drying, (5) gluing, (6) pressing, (7) re-drying and (8) finishing.

1. *Preparation of Logs*.—Logs of certain timber, such as alder, beech, Gaboon mahogany and oak, are first either steamed or boiled to render them pliable. This softening of the fibres takes place in large covered-in concrete pits containing water heated by hot-water pipes situated on the floor; the logs are kept submerged for at least two days—depending upon the size and hardness—until thoroughly saturated. Other timbers, including British Columbia pine and European birch (Finnish, Polish and Russian), do not require this preliminary treatment. The logs are then cross-cut into lengths (7 or 8-ft. or according to the size of the converting machine), the bark is removed by hand or machine (called a *barking lathe*), hard knots are cut out and any irregularities removed.

2. *Conversion*.—The prepared logs are now converted into veneers by either (a) rotary veneer cutters or (b) veneer slicing machines.

(a) *Rotary Cutting Method*.—More than 90 per cent. of veneers are cut by this method. A *rotary veneer cutter* or *peeler* is a powerful lathe with a very sharp fixed knife slightly longer than the log (see J and K, Fig. 40). The log, prepared as described, is conveyed by a crane to the peeler, lowered and then

¹ The thickness of plywood imported from continental countries is specified in terms of millimetres; thus, boards from Russia, Finland and Poland are referred to as being 3, 4, 6, 9-mm. etc., thick. A millimetre = 0.039-in., hence 7-mm. = 0.27-in. (approximately $\frac{1}{4}$ -in.). American, Canadian and English plywood is specified as $\frac{3}{8}$ -in., $\frac{1}{2}$ -in., $1\frac{1}{8}$ -in., etc., thick boards.

clamped between two centres or chucks which penetrate the ends of the timber at the "centres" previously marked. The horizontal log is revolved and a continuous ribbon of veneer, uniform in thickness, is cut by the knife and emerges—like a roll of paper being unrolled—between it and the *pressure* or *nose bar*. This bar prevents the wood from splitting, and the distance between it and the knife is regulated according to the thickness of the veneer. Logs converted in this manner should be of large (not less than 10-in.) diameter, straight grained and reasonably free from knots and other defects; the diameter of Gaboon mahogany and Douglas fir (both extensively used for plywood) logs varies from 2 to 6-ft. or more. The veneer deteriorates in quality as the log unrolls owing to the increase in the size and number of the knots towards the centre. Hence the veneer is sometimes increased in thickness as the peeling proceeds and is used for cores, the thinner and better veneers being used as face plies. The peeling process is continued until the diameter of the log has been reduced to about 6-in.

A modification of rotary cutting, used to produce highly decorative veneers from rarer woods, is known as the *half-round* or *stay-log cutting* method. The log is divided longitudinally by means of a circular saw, a half log is secured to a strong bar fixed between the centres of the rotary cutter and with its sawn face against the long knife. Thus, commencing from the heart, a series of veneers is produced as the half log swings round and descends on to the knife. As the conversion is not tangential to the annual rings, the resulting figure is generally richer than that produced by the first method.

(b) *Slicing Methods*.—Decorative veneers are obtained from certain valuable richly figured rare timbers by slicing in order that the attractive figure may be shown to greater advantage than that produced by the rotary cutter. Burls, crotches and stumps (see A, Fig. 40 and p. 5) are often converted in this manner. There are two types of machine used for this purpose, *i.e.*, the (i) horizontal veneer slicer and the (ii) vertical veneer slicer.

(i) *Horizontal Veneer Slicing*.—The slicer is a heavy, powerful machine which has a fixed bed in addition to a wide knife with pressure bar in a movable frame. The log is divided into two down its length, and one-half is fixed to the bed with the sawn face uppermost and level. The knife cuts the veneer to the required thickness as the frame is forced forward over the fixed timber. During the slicing process the veneer passes upwards between the knife and pressure bar and over the frame. On completion of the cut the knife is returned to its original starting point and the timber is automatically raised by an amount equal to the thickness of the veneer. This process is repeated until the half-log has been converted. The thickness of the veneers varies according to requirements and the nature of the wood, but $\frac{2}{8}$, $\frac{3}{8}$, $\frac{1}{4}$, and $\frac{1}{8}$ -in. thick veneers are common. In addition to burls, crotches, etc., boles of satinwood, sycamore, teak, walnut and several other timbers are sliced, as rotary cutting is apt to cause splitting. Each veneer is numbered as it leaves the machine and stacked in that order. This ensures correct matching (see p. 100). Flitches are also converted into veneers by slicing.

(ii) *Vertical Veneer Slicing*.—This machine has a fixed knife and the log is secured to a movable bed. The slicing operation is therefore the reverse to that described above, the veneers being produced as the bed travels along the knife.

The above methods are known as *flat cut* and the veneers show a straight grain on each side of the central heart. Whilst avodiré, silver greywood, Cuban and Honduras mahogany, sapele, and timbers (such as oak) which have the medullary rays well developed, are sliced as above described, more highly figured veneers are