Length of Drying Period.—This varies with the size, characteristics and quality of the timber. Approximately the time required in a forced draught kiln to reduce the m.c. of 2-in. thick timber from a maximum (green) to 12 per cent. is from one to two weeks for softwoods and three to twelve weeks for hardwoods. These times are increased by about half if the timber is seasoned in a natural draught kiln. Preliminary air seasoning to 20 per cent. m.c. reduces the above kiln periods to approximately one-third. These figures should be compared with those given for air-seasoning (see pp. 8 and 9).

PRESERVATION

Decay in timber used for certain purposes can only be prevented if it is subjected to an effective process of preservation. Thus, timber required for piles, sleepers, fences and gates, wall plates and ends of floor joists built into walls, floor fillets partially embedded in concrete, weather-boarding, etc., for temporary buildings and unpainted external woodwork, should be treated with some form of preserving agent.

Fungi (plants of the mushroom tribe) are the principal cause of decay in timber used in this country (see pp. 14-16). This low form of life requires food, a certain amount of moisture and oxygen for its growth, and the absence of any one of these prevents decay. Thus the fungi cannot exist in timber if either (1) the food supply in the form of organic matter (of which timber is chiefly composed) is poisoned by a suitable preservative such as is described below, or (2) the timber is sufficiently seasoned (to a minimum m.c. of 20 per cent.—see pp. 7 and 15) and maintained in a dry condition, or (3) air is excluded (timber—such as wood piles—will not decay if kept permanently waterlogged). Fungus develops more quickly in warm weather than in cold, especially if the temperature is between 80° and 90° F.; most fungi will not grow if the temperature exceeds 105° F. or is at freezing point. In addition to fungi, much damage is done to timber by insects (see p. 16).

Effective preservation depends upon the preservative employed and its application. An efficient preservative should be poisonous to fungi and insects (but not to persons handling it), permanent, able to penetrate sufficiently, cheap and readily available; it should not corrode metal fastenings, etc., nor should the timber be rendered more inflammable by its use.

Substances used for wood preservation include (1) oil preservatives such as creosote and coal-tar, and (2) water soluble preservatives of which zinc chloride, sodium fluoride and magnesium silicofluoride are examples.

Creosote [1] is the chief preservative used and is considered to be the most effective for general application. It is a black or brownish oil, and, as stated on p. 54, Vol. II, is produced by the distillation of coal-tar. Creosote has all of the above requirements except that the inflammability is increased. It should not be used for internal woodwork if its characteristic smell is objected to. Creosoted wood cannot be painted satisfactorily.

[1] The British Standard Specification, No. 144, includes a description of the tests which may be applied to creosote.

Coal-tar as a preservative is not as effective as the creosote produced from it. Tar is less poisonous, it does not penetrate the timber because of its viscosity, it is blacker than creosote and is unsuitable for internal woodwork.

The water soluble preservatives referred to in the preceding column are not satisfactory for external use, as they are liable to be removed from the timber by rain. They are, however, very suitable for interior work, as they are comparatively odourless and colourless, and timber so preserved can be painted. They are obtained in concentrated form and require to be diluted with water to give from 2 to 5 per cent. solutions. Other preservatives of this class include mercuric chloride (corrosive sublimate) and copper sulphate, but neither is much used in this country as the former is highly poisonous to human beings, the latter is not permanent, and both have a chemical action upon metals.

There are a number of patent preservatives available. Some of these consist of poisonous chemicals (such as chlorinated phenols and naphthenic acids) dissolved in volatile oils. When such a preservative agent is applied, the oil evaporates and leaves the chemical in the timber. Their high cost limits their use.

The timber should be seasoned before being subjected to a preserving process, as the presence of moisture impedes the penetration of the preservative.

The process of preservation is just as important as the preservative, and to be effective the material must sufficiently penetrate the timber. The extent of the penetration depends upon the conditions to which the timber is to be subjected; thus, timber which is to be submerged in water or embedded in the ground should be thoroughly well impregnated with the preservative, whilst certain internal woodwork may be given adequate protection by surface treatment only. Preservatives are applied by (1) pressure, (2) non-pressure and (3) superficial processes.

1. Pressure Processes.—There are several pressure processes and these are generally adopted for treating timber on a large scale. Maximum penetration of the preservative results from pressure treatment. In each of the several methods the timber is placed in a strong steel cylinder, 5 to 10-ft. diameter and 15 to 20-ft. long, and having a tight-fitting door at each end. The cylinder is fixed horizontally at ground level, and a storage tank containing the preservative (and steam coils for heating it) is connected to it. The timber is either piled directly in the cylinder or stacked in bogies and run into it.

Creosoting is the principal pressure-process, and, as is implied, creosote is the preservative used. There are two methods of applying the material, *i.e.*, (*a*) full-cell process and (*b*) empty-cell process.

(a) *Full-cell Process.*—This is so called because the wood cells remain filled with the preservative after the timber has been withdrawn from the cylinder; it is also known as the *Bethel Process* (after the patentee who introduced it about a century ago). The first operation, after the cylinder has been piled with the seasoned timber and the doors have been clamped, is the reduction of the air pressure within the cylinder and the removal of the air and moisture from the