COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.72.

1st January, 1938.

DRYING AND CONDITIONING OF GLUED JOINTS.

How much moisture is added to a panel or glued-up assembly during the gluing operation? A simple calculation will show the theoretical increase in moisture content providing certain assumptions are made. For example, assuming the use of a glue mixed 1:3 with water, a spread of 40 sq.ft. of single glue line per lb. of dry glue, and that all of the water added by the glue is absorbed by the wood, then the percentage of moisture added is as follows:-

(a) 1/12" pepperwood crossbands glued to a 11/16" P.radiata core ---- 8% added.
(b) 1/28" walnut face and back glued to 1/12" pepperwood crossbands which have been previously glued to 11/16" P.radiata core and dried to 12% moisture content ---- 7% added.
(c) Hoop pine 3/16" 3-ply ---- 30% added.

The assumption that all the moisture from the glue is absorbed by the wood is not strictly correct as a certain proportion escapes by evaporation and some is lost in the glue that is squeezed out during the pressure period. However, the calculated percentages agree fairly well with the percentages found in actual practice.

It can be readily seen from the above table that when gluing relatively thin crossbands or face veneers to a thick core approximately 7-8% moisture is added. Note the difference however when gluing 3/16" hoop pine 3-ply when the increase amounts to 30%.

In order that the joints may develop their full strength, so that warping, checking, and the development of sunken joints may be prevented it is essential that the assembly be evenly dried to the moisture content most suitable for its subsequent use. Under average conditions in Australia this point may vary around 12% but in some parts of the Continent and also in artifidally heated buildings a moisture content of 7-8% may be satisfactory.

The added water is concentrated in the vicinity of the glue lines. The glued-up stock should therefore be carefully piled on spacing strips and allowed to attain equilibrium under factory conditions, or dried in a panel kiln to the desired moisture content. The latter procedure is preferable because the conditions can be controlled during drying, factory space can be saved, and there is less interruption in the flow of work through the plant.

BORERS IN HOUSES.

With the coming of summer the Division of Forest Products is receiving its annual budget of enquiries concerning the powder-post borer which becomes more active as the weather grows warmer. Most householders are familiar with the damage caused by this insect pest which is frequently found attacking the hardwood timber in the house. Floor and ceiling joists are the most common portions which suffer damage. The occupants of the house notice the piles of dust made by the boring larvae and after closer inspection find small holes in those pieces of hardwood from which the dust is being extruded. These discoveries frequently cause considerable alarm due to the belief that the borers unless checked will steadily destroy the timber framing of a house until the whole structure collapses upon the unfortunate occupants. Nothing could be more absurd. Such a happening has never been recorded and there is no likelihood that

in Australia it ever will. In fact, it is very rare indeed to find in any house a piece of timber damaged to such an extent by this borer that it must be replaced.

The powder-post borers live on starch which is present only in the sapwood of timbers, e.g. certain of the Australian hardwoods. The sapwood varies in width according to the different species but is on the average no wider than 1". Most of it is removed during the conversion of the log into boards, but strips and edgings of sap are frequently left on building timbers. The borers, which are common in all countries of the world where hardwood timbers are used, explore the fresh sawn timber and infest any pieces of suitable sapwood that are available. They do not attack the best of the timber which never contains starch and is thus immune. The destruction of the sapwood strips and edges is of no importance as far as the strength of the timber is concerned. In the majority of cases one has to crawl beneath the floor or climb above the ceiling to find the damage which in most cases can be regarded as negligible.

There are many houses in Australian cities in which borer attacked timber has been in service for many years. The borers have disappeared after destroying the small amount of sapwood available in the structural timbers and the present householders are either unaware of the presence of such timber or have wisely forgotten that the borer was ever present. The powder-post borer should not be regarded as a menace to houses and the best thing to do if its presence is detected in rafters, joists or roofing timber, is to forget it.

In cases of attack in furniture where the holes in the infested wood present an unsightly appearance there are two courses open:-

(1) If the piece of timber is badly attacked, it is best to replace it by sound material free from sapwood.
(2) If the attack is detected in the early stages before much damage is done then the piece of timber can be treated by forcing a solution of para-dichlorbenzene in kerosene into the flight holes by means of a small syringe.

Full details of this method of treatment which is cheap, simple, and effective, have been given in Trade Circular No.6, which is issued free of charge on application to the Chief, Division of Forest Products, Yarra Bank Road, South Melbourne, S.C.4.

PRESERVATIVE FOR TIMBER.

A recent issue of the German engineering journal, Die Bautechnik, contains an interesting comment on the superiority of creosote oil as a wood preservative. The present position of wood preservation in Germany has been reviewed by Mörath who is well-known for his work in this field. After discussing the various types of synthetic preservatives which have been developed (and tried extensively on the Continent), Mörath concludes by stating that observations made by large timber consumers, in Germany and abroad, show conclusively that impregnation of timber with creosote oil is the best means of preserving it. For years the Division of Forest Products has been strongly recommending this method of treatment for preserving poles in Australia. The layer of sapwood on round poles is readily penetrated by creosote if suitable methods of treatment are employed. The increase in the life of the treated timber repays many times the cost of treatment. One of the objections sometimes raised against the use of creosote is the dark colour. This however often proves a distinct advantage, since one can always tell that the timber has been treated and can obtain some idea as to the penetration of the preservative. When colourless preservatives are used it is frequently difficult to tell whether the timber has been treated or not.

AUSTRALIAN STANDARD SPECIFICATIONS FOR TIMBER.

A meeting of the Timber Sectional Committee was held in Sydney at the headquarters of the Standards Association on Tuesday, 30th November. Those present included Mr. I.H. Boas, Chief, Division of Forest Products, C.S.I.R. and representatives from the Commonwealth Forestry Bureau, State Forestry Departments, Timber Merchants and Sawmillers Associations and the Standards Association.

It is the policy of the Standards Association to circulate as widely as possible copies of specifications for public critical review before they are issued as Australian Standard Specifications. The following specifications have been circulated and these together with the comments received were discussed at this meeting:-

1. Jarrah and Karri (including wandoo sleepers)
2. Hoop pine, Bunya pine and Kauri Plywood.
3. Hoop pine, Bunya pine and Kauri Milled Lining.
4. Eucalypt and miscellaneous timbers of New South Wales and Queensland Milled Lining and Weatherboard.
5. Trade Names for Australian Timbers.

In addition, draft Standard Specifications for Doors and a draft list of Standard Botanical Names for Australian Timbers were discussed. These have been revised as a result of comments received from the various State Sub-committees and they will be issued for public critical review. It is the intention of this Committee to proceed immediately with the preparation of Standard Specifications for Scantling, Joinery Stock and Solid Corestock. It was decided to recommend to the Technical Standards Committee that a specification for Joiners' Glue be prepared, based on the specification recently published by the British Standards Institute.

The Chairman reported that advantage had been taken of the presence in Sydney several weeks ago of officers of various State Forestry Departments for an informal discussion on the progress of the work of standardisation in the timber industry. A number of suggestions were made with the idea of bringing about the more general adoption of timber standards and publicising the activities of the Timber Sectional Committee and the State Sub-committees. The Division of Forest Products, C.S.I.R. is co-operating wherever possible and arrangements have been made for three officers of the Victorian Railways and one officer from the N.S.W. Railways to spend some time at the laboratory studying amongst other things, timber grading. Already several Associations, amongst them being the South African Standards Institute, have agreed to use Australian Standard Specifications, and it is hoped that in the near future architects and Government Departments and in fact all those interested in the use of timber in construction will be referring to standard specifications when letting contracts.

As yet the Timber Sectional Committee has only been able to prepare those specifications which are most urgently required and there still remains a large field of work which will have to be covered in order to bring about a greater measure of standardisation in the timber industry. This can best be achieved by the general adoption of standard specifications by architects, builders, timber merchants and sawmillers.

BREVITIES.

Mr. N. Tamblyn, B.Agr.Sc. has been awarded the degree of Master of Science by the Faculty of Agriculture of the University of Western Australia for his work on the pathology of some Australian wood destroying fungi. Mr. Tamblyn, who is the holder of a Council for Scientific and Industrial Research Fundow Research Studentship spent recently some months in the laboratories of the Division of Forest Products investigating the problem of "heart" and other forms of decay in the Victorian eucalypt timbers.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.73.

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"SHOULD I BUY A VACUUM TIMBER KILN?".

Considerable publicity has recently been given in trade journals to an overseas method of vacuum timber drying, for which are claimed very wide advantages. Among these are:- "The method extracts the salts, starches, glucose, etc., in solution with the sap, by application of a vacuum and at a low temperature, which withdraws the sap in liquid form. The surface of the timber is not casehardened, and that means that the sap is withdrawn from the centre of the piece also. When timber thus treated is exposed to the air, it continues for a number of days to lose weight consistently, as any additional moisture is naturally evaporated. After the wood is seasoned, there is no gain in weight, no swelling or warping, even though the wood is exposed to rain or to the effects of a humid atmosphere. The wood is generally thoroughly dried in about ten days after it has been subjected to the process."

It will be noted that this process does not claim to be a complete drying process, but that it is still necessary to season the timber further after its removal from the kiln. It is claimed, however, that the advantage lies in the removal of extraneous material which is alleged to be responsible for the shrinkage and swelling of timber in service. This is, of course, a fallacy because even if these materials were removed, timber would still shrink and swell. This can be readily appreciated by considering paper, which is prepared from the constituents of wood remaining after extraneous materials and lignin have been removed by pulping the wood in the form of chips with chemicals at high temperatures. Even after this drastic treatment, paper will retain the property of swelling and shrinkage with changing moisture conditions.

The vacuum process in drying timber appears to attract the timber man mainly on the basis of the claim that a vacuum will suck the sap out of timber. This misconception is primarily due to a lack of appreciation of the true nature of a vacuum. Most people regard a vacuum as a negative pressure, and the word 'vacuum' conveys to them the idea of sucking something in. Actually, this is the wrong way to regard a vacuum. A vacuum is not a negative pressure, but simply a reduced pressure, and when something is apparently sucked in to a vacuum chamber, it is really being pushed in by the higher pressure outside. In other words, the sucking effect is simply a movement from a position of higher pressure to a position of lower pressure.

When timber is placed in a vacuum kiln and a vacuum is drawn, there is an expansion of a small amount of air contained in the green timber, and during this expansion process, a very small amount of material may be forced out of the timber. However, after the timber has been in the vacuum for a time, a state of rest is reached and there is no difference in pressure to cause the forcing out of the sap from the timber into the vacuum chamber. For vacuum kilns to be effective, therefore, as a means of drying timber, it is necessary to introduce heat to vaporise the water in the timber so that the moisture content of the wood can be reduced. As this method of removal of water by vaporisation is one which is responsible for the drying of timber in open air stacks or conventional drying kilns, it will be appreciated that the vacuum kiln has not any marked difference in this respect.

On the other hand, drying in a vacuum is under a very serious disadvantage because, for drying to continue, it is necessary for the supply of heat to be maintained, otherwise vaporisation of

water ceases. In the open air or in a conventional kiln, the supply of heat is maintained by passing a stream of air over the surface of the timber, but in the vacuum kilns, the timber is surrounded by a vacuum which is a very good heat insulator. Hence, it is very difficult to conduct heat to the timber. This has been overcome in two ways:- firstly, by placing the timber in direct contact or receiving direct radiation from heaters, or, secondly, by breaking the vacuum to heat up the timber, drawing the vacuum again to dry, breaking the vacuum again to heat up, and so on. It will be realised that such methods must be costly in construction and maintenance.

Vacuum kilns are not new to Australia, and several have been erected and tried out, but in all cases, they have fallen into disuse because their operation is not economical. This should serve as a warning to others, but unfortunately, there is a tendency to neglect the well known principles underlying the difficulty of making a commercial success of a vacuum kiln, and to attribute failure incorrectly to other causes. The most common of these alleged causes of failure is inefficiency of the vacuum pump, and from time to time proposals are ventilated for new types of vacuum kilns which are claimed to be successful because they have a more efficient vacuum pump than previous types. Vacuum kilns do not fail from inefficiency of vacuum pumps, but from difficulties associated with the supply of heat in drying when the timber is contained in a vacuum.

The answer, then, to the query : "Should I buy a vacuum timber kiln" is most definitely "No". Vacuum kilns can dry timber, but they cannot compete on a cost or convenience basis with the conventional methods of drying.

HOT PRESSES FOR GLUING.

Hot presses were in use for many years prior to the advent of artificial resin adhesives. They still find extensive application in conjunction with blood and casein glues in the bonding of birch plywood as carried out in the Baltic States and the U.S.S.R. Artificial resin glues demanded, however, presses of new design to withstand temperatures up to 300°F., combined with pressures up to 300 lbs/sq.in. Two German firms were in the fore-front of manufacturers of this type of equipment. American interests, however, quickly realised the manifold advantages of the new laminating material and a rapid development in bonding technique and the manufacture of equipment took place. This can be illustrated by the manner in which the size and capacity of hot presses has been increased to cope with the demands of the mass production plants of the Pacific Coast of the U.S.A. One press of high capacity design has an output of 27 8 ft. x 4 ft. panels per charge. Presses of this type are loaded and unloaded by completely automatic processes.

These presses are hydraulically operated with several rams and the platens are usually steam heated. One Australian manufacturer has developed a novel hot press in which a single ram is incorporated. This ram is rectangular in shape and is the same size as the platens (approximately 7 ft. x 4 ft.). The main advantage of the single ram is that, for a pressure of 200 lbs/sq.in. over the panel, it is necessary only to apply the 200 lbs./sq.in. preasure to the ram. This press is also equipped with a special rapid closing drive which enables it to be closed in several seconds. This is an important point, for it is essential when using artificial resin glues that the pressure should be applied before the heat of the platens can polymerise or "set" the glue. One other feature of this press worthy of note is the oil heating of the platens. This is a convenient method of heating when steam is not available.

A prominent American manufacturer has also developed a line of presses incorporating certain novel features. Rams have been discarded and the initial closing is accomplished by means of a differential plate movement in which all the spaces close at the

same time and the same rate. The final pressure is then applied by means of a rubber diaphragm confined in a steel box the full size of the plates of the press. In the early models, this diaphragm was inflated by hydraulic pressure, but in later models compressed air is used. This is cleaner, more flexible and very rapid in action.

One other recent development is worthy of note, and that is the use of flexible electrically heated plates instead of the rigid drilled steel type. It is claimed that by using this type a maximum uniformity of bond is obtained, but the panel requires a maximum of sanding to bring it to uniform thickness.

QUEENSLAND WALNUT.

This world famous Australian timber is derived from the botanical species, Endiandra palmerstoni, and is quite unrelated botanically to the walnuts of America and Europe, which belong to the genus Juglans. However, it does bear some general resemblance in colouring and appearance to the true walnuts and has for this reason been called by the timber trade a variety of vernacular names, most of which include the word walnut. The adopted standard common name is Queensland walnut, but other names which have been commonly used are walnut bean, Australian walnut, oriental wood.

The tree is large, reaching a total height of 120-140 feet, and a basal diameter up to 6 ft. Above its buttressed base it usually carries a well-shaped bole. It grows in a restricted region in North Queensland between Atherton and Innisfail, and is one of the more abundant trees in this region occurring singly, in clumps, or as the dominant tree of a jungle formation of cabinet woods.

The timber is variegated in colour and a mixture of black, grey brown, chocolate, and even pink shades or streaks are imposed on the walnut brown background. Light and dark bands tend to follow the longitudinal axis at more or less regular spacings, and on the radial or quarter-cut surface, give a distinctive striped figure. This effect is assisted by the ribbon figure due to the interlocking grain of the timber. On the back-cut surface, the bands of colour variations run across the face in more or less wavy streaks, varying in direction from horizontal to vertical. The colourings in combination with wavy or interlocked grain give to Queensland walnut an exceptional variety of figure.

The timber is of medium weight, being approximately 46 lbs/cu.ft. when dried to 12% moisture content. Its seasoning requires care, although it is not refractory, and the shrinkage accompanying drying from the green condition to 12% moisture content is 7% in back-sawn boards, and 4% in quarter-sawn boards. It is firm to hard to cut, sawing usually without difficulty in the green condition but, when dry, having an abrasive effect on saws and planer knives. It turns and polishes well.

The qualities of the timber and its attractive colouring and graining make it eminently suitable for panelling and interior decoration, and for such purposes, it has enjoyed a widespread popularity for many years. Important decorative schemes in Australian and English banks, halls, reception-rooms, theatres, etc., have been carried out in Queensland walnut, and it has been used to considerable advantage in the panelling of recently completed luxury ships and railway coaches. Examples are the P.&O. Liner "Strathmore", the "Queen Mary" and the Victorian Railways "Spirit of Progress", in all of which this timber has been extensively used. It is widely sought by overseas buyers of fancy and veneer timbers, and it is largely used in Australia for furniture, cabinet making, and all types of veneers.

The wood may be obtained in sawn sizes and in the form of veneers and plywood. A wide range of fancy veneers sliced or rotary

cut is available. It may also be obtained in flush panels. In past years, it has been exported quite extensively to the U.S.A. in the form of logs and flitches, and it is known there as oriental wood.

The following quotation from an article by David Joel in the English Journal "Wood" sums up admirably the true worth of this timber:-

"Dealing with the walnuts, there is no doubt that Queensland walnut, for the introduction of which into large use in this country my firm is given some of the credit, is probably the best of all the walnuts. Again, it is not a walnut strictly speaking, but nobody seeing finished furniture of this wood, after it had had time to mellow down, could fail to think anything else but that it was a nicer walnut than the other walnuts."

THE BORER.

The summer months bring forth many complaints about borer in timber, and these complaints come to a large extent from householders. It is well to remember, however, that under the one term are grouped three distinct types of insects. One of these, the pinhole borer, is of practically no importance at all in sawn timber, as its activities are confined to living trees, felled trees or green timber. It cannot continue or initiate attack in seasoned timber. It makes small straight holes across the grain of the wood, and these holes,which are much the size of a pin-head, are free from dust and generally characterised by a dark nearly black stain. Obviously, it is unnecessary to treat timber in which pinholes are present. Except where pinholes are massed together, when they may affect strength, the objection is only one of appearance and usually the holes may be filled before finishing without detriment to the material.

The other two types are the Lyctus or powder post borers, and the Anobium or furniture borers. The former attacks strips of sapwood left on sawn hardwoods and the attack does not extend beyond the sapwood. In framing and building timbers, the damage by these borers is of no account and timber showing wane is usually accepted without question for building construction. When the attack of this type of borer is discovered, the householder can reassure himself with the fact that only a small fraction of the wood can be attacked. Only in cases where appearance is of prime consideration, as in furniture, is treatment of any kind necessary.

The furniture borer is readily distinguished from the powder post borer because it attacks only softwoods (non-pored timbers) and certain imported hardwoods. The Australian hardwoods are very rarely attacked. This borer is not limited to the sapwood, but it is a slow worker and may be fairly easily controlled.

The Division of Forest Products has published three trade circulars dealing with these pests, and copies of these circulars may be obtained free on request to the Chief, Division of Forest Products, Yarra Bank Road, South Melbourne, S.C.4.

BREVITIES.

Mr. H.B. Wilson, Assistant Preservation Officer in the Division of Forest Products, has been chosen by the selectors to represent Australia in two athletic events at the forthcoming Empire Games in Sydney. He will compete in the shot putt and the discus throw and it is hoped that he will add a British Empire Championship to his athletic successes.

Mr. J. McAdam, Dip.For., late of the Queensland Forest Service and recently appointed District Forester under the Department of Lands, Forests, Survey and Mining of the Territory of New Guinea, spent the latter part of January at the Laboratories of the Division of Forest Products. Mr. McAdam, in company with officers of the Division, called on various timber merchants who are importing logs from New Guinea and discussed problems with them. Earlier in the month, Mr. J.L. d'Espeissis, who has also been appointed Forester in New Guinea, spent a week at the Laboratories of the Division on his way from Western Australia to New Guinea. Mr. d'Espeissis is a former officer of the Western Australian Forest Service.

Mr. Simpson, chief timber inspector of the N.S.W. Government Railways, is spending a period of six weeks in the Division of Forest Products, studying the Division's methods of timber grading. This close co-operation between officers of large Government timber-using departments and the Division is most valuable, and Mr. Simpson's visit will prove of value to both the N.S.W. Railways and the Division of Forest Products.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

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THE CHEMICAL SEASONING OF TIMBER.

During the past few years a considerable amount of work has been done overseas investigating the possibilities of chemical or salt seasoning of timber. The process consists simply of a preliminary treatment of the timber in a concentrated solution of any one of a number of hygroscopic inorganic salts or of certain sugars, common salt being the substance most commonly used. Following this treatment the timber is air-dried or kiln dried. While a certain amount of drying takes place in the solution the main advantage is that the treatment reduces the likelihood of degrade during subsequent drying. A modification of the treatment is to spread the solid salt on the boards to be dried when stacking them.

The idea is not a new one but it was not until comparatively recently that the principles involved were studied intensively. Research work at the United States Forest Products Laboratory at Madison, Wisconsin, has been responsible for a better understanding of what occurs during the treatment and consequently for a more intelligent approach to its application. The work remaining to be done is principally in the details of individual treatments for different species and sizes of timber and in overcoming certain practical difficulties in commercial application. Even when these problems are settled the treatment will not be one to be adopted generally but rather for specific cases.

The Division of Forest Products has already done some work and established details of treatment for one particular wooden product and further work is to be carried out with other lines in the immediate future. This work has been assisted considerably by the recent gift of a "Proofwood" treating bath donated by Messrs. Frederick Rose Pty.Ltd. of Sydney. Metal baths are not satisfactory for the treatment where certain salts, including common salt, are used and it is hoped that the bath donated, which is made of bent synthetic resin glue plywood, will prove a satisfactory solution to this problem in so far as small scale treatments are concerned.

GOOD CORE WOOD.

The attributes of a good timber for cores for use in the construction of veneered panels.

Experience has shown the fallacy underlying the idea that any sort of timber can be used in the construction of a core to act as a foundation for the laying of a fancy face veneer. This experience was very costly, however, for it was gained only at the expense of establishing in the public mind that veneered furniture was synonymous with shoddy furniture. Now, it is the furniture manufacturer's task to eradicate this idea and by proper attention to manufacturing methods to renew public confidence in the veneered article.

Even though it remains unseen, the core must comprise properly selected timber built up in such a manner that it provides a perfectly flat, stable base for the laying of crossbands and face veneers. The best core woods are of low density, of low shrinkage, with little contrast between early and late wood and of species which are easily glued. How do the species used locally measure up to these requirements? The following table gives the density and radial and tangential shrinkage of five timbers which are commonly used.

Species	Air-dry density at 12% moisture content	Shrinkage when dried to 12% moisture content	
		Radial - %	Tangential - %
Pinus radiata	31 lbs./cu.ft.	2.2	3.7
N.S.W. sassafras	36 "	2.2	5.0
Coachwood	39 "	2.8	5.4
Hoop pine	34 "	2.4	4.3
Douglas fir	35 "	2.6	4.0

Douglas fir usually shows a contrast between early and late wood but if quarter-cut timber is used the exposed edge grain is less likely to show in the finished panel than if back-sawn stock is used. The other timbers are of remarkably even texture; all the timbers are easily glued.

Quarter-cut and back-cut stock should never be used in the same core plate. A core built up from all quarter-cut material will remain more uniform in thickness with changes in moisture content than one made by combining the two classes of material. The use of straight grained timber also tends towards a flatter panel as any shrinkage is in the width of the panel only and does not result in twisting or warping.

The individual pieces of the core should be dried to approximately 8-10% moisture content before gluing. The gluing-up process must then be followed by a conditioning period to allow the moisture added by the glues to distribute itself away from the glue line. This ensures that the core is of a uniform moisture content before surfacing, thereby preventing any possibility of the occurrence of sunken joints in the finished panel.

PUBLICITY AND BORERS.

The Division of Forest Products has recently pointed out that in many cases borer attack in Australian hardwoods i.e. pored woods, is not a matter for concern. This statement has apparently aroused such interest in borers that householders have been led to search for and to discover borers in places where they were not suspected.

In some cases it is desirable, and in the case of the softwood or non-pored timbers such as hoop pine, N.Z. white pine, it is necessary to check the pest before the damage becomes severe. However if the attack is in the eucalypt hardwoods, householders should bear in mind that,

(i) the attack will only be found in and will not extend beyond the strips of sapwood left on certain pieces of timber,

and (ii) the actual damage in such cases, particularly in the framing timbers of a building, is so slight that it can be neglected.

Under these circumstances treatment of attacked timber is obviously unnecessary. If however, softwoods (non-pored timbers) are attacked the Division will upon request supply advice as to the best means of controlling the damage.

WOOD IN AIRCRAFT CONSTRUCTION.

There is a tendency to consider the use of wood in aeroplanes as being out-of-date and generally to be condemned. This is far from true however, as the following extract from one of the leading British technical journals, "The Engineer" will show:-

"Details (of the new de Havilland "Albatross" being built for the Transatlantic Service) are lacking but it is known that a new system has been evolved. This system may yet be found to endow wooden construction with a new lease of life. The wing and fuselage coverings of the "Albatross" form part of the stress bearing structure. The wings are clothed with laminated plywood. The fuselage comprises a monocoque shell with a covering about 1½" thick consisting of balsa wood between two layers of plywood. This example illustrates the fact that the days of wooden construction are still not over. Other British manufacturers adhere to the wooden or composite form of construction and it is known that large numbers of highly efficient Italian bombing aircraft are built with frame-works of welded steel tube with fabric as the coverings of the bodies and plywood for the wing coverings. The all-metal machine should therefore not be regarded as being the only type worthy of consideration."

THE PROPERTIES OF AUSTRALIAN TIMBERS.

GREY IRONBARK.

Grey ironbark is the standard common name of the timber derived from the species Eucalyptus paniculata. The name is really indicative of the nature of the bark of the tree but is somewhat appropriate to the timber which is extremely hard and heavy. It is one of the prime hardwoods of Australia and has built up under this name a reputation based on its own intrinsic merit and not because, as is sometimes the case with other timbers, of any similarity in colour or appearance to overseas timbers such as mahogany, ash, oak, etc.

The tree is of medium size reaching a total height of 130 ft. but more usually around 80 ft. and a basal diameter of 3-4 ft. It is characterised by a deeply furrowed bark, hard and thick, grey or black in colour, and with a somewhat metallic appearance. It is grown commonly on the slopes and ridges of the coastal areas from southern New South Wales northwards to the south-east corner of Queensland as far north as Gympie, and is also found on the Atherton and Eungella tablelands in Queensland and on Fraser Island. Other ironbarks of generally similar characteristics are distributed fairly widely in the coastal and inland forests of eastern Australia.

The timber varies considerably in colour from brown, dark brown, chocolate brown, to red brown, but is usually chocolate or brown. The sapwood varies in width from ¾" - 1½" and is white to pale brown in colour. The grain is interlocked, the texture fine and uniform, and there is little or no figure on back-cut faces. The timber is hard and extremely heavy; when seasoned to 12% moisture content it weighs 68 lbs./cu.ft. It has an excellent reputation for durability and is actively sought for constructional uses in contact with the ground. It is very strong and very tough and therefore particularly suited for structural purposes. It seasons very slowly and the shrinkage in drying to 12% moisture content is 6% in back cut pieces and 4% in quarter cut boards. It is hard and horny to cut and fairly difficult to work although turning fairly well.

This timber is the most valued in Australia for railway sleepers, posts, house stumps, poles and piles. In sawn or hewn forms it is widely used for bridges and wharves, giving exceptional service as girders, corbels, headstocks, walings, braces, sills and other parts of outdoor structures. The sawn timber is used for general house and factory framing. In railway workshops it is largely employed for underframes and sheathing of wagons, and for floor framing of carriages. It is also used for machinery foundations and buffer beams. It is excellent for spokes, naves, and shafts of heavy duty vehicles. In the ship-building trade it finds particular use in the framing and planking of punts and lighters and is also used for keels, stringers and main deck beams.

Supplies of rouhd, hewn, and sawn ironbark are available through timber merchants in New South Wales and Queensland and their agents in other states.

Additional information on this or other Australian species may be obtained from the Chief, Division of Forest Products, Yarra Bank Road, South Melbourne, S.C.4 and from the State Forestry Departments.

BREVITIES.

Mr. W.L. Greenhill, M.E., Officer-in-Charge of the Section of Timber Physics in the Division of Forest Products sailed on the "Mariposa" at the end of February for the United States. Mr. Greenhill has been granted special work leave and while abroad will continue his studies in Timber Physics at the United States Forest Products Laboratory at Madison, Wisconsin, the Canadian Forest Products Laboratories at Ottawa, and the English Forest Products Laboratory at Princes Risborough. While abroad, Mr. Greenhill will represent the Division of Forest Products at the Fourth International Conference on Timber Utilisation to be held in Vienna in July, 1938.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.75.

1938##075 1st April, 1938.

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LAMINATED WOVEN VENEER.

The January number of Modern Plastics includes an article illustrated by excellent plates indicating the numerous uses of laminated woven veneer. This material is produced by an American firm and its potentialities appear unlimited. It is made up in four different forms. One of these is produced by closely weaving by hand thin strips of veneer into sheets up to 51" x 21". The strips may run diagonally or straight. A sheet surfacing of clear transparent cellulose acetate is applied either to one or to both sides and the sheet subjected to heat and pressure in a hot plate press, remaining under pressure until cooled. The resultant product is of great strength with a hard surface, but is pliable enough to be shaped to almost any contour. The sheet is usually finished in this manner only on one side - an adhesive may then be applied to the other side to cement the sheet into position.

Coloured transparent cellulose acetate may be substituted for the colourless variety to give a beautiful coloured sheen without detracting from the appearance of the natural grain of the wood.

Strips of metal - brass, copper, or aluminium - may also be interwoven with the wood veneer, the metallic sheen of the metal providing a contrast with the natural beauty of the wood.

Another variety of this material is constructed by regulating the weave of the strips of veneer to leave half inch spaces. The sheet is then finished in the usual manner to give the appearance of wood interspersed at regular intervals with little windows either clear or in colour.

The variety of patterns and colours available ensure a wide range of usefulness for this product. It provides architects and designers with decorative wood which can be curved to any reasonable radius. It can be used on table tops giving an extremely wear resistant surface which can be cleaned often and easily with soap and water. Some outstanding examples of flush doors faced with this material or inlaid with decorative strips or panels have been fabricated. It is also finding wide application in the novelty field as a surface for such articles as handbags, or as inlays in jewelry boxes, powder compacts or packages for toilet requisites. The sheets are also strong enough to be employed for the surface of canoes or lifeboats.

Laminated woven veneer thus provides the first combination of plastics and veneer. The process retains every bit of the detail of the grain of the wood and gives it a protective plastic covering which is easily cleaned and permanently finished.

HOW TO PREVENT DARKENING OF ENGLISH ASH DURING KILN DRYING.

An interesting experiment has recently been carried out in the seasoning laboratories of the Division of Forest Products. The object of this experiment was to develop a method for preventing the darkening of English ash during kiln drying and it was initiated as a result of a discussion between an officer of the Division and the principals of a sporting goods manufacturing firm. The manufacturers had, some years previously, erected kilns in order to ensure rapid and thorough drying of stock which was to be used in the construction of tennis racquets. They found to their dismay, however, that the kiln drying was causing even

partially air-dried English ash to darken in colour. This militated considerably against its use more from considerations of appearance than because of any reduction in mechanical strength. The tennis playing public apparently regarded the darker coloured wood as of inferior quality with the result that its value was correspondingly reduced. The immediate result was the closing down of the kilns, the adoption of the attitude that "kiln-drying is no good", and the reversal to the much slower air-drying.

At the request of the manufacturers, experimental work was initiated by the officers of this Division and this indicated quite soon that the darkening of the timber was accentuated by conditions of high relative humidity. Subsequent work and comparison with controls which had been air dried showed that, for partially air dried English ash at least, there ware little, if any, undesirable effects provided that a large wet bulb depression was maintained during the period in the kiln (equivalent to relative humidities as low as 30-40%). The allowable variation in temperature was between 110° and 140° Fahrenheit. Under these conditions the timber was successfully kiln dried free from the discolouration effects which had previously been found so troublesome.

WOODEN DOORS SUPERIOR TO IRON DOORS.

In a recent issue of the International Review on Timber Utilisation, it is stated that the New York building regulations have been revised as from January 1, 1938. Of particular interest are the statements concerning the efficacy in the event of fire of wooden doors that have been impregnated with a fire retarding compound. The progress that has been made in the manufacture of such doors has resulted in their proving superior to the iron doors for checking fire.

Numerous official experiments showed that it was impossible to stand more than 10 minutes behind a metal door subjected to the fire insurance companies' test on account of the smoke and gas which penetrated through the cracks. On the other hand, with a wooden door, it was possible to stand very close for more than an hour, and in addition, the bare hand could be held on it for the whole duration of the test. Accordingly the new regulations recommend the use of fireproofed wooden doors in particular for corridors and exits to the stair well.

INAUGURAL INSPECTION OF THE EXPERIMENTAL POLE SITE AT BALLARAT.

Investigations into the methods of pole preservation will be advanced a step further when the first annual inspection of the experimental poles at the Ballarat test site is carried out early in April. This is test site number seven of a number of experimental test plots which have been installed in various parts of Australia, for the investigation of the durability of treated poles. In the experiments, the Division of Forest Products is co-operating with the State Forestry Departments and the various pole consuming concerns, with the object of reducing considerably the yearly expenditure on poles, which is in the neighbourhood of £1,000,000. In the various test plots promising methods of pole treatment and species of timber not previously used for poles are being investigated.

In the experiments at the Ballarat test site the principal co-operating concerns are the State Electricity Commission of Victoria, the Victorian Forests Commission and the Division of Forest Products. Three non-durable Victorian timbers, silvertop, messmate and mountain ash, are being tested using six different methods of preservative treatment. For comparative purposes, some grey ironbark poles from New South Wales have been included with the

less durable Victorian timbers. It is confidently expected that some, if not all, the methods of treatment will confer on the less durable timbers a life similar to that of the grey ironbark and other durable species at present being used for poles. Such an increase in service life will permit the use of species which are much cheaper than the durable timbers, but which have not been previously considered suitable for use as poles owing to their low durability.

AUSTRALIAN TIMBERS - CYPRESS PINE.

Cypress pine is the common name given to Australian timbers of the genus Callitris, of which there are 18 different species in Australia. Nearly a dozen of these reach some commercial size, but the timber is mainly derived from Callitris glauca, which is the most important and most abundant. Callitris macleayana, C. calcarata, C. arenosa, C. intratropica, and C. gracilis are others from which timber is obtained; they have been listed in the order of probable importance. Other names are Murray pine, sand cypress, white cypress, white pine, etc.

Cypress pine is characteristically an inland species where it is found in more or less scattered and open stands behind the coastal ranges. It thrives in the more exposed, hotter, and lower rainfall areas. The trees are distinguished by the cypress like foliage in which the leaf development fuses with the branchlets. The bark may be corky, fibrous or stringy and in some species becomes hard and compact. There is a great variation in size of trees between localities and between species, ranging from shrubs to trees 150 ft. in height and 2½ ft. basal diameter. Callitris glauca, the most important species commercially, attains a maximum height of 100 ft. and a maximum diameter breast height of 2½ ft., but the average tree is considerably less developed. The usual millable tree is small and branches commence in the lower third of the height.

The timber is light brown in colour, but streaked longitudinally with a dark brown. Its grain is generally straight, except around knots which are common. Growth rings are sometimes distinct but generally indefinite. The surface is somewhat greasy, and often shows fine white crystals which are characteristic. The odour is also characteristic and distinct and by it the timber may be readily recognised. It is moderately light in weight, being approximately 42 lbs/cu.ft., when seasoned to 12% moisture content. Its durability is a special attribute, the timber being in great demand for use in termite infested districts, and also for purposes where resistance to decay is necessary.

The strength of the clear wood is slightly above that of douglas fir, but it is brittle. The timber seasons readily, but because of its unusually low shrinkage, it is customarily used in the green or partially air-dried condition. In seasoning from the green condition to 12% moisture content, it shrinks only 3½% in back-sawn boards and 2½% in quarter-sawn boards; the similarity in the degree of shrinkage in the two directions being a special advantage as it materially reduces warping tendencies. Kiln drying schedules have been devised and by using these, it is expected that green boards will be dried to 12% moisture content in 9-10 days. The timber saws and cuts easily and cleanly, care being necessary in dressing to avoid chipping the grain around knots. Its tendency to split in nailing is overcome in practice by the use of pointless nails.

Because of its high durability, this timber is especially suited to use in exposed positions and in termite infested areas. It is the timber most frequently used for general house construction in inland districts and its use will be similarly encouraged in coastal districts in the near future. It has a wide use for poles, posts and stumps, and is in good demand for bearers, joists, plates and studs. It is also milled for flooring, linings and weather-boards. For interior uses most attractive effects can be obtained; sound, tight knots producing most decorative effects in floorings

and linings.

Additional information on this and other species may be obtained from the Chief, Division of Forest Products, Yarra Bank Road, South Melbourne, S.C.4, or from the various State Forestry Departments.

VENEER FROM EUCALYPTS IN U.S.A.

According to a short note in a recent issue of the "Timberman", a species of Eucalyptus, probably E. globulus, is being used in U.S.A. to a limited extent to provide veneer for furniture and high class fixtures. It has been graced by the distinctive name, "Yuba wood". The veneer logs are obtained from trees planted 50 years ago and the bulk of the veneer produced possesses a plain striped figure, although mottled and fiddle-back effects are quite common.

The time is not far distant when our native eucalypts will be finding extensive application in a similar way in Australia. Certain difficulties in connection with the slicing and drying of the veneer have to be overcome, but preliminary experiments indicate that these are not insuperable, and it is perfectly feasible to utilise a number of eucalypts for high quality panels and fancy plywood.

BREVITIES.

Mr. S.A. Clarke, B.E., Deputy Chief of the Division of Forest Products, has been granted leave for six months, during which period he will be acting in an advisory capacity for New Zealand Forest Products Ltd. Mr. Clarke sailed for New Zealand on March 28th.

Miss A.M. Eckersley, M.Sc., Assistant Research Officer in the Division of Forest Products, is leaving for Europe on the "Narkunda" on April 5th. Miss Eckersley has been granted leave of absence, and while overseas, will visit laboratories carrying out forest products work.

On March 14th, the Victorian State Committee of the Council for Scientific and Industrial Research held their monthly meeting in the laboratories of the Division of Forest Products. They were addressed by the Chief of the Division, Mr. I.H. Boas, who discussed the work being carried out, and after this address, the members of the Committee and other visitors were conducted through the various laboratories.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

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BUILT-UP DOORS.

One of the noticeable developments in the design of fittings of late years has been the use of built-up doors of two main types, viz., those consisting of a frame to which plywood is glued and those with a solid built-up core on both sides of which veneers are laid.

In the former type there are two general methods of constructing the frame, firstly, that in which the top, back and bottom rails are tenoned into the mortised stiles and the intermediate rails fastened to the stiles with corrugated fasteners and, secondly, that in which all the rails are fastened to the stiles with corrugated fasteners. The latter is, of course, a much cheaper construction, and it is a matter of considerable interest as to whether it gives as satisfactory a finished article after the application of the plywood to both sides. Recently, tests were carried out in the Division of Forest Products to determine the relative strengths of the two types of doors. A number of frames and a number of finished doors were made up using the two forms of construction. These were subjected to diagonal pressure in the Southwark Emery testing machine.

The mortised and tenoned frame, as expected, showed considerably greater resistance to distortion and to final destruction, being five times stronger and six times stiffer than the frame made with corrugated fasteners.

When, however, the completed doors were tested it was found that so great is the strength developed by the gluing-on of the plywood that the differences due to two types of frame construction are completely swamped. This is shown by the following figures for finished doors:-

		Strength lbs.	Stiffness lbs/ in.
(a)	Mortised and tenoned construction	37,700	8,800
(b)	Corrugated fastener construction	36,200	7,660

In other words, it has been shown that the cheaper form of construction gives a door equally as strong as the more expensive type and from this point of view there is nothing to be gained by adopting the mortised and tenoned construction.

This is a point of considerable interest and should be taken advantage of in cheapening the construction of this type of door.

Further tests are planned as time permits on other factors in door construction and other built-up fittings.

THE RETTING OF FLAX.

For the past six months, work has been carried out in the Division on the retting of flax grown in Victoria, with funds provided by Flax Fibres Ltd. It is cause for satisfaction that permission has now been given to engage two chemists to carry on this work from which interesting results have already been obtained. The possibility of developing a large flax industry in Australia depends to a large extent upon the success that can be attained in retting.

Considering the age of the flax industry, surprisingly little is known about the process which has mainly been a peasant industry carried out on purely empirical lines. Improper retting can so reduce the value of even the best flax that it would not pay to grow the crop. The investigations being carried out are consequently of great importance. The British Empire depends mainly upon foreign sources for its flax and it will be of definite importance to the Empire as well as to the farmers of Australia if high grade flax can be grown and processed in the Commonwealth.

COURSE ON WOOD PRESERVATION.

During the last week in March a short course on wood preservation with particular reference to pole timbers was given to the Officers in charge of Maintenance in the various branches of the Electricity Supply Department of the Victorian State Electricity Commission. The structure of wood was first discussed, followed by an account of the various agencies which cause deterioration of poles in service. The various preservatives and methods of pole preservation were outlined and their relative advantages and disadvantages shown. An inspection of the laboratory was made and other problems of timber discussed with the various sections.

As well as the laboratory lectures, two field trips were made. In the first, an inspection of the treatment of partly decayed standing poles was made and the most satisfactory method demonstrated. The other trip was to the pole test plot of the Division at Belgrave where poles treated by various methods have been in service since about 1932. This inspection gave a further opportunity of discussing the various methods of pole treatment and of illustrating these under service conditions. The course was attended by twelve officers, all of whom were greatly interested in the subject, and from expressions received the course given was of considerable value to those attending.

LONGEVITY OF WOODEN STRUCTURES.

Many European countries possess splendid examples of the value of wooden construction carried out during the 14th, 15th and 16th centuries. For instance, there are two fine bridges, one near the town of Aarberg, and the other near Wangen, both on the river Aar in Switzerland, built in 1550 and 1560 respectively. Today these bridges are still open to traffic. Both are of a total length of 327 feet with clear spans of 65 ft. Near Ruegsan, also in Switzerland, there is a century old bridge in the form of an arched timber frame spanning the river Emme in one clear span of 230 feet. The bridge of Wettingen, near Baden, holds the record, however, with a clear span of nearly 390 feet.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

Scented Satinwood.

Scented satinwood is the standard common name of the timber which, botanically, is known as *Ceratopetalum apetalum*. Other common names for the timber are coachwood and rose mahogany, but as neither of these names describes a main use or a main characteristic of the wood, the more applicable name of scented satinwood has been proposed as the standard.

The distribution of the species is confined to the gullies of the coastal range forests of north-eastern New South Wales extending from about the latitude of Sydney northwards to the Queensland border, but it may be found further north occasionally.

The tree is of small to medium size attaining a height up to about 100 feet and a diameter at breast height up to about 2 ft. 6 ins. Its bark is smooth and greyish in colour, whilst the leaves are large, shining and serrated.

The timber varies in colour from light brown to pinkish brown and has a very characteristic odour resembling caramel. Its grain is straight, its texture fine and uniform, and it shows a delicate figure on back-sawn faces due to bands of soft tissue. It is moderately light in weight, averaging 41 lbs/cu.ft. when dried to 12% moisture content. In strength it is similar to Douglas fir in static bending and in toughness, and is superior in hardness. It seasons readily, narrow boards being comparatively easy, but wide boards requiring some care to prevent checking by rapid drying. In drying from the green condition to 12% moisture content, back-sawn boards shrink 5.4% and quarter-sawn 2.8%. The timber is not recommended for use in exposed situations, but it has many attractive properties fitting it for indoor uses. One feature enhancing its value for indoor use is the small size of its pores on account of which it is rendered immune from attack by the Powder post borer, and which reduces to a minimum the amount of filler required during polishing. The wood is easily worked, machining readily to a smooth surface under hand or machine tools, and it turns and carves well. It holds screws excellently, and is readily glued. It takes water stains better than oil stains and is readily polished.

Scented satinwood is a very valuable factory timber. It is largely used for furniture and cabinet work, for joinery and interior fittings such as mouldings, architraves, skirtings, flooring and lining or panelling. It is popular for turnery purposes, being favoured for brushes, brooms, handles, dowels, shoe heels, finishing lasts, bobbins and small turned articles of all kinds. It has been used in motor bodies, in the construction of railway carriages and tramcars, in boat building, and in the manufacture of sporting goods. It is greatly valued for veneers, plywood, corestock and laminated panels.

The timber may be obtained in sawn boards of narrow to medium width, in squares, in dressed or milled products, and in the form of veneers and plywood. It is available from sawmillers and timber merchants in New South Wales and through their agents in other States.

Additional information on this and other timbers can be obtained by addressing the Chief, Division of Forest Products, 77 Yarra Bank Road, South Melbourne, S.C.4.

A.S.T.M. ADOPTS SPECIFICATIONS FOR TESTS OF FIRE RETARDANT WOOD FOR SCAFFOLDING.

At the recent annual meeting of the American Society for Testing Materials the committee on fire tests of materials and construction submitted proposed specifications for the determination of the fire-retardant properties of wood treated with fire-retardant chemicals for scaffolding and shoring, which were approved for publication as a new tentative standard of the Society.

The committee report indicated the need for standard specifications by which to judge the suitability of treated material for scaffolding and shoring from the standpoint of fire resistance. Wood is the material most generally used for scaffolding. If the untreated wood is ignited, as sometimes happens, from flame torches, cigarettes, hot rivets, etc., not only the scaffold is endangered, but nearby buildings as well.

No new method of testing fire retardant wood is prescribed in the proposed specifications. The timber test described therein is one that has been in use for 33 years for official testing purposes by the building authorities of New York City in passing on the

acceptability of chemically treated wood under the city building code. In effect, the proposed specifications are a yard-stick for measuring the fire resistance of wood treated with fire retardant chemicals used in the construction of temporary equipment where it is deemed unnecessary to secure as great fire resistance as is required in permanent construction.

BREVITIES.

Mr. R.F. Turnbull, B.E. (Hons.), Officer-in-charge, Section of Utilisation, Division of Forest Products, recently spent two weeks in Brisbane investigating problems relating to the grading of hardwood floorings.

Mr. W.R. Ferguson, B.E., Assistant, Section of Utilisation, D.F.P., is at present delivering a course of lectures on timber as a building material to students in the faculty of Architecture, Sydney University.

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THE COMPARATIVE STRENGTH OF SAPWOOD AND TRUEWOOD.

Some timber users regard the sapwood of every species as quite inferior to the truewood, but they should always withhold judgment until they consider the possible uses for the timber in question. Careful consideration should always be given before specifying timber free from sap since it is a question of considerable importance in the utilisation of our timbers. This will be realised when it is seen that the percentage of sapwood in an average log is fairly high. For example, a 1" width of sapwood in a 12" diameter log means that 31% of the total volume of that log is sapwood. If the width of sapwood is as high as 2" in the same diameter log, then 56% of the volume is sapwood. Even in a 48" diameter log with 2" width of sapwood, 16% of the volume of the log will be sapwood. Thus, it is very necessary to know something about the properties of the sapwood in comparison with the truewood of the same species, forming as it does such a high percentage of the log.

The manufacturers of tool handles and sporting goods usually prefer the sapwood to the truewood; thus, in tennis racquets, only the sapwood of English or American ash will be accepted, and in tool handles, white hickory (sapwood) is preferred to red hickory (truewood). On the other hand, the opinion is prevalent among engineers and users of structural timber that sapwood is considerably inferior to truewood in strength. Which is right?

To solve the problem, a large number of tests have been made in various parts of the world, all of which have shown that there is not very much difference in the mechanical properties of the wood from the two portions of the tree. In most species, the truewood is a little denser and stronger than the sapwood under static loading, but the difference is not usually sufficient to worry about, and for all practical purposes, the static strength of sapwood can be taken as equal to that of truewood. The real reason for the antipathy to sapwood for structural purposes is the fact that it is liable to be attacked by borers and is also much less durable than truewood. Thus, in outdoor structural work, the sapwood usually decays comparatively quickly or else is completely destroyed by borers. However, it is a fairly easy matter to impregnate the sapwood with preservatives and so to render it immune to borer and fungus attack. If this is done, the full strength of the sapwood can be utilised with a consequent reduction in the size of the piece. For instance, in the case of a telegraph pole, 9 inches of sound timber may be required at the ground line to safely carry the load. Under ordinary circumstances, this would require a 12" diameter pole (assuming a sapwood width of 1½") to give the necessary strength when the sapwood is destroyed. If, however, the sapwood were treated effectively with preservative, it would last as long as the truewood and a 9" diameter pole would be satisfactory, this resulting in a saving of about 45% in the cost.

In some species, such as Canadian yellow birch, the sapwood is a little tougher than the truewood, but in general, there is no great difference. The reason for the preference for hickory sapwood is because the best hickory comes from fast grown trees which have a wide sapwood, whereas slow grown trees have a narrow sapwood. Thus, by specifying white hickory, there is a better chance of getting fast grown wood. A much more reliable way of estimating the quality of hickory, however, is by its weight; the heavier the wood, the stronger it is.

MORE INTERESTING USES OF PLYWOOD.

Research in England and on the Continent has shown that by using a very large number of thin plies and subjecting them to a pressure much greater than that normally adopted, it is possible to produce a product of very high strength and extreme toughness. It can be made in a wide range of thicknesses. Cog wheels made from such plywood are now giving exceptional service in tractors. This should be a good test of the wearing qualities of the material.

Another recently developed type of plywood, in which the wood is joined to a metal such as brass using the above described method, appears to provide an ideal brake lining. It has been tested for this purpose on motor and railway trucks and has proved to be much superior to commonly used brake lining fabrics. Its use results in increased braking power, and it is claimed that it will outlast the ordinary motor car, thereby obviating the necessity for periodic relining.

These uses indicate that the time is approaching when plywood will be used for moving parts where there is considerable friction, and particularly where hard wear and tear is to be expected. In these cases, it will obviously come into competition with various metals.

The civil war in Spain has also afforded some illuminating evidence regarding the respective merits of metal and plywood in aircraft construction. When bullets hit aircraft made of metal, the latter is often ripped to such an extent that equilibrium is upset, causing casualties which, it is contended, could have been avoided by the use of wood.

WOODEN RADIO MASTS.

Discussing the use of wood in "Engineering", the Swiss correspondent of the "International Committee on Wood" stated that wooden radio masts were better than steel for short wave plants, because the steel masts caused loss of energy from the antennae. Steel masts also diminish the uniformity of radiation in all directions.

The German Post Office has been erecting an increasing number of wooden masts in recent years using larch which has been treated with preservatives. At first, some trouble was experienced due to lack of knowledge of proper design, but this has been overcome. Radiation measurements proved that the degree of efficiency compared with steel masts was three-fold. The best proof of the esteem in which the wooden mast is held in official circles is the erection of two wooden masts 115 metres high (approximately 440 ft.) for the broadcasting station in Munich.

RAYON.

From time to time, inquiries are received as to the possibilities of making rayon from waste wood at mills or from small plantations. It is, of course, possible to make rayon from such materials and the only question is whether such an operation can be made to pay. The main factor in this consideration is the depreciation necessary on the very large capital costs which necessitates a fairly large unit and operation to full capacity. It is considered that the smallest possible economic unit would produce 1 ton per day of finished product and the capital outlay for such a plant will be in the neighbourhood of £400,000 in Australia. Labour charges will vary from 33 - 50% of the cost of production. Raw material, depreciation and overhead will about equally divide the balance of the cost. A plentiful supply of pure water is essential, and very close technical control is necessary, so that highly skilled staff must be engaged. Rayon manufacture is, therefore, not a project that can be considered by small operators.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

Spotted Gum.

Spotted gum is the standard common name of the timber which, botanically, is known as Eucalyptus maculata. Both the specific name "maculata" and the common adjective "spotted" describe the dimpled condition of the bark of the tree, which belongs to the "gum" class.

The geographical distribution of the species is from the south coast of New South Wales, thence at intervals up to the north coast, spreading out into the sandstones of the Clarence River valley, passing into Queensland along the dry gravelly ridges and re-appearing finally in open forests 150 miles west of Brisbane.

The tree is of medium size for a Eucalypt, reaching its best development in the southern parts of its range. It attains a height up to 120 feet and diameter at breast height up to about 3 ft. 6 ins. In general, it has a slim erect bole, and is a handsome tree on account of both its form and its colouring.

The timber varies in colour from light brown to grey brown, but some Queensland samples are dark-brown. The sapwood is white and may attain a width up to 2". The sapwood usually contains a high percentage of starch, which makes it susceptible to attack by the powder post borer. The grain of spotted gum is straight or slightly interlocked, occasionally wavy, and its texture open and coarse. Generally there is no prominent figure, but fiddleback is sometimes found. The timber has a somewhat greasy nature. It is one of the heavier eucalypts, ranging from 52-70 lbs/cubic foot when seasoned to 12% moisture content. It is hard, strong timber and very tough. Seasoning requires some care to prevent degrade. In drying from the green condition to 12% moisture content, the timber shrinks on the average 4.3% across back-sawn widths and 3.6% across quarter-sawn. It is fairly easily worked, planing fairly well. Its steam bending qualities are moderately good.

Spotted gum has the qualities of a good structural hardwood, and is largely used for heavy framing where qualities of strength, shock resistance and hardness are required. The Railway Departments of Queensland and New South Wales use the timber in the under-framing of carriages and trucks, for the construction of wagons, platform barrows and trolleys, for the arch-rails of covered wagons, and for external fittings, flooring and body-framing. It is widely used in Queensland in bridge construction for transoms, girders, wales, braces, headstocks and corbels. Wheelwrights and coach-builders favour the timber for shafts, axle-beds, swingle-bars and to some extent for vehicle bodies. It is used in the manufacture of agricultural machinery. In shipbuilding it is extensively used for the planking of barges and small wooden vessels and exclusively for the large wooden teeth in the cog-wheels of harbour bucket dredges. It is in active demand in wood-bending plants. It is the most satisfactory available Australian timber for handles of axes, picks and shovels, and is manufactured into these in considerable quantities each year. It is also a good flooring timber.

Additional information on this and other timbers can be obtained by addressing the Chief, Division of Forest Products, Yarra Bank Road, South Melbourne, or the various State Forestry Departments.

BREVITIES.

Silky oak for Bending.

Recent work in the Division of Forest Products has shown how very satisfactory back-sawn Queensland silky oak (*Cardwellia sublimis*) is for steam bending. Quarter-sawn silky oak is also a fair bending timber, but is much inferior to the back-sawn. It is, however, pleasing to note that silky oak offers so much promise as a bending timber, and as a result, it should find a greater outlet in the timber market. Unfortunately there are not many Australian timbers that may be classified as good bending timbers, but it is hoped that the investigations at present proceeding will reveal other species of equal value in this important field.

Recently Published Textbook on Timber.

An interesting book on "Timber, its Structure and Properties", by H.E. Desch, published by Macmillan & Co. Ltd., London, has recently reached the Division of Forest Products. In this book the author has been successful in keeping technical expressions in the background, and the result is a concise, but profusely illustrated, summary of present day knowledge of timber. The subject matter has been divided into four main parts, namely, (i) The structure of Wood, (ii) The Gross Features of Wood, (iii) The Properties of Wood, and (iv) Considerations influencing the Utilization of Wood. Although an English publication, the book is of general reference and practices and conditions met with in tropical and sub-tropical countries have been duly considered. The book has briefly brought together under the one cover various items of information which have been published from time to time in separate pamphlets and bulletins by the various Forest Products Laboratories, and has welded the information into a form which is easy to read and simple for reference. This new text book is, therefore, one that should be readily available to the practical timberman, and to the student of timber, both of whom will find the reading of it of definite value to themselves and their work.

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1938##078 1st July, 1938.

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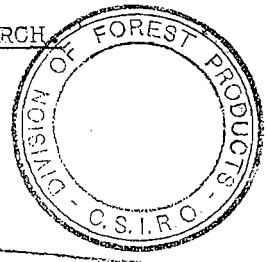

INSURANCE OF NEW HOMES AGAINST WHITE ANTS.

White ants, or as they are more scientifically termed 'termites,' are widely distributed throughout Australia, and their depredations are known to all. In certain districts it is not uncommon to find a large proportion of the residences attacked by these white ants to a greater or lesser degree, and the householder very often is put to considerable expense and annoyance in an effort to eradicate them from his home. How many people realise that simple precautions taken at the time of erection of the building will render them immune from white ant attack for all time? It is necessary to insure against fire - why not, therefore, spend a few pounds during the erection of your building and regard it as an insurance against white ants and thus obtain freedom from the expense and annoyance of future maintenance!

In Australia, practically all of the damage to wooden structures is done by a group of white ants which are subterranean in their habits, that is, the white ants actually live in the soil and it is essential for their continued development that they must have constant access to it. If they infest your building, then it is always possible to trace back from the point of damage to the ground line, either into the soil, into timber debris or into an old wooden stump. Sometimes also, the attack may be traced back through the soil to the typical white ant mound, but of course all species of white ants do not build mounds. The fact that they must maintain contact with the ground is an interesting feature in the life history which materially assists us in effectively preventing them from entering the building.

During the construction of a new house, there are six simple rules or points which must be carefully watched:-

1. In clearing the site for the building, ensure that all stumps, roots and debris are removed.

2. Plan the building so that it is sufficiently clear of the ground to provide for inspection, particularly in localities where white ant attack is severe.

3. As well as supplying sufficient space to permit inspection, be sure to provide ventilation beneath the floor. Good ventilation prevents dry rot and is not conducive to white ants.

4. Where timber stumps are to be used, select a durable wood such as red gum, cypress pine, ironbark, jarrah.

5. Cap all stumps or foundations with white ant shields. Also, in the case of brick buildings, ensure that white ant stops be placed between the brick courses so as to prevent the white ants from building their galleries up the walls and thus connecting with the timber work in contact with the footings. A white ant shield or cap is simply a piece of sheet metal or galvanised iron of about 24 or 26 gauge, the edges of which have been turned down at an angle of about 4 The white ant stop is a metal strip placed around the inter surfaces of masonry or concrete foundations below the bearer. It extends an inch or two beyond the foundation and is likewise bent down at an angle of 45°. The inclusion of these white ant shields or caps and stops is one of the most important aspects of white-ant-proof construction, and should not be neglected. There are various details which are not always correctly understood in the use of these, and free

advice will be gladly given by reference to the Chief, Division of Forest Products, Yarra Bank Road, South Melbourne, S.C.4.

6. It is obviously foolish to provide an efficient white ant barrier such as caps and stops on the brickwork if unprotected piping is allowed to provide direct access to the ground, or if unprotected steps or other structures are left leaning against the building, every care should be taken to see that the effectiveness of the stops is not inhibited by bad practice, and down-pipes and drains should also be provided with suitable metal shields.

It is not, of course, possible in this short article to give full details of the various points raised, but it will be readily appreciated that the precautions to be taken are simple in nature and are really based on a common-sense understanding of the habits of the white ant. If they are carefully followed, then the possibilities of white ants infesting the house are very remote indeed and the increased cost, at the most 2% on the cost of the dwelling, will be adequately repaid, particularly in localities where bad white ant attack is experienced.

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CLEANLINESS IN THE GLUE ROOM.

An American visitor recently unleashed some scathing criticism regarding the uncleanliness of the average Australian furniture factory glue room and equipment. This outburst was subsequent to an inspection of a glue room ankle deep in paper, with the spreader, glue, buckets, cauls, etc. encrusted with putrefying adhesive. As he pointed out, such a state of affairs should not exist and is indicative of failure to appreciate the benefits to be derived from cleanliness and orderliness.

Speed in production has contributed largely to the lack of attention to the essential task of keeping equipment clean. Carelessness in this way, however, breeds a crop of faults in the finished panel which ultimately costs the manufacturer money to remedy or replace.

Most manufacturers realise that animal and casein glues are liable to attack by bacteria and fungi. They do not appreciate the fact, however, that putrefying glue rapidly loses its adhesive properties and in some instances the decomposition products are entirely worthless for bonding purposes.

The glue spreader, the glue mixer, glue buckets, brushes and the floor surrounding the spreader and mixer should be thoroughly cleaned at least once a day upon the completion of operations. Particular attention should be paid to the cauls. A wooden scraper is preferable for detaching adhering particles of glue. Three essential points of procedure should always be kept in mind - (1) to make sure that the surface of wooden cauls is periodically waxed and kept in a thoroughly smooth condition. (2) to grease metal cauls to facilitate the removal of glue. (3) to tidy up the room generally. This is a simple procedure. It will pay to adhere strictly to it.

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THE PROPERTIES OF AUSTRALIAN TIMBERS.

Blackwood.

The timber so well known under the trade name of "blackwood" is derived from the botanical species Acacia melanoxylon.

The tree has a somewhat extensive distribution, occurring in the higher rainfall areas of New South Wales, Victoria and South Australia, while it reaches its best development in the western part of Tasmania. This species is one of the best of the acacia

(or wattle) genus and it reaches a maximum height of 80-100 feet and a basal diameter up to 3 feet. It is one of the broad-leaved type of wattles with a hard, rough and furrowed bark.

The timber varies in colour from a golden-brown to a darker brown, sometimes with a reddish tinge or red longitudinal streaks. The grain is usually straight, but sometimes slightly interlocked or wavy. The wavy grain gives rise to a beautiful fiddle-back figure in the converted timber. This fiddle-back is generally associated with a sheen and makes blackwood one of the most decorative of Australian timbers. Darker coloured bands of late wood are fairly prominent on the backsawn surfaces and assist in giving further figure to backsawn material. The timber varies somewhat in weight from light to moderately light, averaging 40 lb/cu.ft. when air-dried to 12% with a possible range from 30-50 lb/cu.ft. It is fairly soft to cut and not very tough. It may be easily seasoned without degrade even in backsawn boards. When dried from the green condition to 12% moisture content, its shrinkage is low, being approximately 4% in backsawn boards and 2% in quartersawn. It is easily worked, saws and planes with ease, turns well and dresses to a smooth finish which can be highly polished. It is well known as one of the most satisfactory Australian timbers for steam bending. It is available in the form of split staves, sawn timber and plain or fancy veneers.

Blackwood is a highly valued, decorative cabinet and furniture timber. It is seen at its best when fiddle-back figuring is present, and cabinet work, office fittings, panelling and veneers made from this figured material are particularly decorative. It is extensively used for interior joinery work in office, bank and shop buildings and for the panelling of railway carriages, ship's cabins, halls and domestic or public buildings. The furniture and cabinet trades have made wide use of it and it has also been employed in the manufacture of billiard tables and pianos. Because of its bending qualities, it is extensively used for bentwork in the coach-building, boat-building and furniture trades and has also found an outlet in the manufacture of tennis racket frames. It has proved a most satisfactory Australian timber for beer barrel staves and staves for wine casks, although it seems somewhat incongruous that one of the most beautiful cabinet timbers is also used for barrel staves. It is also used extensively in carving and turning and for the manufacture of walking sticks and presentation boxes and trinkets.

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

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WASHING WOODEN FLOORS.

Wooden floors are usually washed with plenty of hot water, soap and energy. The practice is certainly not to be condemned, but some moderation in the use of hot water is recommended.

The case of a damaged floor in a city cafe illustrates this point. Sunken areas beneath the linoleum revealed the presence of decay in the flooring boards. Curiously enough the decay was limited to the upper portions of the boards which were nailed to joists embedded in concrete over which coke breeze had been spread. The joists and the lower surfaces of the boards were perfectly sound. The decay appeared to have been caused by the accumulation of moisture beneath the linoleum following abundant applications of wash water. Thus, the moisture content of the upper surface of the flooring was raised to a point suitable for the development of decay fungi. Such cases of damage are fortunately rare, and more fortunate still, the remedy is so simple that it requires no explanation. Too frequent washing of uncovered wooden floors also tends to widen the cracks between the boards. The modern practice of waxing floor surfaces has much to

commend it for it greatly reduces the need for laborious scrubbing and maintains the original beauty of the floor.

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INSPECTION OF POLES IN NEW SOUTH WALES.

Early in June an inspection was made of the two pole test sites which have been erected in New South Wales at Wyong and Clarencetown in co-operation with the New South Wales Forestry Commission and various New South Wales pole using authorities.

At the inspections at Wyong there were twenty-four visitors representing the co-operators and other interested parties Most of these people proceeded to Clarencetown to inspect the poles installed at this site where termite attack is very severe.

It is too early to draw any conclusions from the results of the tests to date, but so far all the treatments which have been applied are giving satisfactory results. The untreated control poles at both sites have been badly affected by either decay or termites.

The co-operators and visitors evinced a very considerable interest in the treatments being tested and in the fundamental idea as carried out, of properly planned and controlled field tests. The results obtained from the tests will have a marked influence on the future methods of pole preservation in New South Wales and other Australian States, and will also indicate the possibilities of the utilisation of species of timber which are at present not considered sufficiently durable to be used as poles.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No. 79.

1938##079 1st August, 1938.

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RESEARCH IN INDUSTRY.

A great deal has been written of late years about scientific research and the marvellous results it produces, but popular press articles frequently convey quite an erroneous idea of the meaning and functions of research.

The word "research" is used principally in regard to work that has led to spectacular results such as the production of artificial silk, of petrol from coal and similar achievements. The result is that in the minds of many readers there has been built up a picture of a number of magicians, who, working in mysterious ways with odd looking contraptions produce marvels much like the conjuror of old produced rabbits from a top hat.

This is quite an erroneous conception. There is nothing mysterious about research, nor is there any magic in it. It consists in the main of the study of some phenomenon, in the planning of experiments which measure some property of materials and in the patient collection and examination of data to find any generalisations which can be drawn. Much of the work is quite unexciting and often very tedious and may go on for years before anything of value results. Now and then comes a startling discovery - a new product or a new idea which has some philosophical or practical value in that it affects the comfort of our lives. These discoveries, however, are few and far between and in the meantime thousands of patient workers whose names are unknown to the public, steadily go along laying foundations on which some day a superstructure of discovery may be built.

It is a pity that so many people think of the man who made chocolates from sawdust as a marvel, whereas the real genius is the man who patiently studied the chemical behaviour of wood without any idea of chocolates or anything else so agreeable or practical.

In the timber industry there is plenty of room for improved practices. The development of these depends on as full a knowledge as possible of the properties of innumerable timbers. Tens of thousands of wood sections are cut and studied in detail under the microscope, hundreds of thousands of measurements of density, shrinkage, strength properties, chemical properties, etc. are made, tabulated and statistically examined. Finally a relatively few general principles are established.

When all such work has been done there will have been laid a foundation on which chemists, physicists or engineers can build with some degree of certainty.

In the various Forest Products Laboratories of the world, steady work is going on and more and more is being learned of the properties and behaviour of timber. This has already led to considerable improvement in utilisation and has done a great deal to protect timber from the inroads of substitute materials. Much remains to be done and the work deserves the practical assistance of all those interested in timber.

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PLYWOOD TUBES AND PIPES.

Tubes and pipes are being manufactured from plywood at the present time in Germany. It is claimed that these articles are satisfactory for conducting water, oil or other liquids, as well as for gutters for roofs. The advantages of the tubes are found in their insulating capacity, their low weight and the fact that wood is not a heat conductor and does not expand when exposed to heat.

The manufacture of the tubes from plywood is very simple. Two bands of plywood are glued together in such a way that they half overlap each other. The new band thus produced is wound spirally around a cylinder and glued together to form a tube which consists of a double band layer throughout, and whose inner seams are one-half width removed from its outer seams. The tube is then placed in a mantel press and cut into lengths. All these processes are carried out, it is stated, on the one machine.

It is presumed that an artificial resin glue to give waterproof joints is used as the bonding medium.

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SOME COMMON FALLACIES ABOUT WOOD.

The Forest Products Laboratory, Madison, Wisconsin, U.S.A., has recently drawn attention to four common fallacies associated with the use of wood. Two such false ideas are reproduced hereunder:-

Fallacy 1. That wood used in construction is under all conditions more dangerous than steel in case of fire.

It is true that wood soon becomes charcoal when heated to about 572°F. and that steel is little affected at such temperatures. Wood, however, has one tremendous advantage in that it is a poor conductor of heat, so that the outside of large beams or thick planks may burn or char while the inside retains its strength. Steel in the same fire and carrying the same load is very rapidly heated through, and not infrequently loses its strength and drops its load sooner than wood.

In the case of a burning barn, with the hay on fire, where it is a question of minutes or seconds whether you can save the livestock, the extra support given to the structure by heavy timber framing as compared to light steel members might make all the difference.

Fallacy 2. That all wood in the course of time "naturally" decays as a result of age.

This fatalistic concept ignores the true cause of decay and may lead the user to neglect proper precautions against it. Time or age in itself has nothing to do with the decay of wood. The White House when remodelled in 1928 was found to contain sound roof timbers that had been in place since 1816. The Fairbanks' house, a wood structure in Dedham, Mass., is standing structurally intact after three centuries. Timbers several hundred years old have been recovered from the ruins of Indian pueblos in Arizona and New Mexico. A part of a Roman emperor's houseboat that sank long ago in Lake Nemi was sound enough nearly 2,000 years later to be identified by the Forest Products Laboratory, Madison, as spruce. A log 7' in diameter was found not long ago in a tunnel being dug 150' below the bed of the Yakima River in Washington. A piece of it was sent to the Forest Products Laboratory and the wood was identified as an extinct species of sequoia, of an age estimated by geologists at twelve million years.

These examples prove that wood does not necessarily decay with age at all. Decay is the result of one thing only, and that is the attack of wood-destroying fungus. In the cases mentioned the wood has been kept free of fungus attack in one of two ways. It has been kept dry, as in weatherproof structures or in a dry climate, or it has been kept thoroughly and permanently saturated. A fungus is a plant. If the wood is too dry for it to grow and spread, decay does not occur. If the wood is thoroughly saturated, the fungus is "drowned out." The range of activity of fungus lies between 20 per cent. moisture content of the wood and a nearly "soaking wet" condition.

Fallacies 3. and 4. will be exposed in the next issue of this News Letter.

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THE GIANT TERMITE COMES TO MELBOURNE.

Living specimens of that industrious native of Northern Australia, Mastotermes Darwiniensis, or as he is more commonly known, the Giant Termite, were recently exhibited at the Northern Territory Exhibition in the Lower Melbourne Town Hall. Mastotermes, which dwarfs in bodily size and activity all the other soil-inhabiting termites of Australia is famous or perhaps notorious in Northern Australia for its extraordinary destructive powers which make light of such things as composition billiard balls and bags of salt. To the entomologist it is of particular interest, for it provides a link between the termites and their very distant relatives the cockroaches.

It has been suggested that if some of these living specimens escape, Mastotermes may become established in Melbourne with disastrous results to structural timber. This danger, fortunately, does not exist, for Mastotermes does not develop in cold climates. In addition, if any of the insects did escape and survive, they could not breed, for they are all of the sterile worker class.

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THE PROPERTIES OF AUSTRALIAN TIMBERS.

BRUSH BOX.

Brush box is the standard common name of the timber which botanically is known as Tristania conferta. The timber received its generic name after the French botanist M. Tristan, while the specific name "conferta," from the Latin denoting "close together," refers to the crowded nature of the leaves on the twigs. The timber possesses quite a number of vernacular names, but is usually known as "Box" of one description or another, and other common names are "Scrub box," "White box," and "Brisbane box." It must not be confused with any of the species of Eucalyptus known as "Box."

The tree itself varies greatly in dimensions depending on the site quality, but under the best conditions it attains a height of 140' and a basal diameter varying from 5' to 5'6". It has a brown deciduous sub-fibrous bark on the butt with smooth branches. It has been stated that this bark is occasionally used for tanning purposes, but does not appear to offer any marked possibilities in that direction. Brush box is confined chiefly to northern New South Wales and southern Queensland along the coastal districts. It is generally found in heavy continuous rainfall areas growing in mountain brushes near water courses and in gullies near and on the coast, but only very occasionally in open forest.

The timber is usually brown or pinkish-brown in colour tending to grey on weathering. The texture is fine, close and even with the grain inclined to be curly and somewhat interlocked.

Figure is usually lacking. The timber is hard, stiff and very tough, possessing particularly good wearing properties. It is more than moderately heavy, for when dried to 12% moisture content its mean air-dry weight is 56 lb. per cubic foot ranging from 49-62 lb. per cubic foot. It requires care in seasoning for it is inclined to be refractory when back-sawn. Warping may also prove troublesome.

The timber works and dresses well and finishes smoothly. The shrinkage in drying to 12% moisture content is approximately 7% on back-sawn faces and 4% across quarter-sawn widths. The timber is fairly resistant to termite and borer attack. The logs are usually sound and yield a high recovery of sawn timber. On poorer sites, however, unsoundness tends to develop.

Brush box with its many special qualities lends itself to a very wide and varied list of applications. It is regarded as the best Australian hardwood for bridge and wharf decking. It is used almost exclusively in the northern districts of New South Wales for tram rails for haulage of logs from the forest to the saw-mill. It is not cut by the iron wheels, but owing to its characteristic wearability becomes polished by the friction. Natural bends of Brush box are used in shipbuilding as knees. The timber when properly seasoned makes an excellent heavy floor possessing good wearing and lasting qualities. It is used for both carpenter's and plumber's mallets as well as for numerous other tools such as chisel handles, planes and jaws of hand screws, etc.. In New South Wales it is used to some extent for general building purposes for studding, plates, joists and not uncommonly for flooring and weatherboards.

Further information on this and other timbers may be obtained from the Chief, Division of Forest Products, Yarra Bank Road, South Melbourne, S.C.4. and from the various State Forest Services.

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BREVITIES.

Mr. H. D. Ingle, B.For.Sc., a graduate of the Canterbury Forestry School of the University of New Zealand has been appointed to the staff of the Division of Forest Products. Mr. Ingle will be carrying out work in connection with the structure of wood and its relation to physical properties.

Mr. J. E. Cummins, M.Sc., is visiting Western Australia to confer with Mr. N. Tamblyn, M.Sc., Timber Pathologist of the Division of Forest Products and the Western Australian Forests Department on the details of an investigation of the rots in jarrah. The prime object of this work is to determine whether decay present in the living tree will develop further after the timber is sawn and placed in service.

Timber Seasoning Class.

During the week commencing Monday, 3rd October, the Division of Forest Products will conduct a course of lectures and practical work for those interested in the air- or kiln-drying of timber. The course will be held at the Division's headquarters, 69 Yarra Bank Road, South Melbourne and will occupy the whole of the week, from 9 a.m. to 5 p.m. on week days and from 9 a.m. to noon on the Saturday. Visits to kiln installations and air-drying yards will be included. There will be no charge for attendance.

Applications for enrolment must be lodged not later than Monday, 12th September and should be addressed to The Chief, Division of Forest Products, Yarra Bank Road, South Melbourne, S.C.4, from whom full particulars can be obtained. When enrolling, applicants are requested to state whether they wish to enrol for lectures only or for practical work and visits to plants as well.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.80.

1938##080 1st September, 1938.

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RECENT INVESTIGATIONS OF THE FOREST PRODUCTS LABORATORY, MADISON, WISCONSIN, U.S.A.

The following items of interest referring to developments in forest products research in the United States were recently received from Mr. W.L. Greenhill, Officer in Charge of the Section of Timber Physics in this Division. Mr. Greenhill is visiting the forest products laboratories in Great Britain, Canada and the United States while abroad on special work leave.

"Various phases in the manufacture and utilisation of plywood are receiving considerable attention. The use of phenolic resin glues has increased tremendously in the industry and the advantages attendant upon the use of these have been taken a step forward at the laboratory by impregnating the veneer sheets themselves with a solution of the resin. The plywood is constructed by the application of the requisite heat and pressure to the veneer assembly. Impregnating the wood in the above manner renders it moisture-proof and acid-proof and greatly reduces its tendency to shrink and swell. It increases the weight of the wood by about 20 per cent. The possibility of using plywood so constructed for the exterior of houses is receiving serious consideration. Such use would eliminate the need for painting and the attendant maintenance.

Strength tests on plywood are being made and used to check figures determined mathematically from the strength data of the species concerned and the direction of the grain in the various plies. The shrinkage of plywood sheets is also being tested.

In this connection mention should be made to the continued research on the plywood prefabricated house. The prefabricated house has obviously only a limited future and its wide adoption in Australia appears improbable. Under certain conditions, however, the advantages associated with centralisation of manufacture and the elimination of large seasonal fluctuation in employment in the building industry which now occurs in the United States may more than outweigh any disadvantages associated with prefabricated construction.

The insulation of houses is of much more importance in the United States than in Australia and this is one of the problems on which extensive work is being done. The walls of houses have in the past been constructed with a layer of tarred paper under the weather-boards on the outside of the studs. Such construction has, with the introduction of air-conditioning in the winter, resulted in the condensation of moisture inside the walls. The remedy is to locate the moisture barrier, the tarred paper, on the inside of the studs, that is, immediately behind the lath and plaster.

Nailing and the design of nails are still receiving attention and a special nail, developed recently by a commercial firm, has been shown to possess better holding power than anything previously tested. This particular nail has a very fine vee-spiral, resembling a fine screw-thread, on its shank.

Chemical seasoning is demanding a large amount of attention and the commercial application of various salts has been tried out at a large plant during the year with fair promise of success. At the laboratory, chemicals not previously tested are being tried. Of these, urea either alone or mixed with other compounds is the most important. Urea appears to have remarkable anti-shrink properties and to be non-corrosive.

In the section of Derived Products the development of wood plastics is pre-eminent and this work appears to have tremendous possibilities as a source of utilisation of wood waste. Close co-operation is being maintained between the laboratory and commercial firms who are interested in this work."

A COMMON FALLACY ABOUT WOOD.

That some woods never decay, regardless of exposure and service conditions.

Note: In a recent issue of this News Letter, two common fallacies about wood were reproduced from an interesting report of the United States Forest Products Laboratory. This month another fallacy from the same source has been published, but references have been made to Australian timbers and Australian conditions.

Both this fallacy and the previous one are answered by the fact that no woods decay when fully protected from fungi, and that any wood will decay when exposed to fungus attack that is severe enough and long enough continued.

The conditions that bring about decay of wood are, briefly, dampness and mild to warm weather. If you have a house, porch, or shed built over damp, poorly drained ground, with the foundations bricked or boarded in, look out for decay. Sills of untreated wood resting directly on damp ground are sure to rot. Likewise untreated posts and poles set in the ground are exposed to ideal conditions for fungus attack, and their service will usually be terminated by decay near the ground line, no matter what wood is used.

The sapwood of all species is easily and quickly destroyed by decay. (Sapwood is the outer, light-coloured part of the tree trunk). But it is a fact that the TRUEWOOD of some species resists decay longer than the truewood of others. This is the advantage of using for poles and so on, such durable species as cypress pine, ironbark, wandoo, white mahogany, grey box, etc. They may last for years. Do not imagine, however, that the underground parts of the pole will remain just as you put them in; in a comparatively short time decay will eat away the sapwood, and the business of holding up the pole will be left to a core of the more resistant truewood. Of course, by treating the wood with a good preservative you change the picture materially. The preservative goes mostly into the sapwood and protects the part that is most vulnerable to decay. The sapwood by thorough impregnation with a good wood preservative is rendered similar in decay resistant properties to the more durable truewood.

But to suppose that the use of cypress pine, ironbark, red gum, or any other special wood will excuse you from all precautions against decay is a bad mistake. Don't expect too much of Nature. In the first place, remember that only the truewood is the durable part, and then take care of the service conditions as well as you can. A Laboratory man once went to inspect a floor that was falling in. It happened that the subfloor was of genuine jarrah, specifically put there to ward off decay, but alas! It was laid directly over damp ground and was covered completely with linoleum. What the owner had was a high-powered fungus pit for his jarrah, and the fungus literally "went to town" at the owner's expense.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

QUEENSLAND MAPLE.

Queensland maple is the standard common name of the Australian timber designated botanically as Flindersia brayleyana. As the species is not related to the widely known maple (Acer) genus of America, the distinctive name of silkwood was given to it in

Queensland where it is also known by the names of maple silkwood and red beech. The wood has become so well known on Australian and overseas markets as Queensland maple that, in spite of the shortcomings of this name in describing the features of the timber, it has been proposed as the standard name.

The tree itself, though not often exceeding a medium height of 100 ft., attains a massive trunk which may measure up to 4 ft. diameter at the base. Its bark is brown in colour and sub-fibrous.

The native habitat of the species is in the highlands of north-eastern Queensland, principally on the Atherton - Ravenshoe tableland. It reaches its best development in regions of heavy summer rainfall and of warm equable temperatures. It is found associated with many other timbers in mixed tropical jungles.

The timber varies in colour from light brown, brownish-pink to pink. In texture it is medium and uniform. Its grain is often interlocked and may also be wavy or curly. It displays a wide range of figure varying from plain, to stripe, to waterwave, and the decorative value of these variations is greatly enhanced by the natural silken lustre of the wood. The timber is light in weight, averaging 34 lbs. per cu.ft. when dried to 12% moisture content, and varying from 29-43 lbs/cu.ft. Seasoning requires some care, especially in close-grained samples, but seasoned material is available in commercial quantities.

The timber works easily under hand or machine tools but, when interlocked, its grain may be inclined to pick up in dressing. It takes stains readily, fumes successfully, and is liked by cabinet makers. It polishes excellently and gives a high lustrous finish. It is also regarded as satisfactory for steam bending. It peels and slices very well and glues easily.

Queensland maple ranks with mahogany, walnut, cedar and blackwood among the best cabinet timbers of the world and is the most valuable on Australian markets. It possesses a refinement and character equalled by few other timbers. Interior decorators use it to excellent advantage to produce very decorative effects in panelling, furniture, stairways and shop fittings. It is in good demand for reproductions of antique furniture, for presentation pieces, exhibition productions, high-class furniture and cabinet work of many types. In stair pillars, handrails, doors, mouldings and household joinery, it is widely used to good effect. Interior fittings of carriages, tramcars and pleasure boats are greatly enhanced when this timber is employed. It is also used in railway carriage building for doors, inside framing, seat framing, outside sheathing, glass frames, louvres, partitions and mouldings. Besides its decorative uses in boat fittings, it is also suited for planking outside joinery, and for rudders and stems of small craft. It has proved very suitable for aeroplane propellers and is used in considerable quantities for rifle stocks. As a general building timber, it is highly estimated in its native districts as it holds nails well and does not rust them. It is in active demand for veneer and plywood manufacture.

The timber is available in a wide range of board and joinery sizes, also as veneers, plywood, laminated panels and flush doors. It is stocked by the timber merchants of most States.

Additional information on this and other timbers may be obtained from the Queensland Forestry Sub-Department, or from the Division of Forest Products, Yarra Bank Road, South Melbourne.

SAWDUST AS DOMESTIC FUEL.

Sawdust is now employed in the heating of more than 15,000 homes, offices, theatres and other buildings in British Columbia. In co-operation with combustion engineers, the Forest Products Laboratories of the Department of Mines and Resources have devised

methods to use sawdust for fuel, and the storage and burning of this material has been placed on a sound basis. Formerly regarded as unavoidable waste, sawdust for fuel now returns to mill owners thousands of dollars for a product which was previously sent to refuse burners. The quantity of sawdust produced annually in Canadian saw mills is estimated to be sufficient to cover fifteen or twenty city blocks to a depth of one hundred feet.

Some of the advantages of sawdust as fuel are readily apparent. Sawdust is clean, cheap, very low in ash content and light in weight and easily handled. Added to these qualities is the important fact that it burns freely, requires little attention and makes a fire which is easily controlled.

Special furnaces or stoves are not necessary for burning sawdust, but auxiliary grates are required. These have been designed so they may be easily attached to any standard heating unit. The fuel is fed as required, by gravity, from a storage hopper placed above the grate. The hopper requires filling two or three times a day.

BREVITIES.

VENEERING - Two paragraphs of interest from 'Veneers and Plywood', an American journal:

1. Satisfactory plywood is now being made of eucalyptus or blue gum, and hardwood buyers are actively in the market for this attractive finishing wood. Most of the wood has an ordinary striped figure resembling the popular prima vera, but some trees produce beautifully mottled stock and others possess a close wavy or ripple figure.

2. One cause of surface checks showing through the finish is over-sanding. Both rotary and sliced veneer have right and wrong sides. The right side is the sound side; the wrong, the side that is ruptured as the knife lifts the veneer from the block at an angle. Fractures such as these penetrate almost through the sheet of veneer, and when there is a slight variation in core or crossband thickness, the film of sound wood known as the right side is sanded through during the levelling up, and the fractures are exposed.

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C.S.I.R.

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No. 81.

1938##081 1st October, 1938.

KILN DRIED TIMBER versus AIR DRIED.

An assertion that kiln-drying, as distinct from air-drying, has an adverse effect on the lasting qualities of hardwood weatherboards and flooring has recently been brought to the notice of the Division of Forest Products. This assertion is far from being in keeping with experience over a number of years. Whether it arose from prejudice or from incomplete observation, omitting some vital factors in a particular case or cases, it indicates a lack of understanding of what is involved in kiln drying and air-drying.

The life of weatherboards depends on resistance to weathering and occasionally on resistance to decay. The life of flooring depends on resistance to wear and occasionally on resistance to decay.

Any difference introduced in the life of either class of stock, therefore, would involve some definite effect on the physical or chemical properties of the timber. Repeated tests have shown that chemical changes during drying, either by kiln-drying or air-drying, are infinitesimal and have no bearing on the subsequent behaviour of the timber.

As regards physical or mechanical properties, kiln-drying can, if carried out at very high temperatures, have an adverse effect as compared with air-drying, but even under the highest temperatures practicable in ordinary kilns, the effect is not sufficient to be of consequence in weatherboards or flooring. This assumes, of course, that in both cases the timber is dried under sufficient control of conditions to prevent serious checking.

It is true that timber which has been reconditioned to overcome collapse after either air-drying or kiln-drying is softer and less dense than similar timber which has not been reconditioned. This is the direct result of restoring the cells from their crumpled condition to their normal, open condition. The softening, however, is insufficient to have any effect on the weathering of weatherboards and its effect on the wearing qualities of flooring is negligible under ordinary conditions. Under exceptionally severe wearing conditions the difference might be apparent, but the fact that reconditioned flooring has given satisfactory service for years in dance floors and factory floors in addition to ordinary house and office floors proves that this is of little importance. If the conditions of wear were so severe as to cause trouble it would arise with stock which had not been reconditioned and the only solution would be the use of a denser species.

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SO-CALLED "DRY ROT" IN WOOD.

Note: The discussion below has been derived from an article entitled "Some Fallacies About Wood" prepared by the United States Forest Products Laboratory, Madison, Wisconsin. Since the subject matter in this article has been of such general interest to the Australian public, it has been reprinted in several issues of this News Letter with references to Australian conditions.

Much has been written or said about "dry rot" in building. Any brown, crumbly rot is so called, but the term is a misnomer. No fungus can grow without water. Wood is the food for the wood-

destroying fungi, but they cannot use that food unless it contains at least 20 percent of water (based on the weight of the oven-dry wood.) However, the fungi which are responsible for a large amount of decay in buildings are capable of rotting wood that is apparently much drier, for they produce water-conducting strands which carry water from some source, usually in the ground, up into buildings where the wood normally would be dry. Moreover, some wood-destroying fungi can remain dormant in dry wood for months or even years and then revive and continue their destructive work as soon as moisture becomes available.

Call it dry rot if you wish, the kind of fungus that comes sneaking into a house carrying its water supply with it; it is a bad one, and should have been kept out by proper precautions when the house was built.

Here is an illustration: A house was completely wrecked by this destroyer in less than 10 years. Investigation showed that some floor joists were allowed to rest on an old stump that happened to be in just the right place -- or the wrong place. Don't give this wrecker a chance to get into your home by leaving planks or timbers connecting the structure with the ground. After it gets started it can set up its own connections with the damp ground, an ugly, snakelike growth sometimes as big as your finger and thumb.

A good, dry, well-built frame house is in practically no danger from decay if just a few normal precautions are taken. (1) Build on a well-drained site; (2) secure well-seasoned timber from a yard where rot in foundations and timber piles is not tolerated, rejecting any material that is suspected to contain incipient decay; (3) do not allow the selected material to lie on the ground after it has been delivered on the job; (4) untreated timber should not be allowed to come in contact with the soil or with foundations or walls which are liable to be damp, and should not be embedded in concrete or masonry without leaving ventilation around the ends of the timbers; (5) wood flooring, unless it has been chemically preserved, should never be laid directly on the soil or on concrete that is in contact with the soil; (6) ample ventilation should be provided so that free circulation of air around the wood will keep the wood dry.

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WHEN AND HOW TO PAINT HOMES AND FARM BUILDINGS.

Note: The subject matter in this article has been abstracted from a publication of the United States Forest Products Laboratory, Madison, Wisconsin.

Using Paints:

The great majority of people consider that buildings usually look best when kept well painted and, if they can afford it, are willing to spend money for the purpose. Good paint maintenance not only keeps buildings looking well, keeps surfaces smooth, and retards warping and checking of the timber, but it also gives the property a look of prosperity, encourages general tidiness of the premises, and gives the owner a well-deserved feeling of pride in his property.

When to Paint:

Exterior woodwork should receive the first or priming coat of paint as soon after erection as practicable. Succeeding coats should be applied at intervals not greater than 2 weeks; in warm, dry weather the intervals may be as short as 2 days. It is very poor practice to let exterior woodwork stand for weeks with only a priming coat, or to postpone the application of the third coat of paint for 6 months or more.

Metal surfaces that are to be painted are often primed at the mill. Succeeding coats should be applied promptly after erection. If galvanized iron is to be painted, however, it is helpful to let it first weather for several weeks.

Interior surfaces other than metal should not be painted until moisture from plastering, concrete work, or other operations of building have entirely disappeared. Woodwork should then be painted or varnished, because further delay is likely to entail more labor in sandpapering and properly cleaning the surfaces. Plaster and concrete, on the contrary, become more receptive to paint on ageing and painting may therefore be deferred as long as desired.

Exterior painting may be done in any season of the year during which the painter can work with reasonable comfort. Obviously, paint should not be applied when it is raining or foggy and the surface should be allowed to dry after rain, fog, or dew before continuing to paint. During cold, damp weather paints harden more slowly than they do in warm, dry weather. A sudden drop in temperature while the coating is hardening may make it wrinkle or it may cause dew to form on the fresh paint and damage it. Coatings applied during autumn or winter are likely to become more seriously soiled as time passes than coatings applied in the spring or summer. On the other hand, during the summer, insects and seeds sometimes become embedded in fresh paint and disfigure it.

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THE PROPERTIES OF AUSTRALIAN TIMBERS.

River Red Gum.

River red gum is the name submitted for standardisation for the timber described botanically as Eucalyptus rostrata. The timber is also well known by the names of red gum, Murray red gum and river gum.

The tree reaches its best development when growing on river banks and is found in greatest abundance along the course of the Murray River and its tributaries, with which its name is often associated. Its distribution is wide, however, ranging from inundated areas along river banks in Victoria, New South Wales, South Australia and Queensland.to areas where periodical droughts are experienced. It is a tree capable of withstanding both floods and rainless spells of several months' duration. It is not a tall tree, seldom attaining a height of 150 feet, and frequently has a short massive trunk and a wide spreading crown. At the butt it is covered with a persistent corky fibrous bark, but, higher up, the bark is of the smooth gum type although it tends to slake off in strips and become somewhat scaly.

The timber is red in colour. Its grain is interlocked and often wavy. Its texture is fairly close and it may exhibit a pleasing figure. Gum veins and gum pockets are relatively prevalent. Its density ranges from 49 to 61, averaging 56 lb/cubi foot when dried to 12% moisture content. In drying from the green condition it shrinks 4.4% on backsawn widths and 2.5% on quartersawn by the time it has reached 12% m.c. It is a durable timber in contact with the ground and is resistant to termites (white ants). It is a hard timber, strong in compression parallel to the grain. Seasoning requires care to prevent degrade, warping rather than checking being the chief difficulty. It is not difficult to saw and, apart from a tendency for the grain to rise in dressing, it works well under hand or machine tools. It is capable of taking a high polish.

The qualities of river red gum make it most suitable for structural purposes particularly when durability and wearability are important factors. It is used extensively in wharf, bridge and other structures in the piling and superstructures. It is the

timber most commonly used in Victoria for railway sleepers and is in active demand for this purpose in other States. It has been used satisfactorily for street paving blocks. It is extensively used for the posts in agricultural post & wire fences and is commonly specified for the soles, struts and posts of suburban subdivision fences. In dwelling construction it is greatly favoured for use in contact with or near the ground such as sole plates, stumps, bearers and wall plates and in exposed positions in steps, stairs, door steps and window sills. It is used to some extent for flooring and weatherboarding. Certain wearing parts of agricultural implements and some of the needs of the shipbuilding industry are also met by river red gum.

The timber is available in round, hewn or sawn form. Sawmill supplies are chiefly scantling and squares. Large widths and thicknesses are fairly readily obtained but there are limitations on long lengths. Additional information on this and other timbers may be obtained by addressing The Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne, S.C.4.

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DUAL-PURPOSE SHIPPING CONTAINERS.

According to the journal "Veneers and Plywood", several concerns are experimenting with building their shipping containers of plywood, constructed in such a way that the customer can use them for store or warehouse shelving, drawers or bins after the shipment has been unpacked. One firm, for instance, supplies the base and uprights of a high shelf assembly with a customers first order of goods for a specified amount. Plywood-made boxes containing later shipments are taken apart and cut on dotted lines, to supply the cross shelf material. Others, after being opened as directed and perhaps cut in sections, form drawers to slide in and out on these shelves.

The plan makes a good selling point, leads to initial orde and keeps the merchant interested in the firm's products. Plywood makes it possible in the first place to construct the adaptable container for a reasonable amount, while its strength, durability and appearance make the shelves and drawers practical and worth having.

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BREVITIES.

Mr. S. A. Clarke, Deputy Chief of the Division of Forest Products, has returned to Melbourne after six months' leave of absence in New Zealand where he acted in an advisory capacity to New Zealand Forest Products Limited with respect to the utilisation of their pine plantations.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.82.

2nd November, 1938.

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RESEARCH AND TIMBER DEVELOPMENT.

The second All-Australian Timber Congress organised by the Timber Development Association of Australia has just concluded its business sessions in Melbourne. The Division is happy to have been associated with the Congress and to have had its officers renew personal contacts with delegates from all Australian states and to have met the delegation from New Zealand. By assembling representatives of all sections of the timber trade, receiving addresses on subjects of importance not only to itself but to the community as a whole, the Congress became a significant gathering. Interests that might have held divergent views at other times found cause for unity in discussing common problems. Their desires were in accord with the motto of the Association - "Unity and Action".

In the addresses and discussions the view was repeatedly expressed that the good qualities of timber need greater publicity. Quotations from trade publications clearly showed that timber's competitors do not hesitate to extol the virtues of their materials and often, by more than implication, suggest that timber has few virtues and many faults. It is the timber trades' responsibility to correct that impression. Too long has timber been the Cinderella of the materials of construction and manufacturing. It needs to be rescued from its scoffing sister materials, to be arrayed in modes befitting its inherent beauty and brought out to scintillate on equal terms with them to win favour according to its true worth. A material with such a record of service as timber, a material of such basic importance in our civilisation, is worthy of championing. Rather than let the newer, largely untried or unproved materials win public favour at timber's expense with their so-called "modern" appeal, the trade has expressed determination to allow them to win favour on merit alone.

Publicity will do its part, but it alone will not achieve the aims of timber development. It must be backed with service and this, in turn, must be founded on fact finding, that is, on research.

Research has already played an important part in timber development. It has shown the influence of environmental conditions on the behaviour of timber, traced effects to their causes and distinguished between good and bad practice in timber utilisation. The properties of wood and the range of characteristics within and between species have been systematically determined. Methods of seasoning, grading, preservation and finishing have been investigated. Chemical and anatomical studies have been undertaken to reveal the fundamental composition and structure of wood substance. All this research is aimed at aiding the selection of the right timber for the right purpose, indicating the best methods of preparing the timber for the market and ensuring its best service. Fields for new uses of timber are also being explored. Research, then, is the foundation upon which development and progress can be built. It reveals the factors which influence the quality of timber and establishes the means of using these to best advantage in utilisation.

In Australia, timber research has been actively conducted for ten years by the Division of Forest Products. In this time it has accumulated a vast amount of information on Australian timbers, and is in close touch with all forest products research laboratories throughout the world. Results of its work are freely available to the public and its officers are able and willing to apply these results in the service of the timber industry. It is hoped that through the Timber Development Association the results of research will be applied to their fullest practical extent and rapidly benefit the timber industry.

WHEN AND HOW TO PAINT HOMES AND FARM BUILDINGS.

Note: An introduction to this subject was given in the October issue of the News Letter. The following article abstracted from a publication of the U.S. Forest Products Laboratory, Madison, Wisconsin, continues the series.

Composition and Kinds of House Paints.

Only good, durable paint (or stain) should be used on exteriors of permanent structures because the principal cost of painting is the labour. If a cheap coating is desired for temporary structures or surfaces that must be repainted frequently and do not require protection against weathering, either whitewash or an exterior water paint containing casein may be used.

Many commercial paints bear a label giving the composition of the paint. In the absence of previous experience with a paint, appraisal of its quality must be based upon the information given by the formula label. It is wise to buy only paints that give the formula on the label, and to keep a record of the formula so that paint of similar composition can be purchased when it comes time to repaint the building.

What kind of Paint to use.

The kind of paint to use should be determined when the new building is to be painted for the first time or after previous paint has been removed completely by the painters' blow torch or house paint remover and the bare wood is again exposed. Once the building has been painted, future repainting should be done with the same kind of paint used the first time. Changing kinds of paint for successive paint jobs often leads to abnormally early failure and unsatisfactory forms of failure of the new job. The renewed coating consists of the new paint plus what is left of the old paint and, unless there is past experience with the combination to judge by, no one can tell what the result will be. Certain repainting combinations that have repeatedly been observed to cause abnormal and usually unsatisfactory developments are white paints over yellow ochre primer or paint, white paints over coloured pigment paints such as red, brown, green, or black, almost any house paint over clear varnish, pure white lead paint over mixed pigment paints that have not aged for a very long time, enamelized paints over softer house paints of the ordinary types, and ordinary house paints over enamelized paints.

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Repainting at intervals of less than three years is rarely advisable because, on the sheltered parts of the building particularly, the old paint has not aged long enough to become a reliable foundation for new paint and in the course of time the coating becomes unduly thick and of uncertain behaviour.

A SENSE OF PROPORTION.

"The borers are everywhere" stated a client who approached the Division of Forest Products recently for advice in regard to the treatment of a parquetry floor attacked by "borers". A detailed inspection of the floor by an officer of the Division in the presence of the client revealed that five pieces of timber were attacked. There were not more than two borer holes in any piece. Now, when it is realised that the total number of pieces in this parquetry exceeds a thousand, it is evident that the client's estimate of the damage was not an estimate at all, but a guess and a gross exaggeration as well. This type of mis-statement is inexcusable. It causes unnecessary alarm and tends to stampede people into wasteful expenditure. Cases of severe borer damage are not unknown, but they are definitely exceptional. It is necessary, therefore, in dealing with borers to exercise one's sense of proportion. A careful estimate of the amount of timber damaged will in most cases be reassuring rather than alarming.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

MYRTLE BEECH.

Myrtle beech is the standard common name of the timber designated botanically as Nothofagus cunninghamii. It is also well known under the name of Tasmanian myrtle, or as beech, myrtle or Tasmanian beech. The species is classed botanically in the same family as the true beech (Fagus), a genus widely distributed in the Northern Hemisphere. It is closely related to the Southland beech (Nothofagus menziesii) of New Zealand.

The native habitat of the tree is in Tasmania and Victoria. It is found in moist localities in most parts of Tasmania, but chiefly on the west, north-west and north-east coasts. In Victoria it is confined to the cooler, damp, sheltered gullies in the southern and eastern ranges.

The tree itself is a magnificient evergreen which, under most favourable conditions, attains a basal diameter from 3 ft. to 5 ft. and a height between 100 and 200 ft. Its delicate foliage contrasts strikingly against that of the lighter coloured Eucalypts.

The timber varies in colour from white in the sapwood to pink or reddish brown in the truewood, often with a wide zone of pale intermediate wood. Its grain is straight or slightly interlocked and occasionally wavy. Its texture is very fine and uniform. Growth rings are visible, but not conspicuous. On the radial surface it exhibits some figure and occasionally some particularly fine burr and wavy figure are encountered. In weight it is moderately light, averaging 43 lbs. per cu.ft. when dried to 12% moisture content or varying from 37 to 50 lbs. per cu.ft. Seasoning presents some problems owing to variation in initial moisture content between trees and uneven distribution within the tree and to varying drying characteristics of different samples. In board sizes, seasoning difficulties are readily overcome, particularly when quarter-sawn, but heavier sizes are sometimes troublesome. In drying from the green condition to 12% moisture content, shrinkage of back-sawn widths averages 5% and quarter-sawn 3%. It is resistant to fungal and insect attack. It is a fairly hard wood, fairly strong, fairly tough and fairly stiff. The timber works easily under hand tools, is somewhat inclined to lift in the grain on one face when being machine-dressed on two faces at once, but otherwise works well. It turns and shapes particularly well. It fumes successfully, polishes well with little filling and is well suited to waxed finishes. It peels and slices very well and glues readily.

Myrtle beech finds its best use in the manufacturing trades. It is a popular timber for cabinet-making and furniture, being specially adaptable to use in the colonial style of productions. In the boot industry it occupies a place of importance as it is used very largely for shoe heels, and for boot lasts. It is used extensively in the brushware and broom trade and for carving. Large quantities are used for the manufacture of bobbins, turned tool handles and other turnery. In the motor body trade it has been used for bentwork in the hoods and ribs, and in railway carriage construction is used for glass frames and seat battens and for the sides and ends of wagons. Piano bridges have given satisfactory service in this timber. Its even wearing characteristics make it particularly suitable for high class dance floors, hall floors and domestic floors and parquetry, and similarly for bush tram rails and bridge or wharf decking. In interior decoration it is valued for panelling. It is manufactured into veneers and makes both decorative and hard-wearing plywood.

The timber is available from Tasmanian and Victorian timber merchants in boards of medium widths and lengths and in turnery squares and it can be obtained in the form of veneers and plywood.

Additional information on this and other timbers can be obtained from the Division of Forest Products, Yarra Bank Road, South Melbourne, Victoria.

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

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1938##083 1st December, 1938.

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THE DEVELOPMENT OF TIMBER AS A STRUCTURAL MATERIAL.

Before a material can be used to best advantage for structural purposes, detailed information on its mechanical and physical properties must be known. Timber has suffered through having been used for structural purposes long before its strength properties were determined or before the principles of engineering design were developed. Practices were followed which, while achieving the primary aim of safety, did not make best use of the material. By the time the design of structures began to change from an empirical practice into a relatively exact science, competitors of timber had appeared and their sponsors realised the value of supplying technical data to enable the newer materials to be used both safely and economically. The established practices of timber usage handicapped its progress owing to the reluctance to change old methods and a criticial study of timber's characteristics was not encouraged. In the last 20 years, however, much more attention has been paid to timber with the results that it is gaining a technical footing equivalent to that of other engineering materials.

Today the intrinsic properties of a great number of species are known in detail, and the influence of such factors as moisture content, density, defects, etc., has been determined by research. Efficient structural grading rules, whereby timber can be segregated into strength grades have been prepared and have led to more efficient and economical utilisation. In the absence of structural grading rules, working stresses must be based on the strength of the weakest piece in the species, thus wasting timber by using sizes larger than are necessary. Structural grading rules enable the weak pieces to be segregated and it is therefore safe to increase the working stresses considerably with a consequent saving in material.

Once the intrinsic strength properties of wood are known, new designs and improved systems of construction can be developed. Particularly significant is the study of methods of fastening wooden parts together, because the joints of a structure or fabricated article of wood are usually its weakest parts. Even so simple a device as the common nail has been thoroughly investigated and detailed knowledge on the strength of nailed joints is available. Modern research has also placed the design of bolted joints on a sound basis. A revolutionary development in the use of timber as a structural material has been the advent of what are called modern timber connectors. These consist, in general, of metal rings or wooden discs which, when embedded partly in each of two members and held in place by the tightening of a central bolt, transmit load from one member to another. The use of these connectors has enabled the erection of most spectacular timber structures - for example, an all timber self-supporting radio tower 625' high. A large wooden exhibition building to be built for the Centenary of Wellington, New Zealand, will use approximately 100,000 connectors in its construction. The advent of timber connectors has given timber a new lease of life as a structural material and it can now compete on an economic basis with steel and concrete.

Another outstanding development in the last decade is the development of gluing as a means of building up timber structures. Tests have shown that glued up beams, columns, arches, etc., develop the full strength of a solid member, and at the same time permit the use of smaller timber. Other advantages are that more effective seasoning is possible, lower grade material may be used in the more lightly stressed portion, and structural members of practically any size or shape can be built up.

The use of plywood for structural purposes is also rapidly increasing, particularly in house construction. By gluing plywood to scantling, so forming a box girder, a very strong and stiff unit can

be built up. These units are being used overseas (particularly in U.S.A.) in the construction of pre-fabricated houses. They can be constructed in the factory to close tolerances and fit together on the job in a fraction of the time required by conventional methods. The development of water-proof synthetic resin glues which enable plywood to be safely used even when exposed to the weather have opened up great possibilities for the future use of this material.

It will thus be seen that, contrary to the opinion one often hears that timber as a structural material is doomed, the evidence points to a greater use of timber in the future but perhaps not in the same way as we know it today.

WHEN AND HOW TO PAINT HOMES AND FARM BUILDINGS.

How to Use the Paint.

Two blunders that are frequently made in using paint are excessive addition of liquids, especially of linseed oil, and stingy application of paints. Painters sometimes seek by these means to save paint and manufacturers often recommend maximum allowable additions to convince purchasers that their paints "go as far" as any other.

Repainting Exterior Woodwork.

If the old coating is not too dirty or is first washed, if there are no areas of wood left bare by loss of coating, and if vigorous rubbing of a small area will remove the superficial chalk and restore a fair degree of gloss, a single coat of paint may be sufficient repainting. For this purpose, prepared paint should be applied without addition of any oil or turpentine, or soft paste white lead paint should be mixed with 2 gallons of raw linseed oil, ¼ gallon of turpentine, and 1 pint drier per 100 pounds of paste.

If the old coating is chalking too deeply to restore any gloss by rubbing or if there are small patches of bare wood, two coats of paint are needed. With prepared paint the first coat may be mixed with 1 pint of turpentine per gallon and the second coat applied without addition.

How Much Paint to Apply.

Although paint coatings should be brushed thoroughly they should not be brushed out too thin. Good painters apply coatings of substantial thicknesses. On the other hand, coatings that are too thick wrinkle as they harden. The proper thickness must be learned by experience but the experience can be acquired rapidly if the beginner will observe the amount of paint he applies to measured areas of surface.

The following figures for the spreading rate of paint may be used for estimating the amount of paint needed for a job and for gauging the proper thickness of paint coatings:

	Spreading rate in square feet of surface per gallon of paint for:		
	First Coat	Second Coat	Third Coat
Three-coat painting on new woodwork	700	800	800
Two-coat painting on new woodwork	600	700	-
Two-coat repainting on woodwork	750	800	-
One-coat repainting on woodwork	700	-	-

THE PROPERTIES OF AUSTRALIAN TIMBERS.

RED TULIP OAK.

Red tulip oak is the standard common name of the timber known botanically as Tarrietia argyrodendron var. peralata. It is the largest, most useful and most abundant species in the Tarrietia genus in Queensland.

The native habitat of the tree is in the tropical coast forests of North Queensland, extending from the Atherton Plateau northward along the ranges towards the Daintree River.

The tree itself is of medium dimensions, attaining a basal diameter of about 3 ft. and a height up to 120 ft. At its base it develops characteristic buttresses above which its bole is long, straight and cylindrical in shape.

The timber varies in colour from white in the sapwood to pink or reddish-brown in the truewood. On some logs the sapwood is about 2" thick, and its limits are sometimes difficult to define owing to the gradual deepening of the colour into the truewood. The grain of the timber is usually straight. The figuring is varied and handsome, a fine mottled effect being produced on quarter-cut faces by the dark coloured rays and a delicate wavy tracery on the back-cut faces due to the exposure of fine concentric bands of soft tissue. It is of moderate density ranging from 42 to 58 lb/cu.ft. and averaging 49 lb/cu.ft. when seasoned to 12% moisture content. Seasoning requires some care to prevent warping of boards with sloping grain and checking or end splitting can be minimised by reasonable precautions. In drying from the green condition to 12% moisture content, shrinkage averages 6½% of back-sawn widths and 4% of quarter-sawn. The timber gives satisfactory service in exposed situations above ground but sapwood must be eliminated or preservatively treated against infestations by the Powder post borer (Lyctus sp.). It is a moderately hard wood, strong, tough and stiff. It bends particularly well. It is rather heavy to work with hand tools but saws readily, dresses smoothly and generally works satisfactorily under machine tools. It peels well and can be satisfactorily glued. The better finishing effects are produced with stains applied sparingly in light shades, or with white shellac over a light application of oil.

Red tulip oak finds its best use for internal decoration and for various manufacturing purposes. It is used very effectively for panelling in residences, shops, public buildings, and in railway carriages. It is popular for various classes of joinery, especially for internal doors and is largely used for moulded skirtings, picture rails or plywood cover strips. It makes very attractive floors in both strip and parquetry styles and it is recommended for dance floors. It is highly suitable for cabinetwork and for the manufacture of bedroom or dining-room furniture, book-cases and chairs. Its excellent bending properties are responsible for its use in the bending trades for wheel rims, motor hood sticks, bent parts of vehicles, bentwork for furniture and for some sporting goods. The high electrical resistance possessed by this timber fit it for special uses in electric equipment such as high voltage switch rods and switch boards. For railway purposes it has proved satisfactory for body framing. In its native districts it is used for the internal framing of buildings. It is in active demand for veneer, plywood and flush panel manufacture. Because of its decorative value it is used in considerable quantities for trinket boxes, ornaments and novelties.

The timber is available in seasoned boards of all widths and thicknesses, in milled products and mouldings. Veneers, plywood and a wide range of laminated panels are also obtainable.

Additional information on this timber is obtainable from the Queensland Forestry Sub-Department, Brisbane, or from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne, Victoria.

NEW ZEALAND GRADING RULES FOR BUILDING TIMBER.

The Division of Forest Products has been advised of the issue of a New Zealand Standard Specification for Classification and Grading of New Zealand Building Timber (National Grading Rules) by the New Zealand Standards Institute. The specification (N.Z.S.S.169) covers rimu, miro, matai and totara of the sizes, shapes, and qualities required for light building construction and general uses.

For the purposes of the rules, building timbers are classed into two groups of standard grades: one for framing and the other for finishing. Limits for blemishes and defects are prescribed in three framing grades and three finishing grades.

The provisions were formulated by a special committee set up by the Government in 1928 consisting of representatives of the sawmilling industry, Government Departments and the State Forest Service. Representatives of all other branches of the timber industry and all important wood-using interests were later added to the Committee to consider the development of rules acceptable to all concerned. The specification has been given an exhaustive trial and agreement reached upon it by all major producing and wood-using interests in the Dominion. Adherence to the specification will mean that both producers and users will be free from the endless complications and confusion attendant upon the use of local specifications and grading rules with conflicting names and descriptions.

Copies of the standard are available at a cost of 2/2d. post free from the N.Z. Standards Institute, Wellington, N.Z.

BREVITIES.

In conformity with the policy adopted by the Commonwealth Public Service, the Division of Forest Products has now re-arranged its working hours into a five-day week. In future, the laboratories will be closed on Saturday mornings.

Mr. J. E. Cummins, Officer-in-Charge, Preservation Section, Division of Forest Products, is at present in Adelaide investigating problems of termite infestation of buildings.

Mr. S. F. Rust, Officer-in-Charge, Veneering and Gluing Section, Division of Forest Products, is spending several weeks inquiring into gluing problems in Sydney.

Mr. W. R. Ferguson, formerly Assistant, Utilisation Section, Division of Forest Products, has been transferred to the headquarters staff of C.S.I.R. to undertake architectural duties associated with the Council's building programme.

On Tuesday, 15th November, a meeting of the Melbourne Division of the Institution of Engineers, Australia, was held in the library of the Division of Forest Products. After an address by Mr. I. H. Boas, Chief of the Division, an inspection was made of the Timber Mechanics and Seasoning Laboratories. In the former, a demonstration was given of the testing in the 600,000 lb. Southwark Emery machine, of a 24 ft. composite wooden column built up from two 4 x 2 wooden members and fastened at the ends with timber connectors.

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