WOOD PRESERVATION*

INTRODUCTORY

THIS is a subject which has been receiving considerable attention recently, in view of the threatening timber famine. Very little has been done in Cyprus to encourage the preservation of wood; this is all the more remarkable when one considers the lack of trees in the Near East. The object of this article is to enumerate briefly some of the methods used to render timber more durable, under many varying conditions.

The chief enemies of timber are fungi and insects and these can damage timber under favourable conditions only, such as temperature, moisture, etc. Since man cannot control the elements, it is necessary for him to devise some method or methods for making timber immune to deterioration. Timber which has been well seasoned and is used for interior building construction, furniture, fittings, etc., and where the changes in temperature and relative humidity are not considerable, need not receive any preservative treatment, if precautionary measures have been taken to prevent insect or fungi attack during felling, sawing, seasoning, and manufacture also. Nearly all modern interior work is treated with polish, paints, varnishes, etc., which are in themselves antiseptics.

Decay is the greatest bugbear in all forms of converted timber, and yet at the same time it may be considered as one of the greatest assets to the forester. This may sound paradoxical, but if we did not have decay in the forest we should have to go to considerable expense in clearing up rotten trees, branches, bark, and all the waste from felled trees. This decomposed material goes to form what is generally known as humus. Insects, fungi and certain forms of bacteria are responsible for the decomposition.

The wood substance, or tissue, is the food supply of these insects and deleterious fungi. Prevention of attack means that some method must be adopted which will render the wood unpalatable to insects and fungi. Hence, to put it briefly, wood preservatives are insect and fungal poisons.

It has been said that certain types of oil preservatives render wood inflammable, but such preservatives are usually used for marine and outdoor work, and even should it be necessary to use such material for house construction, there are several methods whereby the wood can be rendered non-inflammable.

ELEMENTARY WOOD PRESERVATIVE METHODS

I propose to discuss several methods of wood preservation which might be of use in Cyprus. In each case I have considered the question of economy in cost of preservative and apparatus or equipment, for carrying

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out the treatment. I do not propose to refer to any of the more advanced methods of pressure and vacuum impregnation treatment, where the machinery is much too complicated for any Cypriot engineer. Technicalities have been avoided, wherever possible.

CHARRING

This is probably the oldest method of protecting timber from decay. It is still commonly used in Cyprus. It is very probable that the primitive man knew of it when he hardened the point of his wooden spear in the fire. Certainly Lake Dwellers knew the preservative value of charring wood. Briefly the process consists in holding the wood to be treated over a fire until the outer fibres are charred. This means that the outer layers of the wood are charcoal which is not attacked by fungi or insects. The depth of charring is usually $\frac{1}{8}$ inch. to $\frac{1}{2}$ inch. The inner layers are thus protected from any injury.

The result of rapid charring with unseasoned timber is that case-hardening occurs. Contraction of the outer layers and the increased pressure of steam and moisture in the inner layers brings about a state of considerable tension between the outer and inner layers, with the obvious result that the charred part splits and cracks so badly, that it is generally known as "starring" professionally. The writer has seen Eucalyptus telephone poles treated in this way, which have split in half for a distance of more than 2 feet up from the butt. It is fairly obvious that the area thus exposed to attack is considerably increased. Unfortunately the charring process in Cyprus is carried out much too rapidly and with unseasoned wood.

There is a secondary reaction caused by the charring of the outer layers. Destructive distillation is set up where the heat is sufficiently high, *i.e.*, in the neighbourhood of the charred areas. This pyroliqueous acid so formed is in itself a fairly powerful preservative agent and is extremely toxic to fungi.

The process of charring is not to be recommended unless as a last desperate resource, and even then it should only be used on thoroughly seasoned timber, and the process should be carried out slowly

BRUSH TREATMENT

This form of treatment is probably used more extensively than any other superficial method. As the name suggests, it consists in merely applying the preservative to the surface of the wood by means of a brush. As is always the case in superficial treatment, the best results can only be obtained when the wood is thoroughly seasoned. Preservatives have always better powers of penetration into dry woods. When using "oil" preservatives it is definitely advantageous to heat certain of them to say 180° to 200° F., *e.g.*, Creosote. Even under favourable circumstances it will be found that the preservative rarely penetrates more than $\frac{1}{4}$ of an inch.

It is very essential that special care be taken in working the preservative into all checks, cracks, joints, etc., as thoroughly as possible. Paints, varnishes, enamels, etc., can all be considered as preservatives under brush treatment, either for indoor or outdoor wood work.

The Cyprus Railways use sleepers, imported from abroad which have been subjected to pressure treatment with creosote as the usual preservative. Even then the General Manager, Railway, finds it profitable to recondition certain of these sleepers in order to prolong their utility. The General Manager, Railway, has kindly granted me permission to quote the following figures:

1 40-gal. Barrel of Bitumen Solution costs 30s.

This amount of solution is sufficient to paint between 850-900 sleepers.

1 labourer on a salary of 15 cp. per day can paint 50-55 sleepers per day.

Cost of brush is 1s. 4½ cp.

Size of sleepers, 5 feet × 6 inches × 4 inches.

Costs work out as follows:

	£	s.	cp.
Bitumen solution	1	10	0
Brush	0	1	4
Labour (17 men @15cp. per day) 850 sleepers	1	8	3
	£2	19	7½

Allow £3 for treating 850 sleepers. Then actual cost per sleeper works out at 26 paras.

DIPPING OR SIMPLE IMMERSION PROCESSES

There is always a certain amount (in some cases a considerable amount) of difficulty in working the preservative into checks, cracks, etc., and so one finds that dipping is more effective than the brush method. In dipping it is necessary to have some tank or container large enough to hold the preservative and allow the material selected for treatment to be submerged. In many instances it is not necessary to submerge the whole piece of timber, *e.g.*, fencing posts, gate posts, telephone poles, etc. In such instances it is only necessary to treat that part which comes into intimate contact with the ground.

Dipping is safer and surer than brush treatment and in general yields much better results. Dipping is a non-pressure process and relies on the absorptive properties of the wood to secure successful penetration; no doubt atmospheric pressure helps to some extent in forcing the preservative into the wood. The apparatus may consist of any open vessel, such as a vat, barrel, tank, cylindrical metal retort, etc.

There are many different methods and processes which may come under the heading of dipping for the purposes of this brief article, although they are not considered as such from a technical point of view. I propose to enumerate a few of the more important in common usage in various countries. Some of them are eminently suitable for Cyprus conditions. It may even be found that two methods may be employed together.

Kyanizing Process.—The timber is steeped in a solution of perchloride of mercury (mercuric chloride or corrosive sublimate) at atmospheric temperature and pressure. The wood is built up in the tank much

in the same way as is done in seasoning, *i.e.*, stickers or lathes are placed between each layer of timber, and a space is left between each piece in the layer. The reason for this is to allow of a free circulation of the solution. The strength of the solution is usually 1 per cent.

The length of time the timber must be kept submerged is variable as it principally depends on the thickness of the material to be treated. A rough estimate would be to allow one day for every inch of thickness, plus an extra day, *e.g.*, a 2-inch plank would steep for 2 days plus the day extra, making 3 days in all.

Needless to say, corrosive sublimate is an extremely dangerous poison, therefore it is imperative that it be handled with the utmost caution. It is always advisable to have a container near the tank from which the solution can be pumped into the tank, and at the completion of the treatment it can be withdrawn and pumped back into the container.

Open Tank Process.—The plan or apparatus consists of a tank or container of any size convenient to the dimensions and quantity of timber to be treated at any one time. The container or tank must be so constructed that it may be heated directly by a fire under the tank or preferably by steam coils passing through the liquid at the bottom of the tank. A suitable storage tank should be adjacent, fitted with a pump so that the preservative may be pumped into or out of the tank.

The timber is placed in the tank and arranged as previously described. The creosote (or other preservative) is then admitted until it covers the timber to a depth of say 4 inches to 6 inches (allowance must always be made for the expansion of oils). The steam coils are then heated until the temperature of the creosote reaches 200°F. in the tank. This temperature is maintained for one hour and then allowed to cool down; care must be taken to keep the timber well covered. Although the usual time allowed to cool down is about 24 hours, this need not be adhered to very strictly, but may vary with the needs or requirements of the operator. The lower the temperature to which the preservative is allowed to cool, the greater will be the absorption.

If the wood is seasoned (as it should be) it contains minute air spaces; thus when the wood is heated the air expands and a certain amount is driven out as air bubbles which, with certain timbers, cause a thick froth on the surface of the creosote. On cooling, a partial vacuum is set up owing to the contraction of the air left in the timber and so the preservative is drawn into the tissues of the timber. This process works very well with sleepers, fencing posts, telegraph poles, and for general farm work.

Powellizing.—In this process the apparatus is similar to the "Open Tank Process".

The preservative in this case is a saccharine solution, frequently containing an admixture of arsenic. Time taken depends on size and species of timber, and may vary from a few days to 3 or 4 weeks. The

saccharine solution coils at a slightly higher temperature than water, therefore the water in the wood escapes as steam. Owing to the slight difference in temperature, the action of converting the wood moisture into steam is not so violent as it would be with creosote at 200°F. The wood fibres are not badly ruptured as would be the case with creosote, and so green wood can be treated by this process as soon as cut.

The material should be left in the solution until quite cold. This insures a very thorough absorption.

Burnettizing.—The solution is made up in the proportion of 1 lb. of zinc chloride to 5 gallons of water. Time of immersion varies from 10 to 21 days (nearly always done by pressure treatment in modern, up to date practice, as the time is reduced to 5-6 hours). Apparatus may be barrels, tanks, etc., etc.

Margayizing.—A copper sulphate solution is used in the proportion of 1 lb. of the salt to 4 gallons of water. Time of immersion is approximately 2 days for every inch of thickness of the material.

I think that enough has been said about wood preservation to form a suitable introduction to a further series of brief articles on this subject.

There is one more process I might mention, which may be of interest to Cypriots. It is used largely by the American farmers for preserving fencing posts. The posts are allowed to stand in a strong solution of lime water until required. They are then removed and dried. When thoroughly dry they are painted over with a dilute solution of sulphuric acid (H_2SO_4). This sets up a form of case-hardening where the acid was applied. It should only be used on dry soils.

The two chief types of preservatives are oils and salts, or a mixture of the two in definite proportions. Generally speaking the oils give better results under all conditions, whereas the majority of the salts are soluble in water and therefore cannot be used in damp soils as the salts leak out very rapidly. On the other hand salts are much cheaper and where the conditions are dry or on well drained land they have proved just as efficacious as the oils.

The vast majority of people to-day are under the impression that preservatives are of rather a drab and monotonous colour. There are many proprietary preservatives on the market to-day which can be obtained in a wide range of pleasing colours; oak, mahogany, ebony, greens, reds, browns, and varying in price from 1s. 8cp. to 5s. per gallon. These are known generally as the decorative preservatives, and when used on timber with a distinctive grain the effect is often very pleasing.