PRESERVING WOOD AGAINST DRY-ROT.*

WOODWORK is subject to damage by beetles, known as worm, and by fungi, inducing dry-rot. Bacteria are not known to participate even to a minor degree. When dry-rot has been discovered, the first step to be taken is to determine which of the many kinds is present, and then to take the most economical action to eradicate it and prevent its recrudescence. An informative report which covers the subject very comprehensively and gives some excellent photographs of typical damage caused by various dry-rot fungi has lately been published by the Department of Scientific and Industrial Research ("Dry-Rot in Wood," Forest Products Research, Bulletin No. 1, H. M. Stationery Office, 1s. 6d.). Treatment of dry-rot depends in each case on the conditions prevailing, and the precise kind of preservative to be used varies with the situation of the wood to be protected. Some wood preservatives are excluded from use, at least inside a house, by reason of their scent. Such is the case with creosote, and even with certain other less aromatic preservatives whose slight odour is still sufficient to taint fat (of bacon or butter), other food substances, and even cigars. Again some preservatives are excluded from use by reason of the colour they impart. Among the wood preservatives advocated as providing adequate protection against dry-rot in houses, some are good, some indifferent, and others worthless. Confidence should not be placed in the following: blue or green vitriols, common salt and lime water, which represent a series of decreasing fungicidal power. Copper sulphate in particular also attacks iron, and in its commercial form in presence of iron can vigorously attack wood. Zinc chloride, sodium fluoride and magnesium silicoflouride (acid) in proper concentrations are more useful, but when too strong the first-named itself attacks wood, while the much more fungicidal acid silicofluoride attacks iron and glass. Corrosive sublimate is highly poisonous, not only to the fungi in question but also to human beings, and has only slight powers of penetrating wood; yet under competent advice it may be used on occasion. It has one useful character, namely that it is soluble in alcohol as well as in water. Opposed to these inorganic preservatives are organic ones, among which carbolic, acetic and salicylic acids, as well as formalin, may be excluded from use on account of their early evanescence. Valuable preservatives for use in houses are some that are mixtures of tar-oils, especially coal-tar oils. Finally, in particular cases, mixtures of sodium fluoride and dinitrophenol or sodium dinitrophenate may be profitably used.

MAGNESIUM SILICOFLUORIDE.

In cases where the use of a tar-oil preservative is undesirable, either from the point of view of colour, odour, or danger of damage to surrounding work, a 5 per cent. solution of acid magnesium silicofluoride may be used, which is colourless and will not have any harmful effect. But the heavier tar-oil preservatives are recommended for the treatment of all timbers whenever suitable, as they are likely to remain effective for a longer period than the silicofluoride. The magnesium silicofluoride to be used is not the pure salt but the acid commercial salt, which is a white solid containing free acid. The solution is made by dissolving ½ lb. of acid

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salt to one gallon of cold water. If desired it may be mixed with whitewash so long as it remains a 5 per cent. solution. It should be noted that this solution will attack metal and glass, and therefore should be mixed in a wooden tub; it has no adverse effect upon wood, brick, stone, mortar or plaster. The solution should be applied to the surface to be sterilised by means of a brush, and every effort should be made to ensure its penetration into all the cavities and cracks. Very often when decayed timbers are removed, bricks are found to be loose, and have to be taken out. They should be thoroughly cleaned of all dust and all mortar, and should be placed in a bucket of the silicofluoride, to soak for a short period before being relaid.

TAR-OIL PRESERVATIVES.

The properties, and consequently the specification, appropriate to a preservative that is composed of tar-oils and is to be merely superficially washed or sprayed on the wood inside a house are different from those demanded by a preservative for use out-of-doors. The first property required by a preservative for outdoor use is that it shall be a powerful and durable preservative, but for indoor use an indispensable characteristic is that it shall not render a house or room uninhabitable by reason of its odour. It must therefore be free from naphthalene; evil-smelling sulphur compounds and thin oils containing a considerable percentage of the light-oils of lower boiling points are unsuitable because they adhere neither to the brush nor wood; moreover, they have a low ignition point so that, although the light-oils penetrate more rapidly, this advantage is lost because it is not safe or economic to heat the preservative to a temperature sufficiently high to aid materially the penetration into the wood; also the light-oils evaporate or change rapidly and their toxic efficiency is short-lived. One authority prescribes as a good preservative filtered anthracene oils 70 per cent., green oils (obtained from the distillation of pitch) 20 per cent., wood tar (devoid of water) 10 per cent. Others prescribe a mixture of tar-oils having a specific gravity of 1:10-1:12, distillation not beginning below 230°C. or boiling not beginning below 200°C. Another preservative found to be effective is a heavy tar-oil with volatile distillates of the character of heavy solvent naphtha. When 100 mil. of this are taken at 38°C, the distillation should conform to specific gravity at 60°F., 1·054; specific gravity at 100°F., 1·037; distillation up to 205°C., 1 per cent. by volume; distillation up to 230°C., 15 per cent. by volume; distillation up to 315°C., 50 per cent. by volume; distillation up to 380°C., 87 per cent. by volume; residue, non-volatile, at 315°C., 51 grams; tar acids, 7 per cent. by volume; tar bases, 1·9 per cent. by volume; naphthalene and other picrate forming hydrocarbons, 12·2 per cent. by volume; water, trace; matter, insoluble in benzene ("carbon"), 0·20 per cent. by weight. This specification contains a percentage of naphthalene, but the odour disappears after a short time, and this class of preservative is considered to be eminently suitable for indoor work. It is not practicable to lay down any one prescription as the right one; conditions vary and a considerable range of mixtures may be effected. The limits of variation within which oils, the products of coal-tar distillation (free of petroleum oils, but allowed to contain other toxic oils and salts) have been found in practice to be efficient out of doors when tested under the drastic conditions prevailing in the tropics, may be indicated as follows: (1) The specific gravity shall not be less than 1·015 and not more than 1·07 at 38°C; (2) the amount of tar acids shall be not less than 5 per cent. or more than 12 per cent. by volume; (3) the amount of water in the creosote shall not be more than 3 per cent.; (4) the amount of matter insoluble in benzol shall not exceed 0·4 per cent. by weight; (5) when 100 mil. measured at 38°C. of the dry

creosote are distilled from a 250 mil. Wurtz flask, with an outlet from the neck approximately 6 cm. from its base, and the distillation completed in about 20 minutes, there shall distil at 760 mm. pressure up to 205°C. from 0 to 7 per cent.; up to 230°C. from 10 to 40 per cent.; up to 315°C. from 45 to 78 per cent.; (6) the material shall be completely liquid on being slowly warmed to 38°C. with stirring, and on cooling down shall remain completely liquid after standing for two hours at 32°C. The heavier tar-oil preservatives have certain marked characteristics: (a) They usually possess a strong pungent smell, and when such a preservative is used on the interior woodwork of a building this smell may persist for weeks, or even months; (b) they are usually dark brown in colour, and therefore stain all woodwork; (c) it is not possible to apply oil paint over some preservatives of this type, as the preservative may "bleed" through and discolour, if not destroy, the paint; (d) oils possess considerable penetrative powers and will "creep" along the cracks or fissures of timber for considerable distances; (e) if the timber near a plaster ceiling or plastered wall be treated, the oils will creep into the plaster and cause discoloration (to prevent this, it is advisable to protect all adjoining surfaces with sheets of paper, or water-proofing cloth); (f) when these preservatives are used at moderately high temperatures, fumes are given off and sometimes cause a sense of discomfort in the eyes of the workmen; there is no permanent effect, however. Heavy tar-oil preservatives are highly inflammable, and whilst heating them every precaution should be taken against fire.

APPLICATION OF PRESERVATIVES.

The method of application of the preservative to wood (or other materials) varies with the degree of protection desired and the need for economy. The simplest and cheapest method is to apply one, or preferably two, coatings to the surface by means of either a brush or a spray. In order to ensure deeper penetration, suitable preservatives should be applied hot (for instance, those derived from heavy coal-tar oils at temperatures between 140° and 160°F.). Some of the silicofluorides, however, easily dissociate when heated and therefore must be applied cold. The weak points in mere superficial application of the preservative are that this penetration of the wood takes place only to a slight depth, with the consequence that, through cracks caused by skrinkage or by other means patches of wood not reached by the preservative are laid bare and the way is open for infection, while those preservatives soluble in water are liable to be washed out by rain, running or dripping water. When using preservatives on timber certain general measures are necessary in order to ensure as much penetration as possible: (1) Before treating old unattacked timbers which are to be retained, it is important that all dust and dirt should be removed; (2) timber to be treated with tar-oil preservatives should be in an air-dry condition; (3) in surface treatments two coats of the preservative should be applied, whenever possible, by means of a brush, and each coat should be thoroughly worked into the surafce fibres and cracks in the timber. Deeper penetration can be obtained by employing these preservatives in a heated condition at temperatures between 140°F. and 160°F. The penetration of the preservative into existing timbers is assisted by boring augerholes across the grain at convenient intervals; particularly, close to the ends from which any defective timber may have been removed. These holes should be filled with the preservative liquid and temporarily plugged. When the liquid has soaked away, the process should be repeated, and the holes permanently filled with wood plugs. This method is especially suitable for dealing with thick timbers, which cannot be removed, and which have had decayed portions cut from them. New timber and any old timber which can be easily removed for treatment should, if

practicable, be immersed horizontally in a bath of the preservative, maintained at a temperature of 140°F. to 160°F. for, say, at least 30 minutes.

PAINT.

The part played by paint on external woodwork is not quite simple. Properly brushed on to appropriately seasoned wood, it serves to hinder the ingress of water, prevents spores from reaching the bare wood, and decreases the liability of the wood to crack through shrinkage. But when the paint is applied to inadequately seasoned wood, it may do more harm than good; for the paint blisters, patches of wood are soon laid bare, and the wood may split as it dries and shrinks. The result is that spores, alighting on bare patches or falling into damp cracks, may germinate and find available to them wood which has been kept relatively moist by the coating of paint, so that decay may be more rapid than if the wood had not been painted.

[Note.—It should be noted that, as far as Ceylon is concerned, much more damage to woodwork is done by termites than by dry-rot of fungus origin.]