COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

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WOODEN AIR-SCREWS.

Large transport planes and heavy military aircraft are usually fitted with all-metal variable-pitch propellors. So much publicity is being given to their production that few people realise that other types are still in demand and that several hundred wooden airscrews are manufactured annually in Australia. The timber most favoured is Queensland maple (Flindersia brayleyana) which is stated by experienced manufacturers to be superior to any other species in the world for this purpose. It works easily, glues well, does not move appreciably with atmospheric changes, is of moderate weight, and has considerable strength. The timber used for air-screws is received in the form of boards 12" or more wide, is all truly quarter cut and is carefully dried to about 15% moisture content. Each piece is thoroughly inspected for defects and mechanical tests are made on samples cut from every board. The first operation in the manufacture of the air-screws is to cut the boards on a band saw into rough shapes, to assemble these into a series of laminations and glue them together. Highly water resistant casein glue is used, and pressure is applied by clamps for periods up to 24 hours. Even in this early stage, particular attention must be paid to balance, each board being balanced before gluing. After gluing, the embryo air-screws are set aside for several weeks to permit the moisture absorbed during gluing to be removed. They are then mounted on a jig or frame and the shaping process commences. Where a large number of air-screws of one type has to be made, they are roughly shaped by means of a special machine, but usually all the shaping is done by hand. Accurately made templates are prepared from the drawings and are used to guide the craftsman. The propellor is first cut to exact shape every 6" from the hub by means of gauges, the templates being used to check the shapes. The intervening wood is then smoothed off by chisel rasp and sand paper, until a smooth surface is obtained. Balance is again tested and any slight lack of balance adjusted by sand papering. An Irish linen "stocking" is then glued over the blades and a brass edge screwed to the leading edge. The final operation consists of giving the air-screw several coats of coloured lacquer. Full details of the type, inspector's mark, manufacturer's name, date of manufacture are stamped on the boss to enable the full history of the propellor to be determined at any time.

Wooden propellors manufactured as described above cannot be constructed with variable pitch, but recent research overseas has shown that by special processes involving treatment of the wood with artificial resin and highly compressing, a so-called "improved wood" can be made suitable for the root of the blades, and wooden air-screws can be produced in the largest sizes. In fact, there is a feeling that as air-screws become larger, it will be necessary to return to wood in order to keep the weight down to reasonable proportions.

CHRISTMAS NOVELTIES.

Amongst the many Christmas novelties offered to the public this year, the ever popular mulga held its place. A new line consisted of an oval slab of wood about ten inches long and four inches wide at the centre, showing the bark, yellow sapwood and brown truewood, on which was printed in gold letters an appropriate verse or greeting. The rich brownish-red colour of the truewood contrasting with the golden colour of the sapwood and the tight bark make this wood particularly ornamental and suitable for use in novelties which are distinctively Australian.

The tree itself is a hardy Australian. It is found in the inland drought areas where low rainfall and desiccating winds produce a climate so dry and intensely hot that other vegetation succumbs. Not only does it survive, but it provides feed for cattle, camel and sheep, and has been known to keep them alive for three years during which no rain fell. It has been called the Manna-tree of the wilderness.

WOVEN-VENEER FINISHES.

The woven-veneer covering material marketed under the name of Parkwood-Teatolite has been used in covering the annual number of the American periodical "Modern Plastics". This material is manufactured by bonding thin veneers impregnated with plastics on to a fabric base and treating the surface with cellulose acetate. A highly decorative effect has been achieved by weaving fine mahogany veneers into a geometric pattern. It makes a novel book covering and displays wood in one of its most attractive forms. The material is reported to be also used for the construction of travellers' cases, especially those for air travel, wherein light weight is as desirable as serviceability and beauty. Illustrations of its use in new finishes for pianos have also been noted.

OUTDOOR PLYWOOD.

An indication of the advances that have been made in the manufacture and use of waterproof plywood is provided in a recent description of its use for the facing of a new furniture store in America. Knowing the public's appreciation of fine cabinet woods, the designer was prompted to adopt as the most important decorative feature in the exterior of the building, not the newer monel metals, black glass and the like, but wood.

Walnut was chosen. Large plywood panels were used to cover the whole of the front of the three storey building. These were made by the hot plate press method using Tego film glue. Special arrangements were naturally involved in producing panels over twenty-six feet long and fourteen feet wide. A special wax finish applied to assist the timber to resist severe winter and summer conditions.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

YELLOWWOOD.

Yellowwood is the standard trade name of the timber described botanically as *Flindersia oxleyana*. The trade name is associated with the actual colour of the wood. It is also known in Queensland as yellowwood ash and in New South Wales as long jack, the latter name alluding to the long slim bole of the tree. The species belongs to the same genus as the well-known Queensland maple and silver ash.

Flindersia oxleyana is found in the coastal forests of eastern Australia and is restricted to the region between Richmond River in northern New South Wales and Gympie in south Queensland, and seldom extends further than about 80 miles from the coast. It occurs singly or in small groups within the shelter of hoop pine forests.

The tree attains a height up to 100 ft. and a diameter up to 4 ft. at breast height. It is a slim-boled graceful tree with a small head of small leaved foliage. Its bark is usually yellow-grey, coarse and flakey.

The timber is medium yellow-brown with some variation in colour. It is both odourless and tasteless. Its texture is medium to fine and uniform. Its grain is usually straight but occasionally is interlocked. Its figure is not usually prominent but where present is due to growth rings and vessel lines containing deposits of a yellowish brown substance. It is of medium density, ranging from 34 to 58 and averaging 45.8 lb/cu.ft. when dried to 12% moisture content. In resistance to decay or termites it is not ranked high but it gives excellent service in outdoor situations above ground. It is a hard, strong and tough timber. Seasoning is not difficult as the timber shows little tendency to check, warp or collapse. In drying from the green condition to 12% moisture content, back-sawn widths shrink 5.6% and quarter-sawn widths 3.2%. It works easily under hand or machine tools, dressing smoothly, mortising cleanly, turning and carving well and taking a brilliant polish. It is a fairly good bending timber, bending somewhat better if back-sawn than if quarter-sawn, and holds screws and nails particularly well.

Yellowwood is a timber combining strength with easy workability and handsome appearance and accordingly it is put to a great variety of uses. In railway works it is extensively used for body framing, seat framing, pillars, external sheeting and finishing. Similarly in coachbuilding, it is highly esteemed for body work, spokes, felloes, shafts and hood sticks and it gives satisfaction in some exacting purposes in agricultural implements. Shipbuilders find it excellent for frames, ribs and decking. It is used for staves in tallow and meat casks. It is a high quality flooring timber and is equally suitable for linings, ceilings and partitions. It makes good baseball bats, tool, rake and mop handles, and skis. It can be used with advantage for cabinet work.

The tree is neither plentiful nor scarce and a fair supply of timber in structural sizes and boards could be maintained. The timber is moderately expensive and never likely to be really cheap. Supplies could be obtained through sawmillers and timber merchants in Queensland and New South Wales. Additional information on this timber could be obtained from the forest authorities in New South Wales and Queensland, or from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

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ACCELERATION OF TIMBER TESTING.

Following the outbreak of war, the Division of Forest Products reviewed its programme of research and modified its activities in anticipation of still greater service to industry and to civil and military users of forest products. Some long-dated investigations have been curtailed in favour of others whose results can be applied to emergency problems. Special efforts have been directed to assembling data on the characteristics, uses and availability of native Australian timbers in order to intensify their utilisation for the purposes to which they are fitted and to encourage, when practicable, their substitution for imported timbers. Where information essential to efficient timber utilisation has been lacking, working plans have been drawn up setting out the lines of investigation necessary to make up the deficiency. All work on immediate problems has been speeded up.

In the Timber Mechanics Section, an accelerated programme of timber testing is well under way. Since the Division's inception, this Section has been carrying routine testing of the strengths of Australian timbers as quickly as staff, funds and equipment have permitted and, as soon as aircraft manufacture was developed commercially in Australia, the Section began to formulate plans for testing the suitability of local timbers for use in this industry. The present need for preparedness has increased the importance of this field of research and suggestions were made to obtain the necessary materials to enable testing to proceed immediately so that results could be obtained in the shortest time. The staff of the Section has been enlarged and fuller use made of testing equipment by carrying out the work in two shifts. Other Sections have co-operated in expediting the preparation of the material for test.

Recently consignments of logs of the first two species to be covered by this revised programme were received and consisted of 40 logs each of hoop and bunya pine selected from each of 30 trees representing the range of sizes and localities of growth of the species. These logs were sawn into $2\frac{3}{4}$" squares, dipped in fungicide to prevent infection of the sapwood by blue stain, end-coated to prevent excessive end drying, and then stacked for air-drying. Initially this timber ranged from 64 to 113% in moisture content. After 18 days in the stacks, the moisture contents had been reduced to 16-27%. At this stage, the squares were kiln dried under mild conditions (temperature not exceeding 125°F.) for seven days, bringing their moisture contents within a range of 10 to 15%. They were then sized into nominal 2" squares and the squares placed in a constant humidity room to bring them to a uniform moisture content of 15% throughout, in which condition they will be tested.

Arrangements are being made for the collection of representative logs of mountain ash, alpine ash and blackwood in Victoria and Tasmania for further tests.

SCIENTIFIC PAPERS.

In the November issue of the Journal of the Council for Scientific and Industrial Research, officers of the Division of Forest Products have published a number of articles relating to the work upon which they have been engaged.

"The Preservative Treatment of Fire-killed Mountain Ash (*Euc. regnans*) and Alpine Ash (*E. gigantea*)" is a paper discussing the conditions favouring the deterioration of fire-killed timber and recommending methods of preservation for salvage felled timber, stored under varying conditions. It is intended as a guide to sawmillers operating in Victorian forests devastated by fire in January, 1939.

"An Artificial Dryer for Wood Wool" is a paper describing the construction and operation of a unit designed in the Division of Forest Products for drying wood wool from the green condition to 18% moisture content in a few minutes.

"A Study of the Bending Qualities of Karri (Euc. diversicolor)" reports on the first of a series of detailed studies on the bending properties of various Australian timbers which have been found in reconnaissance studies to bend well. Results on this timber are of special interest as it is available in bending quality and in considerable quantity.

"The Preparation of a Wood Sample for Chemical Analysis" discusses the effect of a cutting mill and an impact mill on jarrah, a timber with a high content of extraneous material, and on mountain ash, a representative of the pulpwoods. The influence of particle size on subsequent analysis is discussed.

"A Constant Moisture Content Room for Timber" describes the construction, the method of conditioning and the means of controlling a small room designed to bring timber to a definite constant moisture content. Besides its usefulness in laboratories, such a room should have many industrial uses for holding materials to a constant moisture condition while awaiting further processing, or while ageing or awaiting despatch.

"A Note on the measurement of Relative Humidity with reference to paper-testing Rooms" demonstrates the need for a definite air velocity past the wet bulb of a hygrometer if humidity is to be measured accurately and recommends the adoption of an instrument ventilated by a clockwork fan.

"Tests on Small Clear Specimens of Red Tulip Oak (Tarrietia argyrodendron var. peralata)" presents the results of a systematic determination of the mechanical and physical properties of this timber in accordance with the standard methods adopted in English speaking countries. The average mechanical properties are given for the timber in the green condition and at 12% moisture content and are directly comparable with the corresponding results for other species tested in overseas laboratories.

"Flax and its possibilities in Australia" gives an account of the economic importance of this plant, its growth and processing, and points out that the revival of flax cultivation and progress in scientific retting is likely to lead to the development of an important industry in Australia.

All these papers are available as reprints from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne.

FIRST BATHTUB OF WOOD.

The first bathtub in America was made of mahogany lined with lead and was built in Cincinnati in 1842. It was condemned by the press as a "luxurious and democratic vanity". Medical men described it as a menace to health. Philadelphia passed a law prohibiting baths between November and March. Boston allowed only those under a doctor's orders to bathe and baths were taxed at 30 dollars a year.

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THE PROPERTIES OF AUSTRALIAN TIMBERS.

GREY GUM.

Grey gum is the standard trade name recommended for timbers which are described botanically as Eucalyptus major Blakely syn. E. propinqua var. major Maiden, E. propinqua Deane and Maiden, and E. punctata D.C. The standard reference name is Eucalyptus propinqua group. The trees are rather similar in general appearance, especially the bark which is grey, but peels off in large longitudinal rectangular patches, leaving whitish surfaces. It is difficult to distinguish from one another the timbers of these trees known as grey gum, but as they have similar properties of strength and resistance to decay, nothing is lost by this grouping.

Grey gums grow chiefly in the coastal regions of New South Wales and Queensland from the vicinity of Sydney in the south to Gympie in the north and inland at high elevations on the Blackdown Tableland west from Rockhampton. Maximum heights of 150 feet and diameters of 4 feet are attained on the most suitable well drained gravelly hill sites, where they grow in association with other eucalypts and at times on the edges of hoop pine jungles.

The wood is reddish to reddish brown in colour. Its texture is coarse and uniform and its grain usually interlocked. It has no pronounced figure. Not infrequently characteristics grub holes and scabs are found in grey gum and are quite often used in distinguishing it from red ironbark. It is a very heavy wood ranging from 61 to 71 and averaging 66 lb. per cubic foot when dried to 12% moisture content. The sapwood, usually about one inch wide, is somewhat susceptible to attack by powder post borer, but as the timber is chiefly used in large sizes and the sapwood largely removed in conversion, the effect of borer attack is negligible. The timber is highly resistant to decay and termites. It is a very hard timber, exceedingly strong, stiff and tough. Although slow in seasoning, it dries without marked tendency to degrade and in drying from the green condition to 12% moisture content, backsawn widths shrink 6% and quartersawn 5%. The timber saws well but is somewhat difficult to machine.

Grey gum is one of the prime structural eucalypts of Australia. It is regarded as an excellent timber for poles and heavy construction and is one of the timbers imported from New South Wales to New Zealand for these purposes for road, rail and marine structures. In Australia, it is extensively used for sleepers, telephone and electric supply poles, bridges, wharves and fences. For general building, it is used for stumps, bearers, joists, plates and rafters.

The timber is available in round, hewn and sawn sections from merchants in New South Wales and Queensland.

Additional information on this timber can be obtained from the appropriate forestry authorities in each State, or from the Chief, Division of Forest Products, 69-77 Yarra Bank Road, South Melbourne, S.C.4.

TIMBER PRODUCTS GO TO THE ANTARCTIC.

Plywood plays a very important part in the construction of the Antarctic Snow Cruiser which has accompanied the Byrd Antarctic Expedition III to Antarctica. In this novel vehicle special precautions have been taken to protect the crew from blizzards and to keep their living quarters as comfortable as possible during their anticipated 5,000 miles of exploration in south polar areas. The walls and ceiling of the cruiser are of plywood and have an overall thickness of 3 inches. The partitions of the living quarters and control cabin are also of plywood. Wood has been used for flooring and for various fixtures.

This cruiser, 55 ft. in length and 15 ft. high, is able to span crevasses 15 ft. wide. It was constructed in the plant of the Pullman Standard Car Manufacturing Co. under the direction of the Armour Institute of Technology. It is planned to carry a crew of four men with ease and convenience for a period of one year without contact with the outside world. It carries a 5-passenger aeroplane on its back.

The Byrd Expedition also proposes to establish two bases in the Antarctic and has transported nine ready-to-erect houses prefabricated with longleaf pine and douglas fir plywood. The houses are insulated and all like parts are interchangeable. The prefabricated panels and all the beams, trusses, joists, etc., are fastened together with ring connectors. The wall units are faced with exterior grade plywood $\frac{3}{8}$" thick and the interior partitions and the pullman-style bunks are of $\frac{5}{8}$" panels. The outside of the houses will be wrapped in heavy canvas. At each of the two bases there will be a large bunk house, a science laboratory, a machine and carpenter shop and a small generator house. In addition, there will be an outpost building placed on skids so that it can be moved about by a tractor. There are no windows in any of the houses but there are skylights for use during the so-called summer season.

CANVAS-PLYWOOD ROOF.

The development of serviceable roof and outside wall surfaces has been suggested by recent experiments in combining canvas and plywood. The life of such a combination is estimated to be 15 years. A suitable compound for attaching the canvas is said to be a mixture of equal parts of warmed spar varnish and white lead paste also warmed. An aluminium coating used in addition would provide a highly efficient reflective type of coating.

BREVITY.

Mr. D. E. Bland, B.Sc., has recently been appointed to the Preservation Section of the Division of Forest Products to investigate the value and properties of Australian creosotes for wood preservation purposes. This investigation is being carried out in co-operation with the Tar Distilling Industry. This industry has agreed to donate £800 per annum for a period of two years towards the cost of the investigations, and a committee known as the Tar Distillers' Research Committee has been formed to collaborate with the Division in regard to the planning and progress of the work.

Before his appointment to the above position, Mr. Bland was carrying out research work at the Walter and Eliza Hall Institute. He has had previous experience in the tar distilling industry in Victoria.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

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HANDBOOK OF STRUCTURAL TIMBER DESIGN.

In announcing the publication of a "Handbook of Structural Timber Design", the Division of Forest Products considers that it is making a substantial contribution to the increased and more efficient utilisation of timber as a structural material.

Although furnished with ready aids to designing in other structural materials, engineers and architects have not previously h similar data for timber. From standard handbooks on the properties ... load carrying capacities of various sections of structural steel and reinforced concrete, the designer has been able to choose at sight the correct member for a certain part of a structure, whereas the corresponding process for timber design has involved reference to a number of scattered works, the consideration of the influence of many variables and somewhat laborious calculation. For the professional man, designing in timber has been definitely less attractive than in other materials and there has undoubtedly been a tendency, due not only to considerations of convenience, to regard it as an out-dated or out-moded material. Because of the lack of precise direction as to the allowances to be made for various conditions of timber use working stresses adopted have been highly conservative, emphasising safety in construction to an unnecessary degree to the detriment of economical use of timber. The "Handbook of Structural Timber Design" aims to present in ready reference form the information needed for the design of timber structures.

The principal factors affecting the strength of wood are discussed. Structural grades are set out by means of which timbers can be graded into groups within which the strength of the poorest piece does not fall below a fixed percentage of the strength of clear timber. In a summary of the properties of important structural timbers used in Australia, figures are given for their weight and shrinkage, and they are ranked in four strength groups and four durability classes and their origin and main uses are described. Working stresses corresponding to each strength group and durability class are set out and the factors are indicated by which these stresses should be multiplied in protected sites, exposed sites and sites where decay is a hazard. Design methods are given for beams, columns, members subjected to combined bending and compression, for bolted joints and for timber connectors. In tabular form permissible loads are set out for joists and beams, ranging from 3 ft. to 20 ft. spans, and for struts, posts and columns ranging from 3 ft. to 40 ft. in effective length.

In the preparation of the handbook, use has been made of all available information on the mechanical properties of timbers and it brings into focus efforts which have been made by the Division over a period of ten years to fill in the gaps in the information existing as to the strength values of Australian timbers. The work is far from complete and is still progressing but the new handbook gives figures for the most important species and, in a form as complete but as simple as possible, presents all essential information on the use of timber as a structural material. It is hoped that the book will take its place alongside the standard engineering and architectural handbooks.

FLOOR FINISHING.

"Full directions enclosed with every bottle" has sold many a nostrum, and perhaps a few words on the finishing of our beautiful Australian flooring hardwoods will be timely. Folks who would not dream of running their cars without oil, will sometimes use their hardwood floors without giving them that protective finish which is essential, if the flooring is to give lasting and satisfactory service. Complete finishing treatment can be given for no more than 3/- per square yard, resulting in a floor that is beautiful and serviceable, yet we still find people who cover them with poor looking, short-lived coverings which cost them two and three times as much.

The surface should be made smooth, level and clean, it should be impregnated for water-proofing and protection, and then the porous surface should be filled so as to produce a smooth face to make cleaning easy, to bring out the beauty, and to protect it as far as possible from stain. Occasionally the colour of the wood needs to be changed, and for furniture, walls and ceilings, this is quite a simple matter, but for floors which must stand wear, the best service is obtained if stains are not used.

Surfacing the floor comes first. All dirt, building stains, by-wood, and irregularities of the surface must be removed, and the surface of the wood made not only as level as possible, but as smooth as possible because no subsequent treatment can entirely cover up blemishes left at this stage. Sanding and scraping have their respective advantages. In cost, sanding is lower for large areas, and scraping lower forvery small areas. Where floors are stained, scrapinghas the disadvantage that the tracks of the scraper leave a series of minute ridges across the floor, and these begin to show up very markedly as soon as there is appreciable wear on the floor.

Staining of floors is undesirable because unlike natural finish,stained floors cannot be reconditioned without showing laps, and the darker the stain, the more noticeable the laps become. Only those rooms which have large window areas can effectively carry floors dark in colour. However, if the desired colour cannot be selected from mountain ash, tallowwood, jarrah, myrtle beech, blackwood or other hardwoods available for flooring, staining is unavoidable.

Filling the grain is the next step. This may be done with a liquid, or with a liquid plus powder. The latter produces a smoother surface at added expense and, as it is only adopted in the better grades of furniture, people are seldom ready to pay the price of this kind of finish on their floors. The liquid filling, however, is of the utmost importance. It serves to preserve the timber, to harden the surface for resistance to wear, to close up the porous face and prevent dirt from embedding itself into the timber and to provide some resistance to stain which water, tea, and other liquids will inevitably produce in unprotected wood.

So wide is the appreciation of this need overseas that some floors receive three coats, giving them much the same protection as exterior wood-work already gets. The cost is very small, and is a very profitable investment on any floor. Every floor that is swept or is ever likely to be washed should be treated with at least one coat of filler. Sweeping will be more efficient and take less time, and water will be prevented from readily soaking into the wood causing the grain to rise and consequent roughening of the surface. Overseas the practice of flooding floors with three successive coats of penetrating sealers, so that the floors are almost awash with the filler, is growing. The filler sometimes is given as long as half an hour in which to soak its way deep down into the cells of the timber.

Filling usually brings up the grain to a certain extent, and roughens the surface. This is remedied by a vigorous electrical steel-wooling, which cuts away upstanding grain, without removing the filled face. This overseas practice of steel wooling floors has been introduced into this country recently, and samples may be seen in the new Works Cafeteria at Olympic Tyre Co. at Footscray, extensions to a match factory at Abbotsford, and several other places, including the new Rhumba Cafe.

For residential floors and all quality work where the inevitable slipperyness does not exclude it, waxing is used as a last coat. This wax serves two purposes: it completes the filling so that a smooth level surface is produced, and it provides a surface to which few things will adhere. As many dance hall proprietors will tell you, this does not include the ubiquitous chewing gum, but it does prevent most things from sticking. There are two kinds of wax:- paste or solvent wax, and liquid or emulsion wax. The essential difference between the two lies simply in the vehicle; in the solvent or paste wax it is turpentine, and in the liquid or emulsion wax it is water. Each of the waxes has its advantages. Paste wax can be put on a long narrow margin of an inch or two with ease, but has to be rubbed up. The liquid wax is put on with a spray and saves a lot of kneeling in unfurnished areas. When the vehicles have dried out, in both cases you are left with wax on the floor. The paste wax cleans as it polishes. The liquid wax does not, and in this case, the cleaning must be done between waxings, or the floor will become progressively darker with embedded dirt. Over-waxing must be avoided as too much wax will hide the grain and produce a slippery surface. Generally speaking, paste wax is best for small hard-to-get-at areas and the liquid wax has advantages in large open areas. For dance floors, wax is best put on in dry form by a machine, but this is beyond the realm of the housewife.

When filled, an unstained floor has a much darker appearance than the bare wood. If a lighter colour is desired in the finish, the face of the timber after surfacing may be filled with wax alone. The protection afforded by a single coat of wax on bare wood is not very great. This practice, although widespread in Europe, is in little demand in Australia.

The plain filled floor is not dark enough to meet the tastes of some people and there are two alternative remedies: additional coats of filler, or staining. The additional coats of filler deepen the colour and by increasing the degree of impregnation, protect the wood against stains so that the floor can be reconditioned in worn patches without showing overlaps. Staining, being done in one coat, is cheaper but by comparison with filling, its service is poor.

At least three-quarters of the residential floors in Melbourne are finished off by surfacing, applying a light coat of stain, stopping nail holes, and waxing. It would be much better to substitute a coat of filler for the coat of stain, as this increases the protection without altering the cost. Some folks may say that it looks anaemic, but it makes the room bright and it can be re-conditioned by an amateur, so that in ten years' time, there need be no worn spots. On the other hand, a stained floor will certainly show worn spots in that time, unless the housewife has been very diligent with wax.

Grateful acknowledgment is made to Mr. A.A. Pain, Commonwealth Floor Surfacing Co., Melbourne, for the subject matter in this article

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WOOD PLATTERS.

Many diners, a Melbourne cafe proprietor explains, have their teeth set on edge and nerves irritated by the noise of a knife contacting with the surface of a china plate. To avoid this, he has adopted a Swedish custom of using wooden platters. Salads served on wooden platters are a feature of his menu so that his patrons can now cut salads and vegetables without irritating screeching of knives. Another virtue appealing to the proprietor is the reduction in breakages in washing. After a time, he found the first timber tried becoming unserviceable because of cracks which developed during cleaning with boiling water and subsequent drying. He has now a newer set of radiata pine platters sprayed with shellac turned to a modified pattern somewhat thicker.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

SOUTHERN SASSAFRAS.

Southern sassafras is recommended as the standard trade name for the timber from trees known botanically as *Atherosperma moschatum* Labill. The tree usually has an upright trunk and symmetrical form. The bark is aromatic, containing a resin and an essential oil.

Southern sassafras is found in Tasmania, Victoria and south eastern New South Wales in areas where the rainfall exceeds 40 inches per annum. It usually occurs in creek beds and gullies, but in areas with higher rainfall, extends up the slopes. Only in Tasmania, where it sometimes grows to heights of 80 feet and butt diameters of 2 ft. 6 ins., are the trees extensively exploited for timber production. In Victoria and New South Wales the trees are usually smaller and heights seldom exceed 50 feet.

The wood is light in colour, generally almost white but sometimes pale grey to light brown. The truewood is sometimes black when boards may have "tiger cat" figure. Its texture is fine and uniform, while the grain is usually straight. The wood is soft, and light to medium in density, ranging from 30 to 41 and averaging 36 lbs/cu.ft. when dried to 12% moisture content. It is easy to dry, and during drying from the green condition to 12% moisture content the timber shrinks approximately 6% on back-sawn and 3% on quarter-sawn faces. The wood is readily manufactured to a good finish by hand and machine tools. Practically no sanding is required after dressing. It polishes excellently, requiring little filler, and can be stained to practically any desired colour. The uniform texture of the wood makes it very satisfactory for turnery.

On account of its comparatively limited availability, chiefly in smaller sizes, the utilisation of southern sassafras is practically confined to purposes for which it is naturally well adapted. The very low tannin content of the wood makes it particularly suitable for clothes pegs and brush work, especially brushes in which the bristles are attached to the back or handle with metals and which are used in a wet condition as are scrubbing, nail and kalsomine brushes. It makes a satisfactory bobbin of the larger and heavier types. In the shoe industry it is used, but not exclusively, for shoe heels over 2" in height. It is employed in the wooden toy industry on account of its lightness and ability to take a smooth finish, being used for children's building blocks and platforms for toys on wheels. Cask bungs and various types of small ornaments are turned from this timber. It is also satisfactory for carving, mouldings and panelling.

Southern sassafras is available, from limited numbers of firms in the capital cities, chiefly in 1 to 4 inch turnery squares, and intermediate sizes are procurable on special order.

During the latter half of 1939, approximately 500,000 super feet were shipped from Tasmania to Victoria, New South Wales, South Australia and Western Australia.

Additional information on this timber can be obtained from the forestry authorities in each State, or from the Chief, Division of Forest Products, 69-77 Yarra Bank Road, South Melbourne, S.C.4.

DETECTING METAL IMBEDDED IN LOGS.

Metal imbedded in logs has been a serious problem for many sawmillers, having cost large sums of money in repair bills or lost time. The growth of trees has been known to conceal old nails, staples, hammock hooks, spikes, pocket knives, horseshoes, and even sections of forgotten scythe blades. They are always potential causes of costly and sometimes fatal saw-smashing accidents.

A device which consequently should have important practical applications was recently developed by the United States Forest Service for detecting metal objects buried in logs. The detector is described as a unit resembling in size and appearance a portable radio set to which a flat 10" exploring coil is attached by a 6 ft. flexible wire. The operator carries the box on a shoulder strap with the adjustment knobs controlling batteries and circuits resting under one hand. The exploring loop or coil is handled with the other. Headphones are provided and in these an audio tone signal is set up when the instrument is turned on. By twisting the knobs, the operator balances out the signal. When the exploring coil is brought into the vicinity of any metallic object, the balance is disturbed and the audio tone signal is heard anew. By moving the coil, the operator is able to locate the exact position of the buried metal since the volume of the howl varies with the size of the object and its proximity to the coil. Armed with this information the sawmiller can then chop out the metal before the log goes to the saw and causes possible damage.

BREVITIES.

Mr. F. Gregson, Utilisation Officer, Forests Department of Western Australia, spent two weeks at the Division of Forest Products during February investigating a range of problems in timber utilisation.

Mr. M.J. Youhotsky Russell, Forest Engineer, New South Wales Forestry Commission, recently visited Melbourne to consult the Division of Forest Products on the design of fire look-out towers.

Mr. A.J. Thomas, Assistant, Utilisation Section, Division of Forest Products, is at present in Tasmania selecting for test purposes samples representing timber native to that State.

Mr. H.D. Ingle, Assistant, Wood Structure Section, Division of Forest Products, is at present engaged in collecting sample logs of Victorian timbers for testing at the Division.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.99.

1940##099

1st April, 1940.

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STUDIES IN TIMBER PHYSICS.

The physical properties of timber including its weight, rate of change of moisture content, degree of shrinkage or swelling, and electrical and thermal properties are primary considerations in selecting timbers for various uses. Unlike the descriptive properties of colour, odour, taste, grain, texture and figure, they require to be determined by measurement. Soon after its establishment, the Division of Forest Products, realising the incompleteness of the information available on the physical properties and physical behaviour of Australian timbers, commenced to determine these systematically. A Section of Timber Physics was founded in 1934, and its early work was concerned largely with establishing methods by which physical properties could be measured, and then in undertaking the routine determinations.

As weight, or density, is the most valuable single criterion of the general characteristics of a timber, the Section of Timber Physics has devoted a large amount of time to the collection of reliable data regarding the density of the different commercial timbers and variations in density due to position in tree, rate of growth, etc. In general, the denser a timber, the higher its strength properties, the more difficult it is to season, the more difficult it is to glue and machine and within certain groups, the denser timbers are naturally more durable. Weight is a primary consideration in handling and transport and it is of great importance in many uses, particularly in aircraft construction and boat building. In establishing density figures for timber, however, certain complications arise for, although the density of wood substance separated into its minute elements is approximately the same irrespective of its origin, the almost infinite variation in the size and arrangement of the elements in different pieces of wood and the constantly varying proportions of wood substance and moisture produce a wide range of density between species and an appreciable range even between samples of the same botanical identity. Density varies with the moisture content of the timber and as the timber changes its dimensions when it changes in moisture content, it has been found necessary to give the value of the density in the dry condition at a certain specified moisture content. The Section has recently compiled the results of density determination in 172 Australian timbers and published these in C.S.I.R. Pamphlet No.92.

The second important phase of the work of the Timber Physics Section is the study of the shrinkage of Australian timbers. Shrinkage during drying with its attendant troubles of checking and warping, and the "working" of dry wood with atmospheric changes, are perhaps the greatest problems in timber utilisation. Like density, shrinkage varies considerably, not only from one timber to another, but amongst material of the same species. Furthermore, its evaluation for many Australian timbers is complicated by the occurrence of collapse which must not be considered as true shrinkage as it can be removed by a reconditioning treatment. The establishment of reliable information regarding the shrinkage of the various timbers is necessary for their efficient utilisation and effective competition with substitutes. Detailed information for 170 different Australian timbers has now been compiled in pamphlet form and will shortly be available.

These investigations on timber have been followed recently by studies on plywood. It is frequently considered that, on account of its method of construction, plywood does not shrink or swell, but actually, while movement is restrained, it is not eliminated and under very adverse conditions a change in dimension of up to ½% may occur. This represents a movement of nearly 3/16" in a three feet wide sheet.

A third field of activity which has entailed a large amount of routine work has been to investigate the electrical resistance of the various timbers. The fact that the electrical resistance of a sample of wood depends on its moisture content is used as the basis for electrical moisture meters such as the Blinker, which is well known in Australia. Unfortunately, the relation between moisture content and electrical resistance is different for every kind of timber and calibration figures must be used for each species before any confidence can be placed in moisture content readings obtained with electrical moisture meters. The latest list of these calibration figures is included in the Division's Trade Circular No.45.

Studies are being made of the hygroscopicity of wood or the amount of moisture it will contain when at equilibrium at various temperatures and relative humidities. This is a matter of considerable importance as the weight, strength, durability and practically every other physical property of wood varies with its moisture content. In seasoning, timber should be dried to a moisture content such that it will be in equilibrium with the average atmospheric conditions to which it will be subjected in use. Such a procedure will ensure minimum trouble from change in size due to change in moisture content.

As the result of work in the Timber Physics Section, much more light has recently been thrown on the occurrence of collapse during the drying of timber and methods for its subsequent removal. As about 20 per cent. of timber produced from Australian forests is of species subject to severe collapse, the fullest information regarding the occurrence of collapse and the most efficient method for its removal is very desirable.

At the present time the Section is carrying out an extensive investigation of the effect of subjecting timber to various temperatures on its strength properties. This investigation was initiated as a result of enquiries regarding the use of timbers for aircraft construction and the probable need for kiln drying these timbers in order to obtain supplies as rapidly as possible. Obviously the temperatures used in drying must not be such as will damage the timber in any way as maximum strength is required and only small factors of safety can be allowed.

Apart from the studies indicated above, all of which are of immediate practical application, an attempt is being made to delve more deeply into what might be called the fundamentals of timber. The questions asked are, what makes a piece of wood pick up moisture and swell in the winter and dry out and shrink in the summer, how is the moisture held by the wood and how does it move through the wood, what causes collapse and what happens during reconditioning, why doesn't wood shrink equally in all directions, and dozens of other whys and hows. Answers to some of these questions have already been obtained while others are the subjects of investigations at the present time. The more thoroughly the behaviour of timber is understood, the better the use that can be made of it.

NEW USES FOR WOOD IN EUROPE.

An American noted for his writings on forest products utilisation after a recent tour, made the following interesting observations on the new avenues of wood utilisation in Europe:-

New and improved forms of construction. By use of metal connectors and improved design, many structures are now being built of timber, particularly foundations, spans, bridges and many forms of framing to take the place of more expensive steel and other forms of construction. The grandstand and ski jump at the winter sports centre in Garmisch-Partenkirchen were constructed almost entirely of timber, whereas formerly this type of structure was made largely of steel, brick and other materials. The winter Olympic Games were to be held there in 1940.

The almost complete change back to the wooden sleeper in nearly all railway systems in central, northern and western Europe. As is well known, the metal sleeper had supplanted the wood sleeper in several countries for many years. There has been considerable discussion and argument as to which is the cheaper material in the long run. On the basis of many years' experience and exhaustive tests, the wooden sleeper has emerged as the victor in this competition. The metal sleeper has proved to be much more expensive for its life in service than the treated wooden sleeper. Near chemical plants and large bodies of water there is very serious corrosion with metal sleepers. Furthermore, the metal sleeper rattles and causes undue vibration and noise and does not enjoy the resilience supplied by the wooden sleeper.

The increased use of improved forms of beech plywood bonded with artificial resin glues for the manufacture of different products. As late as the spring of 1939, it was found that gun-stocks made from beech plywood were equal or superior to the solid gunstocks made from Circassian walnut. Aeroplane propellors are now being widely made from this material. In June, the high speed world record for short distance flying was made by a German plane equipped with beech propellors. This plywood is also being turned into many forms, particularly for axe, hammer and pick handles, as well as for tool and implement handles of all kinds in place of other more expensive woods.

Many forms of pressed wood have been developed for use in machinery gears, flooring, table tops and other purposes where a hard but warm surface is desired. The specific gravity has been greatly increased by compressing plywood and untreated wood to increase its density.

Plastics have been developed in many forms for the manufacture of handles, trays, drain gutters and other products formerly made of metal and similar materials.

Wood is being widely used as a source of textiles in substitution for wool, cotton and silk. Practically all the uniforms of the military, naval, railway, bus, postal and similar organisations are made from 30 to 40% wood, and have proved very serviceable. Many new factories have been established in various parts of Europe for this purpose, notably in Germany.

As a source of fuel for automobiles, stationary, marine and other types of engines. Wood gas is being made directly from small pieces of dry wood as well as from charcoal. Wood is also being used to produce alcohols, which are mixed in certain proportions with gasoline. Many trucks, buses and stationary engines are now operating on wood and charcoal gas.

SOME AIMS OF TIMBER RESEARCH.

F.P.L. officers are sometimes accused of seeing only the faults of wood and not extolling its virtues enough. You might as well accuse a doctor of paying too much attention to the sick people and not enough to the well. We constantly have the weaknesses of wood as a material of construction brought to our attention. It is our business to overcome such weaknesses as far as we can do so, but a great deal more should be done. It is only by keeping the service that wood gives ahead of or abreast with the services that other construction and manufacturing products give that we can hope to maintain and increase its market. Cheaper harvesting and manufacturin methods, better selection and seasoning; greater decay, fire and insect resistance; less shrinking, warping and checking; greater surface hardness and strength in compression; increased use of low grades especially knotty lumber; lower painting costs, better construction methods; and greater beauty are some of the things that are needed to keep wood in the field as a structural and manufacturing material at its present level and possibly even increased use. Wood has certain inherent advantages to begin with, such as cheapness, workability, lightness and low heat conductivity, but it will take additional effor to capitalise on them. They alone will not bring wood through with flying colours.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

RADIATA PINE.

Radiata pine is the standard trade name recommended for the timber which is described botanically as Pinus radiata D.Don, syn. P. insignis Doug. Confusion in the botanical nomenclature of this pine has arisen due to its description by two botanical authors. In 1837 its first published description was given by D. Don under the name Pinus radiata. In 1844, however, a further and more exact description of the same species was published from specimens collected by Douglas. In accordance with the international Rules of Botanical Nomenclature, the name Pinus radiata D.Don has priority and should therefore be accepted. Other common names attributed to this timber are insignis pine, monterey pine and remarkable pine.

The tree is not native to Australia but, particularly in the past half century, it has been extensively planted in southern Australia and New Zealand. It has become a species of national importance and economic value, and is destined to become one of the main sources of the future supplies of home grown softwoods in the Commonwealth.

Radiata pine has been planted in every state of the Commonwealth with the exception of the Northern Territory and Queensland. A total of 150,220 acres had been planted up to 1938 in various states of the Commonwealth, the distribution being: South Australia, 87,700 acres; New South Wales, 30,000; Victoria, 22,620; Australian Capital Territory, 6,950; and Western Australia, 3,000 acres.

The tree is a fairly large one, attaining a height of about 90 to 115 feet or occasionally taller, and usually 9-12 feet, but may be 15-20 feet in girth at breast height. The bark of the old trees may be 2 inches or more in thickness, of a dark brown colour and divided into deep ridges.

The timber is a softwood with characteristics allied to those of Baltic deals and pines. The sapwood is white to creamy yellow, the truewood being slightly darker with a pinkish tinge, and all latewood being in darker bands, making the growth rings distinct. In the crown zone of the tree and near the heart the grain is often spiralled, but away from these parts the tendency is towards straight grain. Knots are common but silvicultural practice now adopted should reduce both their size and prevalence. The timber is light in weight, ranging from 22½ to 38 lbs. and averaging 30 lbs/cubic foot when dried to 12% moisture content. The timber is rather soft. The bending strength, impact strength and cleavage strength of clear wood at 12% moisture content are superior to those of imported western hemlock, western yellow pine, redwood and baltic pine. It is a timber which lends itself to kiln drying green off the saw economically and this practice has the added advantage of preventing blue stain which may develop during air-drying. In drying from the green to 12% moisture content back-sawn widths shrink 3.7% and quarter-sawn 2.2%, these being low compared with other commercial softwoods. Like most other softwoods, the timber has low resistance to decay and termite attack. The sapwood, however, can be very easily penetrated by preservatives and the treated timber under exposure tests has given service which compares very favourably with that of timbers having a high reputation for natural durability. The timber works readily under hand or machine tools, taking a smooth lustrous finish without grain raising. It nails easily with little tendency to split, holds screws firmly and glues readily. It takes stains, paints, enamels and kalsomine readily but sizing is advisable before varnishing or lacquering.

The extensive utilisation of radiata pine is of comparatively recent development. The major products from it are dressed lines, namely, flooring, lining and weatherboards; boards for manufacturing purposes and industrial uses; and cases. In the manufacture of core-stock, very considerable quantities of radiata pine are used and there is an active demand for it in the furniture trade for cabinet work, shelving, and drawer parts. It is used in a wide variety of manufactures such as brooms, brushware, toys, turnery, handles, pulleys, switch blocks, household joinery and woodwool. The demand in all these uses enables the timber to be used to the limit of its availability, in fact, markets could undoubtedly be considerably expanded if greater supplies were available. In due course, other fields of utilisation are bound to be served by this timber as it is promising for poles, posts, sleepers, mining timbers, veneers and plywood, and for various forms of construction. It is a timber suitable for pulping for paper and boards and the commercial manufacture of these products is now approaching.

Radiata pine is available in the form of sawn boards, building sizes, various lines of milled flooring, lining and weatherboards, and as case stock. Narrow to medium widths are available in short, medium or long lengths. The scale of production is continually increasing. South Australia is the principal source of supply, Government mills producing about 8 million super feet per annum at present with several private companies also in production on a smaller scale. In Victoria several mills are operating, their production being in excess of 3 million super feet. Production is also commencing in A.C.T. and Tasmania, and W.A. In the next decade, it is expected that the production of this timber will be expanded tremendously.

Additional information on this timber can be obtained from the forestry authorities in South Australia, Victoria, New South Wales, Western Australia and Tasmania, and from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne, S.C.4.

STAFF CHANGES.

Mr. J. E. Cummins, who for the past nine years has been officer-in-charge of Preservation Section, Division of Forest Products, has been appointed to the staff of the Information Section at the headquarters of C.S.I.R. He will transfer to his new duties early in April.

Mr. S. F. Rust, Officer-in-charge Veneering and Gluing Section, Division of Forest Products, will shortly take over in addition the administration of the Preservation Section vice Mr. J. E. Cummins.

Mr. C. E. Dixon, Assistant, Seasoning Section, D.F.P., engaged in investigations of seasoning schedules for various timbers, will change over to the Section of Veneering and Gluing to undertake research into the problems of plywood manufacture.

The Division of Forest Products is calling for applicants to undertake duties of assistant research officers in its Sections of Timber Physics and Seasoning.

BREVITIES.

Mr. I. H. Boas, Chief, Division of Forest Products, spent some weeks in Sydney in March on business associated with timber supplies and the programme of work of the Division.

Mr. D.E. Bland, recently appointed to the staff of the Division to carry out investigations on creosotes, has had the degree of Master of Science with first class honours in Biochemistry conferred by the University of Melbourne.

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No. 100.

1940##100 1st May, 1940.

THE CENTENARY ISSUE OF THE NEWS LETTER.

This News Letter is the hundredth to be issued by the Division of Forest Products. Early in 1932 the Division, then only three years old, foresaw that a great proportion of the public would not be reached through its more technical publications, but would definitely interested in popular news items on forest products and in being told how the allegedly mysterious processes of research actually deal with problems of the practical man and really aim at smoothing the difficulties of converting forest products into marketable commodities and in overcoming the problems attending their utilisation. Many of us do not know how our neighbours live; we know little of the commercial activities surrounding us and we know less of the efforts and accomplishments of governmental or private institutions whose activities are based on serving industry. Broad though our contacts and reading may be, there is always something to be learnt from the fresh discoveries and new applications of older discoveries that are taking place outside the sphere of our personal knowledge. Not only is it interesting but it is also often materially beneficial to hear of this progress as soon as it takes place because the adoption of improvements may immediately make our own activities more effective, and possibly lead to further achievements. The Division of Forest Products gives accounts of the progress of its research projects in bulletins, pamphlets and articles in scientific journals which are published and widely distributed. Its staff also contributes to the various technical and trade journals published for or by wood using industries. In its less technical series, the trade circulars, the Division aims also to discuss a range of subjects of special importance to the timber industry, guiding timber workers on the methods necessary to cope with the peculiarities of wood in its preparation on the one hand and instructing users on the other hand on the characteristics that make forest products so valuable in many fields of use. In addition to these more or less technical presentations of facts, there are also very many items of interest to the timbermen and the non-technical public, which would not reach the man-in-the-street if they appeared only in the technical press. The Division's view, therefore, was that some medium for circulation of these news items was required and accordingly for the past eight years it has regularly prepared the "Monthly News Letter."

The News Letter is sent to publishers in every part of the Commonwealth of Australia and to a selected number of overseas publishers and institutions. Its items are meant for general reading and their republishing in original, condensed or expanded form is welcomed. The wide use to which the subject matter of the first hundred letters has been put is very gratifying. City and country newspapers and trade journals in many parts of Australia have made liberal use of its pages and it is not uncommon to see articles reproduced in timber journals of high standing in England and the United States of America. Hoping to broaden the scope and improve the quality of this particular activity, the Division now enters upon the preparation of the second hundred of its Monthly News Letters.

NEW PUBLICATIONS.

During March 1940, the Division of Forest Products distributed several publications of interest to the timber trade.

Trade Circular No.45, "Testing Timber for Moisture Content". This Circular takes the place of two earlier Circulars which described respectively the determination of moisture content by the oven-drying method and by the use of electrical moisture meters. The subject matter of both of these very popular circulars is now covered by the new publication and the opportunity has been taken to present recent developments in the manufacture and use of electrical moisture meters.

Trade Circular No.46, "The Air-Seasoning of Timber". Soon after the Division of Forest Products was founded ten years ago, it conceived the plan of issuing Trade Circulars on subjects of interest to timbermen. Years ago, it found that seasoning practice had many remediable faults, and accordingly, it made "Sound Practice in the Air-seasoning of Boards" the subject matter of its first publication. This first circular was quickly exhausted in its first edition and a second edition was similarly completely distributed later - a total of 6,500 copies in all. Such a distribution demonstrated the undoubted popularity of the circular and its subject matter. Rather than print a third edition, the Division resolved to widen the scope of the subject matter to include air-drying practice of sizes other than boards and now has Trade Circular No.46 available for distribution.

Trade Circular No.25 (Revised Edition) - "Wood Borers in Australia, Part 3 - Pin-hole Borers". This describes the habits of the pin-hole type of borers and emphasises that their activity is restricted to living or recently fallen trees and that the presence of pinholes in dried timber is not an indication that further attack will follow. As there is still a widespread misgiving among timber users as to the possible extension of borer infestation, the practice of rejecting timber showing borer holes is all too common. Except on the grounds of appearance, the rejection of dried timber because of pin-holes is unjustified unless they are numerous and in clusters. It is hoped that the circulation of correct information as to the habits of pinhole borers will stop unnecessary rejections of timber and assist the timber industry and do no harm to the timber user.

Pamphlet No.92 - "The Density of Australian Timbers, Part 2 - Air-dry and Basic Density Data for 172 Timbers". This pamphlet discusses the factors that need to be taken into consideration when determining the density of a piece of wood. As density is the most valuable guide to the general characteristics of any species of timber, the data published should have many useful applications. It is based on routine determinations of density that have been made by the Section of Timber Physics over a period of several years.

TURPENTINE PILES IN VANCOUVER HARBOUR.

Repair work in marine structures often reveals interesting information on the comparative resistance of various timbers to the attacks of marine borers. In the course of a recent visit to Vancouver, one of the officers of the Division of Forest Products had the opportunity to collect evidence which further substantiates the claims of the well-known Australian turpentine (*Syncarpia laurifolia*) to being one of the best timbers for piling. Turpentine was one of the timbers used in the construction of the original timber pier of the Canadian Pacific Railways in Vancouver Harbour in 1909. In the course of repairs to fender piles which had cracked on account of being struck by a ship, a turpentine pile that was removed showed little evidence of teredo attack, although in its 30 years of service, the big end which had been exposed to the elements had split and rot had developed down about 6 feet. Had this pile not suffered the mishap of being struck by a ship, it would undoubtedly have continued to defy teredos and the elements for a longer period. Following a fire in 1938 in another C.P.R. pier in Vancouver, piles which had been driven in 1917 were removed. Some of these were douglas fir piles and some turpentine. Sections of these piles cut below the low-water mark showed appreciable development of teredo infestation in the douglas fir whereas the turpentine had not been attacked.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

Yellow Stringybark.

Yellow stringybark is the standard trade name recommended for the timber which is described botanically as Eucalyptus muelleriana Howitt. The name yellow stringybark is derived from the yellowish colour of the inner bark which varies considerably from a typical stringybark to a more compact less fibrous one. The outer bark is fibrous, dark grey and smooth.

In New South Wales the stringybarks form a fairly large part of the Tableland flora. This particular species is confined mainly to the southern portion of the southern sub-division, on moderately deep and fertile soils in broken country but avoids exposed situations. In Victoria, it is geographically restricted to the East and South and in Gippsland between the Hoddle Ranges and the sea coast. It has been found in elevations up to 1,000 feet on silurian sediments, sands and sandy clays.

The tree is medium sized, attaining an average height of about 120 feet and a diameter at breast height of about 3 feet. The leaves yield about 0.7 to 0.8% of oil, consisting mainly of pinene. The kino contains mainly tannic acid and water but no gum.

The wood is yellowish in colour. It has a moderately open texture and the grain, though usually straight, may be interlocked. Its figure is not distinctive. The timber is moderately heavy to heavy, varying from 46.8 to 63.2 lb. and averaging 55 lb./cubic foot when dried to 12% moisture content. It is hard wood, strong to very strong in bending, stiff and moderately tough. It is resistant to decay and termites ~~and is not attacked by Lyctus or Anobium borers~~. In seasoning it shows some tendency to end split and check but generally it seasons well, and responds well to a reconditioning treatment. In drying from the green condition to 12% moisture content back-sawn widths shrink 7% and quarter-sawn 4.5%. It works moderately well under hand or machine tools, but is not as easily finished as mountain ash.

Yellow stringybark is principally used as a structural hardwood. It finds considerable use in the form of beams for bridges, railway and road requirements and large quantities are cut for sleepers. It is widely used for piles, poles and fence posts. When sawn it is a popular building hardwood finding use in general scantling sizes for stumps, bearers and rafters, and it can be satisfactorily dressed into flooring and weatherboards. It is also used for cross arms.

The timber is available in round and hewn form and in sawn sizes ranging from boards to large structural sections. It usually yields a high proportion of defect-free products.

Further information on this timber can be obtained from the forestry authorities in Victoria and New South Wales, and from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne, S.C.4.

PLYWOOD CONCRETE FORMS.

Smooth surfaces demanded for concrete work in buildings, bridges, viaducts and residential foundations are obtainable with plywood forms and special grades are marketed for that purpose. The use of plywood involves some modifications in formwork construction, but the plywood industry has anticipated these changes and prepared working drawings for constructing plywood forms for the guidance of engineers and contractors. Drawings illustrate virtually every type of form required on a concrete structure including columns, walls, curved surfaces and slab deck.

EFFECT OF SAP STAIN ON THE PROPERTIES OF TIMBER.

There is a general belief that the blue-stain or sap-stain sometimes developed on timber is detrimental to its value. Undoubtedly it disfigures and detracts from the timber's appearance and limits its use for finish purposes. The effect on strength has also been suspect, and engineers and builders have tended to discard stained timber for structural uses while timbermen, on the other hand, have claimed that strength is little affected. In order to end this controversy, forest products research workers have investigated the strength properties of stained and unstained wood and a recent note issued by the Forest Products Research Laboratory, Princes Risborough, England, describes results of studies on the effect of sap-stain on the modulus of elasticity of scots pine sapwood. After determining this modulus from compressive tests parallel to the grain for unstained blocks, they repeated the determinations after the blocks had developed slight sap stain and again after they were moderately to heavily stained. They showed that slight staining caused no decrease in modulus of elasticity of the timber but moderate to heavy staining caused a decrease of 2.8%. Their important conclusion is that from the practical point of view the decrease, even for the more heavily stained timber, though real, is not large enough to be of importance and may safely be neglected.

PROGRESS IN WOOD PRESERVATION.

Development of wood preservation has been closely associated with the expansion of rail transportation which was the first industry to recognize the economy of preservatively treated timber made durable at moderate cost. The first plant in U.S.America commenced operations in 1865. In that country, the railways operated the early plants for their own requirements and sleepers were the predominating item in their production. As the merits of treated wood, notably its durability and economy of service, became better known, many new uses were developed and treating plant facilities increased. In the U.S.A. during 1938, there were 221 wood preservation plants in active operation. Of these, 151 maintain pressure equipment, 55 non-pressure equipment designed primarily for butt treatment of poles; and 15 both pressure and non-pressure equipment. The pressure plants operated a total of 370 treating cylinders.

The increase in the quantities treated by the wood preserving industries has been remarkable. In 1904, 33 pressure treating plants treated 250,000,000 sup.ft. The peak of the industry was reached in 1929 with a total production for all classes of timber of 4,344,108,000 sup.ft. Although the quantity treated annually at the present time is somewhat lower due to the fulfilment of the programme of active substitution of treated for untreated timber in existing lines and the entering of a new phase in which demand is now related to maintenance needs, there is evidence of a wider appreciation of the value of treated timber for other forms of engineering construction. For instance, in New York, which can fairly lay claim to a modern outlook on engineering construction, creosoted timber is intensively used. On the East River drive, which is a part of the new roadway planned to circle completely Manhattan Island, one bulkhead will require 1,500,000 super feet of creosoted timber for caps, flooring and walls and under it will be a veritable forest of 18,000 pressure creosoted piles. After consideration of the requirements, wooden piling was selected as the most suitable material structurally and economically for the foundation of the bulkhead which is stabilised by a fill of rock and overlaid with earth. It is interesting to note that creosoted piles cut off above ground level have been recently accepted in New York as a satisfactory building foundation and this type of construction is finding wider application.

STAFF MOVEMENTS.

Mr. S. A. Clarke, Deputy Chief, Division of Forest Products, has resumed duties with the Division after having spent twelve months conducting investigations on timber utilisation for New Zealand Forest Products Ltd. During the past year, he has visited New Zealand, Great Britain, U.S.A., Canada and Sweden to obtain information on timber conversion and wood manufacturing processes and studied their application to the utilisation of small sized softwoods.

Mr. H.B. Wilson, Assistant, Preservation Section, Division of Forest Products, has returned from U.S.A. where, under the terms of a research studentship, he spent twelve months studying wood preservation research at the Forest Products Laboratory, Madison, Wisconsin, and in gathering information on the practical aspects of wood preservation in many parts of that country and Canada.

Mr. S. F. Rust, Officer in Charge, and Mr. R. Deeble, Technical Assistant, Veneering and Gluing Section, D.F.P., will be conducting enquiries into plywood manufacturing practices in New South Wales during May.

Mr. I. H. Boas, Chief, Division of Forest Products, and Chairman of the Timber Sectional Committee of the Standards Association of Australia, will preside at a meeting of this Committee in Sydney early in May. Mr. R.F. Turnbull, Officer-in-Charge of Utilisation Section, D.F.P., who is also one of the joint honorary secretaries of the Timber Sectional Committee of S.A.A., will also attend the meeting.

Mr. Ian Langlands, Officer-in-charge, Timber Mechanics Section, D.F.P., will address the Institution of Engineers, Australia, at its divisional meetings in Melbourne, Brisbane and Sydney on "Modern Developments in the Design of Timber Structures" on the 30th April, 8th and 9th May, respectively.

Mr. G.W.R. Ardley, M.Sc., has joined the staff of the Division of Forest Products as Assistant Research Officer in the Timber Physics Section. Mr. Ardley, who is a graduate of the Melbourne University, was previously engaged in research work in physics at the University.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No. 101.

1940##101

1st June, 1940.

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RESEARCH.

Applied research has been aptly defined as "finding out what you are going to do when you cannot keep on doing what you are doing now". The need for such research is seldom realised by many industrial concerns as they fondly believe that in times of emergency they will still be able to keep on doing the same thing. With others, the realisation comes, but too late; still others are apparently vigorous and healthy but they carry within them the germs of decay. In far too few instances are the developing trends or factors of obsolescence discovered in time and remedial steps taken. Time and again in years of depression and of lack of success the technical staffs of industry have been sacrificed instead of being directed to concentrate on the solution of difficulties which are barring the restoration of activity. Only a few have had the necessary vision to encourage and expand their technical development in such periods.

Many industries, once prosperous and active, have failed, others are desperately sick. What is the matter with them? The demand for their product has declined, human wants have changed, and the form of life has been revised. Necessity has led to invention and ingenuity has been loth to stop with immediate objectives. Industrial research has been the prime factor in these changes and achievements. Only the highly organised industries who accept the rule of industrial change do wait, not for the coming of disaster but explore new markets and develop new products and services. Outstanding examples of diversification and adaptation through research to changing demand may be found in the steel, chemical and industrial equipment industries. As soon as the demand for one of their products has shown signs of declining, another has been ready to take its place and the way prepared for its development.

What of the timber industry? Various substitutes are threatening to replace timber. It has given much ground to steel and concrete in construction, to setting mixtures for flooring, to sheet materials for panelling, to fabricated or pressed metals for joinery and to moulding composition for turned or shaped articles. If we intend to retire, this may have no particular interest for us. If we expect to continue our activities, it is a matter for profound concern for which we require a plan of adjustment to meet future conditions. Research has paved the way for the development of other industries - it can render equivalent service in the forest products industries. Now is the time for these industries to be "finding out what they are going to do" to meet changes due to peace or war conditions.

Comparatively few individual firms in industry can afford alone a comprehensive research programme and this is especially so in forest products industries whose resources and activities, though enormous in aggregate, are spread among a vast number of firms and individuals. In the timber industry especially, a combination of resources and collective effort is required to overcome difficulties. In such a scheme a central institution such as the Division of Forest Products, C.S.I.R., can play a valuable part - in fact in the past ten years its activities have been directed at analysis and solution of the problems of forest products industries. In promoting the utilisation of timber in general and Australian timbers in particular, its contributions in the scientific and practical fields have been far-reaching in their influence. Fundamental work on the pulping of hardwoods and determination of tannin contents of various timbers and methods of tannin extraction have led to the establishment of important industries. Investigations on timber seasoning and dissemination of information on this subject and on the measurement of moisture content has led to a tremendous expansion of kiln drying practice in all states of Australia and resulted in great enhancement of the value of timber in service. The systematic determination of the strengths, densities, shrinkage values and physical properties of Australian timbers together with an appraisement of the service requirements of many industries has provided a foundation upon which expansion of the utilisation of our native resources is being steadily built. These are some of the achievements of the past and present. What of the future? Progress will depend largely on the industry itself. Applied research is not undertaken for itself alone - it needs to be directed to practical problems and its findings need to be applied to industrial practice.

Inthe first place, therefore, the research institution should be used more intensively by industry and, in the second place, it should be stimulated. Though research can stimulate many phases of industry it, in turn, needs assistance from the practical and business men. There are many who can set aside the business cares of the moment to view dispassionately their own plant in relation to developments in their own field and also in related fields. By such analysis it should be possible to determine weak spots and to indicate the direction in which efforts are most necessary for furthering the permanence of their products. Above all, it should be possible to see where research men can be of service and to make use of all their existing facilities.

SUBSTITUTION OF LOCAL FOR IMPORTED TIMBER.

In normal times Australia imports several hundred million super feet of timber which is consumed in industries in addition to the considerable production of native timbers. Because of shipping and monetary difficulties during the war period, the quantity imported is likely to be reduced and as a result, there will be greater demands placed on the resources of local forest industries to effect what is popularly called "substitution of local for imported timbers." This very description implies a state of mind which, though sometimes justifiable, is often grossly unfair to the products of our Commonwealth. Many consumers have always used overseas timbers which have consequently established such a place in the timber trade that no small struggle is required to gain recognition for the qualities of native species. Instead of the native timbers commanding the market to the limit of their suitability, and overseas timbers being imported only to meet the deficiencies in quantity, it is found, on the contrary, that in the states of greatest consumption whole industries are built up based on imported timber and that the native timbers are looked to as substitutes to be used only when overseas supplies are not available.

The Division of Forest Products is constantly asked to recommend substitutes. Sometimes full information is given regarding the service qualities desired but on many occasions no such indication is given, the only statement being the name of the timber formerly used. Effective replacement in the latter circumstances is most difficult because actual service requirements can vary widely. Some timbers are used for certain purposes because of their colour, freedom from odour, closeness of texture or because they turn well, bend well or are resistant to abrasion or decay or because they have some other specific property. On the other hand, in many cases where no particular quality is desired, its use in Australia is merely a habit inherited from overseas where, probably, in addition to being suitable for the purpose, it has been cheap and readily obtainable. In the latter case, the cheapest timbers most readily available in the sizes required are the best substitutes. Where some particular property is necessary for the satisfactory performance of the substitute, special attention to this, together with general consideration of other desirable qualities, is given in selection.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

Red Mahogany.

Red mahogany is the standard trade common name of timbers described botanically as *Eucalyptus resinifera* Sm., *Eucalyptus kirtoniana* F.v.M. and *Eucalyptus pellita* F.v.M., these three being so closely allied that they are grouped under the standard trade reference name of *Eucalyptus resinifera*. The specific name resinifera alludes to the fact that this was one of the first eucalypts from which the early colonists extracted kino, although it is now known that its kino content is comparatively low. Its colour and superficial resemblance to mahogany caused it to be named red mahogany by the same early colonists. The timber is well known in Queensland under the name of red stringybark and also as red messmate.

Eucalyptus resinifera is distributed in the coastal forests of eastern Australia from the latitude of Sydney in New South Wales, northwards through the Maryborough and Fraser Island districts of Queensland and recurs again on the tableland round Atherton in North Queensland. It is found in forests of mixed eucalypts and is commonly associated with tallowwood.

The tree attains an average height of about 130 feet and a maximum diameter of 5 feet at breast height. Its bark has a rather frosted appearance and is of the stringy type from base to branches.

The timber is deep mahogany coloured and in many features resembles Western Australian jarrah. Its grain is somewhat interlocked and its figure sometimes rippled. In texture it is fairly open. It is a very heavy wood ranging from 52.4 to 64.7 lb. and averaging 58.5 lb. per cubic foot when dried to 12% moisture content. It is fairly resistant to decay, fungi and termites. It is a hard wood, very strong, very stiff and tough. It seasons well and in drying from the green to 12% moisture content, back-sawn widths shrink 5% and quarter-sawn 3%. As it collapses only slightly a reconditioning treatment is unnecessary. It is easily worked with hand or machine tools, cutting cleanly and taking a good finish.

Red mahogany is particularly valuable as a structural hardwood. It is a popular timber among house carpenters, and is an excellent timber for bearers, joists, plates and studs. Because of its ability to dress cleanly, there is an active demand for it for flooring, milled weatherboards, and match boards for ceilings and partitions. It has been used in considerable quantities for sleepers and for the sheeting and flooring of railway wagons. In shipbuilding it has been used for barge construction. It is relatively heavy for cabinet work but it has given long and satisfactory service in the form of office fittings and counters.

The timber is available in board and scantling sizes and in various milled patterns from timber merchants in New South Wales and Queensland.

Further information on this timber can be obtained on request from the forestry authorities in New South Wales and Queensland, or from the Chief, Division of Forest Products, 69-77 Yarra Bank Road, South Melbourne, S.C.4.

PLYWOOD REPLACES MAGNESITE.

Preparatory to opening the New York World's Fair for the 1940 season, the Trylon 610-ft. high in the theme centre is getting a new 50,000 sq.ft. coat of exterior grade ½-in. 5-ply Douglas fir plywood to replace the old covering of magnesite stucco on gypsum board backing.

With the old magnesite coating severe condensation took place on the sheathing and continued even after installation of three louvres for induced circulation. As a result the gypsum board lost its nail holding power and late in 1939 large areas were ripped off by high winds.

The new plywood cover is supplied on sheets 8 ft. and 9 ft. long and in width to suit the nailer spacing on the framework. Each sheet is buttered along the edges with a caulking compound and then nailed in place. The joints are then sealed before application of the first coat of rubber base paint.

VISCOSE RAYON.

Over half the wood-pulp used in industries other than paper making is consumed in the manufacture of viscose rayon. It is estimated that 370,000 tons of pulp were manufactured into viscose rayon in 1936 and a further 330,000 tons of pulp of rayon grade made from cotton linters were consumed in making other types of rayon - acetate rayon, or celanex, and cuprammonium rayon. Some acetate rayon is also made from wood pulp and possibly this will increase in the near future.

Viscose rayon is used in clothing, house furnishings, curtains, draperies, bedspreads, etc., and is one of the most important textiles. It has been tried as a tyre fabric in extra-heavy duty tyres for buses and trucks. Prolonged tests have shown that it is far more serviceable than cotton cord for heavy-duty purposes, and it is even said to give four times the mileage of cotton-cord tyres. Possibilities in this field are large as it is said that in the U.S.A. alone 200 million pounds of cotton are used as tyre cord.

PROTECTION FOR PILE HEADS.

To protect pile heads from weathering and decay, they should be thoroughly swabbed with hot creosote (two coats) and then with soft pitch, previously melted, to form a cap. This cap can be made more permanent by covering it with building paper. Hard pitch should be avoided for it is brittle. It is also good practice to swab or brush hot creosote onto all exposed joints, or timber surfaces which come into contact. The creosote should be applied before the timber is put into place. Moisture accumulates in joints and between timbers in contact. Creosote checks the growth of decay fungi which thrive under such conditions.

BREVITIES.

Mr. I. H. Boas, Chief, Division of Forest Products, has returned to Melbourne after several weeks spent in visiting various centres in New South Wales and Queensland on Divisional business.

Mr. S.F. Rust, Officer-in-charge, Preservation Section and Veneering & Gluing Section, D.F.P., visited many plywood manufacturers in Sydney and Brisbane in May.

Mr. R. Deeble, Technical Officer, Veneering & Gluing Section, D.F.P., last month gained experience in veneering in plants operating in Sydney.

Mr. D.E. Bland, Research Chemist, carrying out investigations on Australian creosotes in the Preservation Section, D.F.P., recently visited Sydney to establish contact with the various laboratories maintained by gas companies and by firms marketing creosote and its products.

Mr. P. Gurdon, B.Sc.Agr., Pathologist in the N.S.W. Forestry Commission, Sydney, is spending a week at the Division of Forest Products, Melbourne, investigating the methods developed for the boric acid treatment of veneer to reduce its susceptibility to infestation by Lyctus borers and is also inquiring into work progressing on heart rots and other decay problems in timber.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No. 102.

1940##102

1st JULY, 1940.

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ROTARY PEELING OF VENEER AT THE FOREST PRODUCTS LABORATORY.

For a considerable time prior to the formation of its Veneering and Gluing Section the Division of Forest Products realised that the importance of the veneer and plywood industry in Australia justified close attention to the many problems associated with the cutting of veneer and fabrication of laminated stock. Many obstacles, chief of which were lack of funds and lack of staff, delayed establishment of the Section till July 1938. Since that date progress has been made with appointments of staff and provision of equipment and, in the last few months, accommodation has been appreciably expanded, and equipment purchased, largely through the generosity of Mr. W. Russell Grimwade C.B.E., B.Sc., has been installed and brought into operation. The laboratory is steadily taking the appearance of a small scale plywood plant and is equipped with log hoists, log vat, 3'6" rotary veneer lathe, clipper, glue spreader and both cold and hot-plate plywood presses.

Preliminary trials have been completed of the lathe which takes logs up to 3 ft. long and 4 ft. diameter and driven through a variable speed transmission giving a 4 : 1 reduction. Two lengths of northern silver ash (Flindersia pubescens) have been peeled according to the scheme drawn up for the study of the suitability of this species for the manufacture of aircraft plywood. The logs were peeled cold and with no difficulty peeled into 1/100" and 3/100" veneer of very high quality. The 1/100" veneer tested with a micrometer showed that the variation in thickness over the sheet was nowhere greater than 1/1000". The 3/100" was likewise very regular in thickness and was cut very tightly on the back.

As soon as the veneer drying kiln is completed, a start will be made with the routine peeling of various Australian timbers. A number of logs of eight species from Queensland and Tasmania are at present being held in storage. These preliminary experiments are aimed at the discovery of suitable Australian substitutes for birch aircraft plywood. Previous work has demonstrated the suitability of scented satinwood (Ceratopetalum apetalum) for this purpose, also that silver ash may be satisfactory. Thus, a more intensive study is to be made of the peeling, gluing and strength characteristics of the latter species.

The earlier work on scented satinwood and silver ash has been facilitated by the whole-hearted co-operation of various members of the plywood and veneering industry. It is impossible, however, for a firm in commercial production to interrupt its normal routine to give the care and attention that is necessary for experimental peeling and thus the installation of the lathe and necessary gluing equipment at the laboratory is a most satisfactory solution of the problem.

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WOOD AS A FUEL.

Many people observe that some wood burns better than other and in purchasing for domestic use show their preference for those woods by paying higher prices for them. Is this observation real or is it only apparent?

Theoretically, since all woods are composed fundamentally of cellulose and lignin, one would expect all woods to have approximately the same calorific value. Laboratory tests confirm this theory, and broadly speaking the calorific value of 1 lb. of oven-dry wood of any species is approximately 8,500 B.T.U. Variations in calorific values of timbers at the same moisture content may be due to varying proportions of cellulose and lignin, and the presence of different amounts of materials such as resins, oils, fats, waxes, tannins, pigments and salts of organic acids and mineral substances which are left as ash. Most of the organic materials have calorific values higher than cellulose and lignin. Resinous woods consequently have higher calorific values than non-resinous woods. Truewood is commonly richer in these organic substances and therefore generally has a higher calorific value than sapwood. In general the more ash the lower the calorific value.

Probably the most important factor affecting the calorific value of wood is its moisture content. When equal weights of green wood and dried wood are burned the amount of heat given off by the green wood is lower primarily because it contains a smaller mass of dry wood substance to emit heat in burning, and secondly more heat is required to change the greater mass of water in the wood to steam and raise it to the same temperature as the gases of combustion.

The burning qualities of timbers do not always correspond with their respective calorific values. For instance, the calorific value of grey box which is an Australian timber widely favoured for domestic fuel is lower than that of some stringybarks, peppermints and other eucalypts which are not highly regarded as fuel. A possible explanation is that general observations of burning tend to be based on the heat given out from open fires where the feeling of warmth is dependent on the heat radiated. This, in turn, is dependent on the temperature of the glowing charcoal or of the flame. If the temperature attained in burning grey box is higher than that in "stringybark", one naturally feels that grey box is the better fuel. The rate of burning and differences in density are generally overlooked, and it is not always appreciated that grey box, which has generally been obtained from dry ring-barked trees, has been drier than other woods. Another factor often masking the comparison of burning qualities is the size of the pieces being burnt. While small dry pieces of kindling make a quick hot fire, a single bulky block will not burn by itself, but will char and go out. This is due to the decomposition of the outer wood layers into volatile substances which burn readily and leave behind a layer of charcoal which is a poor conductor of heat. Unless sufficient heat is available to pass through this layer to cause the decomposition of more wood or to ignite the charcoal, the fire goes out.

When firewood is purchased by weight and is used in open fireplaces so that its burning qualities are judged on the amount of radiant heat emitted, low moisture content is a prime requirement for satisfaction, otherwise one would be paying for water in the wood. Consideration should also be given to the higher temperatures associated with the burning of some woods and the size and amount of wood on the fire, and the rate of burning. Density is of little importance except that a greater volume of wood of low density must be burnt to give a total amount of heat equal to that produced by heavier woods.

If firewood is purchased by volume measurements common for industrial purposes moisture content is not so important because such wood is frequently kept for some months before being used and during this time its moisture content will be considerably reduced by drying. Wood fuel for industrial boilers or for cooking and heating stoves is utilised more economically than that burnt in open fireplaces. The heating developed is greatly influenced by the efficiency of stoking and the path of the heated gases through the unit before passing out the flue into the atmosphere.

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THE PROPERTIES OF AUSTRALIAN TIMBERS.

SILVER SILKWOOD.

Silver silkwood is the Standard Trade Common Name recommended for the timber which is described botanically as Flindersia acuminata, White. This timber has been commonly called Putt's Pine after a man who mistook its identity for a pine instead of a hardwood. Other common names by which this timber is known are white silkwood, Paddy King's beech and silver maple.

The distribution of silver silkwood is confined to Queensland where its best development is in the North East and the Atherton and Evelyn Tablelands.

The tree grows to a moderate height of 100 feet and attains a diameter at breast height of 5 feet. It is unbuttressed with a fairly cylindrical bole.

The timber is pale to yellowish-brown in colour, often displaying a silken lustre and frequently streaked with darker brown lines due to cell contents. It is non-fissile and somewhat interlocked, making straight lengths difficult to obtain. There is a ribbon-like figure present due to the irregular grain. It is moderately light in weight, ranging from 21 to 40 lb. and averaging 30.4 lb. per cubic foot, when dried to 12% moisture content. The timber is not difficult to season and on drying from the green condition to 12% moisture content backsawn boards shrink 4.3% and quartersawn only 2.2%. It is immune from attack by Lyctus borers, but is not highly resistant to decay. It is soft, moderately strong and stiff, but not tough. It is light and easy to work with hand or machine tools showing some slight tendency to lift its grain in dressing. It peels, slices and glues well. It fumes to a grey colour, takes stains readily and takes a good polish.

Silver silkwood finds its best use for manufacturing and decorative purposes. Its light colour and easy working make it a popular wood for cabinet work and interior fittings and it finds considerable use in the furniture trade for productions with blonde, fumed or stained finishes. Boat builders use it for the planking of sailing skiffs. In the districts round which it naturally grows it is used for general building purposes as a framing, roofing, joinery and finish timber. It is an excellent wood for panelling, lining and ceilings. It is also used for churns, butter pats and moulds as well as for staves of tallow and meat casks.

The timber is available in boards and furniture sizes in medium to broad widths. It is also available as veneers and in plywoods.

Additional information on this timber can be obtained from the Queensland Forestry Sub-Department or from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne.

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CONSTRUCTION AND CARE OF CAUL BOARDS.

In plywood manufacture and veneering a variety of caul boards flat or shaped, wood or metal, depending on the particular type of work being performed may be used, but the scope of this article will be limited to flat wood cauls as used in the production of plywood and similar flat stock.

Two types are in common use. Heavy cauls 2½-3 in. thick are used at the top and bottom, while thinner cauls ½-¾ in. thick are distributed at intervals in the assembly between the top and bottom cauls. The heavy cauls may conveniently be made in a five-ply construction. The core comprising the three inner layers is fabricated first by gluing end nailing together three dried and conditioned layers of 1 in. stock, the centre course being longitudinal, and the two outer layers at right angles to the centre. To get rid of the water introduced in gluing, this core should be re-dried and conditioned, and any nails used in its assembly should be punched well below the surface before dressing the faces to smooth parallel surfaces. Sheets of plywood which preferably should have a hard face veneer are then glued to the faces of the core. Before use the caul board should be again conditioned to eliminate water from the glue lines. For the light or inter-leaving caul boards plywood $\frac{1}{2}$-$\frac{3}{4}$ in. thick with hard face veneers is commonly used.

After the construction and conditioning of caul boards of both kinds they should be treated with some surface preserving preparation to protect them from glue moisture, and prevent the adhesion of particles of glue. A mixture of equal parts of tallow and beeswax provides a satisfactory dressing. This should be melted and applied with a brush. Another suitable dressing is prepared from kerosene (1 pint) and paraffin wax ($2\frac{1}{2}$ lb.). This dressing should be applied when both the cauls and the mixture are hot. Throughout the life of the cauls, further coats of these dressings should be applied as required.

A third method sometimes recommended for the treatment of caul boards consists of the application of several coats of linseed oil or shellac to fill the pores of the wood. Cauls treated in this manner should be waxed or soaped twice a week.

As caul boards are used to provide flat surfaces or bases for each plywood sheet, panel, or group of sheets or panels in the press it is essential that every care should be exercised to ensure the original flatness attained in construction is maintained in their use. When the assembly is dismantled after pressing each caul board should be examined and any glue adhering to the surface should be removed. Wooden scrapers are preferable to metal scrapers which should not be used for this purpose.

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PREVENTION OF RESIN EXUDATIONS.

A problem recently investigated by the Division of Forest Products was to prevent the exudation of resin from certain boards cut from large pines grown in old wind-rows and shelter belts. When dried under customary kiln conditions this stock exudes resin in liberal quantities and is troublesome in subsequent machining and gluing operations. Temperatures as high as 200°F. fail to set this resin but it has been found that by drying at about 110°F. the exudation is prevented. Moreover, the stock likely to give trouble can be detected by the obvious bands of resin-filled cells in the growth rings, so that it can be sorted for special treatment from the general run of boards.

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BREVITIES.

Mr. S. A. Clarke, Deputy-Chief, Division of Forest Products has been in New Zealand acting in an advisory capacity to New Zealand Forest Products Limited on the initiation of a plan of utilisation in softwood plantation forests.

Mr. R. F. Turnbull, Officer-in-Charge Utilisation Section, D.F.P., visited Lithgow during June in company with officers of the Department of Supply and Development to investigate the qualities required in timber supplies for defence equipment.

Mr. A. C. Pond B.E. (Hons.), a graduate of the University of Western Australia, has been appointed to the staff of the Division of Forest Products as Assistant Research Officer in the Section of Seasoning. He will be engaged on projects aimed at developing seasoning schedules for Australian timbers.

Mr. A.W. Munro and Miss J. Couchman, officers engaged in research on the processing of flax fibres, have been applying retting control methods at the rettery of Flax Fibres Pty. Ltd. at Colac.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

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"IMPROVED WOOD" - WHAT IT IS AND WHAT IT CAN BE USED FOR.

"Improved wood" is wood changed mechanically by compression or impregnation or both. With impregnation methods, materials - usually synthetic resins - which reinforce the wood by their own mechanical properties are used. Strictly speaking, all laminated stock bonded with synthetic resin comes under this heading since relatively high pressure is always used in bonding, causing at least some compression, and at least some penetration of the resin into the wood is involved. Usually, however, the term is applied to wood much denser than untreated material on account of the high percentage of resin contained and the very appreciable amount of compression that has been induced by means of high pressures.

The properties of improved wood depend, of course, on the details of its construction and on the amount of resin contained. Generally, in addition to being denser and harder than untreated wood, it is much higher in compressive strength and somewhat higher in other strength properties with the exception of toughness, which is reduced. Improved wood is high in electrical insulation value. Its resistance to moisture content changes in air and to shrinking and swelling is greater than that of untreated wood, and, also, when immersed, it absorbs water much more slowly. The properties desired in improved wood obviously depend on the purpose for which the wood is required and by controlling the conditions of manufacture, it is possible to vary the characteristics of the final products and to impart properties most advantageous for the particular requirements of use.

The development of improved wood has received most attention in Germany but very considerable work in this field has also been carried out in England and the U.S.A. Recently investigations have been made in Australia at the laboratory of the Division of Forest Products, using Australian timbers and synthetic resin of Australian manufacture. This work has shown these materials are entirely satisfactory for the purpose and that improved wood, equal to any produced overseas, could be made in this country.

Perhaps the most important use of improved wood today is in aircraft construction. The wood may simply be in the form of resin-bonded plywood, with a density very little different from that of untreated wood or it may be in the form of impregnated and highly compressed wood such as is used in certain processes to reinforce the roots of the blades of aircraft screws. Mention should also be made of the use overseas of improved wood in shipbuilding and coachbuilding.

In the electrical field improved wood is used successfully for transformer parts, protective walls, bearers on transmission masts, switch operating rods, switch handles, bus bar supports, core spacers, slot wedges, insulating stools, tension insulators, instrument cases, terminal boards, and mounting blocks for switches, fuses, etc.

According to both German and English literature on the subject, improved wood has been found very useful for bushes for highly stressed bearings and in Australia could probably replace some of the imported woods used for this purpose. Other engineering uses are for bearing plates, teeth of mill wheels, gear wheels, tool handles, and moulds for light-metal castings.

Miscellaneous uses mentioned include chemical containers, vats and tanks, bobbins, parquetry, shoe-lasts, sporting goods, and such minor purposes as for buttons and ornaments.

Quite obviously, many of the uses to which improved wood has been put in countries such as Germany are dictated mainly by the desire to eliminate dense imported woods or to conserve metals but, on the other hand, there is no doubt that in some directions, improved wood is to be recommended for use even where such economics do not apply.

Regarding the manufacture of improved wood for specific requirements, the Division of Forest Products is equipped with the plant and has the staff capable of carrying out developmental work. Enquiries should be addressed to the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne.

ECONOMY IN THE MAINTENANCE OF POLES.

The Division of Forest Products has just completed an inspection of its pole test sites at Ballarat, Victoria, and Wyong and Clarencetown, N.S.W. These sites were established to enable the effectiveness of several preservatives and methods of pole treatment to be tested and with a view to improving Australian practices of pole maintenance. It is gratifying to find that all treatments, after testing for periods ranging from 5 to 7 years, have given very satisfactory results. Some of the methods under test quickly showed such obvious improvements over those customarily used that they have been copied in commercial practice and are now in actual use under service conditions in certain localities. Appreciable savings are already apparent from the progressive action.

As the tests progress and further confirmatory evidence is obtained, it is hoped that methods of pole treatment will be made available which will permit the use of timbers which are little used as poles at present, due to their low durability. This will extend the range of the acceptable pole timbers, which are very limited in number, and consequently are in great demand. The principal timbers in these tests have been selected from those available in large quantities, e.g., messmate stringybark and blackbutt, which have comparatively low durabilities. The successful treatment of such timbers in this experimental work encourages the view that supplies of ironbark and similar timbers may be augmented in the future by quantities of cheaper poles of less durable species, the service life of which, following correct preservative treatment, will approach that of our best durable hardwoods.

BREVITIES.

Mr. I. H. Boas, Chief, Division of Forest Products, Dr. W.E. Cohen, Officer in Charge Chemistry Section, and Mr. H.E. Dadswell, Officer in Charge Wood Structure Section visited Tasmania during the month to confer with representatives of Tasmanian Paper Companies.

Mr. H. B. Wilson, Assistant, Preservation Section, Division of Forest Products, carried out field inspections at pole testing sites in Victoria and New South Wales during July.

Mr. A. J. Thomas, Assistant, Utilisation Section, has returned to the laboratory of the D.F.P., after having spent several months in Tasmania collecting logs of Tasmanian timbers which are to be studied in the Division's investigations on timbers suitable for aircraft.

Mr. H.D. Ingle, Assistant, Wood Structure Section, Division of Forest Products, is at present in the Bago district of New South Wales, collecting sample logs of alpine ash for test purposes in connection with aircraft timbers.

Mr. I. Langlands, Officer in Charge Timber Mechanics Section, D.F.P., spent the last week of July in Sydney, calibrating testing machines with the Division's standard Proving Rings.

Mr. E. B. Huddlestone, Research Officer in New South Wales Forestry Commission, recently paid a brief visit to the Division of Forest Products, to discuss co-operation in investigations on timber testing for Aircraft Timber Investigations.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

GREY BOX.

Grey Box is the standard trade common name recommended for the timbers described botanically as Eucalyptus hemiphloia F.v.M. and Eucalyptus largeana Blakely and de Beuzeville. The timbers of these two species are so similar that they are grouped under the standard trade reference name of Eucalyptus hemiphloia. In New South Wales and Victoria, grey box is the name almost universally applied to this timber, but in Queensland, it is also known as grey ironbox or gum-topped box.

Grey box is distributed extensively in eastern Australia. It is found in South Australia, in north east, central and western Victoria, in the coastal forests of New South Wales and in Queensland it occurs in coastal regions as far north as Rockhampton, thence 100 miles north west and 200 miles west, and is reported again on the Atherton Plateau in North Queensland. It reaches its best development in heavy soils where these are water-soaked.

The trees seldom attain very large dimensions, very rarely exceeding a total height of about 90 ft. with an average diameter of about 2 ft. at breast height. The bark is of the gum type ranging from whitish to dull grey.

The timber is pale to light brown in colour. Its texture is fine and uniform and its grain generally interlocked. It is an extremely heavy wood, ranging from 64 to 78 lb. and averaging 70 lb/cubic foot when seasoned to 12% moisture content. It seasons slowly but usually is not prone to checking and, in drying from the green condition to 12% moisture content, shrinks 6.9% across backsawn widths or 3.5% across quartersawn. It is highly resistant to decay and termite attack. It is extremely hard, extremely strong, extremely stiff and very tough. It is hard to work either by hand or in machines.

Grey box, on account of its great strength and durability, is one of the best eucalypts for structural purposes. In round form it is widely used for poles and piles. In hewn form it is in active demand for railway sleepers and crossing timbers and for bridge and wharf girders. It is sawn for use in heavy constructional work and for wheelwrights' purposes for naves and spokes of wheels, and shafts and poles of drays or wagons. In railway wagon construction, it is used for transoms and underframing. It is excellent for mauls. Grey box is considered one of the best of the wood fuels and so contributes large tonnages to the firewood industry.

The timber is available mainly in round or hewn form from logging and hauling contractors in the eastern states, but also in a fair range of sawn sizes.

Further information on this timber could be obtained from the forestry authorities in South Australia, Victoria, New South Wales and Queensland, or from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne, S.C.4.

TERMITE EXTERMINATION.

From time to time, new substances are "discovered" for eradicating termites (white ants) or various wood borers and not infrequently these are only well known poisons mixed in new proportions. Recently a termite exterminator employed a poison containing arsenic, strychnine and cyanide. This formidable combination was unfortunately not as successful as its composition might lead one to expect. The success of termite control methods depends upon factors other than the toxicity of the poisons used, as it is essential to introduce these in a manner that will ensure their being taken by the termites and well distributed in the termite colony. Such dangerous substances as strychnine and potassium cyanide are singularly out of place in a dwelling and there appears to be no justification for adding these to white arsenic which is an excellent termiticide and, although very poisonous to man, not quite as deadly as cyanide.

Poison dusts are a useful means of controlling difficult cases of termite infestation.

It is, of course, preferable to supply new buildings in dangerous areas with metal termite shields. Where these have not been supplied and termite attack occurs, the termites should be traced, if possible, to the point of entry when suitable steps can be taken to deal with them. Poison dusts should be applied scientifically to termite galleries with as little disturbance as possible to induce the termites to continue working in the dusted areas. The poison grains are then picked up on the bodies of the insects and carried back to the nest which may be destroyed.

The use of extremely poisonous substances is not a guarantee that this will happen. Success depends upon the careful inspection and appraisal of the damage, the selection of the galleries to be treated and the personal skill and experience of the operator. A sound knowledge of the habits of Australian termites is an essential prerequisite for the operator.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No. 104.

1940##104

1st September, 1940.

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TIMBER CONTROL.

For some time past it has appeared desirable to institute some form of control in the timber industry in Australia. The necessity has arisen because of conditions set up by the war. Two main features have been operating. One is the serious decrease in the volume of imported softwood timbers owing to the restriction of purchases to save exchange; the other is the unprecedented call for timber for numerous defence requirements. In addition, it has become impossible to obtain requisite quantities of a number of speciality timbers which, until recently, were imported in relatively small amounts. These and other factors such as the difficulty in interstate transport have led to conditions in the timber industry which are not far short of chaos and which are likely to become worse.

The Commonwealth Government has therefore decided to set up an organisation whose objective shall be to bring about the most orderly and efficient machinery for the marketing of both local and imported timbers. Much first grade timber has been used for purposes where a lower grade should be equally effective and this has often proved to be disadvantageous to certain industries. It should be possible to organise the timber industry in such a way that the most efficient use is made of any timber with the least amount of transport.

The Department of Supply and Development has set up a control organisation for all supplies for both civil and defence work under Mr. H. C. Green, Assistant Secretary of the Department. Acting under Mr. Green are Assistant Controllers for specific kinds of material. Mr. I. H. Boas, Chief of the Division of Forest Products, Council for Scientific and Industrial Research, has been appointed Assistant Controller for timber and has recently begun his work in this direction. With the goodwill and assistance of the Forestry Departments, the Sawmillers, the Timber Merchants and the users of timber, there should be no serious difficulty in getting order out of the present condition of chaos, with advantage to the country and to all concerned in the timber industry.

All questions relating to supplies of timber should be addressed to the Assistant Controller of Timber, Department of Supply and Development, 83 William Street, Melbourne, C. 1.

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WOOD FOR CHEMICAL NEEDS.

Wood serves the chemical engineer as one of his most important materials for the construction of vats, tanks and other containers for liquid chemicals or solutions. The timber to be used for this purpose must be chosen with deference to the absorption of the liquids to be used, the action of the wood on the chemicals, and conversely of the chemicals on the wood, and to the conditions of service.

The absorption by the wood is important because a large percentage of expensive chemicals may be thus lost in the equipment, but the more detrimental effect of active chemicals on woods with high absorptions than on those less subject to penetration is probably a more important factor.

Contamination of the chemicals by the wood must be absent or as low as possible. One of the most important considerations is the possibility of the wood causing a colour change in the liquid. The wood might also impart a flavour or odour to the liquid. Fortunately, for most industrial purposes, the volume of liquid is generally so great that any colours, flavours or odours from the wood are scarcely noticeable, and seldom objectionable.

The effect of chemicals on wood is generally as much a function of the conditions of service as of the chemical itself. In general, it may be said that the main chemical action on the wood is to destroy or mutilate the exposed fibres by reacting either with the cellulose or the lignin or both. It should be remembered that the wood will be more susceptible to strong than to weak solutions. Sulphuric and hydrochloric acids appear to affect all woods detrimentally, although dilute solutions of these acids do not injure them to any extent. Acetic acid does not seem to have any destructive action, but only those woods which will cause little or no coloring should be used in contact with this acid.

In general, all woods appear to withstand the action of acids and acid solutions better than strongly alkaline and caustic solutions. These latter attack and disintegrate the fibre, although weak alkaline solutions do not affect the wood to any great extent. Lime, magnesia, and iron solutions are most detrimental and appear to have an actual corrosive effect. Strong oxidising agents such as nitric acid, chromic acid, potassium permanganate and free chlorine should not be brought into contact with wood, as they rapidly affect it.

At ordinary temperatures a solution may have no appreciable action on the wood for a definite period, but an increase in temperature may cause an immediate and rapid destruction of the material. This effect appears to be proportional to the degree of temperature rise.

If the level of the liquid in the wooden container varies considerably and for long periods, attention must be paid to the shrinkage and swelling of the wood, and consequently to the design of the container. This may be dictated by some technical requirement, but it should be kept in mind that tanks and vats circular in cross section are most efficient.

Having decided what species of timber to use, it is essential to select quartercut pieces with straight grain, free from sapwood, knots, insect attack and decay.

The service life of a wooden tank or vat can frequently be increased by applying chemical resistant coatings such as pitch, shellac, nitro-cellulose lacquers and synthetic enamels, or lining it with lead or other resistant metal, or alloys such as stainless steel and monel metal, or rubber.

Timbers used overseas in the manufacture of chemical tanks and vats are oak, Douglas fir, yellow pine, spruce, redwood, maple and cypress. In Australia it has been found that these timbers can be replaced by kauri, celery top pine, huon pine, King William pine and blackwood. It is probable that other Australian timbers are equally satisfactory for use in the manufacture of vats for chemicals, but to date, experience has been confined to those already mentioned.

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WOOD AS WAR MATERIAL.

According to the Canadian Forest Products Laboratories, the value of wood as a raw material is attested by its inclusion in certain lists of war contraband. Timber is essential for boxes for ammunition and supplies, for the building of aerodromes, aircraft, dug-outs, shelters and pontoon bridges and to provide railway sleepers. It is also used in the manufacture of war equipment as for example in the stocks of rifles and light machine guns. Cartridge wrappers consist of paper made from wood pulp and large quantities of fibre-board and corrugated board are used in packaging. Further purified wood pulp yields cellulose nitrate used in explosive manufacture and also as the chief ingredient for smokeless powders, photographic films and celluloid plastics. Blasting explosives of which wood flour forms an appreciable part, are employed in construction work outside of war zones. Specially prepared charcoal is the chief working substance in gas masks. Acetone, obtained as one of the products from the destructive distillation of wood, performs the function of a solvent or dilutent in some explosives.

Wood is also an important auxiliary war material. Rayon and staple fibre from wood pulp can be more extensively used in place of cotton. Producer gas from wood and charcoal may be used for developing power for cars and trucks and so release petrol for military purposes. Thus the timber resources of any country which are so important in peace time trade, play an equally important role in war.

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PLYWOOD FOR TEA CHESTS.

The exports of tea from Ceylon, India, Java and British Africa amount to more than 10,000,000 chests per annum. Prior to the war, plywood shooks for these chests were imported chiefly from Scandinavia and also from Japan and other countries in the East, but now, with Scandinavian supplies cut off, and the desire to purchase within the sterling area, tea exporters are looking towards Australian plywood mills to supply part of their requirements. Existing Australian plants which now produce approximately 100,000,000 sq. ft. of plywood per annum could not fulfil the total demand which would require approximately 200 million sq. ft., but their production might be expanded and considerable orders have already been placed with Queensland manufacturers, and others will surely follow.

The opportunity seems ripe for the utilisation of timbers which are at present only of secondary importance in plywood manufacture. Amongst others these include yellow walnut and grey satinash which have already been accepted. Apart from mechanical considerations, the chief requirement is that the timbers used will not taint tea packed in them. Consequently it is probable that additional timbers might be exploited for this purpose.

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BREVITIES.

Mr. I. H. Boas, Chief of the Division of Forest Products, C.S.I.R., and Mr. R. F. Turnbull, Officer-in-Charge of the Utilisation Section of the Division of Forest Products, will be visiting Canberra, Sydney and Brisbane during the first week of September.

Mr. A. Gordon of the Utilisation Section of the Division of Forest Products will spend some time in North Queensland during September, making arrangements for the collection and transport of selected logs of North Queensland timbers, for the investigation of mechanical properties. This work which is connected with the investigation of Australian timber for aircraft, will be carried out in the Timber Mechanics Section of the Division of Forest Products.

The Division of Forest Products maintains a liaison officer at Victoria Barracks, Melbourne. This officer is available to advise the Services on any question of timber specification and timber utilisation.

Mr. E. B. Huddleston and Miss Winifred J. Rosling of the New South Wales Division of Wood Technology have arranged to spend the first week of September at the laboratories of the Division of Forest Products. They will be investigating methods used in the testing of timber for aircraft.

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THE PROPERTIES OF AUSTRALIAN TIMBERS.

RED CEDAR.

Red cedar is the standard trade common name for the timber cut from the species known botanically as Cedrela toona Roxb. var. australis C.DC. Strangely enough, this species is one of the few which are free from the confusion due to a multiplicity of trade names. It is a cedar belonging to the same genus as the perhaps better known Spanish or cigar-box cedar. It is known throughout Australia as red cedar.

The tree is large, often attaining a height of approximately 100 ft. with a stem diameter up to 6 ft.; and sometimes buttressed at the base. It is one of the very few deciduous native trees. The species is generally distributed more or less as single trees along the eastern coast of Australia from south of Sydney northward. It is somewhat more concentrated on the highlands of Eungella some 60 miles west of Mackay, Queensland, and extends through the tropical mixtures of the Atherton Plateau. It is also found on the highlands of New Guinea. This tree was in such demand by the early settlers in Australia that it was rapidly cut out in many districts and is now nearing extinction in these districts.

The timber has a rich reddish-brown colour and a distinct pleasant "cedary" odour. The grain is usually straight, but may be somewhat interlocked. The texture is coarse and definite growth rings may be observed. It is one of the few Australian timbers in which growth rings are distinct. The figure is pronounced on backsawn surfaces and is due mainly to these. Fiddleback figure is not uncommon. The timber seasons readily, but fairly mild conditions are required for the kiln-drying of backsawn stock. On drying from the green condition to 12% M.C. backsawn boards shrink 4.1% and quartersawn 2.2%. The timber may be classed as light in weight, the density at 12% M.C. being approximately 28 lb./cu.ft. with a range 21-35 lb./cu.ft. The wood is desired by cabinet makers because it is particularly easy to work, cutting and dressing cleanly both with hand or machine tools. It also takes an excellent polish exhibiting its natural lustre.

Red cedar is undoubtedly a specialty timber. It has become extremely well known as a timber for interior decoration and fine cabinet work where a rich colour and beautiful finish are desired. It is sought for the construction of racing boats because of its durability and lightness and it is also used for panelling, furniture, joinery, ornamental boxes and bent work. Unfortunately, it is available only in limited quantity in boards and as small dimension stock.

Additional information on this or any Australian timber may be obtained from the State Forestry Departments by application to the Chief, Division of Forest Products, Yarra Bank Road, South Melbourne.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No. 105.

1st October, 1940.

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THE DIVISION OF FOREST PRODUCTS AND THE WAR EFFORT.

The Division of Forest Products is one of the Divisions of the Council for Scientific and Industrial Research which is actively engaged on work directly connected with the national war effort. Its activities may be considered broadly as (i) those of a purely advisory nature and (ii) those which cover a tremendous amount of experimental work. In the first place, since timber is a commodity which must bulk largely in all military and civil requirements, the Division has been and still is acting in an advisory capacity to the purchasers of timber whether military or otherwise. The knowledge of Australian timbers, of timber design, and of timber utilisation built up during the past twelve years is now paying interest and the staff of the Division can draw upon the years of accumulated data based on much painstaking research when answering the numerous enquiries received every day. While the work of answering these enquiries falls mainly on the shoulders of the members of the Utilisation Section they, in turn, obtain data on specific points from the members of all the other Sections. Thus, one enquiry might call for the opinion of the wood identification experts, another for the help of the wood preservation experts and still another for the assistance of the chemists. There are also enquiries engendered by the shutting down of the import trade. Timber users are hunting around for Australian substitutes for various purposes and they turn to the Division for assistance.

The above is just one aspect of the work. Behind this and supporting it lies the vast machinery of organised research into the properties of Australian timbers. This organised research, which is functioning as smoothly as a well-run factory, is essential for determining the suitability of Australian timbers for numerous purposes of which not the least outstanding is their utilisation in the manufacture of wooden aeroplanes. For such a purpose a tremendous amount of data has to be compiled and all the specimens used in such compilations have to be subjected to microscopic examination. While the work embodies the survey of numerous species, it is not generally realised that the study of one species covers the examination of forty logs from thirty different trees. From each log an average of twenty test specimens may be obtained on which over 100 tests are carried out. This means that some 4,000 tests are necessary before the data on the mechanical properties of a species can be adequately determined. For many of our Australian timbers the information is urgently needed, so that they can be used to best advantage and at the present time, the Section of Timber Mechanics is working two shifts in order to speed up the production of such information. While this Section carries out the actual testing of the materials, it is necessary to have the co-operation of nearly all the Sections of the Division in this work, as it is mainly a question of team work. For example, the Section of Wood Structure carries out some thousands of microscopic examinations on all the test material for each species in order to determine the relation between macroscopic and microscopic details of structure and strength properties. The Division of Wood Technology of the New South Wales Forestry Commission is also working to capacity in this direction to assist in obtaining this essential data.

Timber, for both defence and civil needs, is also utilised in the form of plywood and the knowledge of the veneering and gluing properties of Australian timbers has to be built up. Therefore, the Veneering and Gluing Section of the Division is worked to capacity peeling numerous timbers and studying the gluing properties of the peeled material. The main object of this work is to obtain information on the strength of the plywood made from the peeled material, so that its suitability for use in aircraft construction can be determined.

Among other very important investigations being pushed ahead are (i) the fireproofing of Australian timbers, (ii) the study of "improved wood" using Australian timbers, (iii) the investigation of the effect of heat treatment on the strength of timber. The latter is a most important project since, on the results depends the development of safe kiln-drying schedules for timbers to be used for exacting purposes. It is of little use to discover an Australian timber eminently suited for say aircraft construction if, in seasoning, the conditions are such that the strength of the timber is even slightly affected. The Seasoning Section is co-operating in this work in developing suitable kiln-schedules for the various timbers under investigation.

One further point must be stressed. While the Division is actively engaged on this work, which has a direct defence aspect it is not neglecting certain investigations which aim at assisting industries of an essential nature. For example, the Section of Wood Chemistry is working on problems connected with the development of the pulp and paper industry in Australia and no one can say that this is not an essential industry at the present time.

This brief survey has been designed to indicate just how much the Division of Forest Products is contributing at the present time and it appears likely that it will be called upon to its utmost capacity in the fields of endeavour in which its staff is so actively engaged.

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RADIO ENTERS THE GLUING FIELD.

Heat reactive glues such as Tego-film have now been in common use for some time for the manufacture of waterproof plywood and laminated stock up to about two inches thick. It is, however, extremely difficult to heat thicker assemblies uniformly throughout to the required temperatures of 180°-350°F. by external plattens without damaging some of the timber. In November 1938, Mr. I. H. Boas, Chief, Division of Forest Products, suggested that it might be possible to use radio oscillations to generate heat. Experiments, which were in the hands of Mr. A. J. Thomas, showed immediately that this idea was feasible and that it was possible that an economically sound process could be developed.

Broadly speaking, the procedure is to use the assembly as a di-electric between two plates connected to the output of a short wave transmitter. The wood need not necessarily touch the metal plates as there is no flow of electric current in the ordinary sense. The wood slowly heats up and the temperature is uniform everywhere except at the surface where it is exposed to the surrounding air. When the experiments were carried out using various standard glues including Tego-film and various thicknesses of timber, the gluing of assemblies up to 13 inches thick was found to be relatively simple. Further experiments were directed to the solving of the problem of localising the heat near the glue line and thus saving the power and time required to heat the bulk of the timber unnecessarily. These experiments have now proved successful. However, further developmental work was put to one side at the outbreak of the war. It is now of interest to record in this connection that in the "Southern Lumberman" for August 1st, 1940, there appears an article on "Quick Drying and Gluing by New Electric Process." It is stated that this process, in brief, consists of the application of a high-frequency electrostatic field to the wood being treated using an arrangement of tubes, etc. such as are used in a radio sending station. It is claimed that such an application enables the gluing up of laminated panels to be accomplished almost instantaneously. The development of these gluing experiments has progressed to such an extent that a panel manufacturing plant on the West Coast of America has purchased a

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"Thermal Gluing Unit" (product of the Thermal Research Corporation). This unit will hold six inches of panels and will glue them in less than five minutes.

The Division of Forest Products is therefore well in the forefront in regard to the latest developments in the gluing field and, in fact, reached a stage in experimental work when all that remained to be done was to find someone sufficiently interested to try the procedure outlined on a commercial scale. Details of the construction and operation of the equipment, for which there is no space in this short article, will be made available to those interested in such a commercial development. Further information can be obtained on application to the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne, S.C.4.

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PRACTICAL RESULTS IN THE PRESERVATION OF WOODEN-TELEGRAPH AND TRANSMISSION POLES.

Data supplied by post office, telegraph and telephone authorities and large power stations of seventeen European countries were recently compared in a publication by the International Advisory Office on Wood Preservation.

A comparison of the quantities of poles, by species, as reported or estimated shows that the following proportions prevail:-

	per cent.
Pine	76
Fir	18
Larch	2
Oak	2
Chestnut	2
	100

and for the principal preservatives used

	per cent.
Coal tar creosote	67
Corrosive sublimate	11.8
Copper sulphate	15.9
Basilit, Tanalith U salts	3.1
Other preservatives	0.2
Untreated	2.0
	100

The average length of life does not admit of close comparison because climatic conditions and types of timber in different countries vary greatly. The following averages should therefore be considered with due regard to these reservations.

Average Life of Poles

Treatment	Years
Coal tar creosote	26
Corrosive sublimate	18.1
Copper sulphate	20.9
Basilit, Tanalith U salts	16.2
Other preservatives	12
Untreated	9.5

The principal North American telegraph companies estimate the average life of creosoted poles to be about 50 years. This is undoubtedly due to the fact that in the United States of America higher absorptions are prescribed. More resistant species are also used. It is evident, however, that coal tar creosote is by far the best preservative for poles and hence it is not surprising that its use surpasses that of all other preservatives taken together.

Our experience in Australia over the last decade has engendered the same confidence in the value of coal tar creosote as a wood preservative, as is shown in Europe. It is certain that properly creosoted poles will have a service life three or four times that of the untreated article.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

GREY SATINASH.

This is the standard trade common name given to the species Eugenia gustavioides Bailey which is also known to bushmen as water gum. The Queensland Forest Service record that the tree reaches 100 ft. in height and up to three, four or even five feet in diameter. It occurs in the north eastern highlands of Queensland and is particularly dominant on the Eungella Highlands some 60 miles west of Mackay.

In tests carried out on a number of specimens in the laboratories of the Division of Forest Products an average air-dry density of 38.4 lb./cu.ft. has been obtained. This figure for non-reconditioned timber is considerably lower than the 47 lb./cu. ft. recorded by the Queensland Forest Service in "The Timbers and Forest Products of Queensland." However, it was based on specimens from 11 trees supplied from Queensland. The timber is yellowish-grey to yellowish in colour and may be classed as of uniform and medium texture. The grain is, however, often interlocked; the figure is not prominent and where any shows it may be traced to the bands of soft tissue or to irregularities of the grain. It may be classed as an ordinary wood working species being neither difficult nor easy to handle. In seasoning, the timber has little tendency to degrade, but there is a marked difference in the drying rates of different boards which fact necessitates care in reaching a uniform final moisture content. It is possible to kiln-dry green 1" quartersawn stock to a moisture content of 12% in approximately 11 days. In material tested the shrinkage of back-sawn boards was found to be very uniform averaging 5.6%; that of quartersawn boards averaging 2.1%. This is certainly not a high shrinkage and records of very high and uneven shrinkage for this species may be due to the presence of interlocked or wavy grain in the specimens tested. Very little collapse occurs during seasoning, but a reconditioning treatment does cause some recovery.

The timber is not particularly durable, being attacked to a certain extent both by fungi and termites. For this reason it should not be used in contact with the ground. The sapwood is not very prone to the depredations of the Powder post borer (Lyctus).

The timber has found many uses in Queensland including the following:- (a) Building construction - plates, bearers, studs, roofing, lining, flooring, skirtings, scotias, etc.; (b) Furniture and cabinet work; (c) Picture mouldings; (d) Turnery - electric light blocks, etc.; (e) plywood; (f) Cases; and (g) butter boxes for local trade. The successful utilisation of the species can be assured by the adoption of modern methods of conversion, seasoning, and machining.

It may be classed as definitely available in Queensland in the form of sawn timber and in late years it has been satisfactorily peeled for veneers. Further information on the properties and uses of this timber may be obtained on application to the Chief, Division of Forest Products, or the Queensland Sub-Department of Forestry.

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BREVITIES.

In a recent issue of "Flight" reference is made to the fact that the use of wooden blades for air-screws has now been successfully mastered and that these may be fitted instead of magnesium alloy. There is a saving of approximately 20 lb. per blade if wooden blades are used on a 1,000 h.p. air-screw. With wooden blades it is necessary to fit a different type of steel adaptor with a wide-pitch thread of special form and the wooden blade is screwed and cemented into this.

Dr. W. E. Cohen, Officer-in-Charge of the Wood Chemistry Section of the Division of Forest Products, has been awarded the Smith Memorial Medal by the Australian Chemical Institute. This award which is for distinguished research in the chemical field is made annually and in their choice of the recipient for 1940 the Chemical Institute have selected a chemist whose field of work, including as it does the investigation of the chemistry of wood and of pulp and paper, is very much related to that of the late H. G. Smith himself, who was one of the pioneers in the chemical investigation of Australia's natural products.

Mr. A. W. Mackney of the Wood Chemistry Section of the Division of Forest Products has resigned his position in order to join Australian Newsprint Mills Limited, Hobart. Mr. Mackney was farewelled by his brother officers at a small dinner party and the day before his departure for Hobart was presented with a silver-plated coffee percolator and fountain pen by Mr. I. H. Boas, the Chief of the Division on behalf of the members of the staff of the Division.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No. 106.

1940##106 1st November, 1940.

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EXPERIMENTAL POLE TEST.

The Division of Forest Products has just completed its annual inspection of the experiments being carried out at Benalla and Belgrave (Victoria) to determine the effectiveness of various preservative methods designed for prolonging the life of wooden poles. In these experiments the timber employed is Eucalyptus obliqua, messmate stringybark.

There are broadly speaking two methods of applying preservative chemicals to wooden poles. In the first the preservative may be applied to the outside surface only; in the second the wood is impregnated usually under pressure. Creosote is the commonest preservative used. Experimental poles treated by bot methods are represented in test at the two Victorian test sites. Following the inspections it is now obvious that most of the various surface treatments are of very little value, when applied to messmat stringybark at least, and do not compare favourably with the impregnation treatments.

After 8 years service, all the impregnated poles appear to be quite sound. This is encouraging and in keeping with the result obtained in America and Europe.

With timbers of low durability only a thorough preservativ treatment is satisfactory. Surface treatments may have a greater degree of success with the more durable species, but it is doubtful whether they will compare with the impregnation treatments for lengt of service.

It is of interest to note that decay is just as severe at the Benalla test site as it is at the Belgrave site, although the latter has a heavy forest soil and receives a much higher rainfall. It was found at the Benalla test site that the termites were quite capable of passing through or below soil impregnated with creosote o arsenic to a depth of 18" or more.

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WAX FINISHING OF WOOD.

In a recent issue of the journal "Industrial Finishing" appears an article on the wax finishing of raw wood which should be of general interest. The advantages of the wax finish are that it is highly moisture resistant, not readily marred, and easily restore or repaired. For this purpose straight carnauba wax is recommended in the article referred to and instructions given for its applicatio In the first place it is suggested that the wood surfaces to which th wax is to be applied should be thoroughly sanded and "insured" agains future grain raising by at least one sponging and resanding. The products should then be placed in a warm room for several hours in order to warm the timber through; for this a room temperature of approximately 110°F, is recommended. The carnauba wax should be ground or crushed and used in the proportion of 1 lb. to 1 gallon of V.M. & P. naphtha (petrol). It will slowly dissolve when heated on water bath as for example in an ordinary glue pot which has been adjusted to maintain a correct temperature in the inside container fo animal glue. The wax will go into solution completely at a point below the boiling point of the solvent and will come out of solution again as the material cools - at a temperature around 100-110°F. When cold, it is in the form of a thin paste and may be kept indefinit ly in a tightly covered container. When ready to be used the wax suspension should be warmed to approximately 160°F. and applied to the previously warmed wood with as large a brush as practicable if brushing is to be the method employed. The temperatures of the wood and solution are important, as they control the penetration. Surfaces thus waxed will be ready for polishing in 15 minutes. If there is too much wax on the surface, it is a sign that the solution has been applied too heavily or it is too concentrated for the wood being treated.

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DESTRUCTION CAUSED BY THE USE OF FAULTY TERMITE SHIELDS.

The Division of Forest Products was recently requested to inspect the results of termite attack in a new home in one of Melbourne's suburbs. The district is not one heavily infested by termites and cases of attack in buildings are comparatively rare. However, in the house inspected termite attack was found in some of the interior woodwork and investigation indicated that the termites had effected their entry over the red gum stumps and metal termite caps. The latter were of such faulty construction that they offered no obstacle at all. This is quite inexcusable. Good termite shields properly fitted cost very little more than a poor article and are a secure protection against termite infestation.

The blanks for the metal shields should be cut from 24-26 gauge galvanised iron and shaped by stamping where convenient. If the shields are however shaped by cutting, the subsequent gaps should be soldered. All joins in strip shields along masonry foundations should be lapped and soldered. The shields should not be injured by spiking and if it is essential to fasten the bearers to the stumps this can be done by means of metal straps passing through the shields or riveted to upper and lower surfaces. In Queensland a bent metal arm passing through the bearer and fastened to the stump below the shield by means of a wood screw has been proved very satisfactory. These devices are not necessary in floor construction inside masonry walls.

It is practically impossible to apply shields to an erected house or to improve faulty construction after the building is completed. Therefore, it is essential to see that, if termite proof construction is attempted, the work is thoroughly and effectively carried out. The Division of Forest Products has issued two trade circulars dealing very fully with this subject and these may be obtained by anyone interested on application to the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne.

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BREVITIES.

Mr. I. H. Boas, Chief of the Division of Forest Products, visited Adelaide and Perth on official business during the latter part of October. He was accompanied to Adelaide by Mr. R.F.Turnbull, Officer-in-Charge of the Utilisation Section of the Division.

Mr. I. Langlands, Officer-in-Charge of the Timber Mechanics Section of the Division of Forest Products is rapidly recovering after his recent operation for appendicitis. He expects to return to duty in the early part of November.

Mr. A. Gordon of the Utilisation Section and Mr. H.D.Ingle of the Wood Structure Section of the Division of Forest Products are both busy collecting timber specimens in connection with the examination of the suitability of Australian species for aircraft construction. Mr. Gordon is still in North Queensland, while Mr. Ingle has spent the last part of October in the Tumbarumba district, New South Wales.

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THE PROPERTIES OF AUSTRALIAN TIMBERS.

SILVER-TOP ASH.

This is the standard trade common name given to the species botanically known as Eucalyptus sieberiana F.v.M. This species is also known as coast ash or mountain ash in Victoria and New South Wales, ironbark in Tasmania, and silver-top in Victoria. The tree is a comparatively tall one, reaching a height of 150 ft. and possesses a rough, compact, deeply furrowed bark which has given rise to the name "ironbark" owing to its resemblance to the bark of the true ironbarks. It is found in central coastal and south coastal districts of New South Wales, in the eastern coastal and central Gippsland districts of Victoria, and in the northern portion of the east coast of Tasmania.

The timber falls into the class of timbers generally known in Australia as the "ash" group or Tasmanian or Victorian oak. It is however somewhat denser than mountain ash, alpine ash, or messmate stringybark - the three main species of this group. The average weight of the timber when air-dried to 12% moisture content and without reconditioning is 53 lb./cu.ft. with a probable range of 40.5 - 65 lb./cu.ft. However, with material dried and reconditioned to 12% moisture content, the average weight is 50 lb./cu.ft. and the probable range 38 - 62 lb./cu.ft. It will be seen from these figures that collapse may be considered fairly common as the reconditioning treatment reduces the weight per cu.ft. some 2½ - 3 lb. This fact is also revealed in the shrinkage data available. When the timber is dried to 12% M.C. without reconditioning the tangential shrinkage is around 9½% and the radial 6%; however, if the timber is reconditioning, the shrinkages are reduced to 5½% in the tangential direction and 3% in the radial. The wood is brownish in colour, being similar in this respect to the timbers mountain ash and messmate stringybark, but is somewhat finer in texture and the grain is slightly more interlocked. Gum veins are fairly common. The sapwood is usually up to 1" in width and is not very distinct in seasoned timber. It is susceptible to the attack of the powder post borer.

This timber is more difficult to season without degrade than either mountain ash or messmate stringybark and the rate of drying under similar conditions is decidedly slower. Quarter-sawing and partial air-drying before kiln drying are essential for the best results. It is possible to kiln-dry 1" quarter-sawn stock which has been partly air-dried, under the same schedule as used for partially air-dried mountain ash.

In the "Handbook of Structural Timber Design" issued by the Division of Forest Products, silver-top ash has been listed as falling into Strength Group B which group also includes such timbers as bangalay, blackbutt, red box, yellow box, yellow gum, southern blue gum, karri, tallowwood, and the stringybarks. In durability, however, it is not classed with these timbers, being less durable than all those listed. It cannot be considered much better than mountain ash and probably about the equivalent of messmate stringybark in durability.

The main uses for the timber are in general construction (bridge structures, etc.), building construction (scantling timber) and to a certain extent in vehicle construction for beams, poles, and shafts. It has also been used in Tasmania for poles. Secondary uses are flooring, handles as for picks, rakes, and certain types of hammers, packing cases, fencing, and the construction of railway tracks.

The species is generally available in the south coast districts of New South Wales and in the central and eastern Gippsland districts of Victoria, while sawn material can be obtained in Victoria and in Tasmania.

Further information on this or any other Australian timber may be obtained on application to the Chief, Division of Forest Products, or to the officers of the State Forest Services.

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PRACTICAL RESULTS IN THE PRESERVATION OF RAILWAY SLEEPERS IN U.S.A.

The results of the 1939 inspections of the experimental sleepers laid by the Chicago, Burlington, and Quincy Railroad Co. in 1909 and 1910 indicate the economies that can be effected by the use of preservative treatments.

The treatments tested include (i) coal tar creosote by the full cell process with 10-12 lb. of the preservative per cu.ft., (ii) zinc chloride (Burnett process) with ½ lb. per cu. ft., (iii) a mixture of these preservatives (Card process) with ½ lb. of zinc chloride and 3 lb. of creosote per cu.ft.

The following Table summarises the results of 30 years service:-

Lines East

Process	Total placed	Total removed to date	Per cent. removed account decay	Actual average years life to date
Creosote	2,046	1,493	25	28.0
Card	10,241	9,568	34	19.1
Burnett	1,578	1,571	55	16.1
Untreated	2,046	2,046	90	5.4
		Lines West		
Creosote	1,236	838	17	28.5
Card	5,591	5,195	34	17.9
Burnett	910	907	49	15.0
Untreated	1,226	1,226	91	5.8

The last column - actual average years of life to date - gives a clear picture of the present position. The figure for untreated sleepers is 5.4 years while coal tar creosote is by far the most effective preservative giving an average life to date of 28.0 years. From these results it is certain that the C.B & Q. R.R. Co. is a keen advocate of the use of creosote for the treatment of railway sleepers.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

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WHAT IS REACTION WOOD?

Most timber users have, by this time some knowledge of compression wood, that is, abnormal wood, found in so many coniferous trees. They are, however, not so familiar with tension wood which is the counterpart, in broad-leaved trees, of compression wood. In either case they should possess a knowledge of the properties of the timber derived from trees in which such abnormalities have developed. It is the purpose of this short article to consider briefly what is known of both compression wood and tension wood.

These two abnormalities can be considered under the one heading, namely, "reaction wood." They are essentially the result of a reaction during the growth of the tree to some definite stimulus. When a tree has developed a lean or been pushed out of the vertical as a result of wind action, of landslide or of other causes, it always tries to regain the vertical position. On the other hand, when a tree is growing in the fierce competition of a dense forest it might endeavour to overcome gravitational force and develop a lean in a definite direction in order to obtain sufficient light for growth. In either case there is a change from normal conditions of growth and a different type of woody tissue is laid down as a result. In the coniferous trees this tissue called "compression wood" is formed on the lower or compression side of the leaning trunk or of a limb; in the broad-leaved trees this tissue, tension wood, is laid down on the upper side of a stem or branch. In the former case its function is to assist the stem by pushing it upright or into the position desired; in the latter case its function is to pull the stem upright or into the position desired. As the tree grows older and the need for the development of reaction wood diminishes such reaction wood is covered by the development of normal woody tissue and in many cases it is not until the tree is felled and the timber converted that the presence of reaction wood is noted. It is at this time that it becomes of definite interest to the timber user because he should know how it will behave during drying and in subsequent use; he should know whether to eliminate it immediately to avoid future trouble.

Reaction wood has certain definite properties one of which is excessive longitudinal shrinkage. It is well recognised that ordinary timber has little or no longitudinal shrinkage. Reaction wood on the other hand, has definite longitudinal shrinkage which may be, in very bad cases, as high as 3%. When converted timber has a band of reaction wood alongside a band of normal wood the excessive longitudinal shrinkage of the reaction wood will show up during drying because of the development of a definite spring (if quarter-sawn) or bow (if backsawn). Such spring or bow is a definite disadvantage and for many purposes timber with excessive spring or bow has to be rejected. For example, in blindroller stock the presence of reaction wood is a definite disadvantage because one essential of blindrollers is their ability to remain straight.

The two types of reaction wood differ slightly in mechanical properties although both of them are definitely denser than normal wood taken from the same tree and in close proximity. In the work of the Division of Forest Products it has been found for certain species at least, that the presence of compression wood has no great effect on such properties as Static Bending, Crushing Strength, Toughness. However, the stiffness of timber containing compression wood is very much lower than that from the same tree without compression wood. Or again, the tensile strength of timber with compression wood is apt to be considerably lower than that without compression wood. The influence of tension wood on mechanical properties is not quite so well known but it has been shown that tension wood is definitely lower in crushing strength than normal wood from the same tree. Tension wood also shows a decided woolliness of the grain when machined. Work that is at present being carried out in the Division of Forest Products on certain Australian timbers might throw further light on the properties of tension wood in comparison to normal wood.

One might wonder just how extensive is such reaction wood in the various timber species. Compression wood has been recorded for practically all of the coniferous species including all the pines, spruces, Douglas fir, redwood and many others. It has been observed in the various Australian coniferous timbers, namely, hoop pine, bunya pine, kauri, King William pine, celery top pine. Therefore one must conclude that it is likely to occur in any tree under abnormal conditions. There is some evidence to support the theory that coniferous trees grown in sheltered positions are less prone to the development of compression wood than those grown on hillsides and in more exposed positions.

Tension wood is also widely spread in various species both Australian and overseas. It is very common in the wattles (e.g., blackwood and silver wattle), but much less common in the eucalypts. It is also found in such northern hemispheresspecies as oak, beech and ash as well as other species.

In all cases the presence of reaction wood can only be determined definitely by microscopic methods. However, compression wood can often be identified macroscopically on examination of the end section of a log or a freshly dressed surface of a board, but tension wood is not so apparent though it may appear as darker coloured bands. In most cases the tension wood is more scattered than compression wood, tending to be in narrow concentric zones.

Further information on the subject may be obtained from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne, S.C.4.

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WOOD MEAL AND WOOD FLOUR.

Wood meal and wood flour are products having a rapidly expanding field of use at the present time, more especially in the field of explosive manufacture and synthetic resin production.

It is produced mechanically from sawdust, wood shavings or small hogged chips of wood and according to fineness, colour, species and resin content is used as a filler in such products as linoleum, wall paper and as a cleaning powder by jewellers. Outside Australia it is also used in different types of rubber flooring.

The fineness of the material used is expressed as a number corresponding to the mesh of the screen through which it must pass; the meshes used vary from 25 to 250 (i.e., 25 to 250 holes per lineal inch). For some uses it is essential to keep the species separate, in particular resinous and non-resinous species. In plastics the resin content must not exceed 1-2%, but for linoleum filler a high resin content is not a drawback.

In Canada the species most commonly used are white pine (*P. strobus*) and the poplars (*Populus spp.*), for high quality wood flour spruce (*Picea spp.*) is mostly used, and to a less extent maple and basswood. In Europe the species mainly used are spruce, pine, larch and fir. In Australia the following species have been used, imported spruce and hemlock, and local supplies from radiata pine, hoop pine, mountain ash and alpine ash.

When in this fine state many or most of the macroscopic characters of the wood are lost and therefore an identification necessitates a laborious and detailed examination under the microscope. Very often a specific identification is not possible where the flour is of the finer mesh owing to the extreme smallness of the particles and to their often partial demolition, but among the non-pored timbers it is possible to distinguish, with a degree of certainty, between the genera. In the pored timbers identification is less certain though the limited number of species encountered is often a guide.

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CORROSION OF METALS BY WOOD.

In a recent note issued by the Forest Products Laboratory, Princes Risborough, England, under the above heading are several points of interest. It has been recognised for some time that under certain conditions wood can corrode certain metals kept close to it or touching it. This effect of the wood is due to certain volatile acids which it contains. These volatile acids are to be found in the vapours given off by all green woods during drying and they may also be set free when seasoned wood is moistened. For this reason the use of incompletely seasoned wood in contact with metals must be avoided and wood used near metals should not be allowed to become damp. Wood for use in this manner should be seasoned to approximately 12% moisture content. The actual moisture content should be the Equilibrium Moisture Content for the conditions of use.

Metals most liable to corrosion by wood are (i) lead and some of its alloys, (ii) iron and steel, and (iii) aluminium and some of its alloys. Brass and copper are not ordinarily corroded by wood but examples of such corrosion are known. Corrosion is most liable to occur under warm moist conditions. Aluminium is subject to an electrolytic type of corrosion at pressure points in a pack where wood or other porous material is in contact with the metal.

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BORERS IN THE SAPWOOD OF ERIMA.

The New Guinea timber erima has been finding a market for various uses for some time past, but this market will be lost if no action is taken to control the incidence of borer attack in the sapwood. Several cases of serious attack by the powder post borer have recently come to the notice of this Division. It does not follow that these borers will always attack boards of erima, but the use of sapwood should be discontinued unless some form of treatment has been applied. Erima is a large tree and the sapwood may be up to 4" in width. Unfortunately it is not always easy to distinguish in sawn timber. The Division of Forest Products has recently developed a process for treating timber green from the saw using boric acid or borax to render the sapwood immune to borer attack. Details of this process may be obtained on application to the Chief, Division of Forest Products.

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NEW BOOKLET ON KILN-DRYING OF TIMBER.

What should prove to be a somewhat unique booklet in Kiln-Drying of Timber is being published through the enterprise of The Australian Timber Journal. It comprises a collection of notes prepared by different officers of the Division of Forest Products and originally published in the above Journal as a series extending over a period of more than two and a half years. The original articles were written as individual notes rather than as integral parts of a treatise on the subject and were written in a comparatively light vein with no attempt to unify the styles of the several authors.

The resulting unanticipated booklet may prove all the more readable to many on this account and it contains in a concise form of 54 pages fundamental information of value to any kiln operator and comments that are worthy of note by owners or prospective owners of timber seasoning kilns. Copies will be avilable by the time this note appears and can be obtained from The Australian Timber Journal, 75 Regent Street, Sydney, New South Wales.

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THE PROPERTIES OF AUSTRALIAN TIMBERS.

CELERY-TOP PINE.

Celery-top pine is the standard common name given to the timber botanically known as Phyllocladus rhomboidalis L. C. Rich.

The genus Phyllocladus is confined to the Southern Hemisphere, chiefly New Zealand, Tasmania, the Philippines, Moluccas and New Guinea. Phyllocladus rhomboidalis is indigenous to Tasmania where it is found chiefly in the western third of the Island. On most sites the commercial trees have a diameter of about 2 feet at breast height with a total height of about 65 feet of which the millable length is usually about 35 feet.

The timber has a pale straw colour to pale brown, usually straight grained with fairly distinctly marked growth rings. It is moderately heavy for a non-pored timber having a mean weight of 33 lb./cu.ft. with a range of 29 to 37 lb./cu.ft. when dried to 12% moisture content. In drying from the green condition to 12% moisture content little shrinkage takes place, backsawn boards shrinking only 2.7% and quartersawn only 1.4%. This attribute has been well known in Tasmania as also the fact that it possesses a very high longitudinal shrinkage. This is due to the presence of abnormal tissue or compression wood, confirmed by scientific tests, which militates against its successful use under certain conditions.

This timber has a high resistance to fungal attack and is durable when in contact with the ground; one of its uses in Tasmania has been in flooring for out-of-doors tennis courts. It works moderately easily with hand or machine tools and is an excellent bending timber being used for coach-building and for Railway carriage construction. It may be used for all classes of joinery, flooring and external and internal fittings and for kitchen furniture. This timber has been found most useful where it is subject to adverse conditions of wet and dry or of heat and cold such as in vats and in doors for reconditioning chambers. It is recognised to be resistant to acids and to chemical liquors and is used extensively in containers for these. More recently it has been used for battery separators in place of Port Orford cedar.

Celery-top pine is available in regular but limited supplies and in small sizes; the annual cut is in the nature of 1,000,000 super feet in sizes up to about 8" x 4", few boards exceeding 12 inches in width.

Additional information on this timber can be obtained from the Forestry Department, Tasmania and from the Chief, Division of Forest Products.

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BREVITIES.

Mr. I. H. Boas, Chief, Division of Forest Products, recently visited Western Australia to confer with representatives of the timber industry in that State on problems relating to war-time timber supply. He also visited Sydney, accompanied by Mr. R. F. Turnbull, Officer in Charge, Utilisation Section, Division of Forest Products, to attend a conference on defence works.

Mr. Alan Gordon, Assistant, Utilisation Section, Division of Forest Products, has continued timber collecting in North Queensland throughout November and has acted in liaison with the Department of Supply and Development in arranging the supply of Queensland maple for defence requirements.

Mr. J. T. Currie, Assistant, Seasoning Section, Division of Forest Products, recently spent a month at Coff's Harbour, New South Wales, to test and advise on improving the operation of a commercial veneer dryer.

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CORRECT PROCEDURE FOR PAINTING HARDWOOD WEATHERBOARDS.

Paint failures on hardwood weatherboards may be expected if the boards show rough areas where the interlocked grain has been picked up during the machining process. Interlocked grain is a common characteristic in Australian hardwoods and its presence in dressed weatherboards is shown by alternating bands of rough and smooth wood; over these rough bands the paint tends to crack and peel unless a suitable paste filler has first been applied. The priming coat should be applied over the filler.

These fillers which usually consist of one of the cheaper pigments, such as silica, are ground in oil and thinned with some volatile thinner for ease in spreading. The filler should be rubbed well into the pores of the hardwood after the thinner has evaporated. The operation makes good painting of hardwoods a rather more elaborate and expensive proposition than the painting of fine grained softwoods. It is rarely carried out in Australia except in the case of furniture and coachwork. There is good reason to believe, however, that in many cases painted houses in Australia would benefit considerably if this practice were adopted. Fillers for general outside use on hardwoods are not sold in quantity in Australia but there is no doubt they could readily be obtained if the demand arose.

In special work where appearance is of particular consideration it would be advantageous to reject boards showing severe roughness due to interlocked grain or any other causes. Timber should not be exposed to the weather before use, and should be painted as soon as possible after erection.

The painted surfaces should be carefully maintained and repainted before any serious failure occurs. Neglect will result in weathered boards with raised grain and sanding may be necessary to produce a satisfactory surface again.

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