COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

DIVISION OF FOREST PRODUCTS

MONTHLY NEWS LETTER No.84.

1939##084 2nd. January, 1939.

Change in Moisture Content of Seasoned Timber During Transit, Australia - England.

During recent months the Division of Forest Products has received a number of enquiries as to the probable change in moisture content of kiln-dried timber during shipment to England. English buyers are asking for stock dried to a moisture content of 10-12 per cent. and Australian suppliers feel that even if stock is dried to this specification it will be at a considerably higher moisture content by the time it reaches England.

Tests made by the Division of Forest Products several years ago, in co-operation with the Forest Products Research Laboratory, Princes Risborough, England, indicated that there was no danger of serious change in the moisture content of seasoned stock provided reasonably precautions were taken in stowing dry timber away from wet timber and in protecting it from rain when latches were opened in wet weather. These results were confirmed by similar tests between British Columbia and England and British Columbia and Australia.

In November 1932 and June 1933, respectively, two test shipments of kiln-dried Mountain ash flooring were made from Australia to England. In each shipment, three bundles of sample boards were placed amongst the rest of the consignment, in chosen locations considered to be most likely to give a maximum range of conditions in the hold. Each bundle contained 37 end-coated samples, three feet in length.

A summary of the results is given below and it is interesting to note that neither the boards at an initial moisture content of 9-10% nor those at an initial moisture content of 15-16% changed any more during the voyage than boards at a moisture content of 12-14%.

Results of 1st Test.

Bundle No.	Range in M.C. Australia %	Range in M.C. London Docks %	Av. M.C. Australia %	Av. M.C. London Docks %	Max. M.C. Change of Individual Board %
1	12 - 16.3	12.5 - 16.3	14.3	14.1	1.1
2	10.6 - 14.8	10.5 - 14.5	12.7	12.7	2.4
3	9.4 - 14.8	10.5 - 15.1	12.4	12.6	3.4

Results of 2nd Test.

Bundle No.	Range in M.C. Australia %	Range in M.C. London Docks %	Av. M.C. Australia %	Av. M.C. London Docks %	Max. M.C. Change of Individual Board %
1	11.6 - 16.1	10.1 - 15.4	13.6	13.3	2.7
2	9.5 - 15.9	9.9 - 14.7	13.1	13.1	1.4
3	11.1 - 14.8	11.4 - 15.4	13.2	13.2	1.0

In the second shipment, after the sample boards had been weighed at London Docks, there was a delay of eleven days before they were received at Princes Risborough. This delay coincided with a spell of exceptionally hot weather and it is interesting to note that in these eleven days, there was a bigger change in moisture content than during the whole voyage to England. This is illustrated by the following table -

Bundle	Ave. M.C. Australia 20/6/33	Av. M.C. London Docks 31/7/33	Av. M.C. Princes Risborough 11/8/33
1	13.6%	13.3%	12.7%
2	13.1%	13.1%	12.3%
3	13.2%	13.2%	12.1%

BLEACHING OF SATIN OAK (Embothrium wickhami).

Satin oak belongs to the same family as the silky oak group. It is sold in Melbourne under the vernacular name of "copper silky oak". The timber is flesh pink in colour showing broad brick-red rays on the quarter cut face and possesses the natural greasiness typical of members of the silky oak group.

Trials with several proprietary bleaches indicated that the timber was remarkably resistant to the bleaching action. Further experiments were then made at the Division of Forest Products using a number of chemicals including bleaching powder, potassium permanganate and sulphur dioxide, oxalic acid, 8% ammonia and 10 and 20 volume hydrogen peroxide. The results in every case showed at the best only a very slight bleaching action. Success was obtained, however, by the use of approximately 7% ammonia and 100 volume hydrogen peroxide. The exact method was as follows:-

(a) The ammonia (.880 ammonia mixed 1:4 with water) was rubbed well in to the surface to be bleached and allowed to dry for approximately 10 minutes.

(b) The 100 volume hydrogen peroxide was then swabbed liberally over the surface and allowed to remain in contact until dry. In some cases it was found advantageous after the application of the hydrogen peroxide to rub over again with the ammonia solution followed by a further application of hydrogen peroxide. Care must be taken, of course, to ensure that the peroxide is not allowed to come in contact with the hands.

NEW PUBLICATIONS ON TIMBER SEASONING.

Two new publications of interest to those concerned with the seasoning of timber have reached the Division of Forest Products recently.

The first of these is "Timber Drying and the Behaviour of Seasoned Timber in Use," by R.G. Bateson (Crosby Lockwood & Son Ltd. England; Australian Agents, Messrs. Robertson & Mullens Ltd., Melbourne - 16s. Aust.). The author is in charge of timber seasoning research at the Forest Products Laboratory, Princes Risborough, England and the book is a clear and simple explanation of essential facts relating to the drying of timber and the correct use of dry timber.

The other publication is "Lessons in Kiln-Drying" by Harry D. Tiemann (Southern Lumberman, Nashville, Tenn., U.S.A. - 2 dollars American). Originally published as a recently concluded series in the "Southern Lumberman", the lessons have now been published in the form of a convenient handbook with a very useful

index included. Mr. Tiemann, as Dry-Kiln Engineer of the Forest Products Laboratory, Madison, Wisconsin, U.S.A., is well known in Australia, and his latest contribution to the literature on timber seasoning will be welcomed by those who wish to make a close study of this subject.

RECENT PUBLICATIONS OF THE DIVISION OF FOREST PRODUCTS

New publications have recently been released by the Division.

C.S.I.R. Pamphlet No.81 - "The Properties of Australian Timbers, Part 3. *Pinus radiata* D. Don (*Pinus insignis* Doug.). Insignis, Monterey, or Remarkable Pine". (Division of Forest Products - Technical Paper No.28).

This pamphlet brings together the general results of studies conducted by the Division for some years on the properties of *Pinus radiata* and sets out other well-authenticated information that is available. The description of its properties and uses should prove of wide public interest as the species is destined to become one of the main sources of the future supplies of home-grown softwood in the Commonwealth.

C.S.I.R. Bulletin No.119 - "The Wood Structure of Some Australian Cunoniaceae with Methods for their Identification." D.F.P. Tech. Paper No.27).

This bulletin forms another of the series on the identification of Australian timbers and develops a key for the identification of members of the family Cunoniaceae which includes such woods as scented satinwood (coachwood), brown alder, rose alder, satin sycamore, brush mahogany, red carrobean, and white birch.

Trade Circular No.41 - "The Selection of Timber, Part 2. Structural Timber".

In this circular the various factors requiring consideration in selection of timber for structural purposes are discussed. A classification of structural timber into broad use groups is suggested. The influence of various characteristics on the strength of timber is discussed and guidance is offered in the preparation of specifications to ensure that certain grades will have certain percentages of the strength of clear timber.

Trade Circular No.42 - "The Selection of Timber, Part 3. Plywood - its uses and grading."

A short account of the history, advantages and uses of plywood is published in this circular together with the Australian Standard Specification for Plywood No. 0.6 - 1938.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

TURPENTINE OR LUSTER.

Turpentine and Luster are two names standardised for timber which, botanically, is known as *Syncarpia laurifolia*. The tree and the sawn timber are widely known as turpentine, the allusion being to the oleo-resin produced in small quantities by the inner bark. The name luster is used for dressed timber.

Distribution: The native habitat of the tree is along the eastern coast of Australia from the latitude of Bateman's Bay, New South Wales to Herberton on the Atherton Plateau in North Queensland. It reaches its best development towards the southern extremities of its range in the sheltered gullies of the coastal hills. It usually occurs in association with mixed stands of brush box, rose gum, blackbutt and red mahogany.

Habit: The tree itself attains a basal diameter up to 3 ft. 6 in. and a total height up to 140 ft. The bole, in general is relatively slim, clean, and covered with a thick, brown, fibrous bark longitudinally fissured.

Properties: The timber ranges in colour from red to reddish-brown. Its grain is interlocked and its texture fine to medium and uniform. It sometimes exhibits a wavy figure. In weight it is moderately heavy ranging from 53 lb. to 69 lb. per cu.ft. and averaging 59 lb. per cu.ft. when dried to 12% moisture content. Seasoning requires care to minimise warping tendencies. In drying from the green to 12% moisture content, its shrinkage averages 6½% of backsawn widths and 4% of quartersawn. The timber is rated high in durability being resistant to decay in exposed situations, resistant to all forms of borer infestation and particularly valuable for its resistance to marine borers. Its resistance to teredo is attributed to the oleo-resin present in the inner bark and, because of this, turpentine piles are usually driven with the bark still intact. Despite its vernacular name, turpentine is one of the least inflammable of Australian timbers. It is hard wood, strong and tough. It has a dulling action on saws and planer knives, but cuts crisply, turns well, takes a smooth finish and is readily polished. It bends satisfactorily when steamed.

Uses: Turpentine finds its widest use for structural purposes. It is in active demand for marine piling and for poles on account of its high durability, and for similar reasons is popular for use in house stumps, fence-posts and railway sleepers. It is valued in the shipbuilding trades for underwater planking and sheeting. For railway purposes it is used for wagon sheeting and for pillars. It is eminently suitable for girders and beams, and when used for wharf decking, it wears slowly and does not splinter. It has given long service as street paving blocks. In building construction it is suitable for plates, joists, studs, sills and steps. Its smooth surface, pleasing colour, freedom from defects and even wearing have made it a popular flooring timber and for this purpose it has won popularity under the name of Luster. It is reported to give satisfactory service for mallets and planers in printing works.

Availability: The timber is available from Queensland and New South Wales timber merchants in the form of sawn, hewn or round products.

BREVITIES.

Mr. I.H. Boas, Chief of the Division of Forest Products, and Mr. S.A. Clarke, Deputy-Chief, visited South Australia during December on Divisional business.

Miss A.M. Eckersley, Assistant, Wood Structure Section Division of Forest Products, resumed duty early in December after having spent extended leave in visiting various parts of Europe.

Many members of the timber industry will be interested to learn of the marriage of Mr. W.R. Ferguson, formerly Assistant, Utilisation Section, Division of Forest Products, to Miss J. Small on 24th. December.

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.85.

1st February, 1939.

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1939##085

SOIL AND FOREST PRODUCTS.

During the month of January, the twentyfourth meeting of the Australian and New Zealand Association for the Advancement of Science was held in Canberra. While this meeting contained much of importance and interest to the scientists of Australia and New Zealand, the deliberations in the various sections of the Association also had some considerable information for the practical man interested in problems related to forestry and forest products. Some short resumé of those papers which had some bearing on these and related subjects should, therefore, be of value to the reader.

In that section dealing with Chemistry, the presidential address was entitled "The Atmosphere as a Raw Material". While this subject, on first consideration, appears to have no relation to forestry, it was shown that the large forest areas of any country were of specific value to mankind in the absorption of carbon dioxide from the air. Further, the danger following the destruction of the forest areas of the world was pointed out. Another point stressed, and one that is not generally understood, is that approximately half the dry weight of any tree is carbon, which is all derived from the air.

In the same Section, there was a symposium on cellulose. While this chemical material is recognised as the main product of cotton, perhaps not everyone realises that it also forms some 60% of the dry weight of wood. Of interest, therefore, was one of the papers which dealt with the total carbohydrate fraction of wood, a substance given the name holocellulose. This paper referred to the fact that holocellulose makes up 75-78% of the total dry weight of wood and is of definite practical importance as a source of raw material for pulping and other industries. Cellulose from wood has also been used as the raw material for such products as artificial silk, cellophane, cinematograph film, etc. So, the practical man will readily realise the great importance of the large amount of scientific effort that is being expended both here and abroad in studying the chemistry and properties of the important total carbohydrate fraction of wood - holocellulose.

Problems encountered in the manufacture of pulp and paper from fibres derived from Australian woods were also discussed.

In the Sub-Section of Forestry, several interesting papers were listed on the programme, but unfortunately, those papers prepared by officers of the Victorian Forests Commission could not be given owing to the absence of the authors on duty in the bush fire zones in Victoria. One paper of interest dealt with the relation of wood anatomy to forest botany. It was pointed out that the scientist in the laboratory studying the structure of the wood of various species can often be of considerable assistance to the forester and taxonomist in classifying timber species. The practical value of correct classification of commercial species is not always realised, although the practical man is always requesting definite identification of his timber. The structure of the wood is often distinctive enough to enable correct identification and classification on that basis alone. Unfortunately, in a large genus such as

the genus Eucalyptus, identification on the wood alone is not always satisfactory. The plea was made for the collection of both botanical material and wood samples for identification and future reference.

At the Australian Forestry School, a most interesting demonstration was given of the stresses existing in a piece of green timber. This demonstration illustrated the facts brought out in Bulletin 22 of the Commonwealth Forestry Bureau on the "Fibre Tension of Woody Stems with Special Reference to the Genus Eucalyptus". In the test specimen, the release of the stresses caused a deflection of little over 1¼" in a log 10 ft. long.

In several papers given in the Section of Botany, the origin of Australian flora was discussed and evidence was given, on the one hand, of the influx of the Indo-Malayan type coming in from the North, and on the other hand, of the relation between certain Australian and South American types, with a special reference to the beeches (Nothofagus spp.) of both these countries. Another interesting point brought out in this discussion was the fact that of all the species of Eucalypts known, some 600, very few occurred in New Guinea as well as in Australia and only one species was found in the Philippine Islands and New Guinea, and not in Australia.

Those papers to which reference has been made, form only a small proportion of a host of interesting and informative subjects which were listed for discussion. They have been referred to specifically, because they have some more or less direct bearing on forestry and forest products. Several others, such as those relating to Virus Diseases, The Plant in Relation to Water, Recent Studies on Eucalyptus Oils, and Some Aspects of Plant Respiration, might also have been referred to, because of their direct bearing on everyday problems. However, sufficient indication has been given of the value of the purely scientific approach in the fields of chemistry, forestry, botany and other branches of science, all of which have a very great bearing on our utilisation of the products of the forest and of our better understanding of the growing tree.

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BUSH FIRE DAMAGE.

In the second week of January, 1939, severe fires swept forest areas in New South Wales, South Australia and Victoria taking heavy toll of life and property, and leaving in their wake appalling wastage. The destruction in Victoria was specially heavy and, still more unfortunately, was largely concentrated in belts of prime "ash" eucalypt forests. It has been announced that in the central division of these forests a log volume of timber in excess of two thousand million super feet was burnt, 39 sawmills destroyed and many lives lost.

The burden of the disaster on the timber industry and on the hardwood milling interests in particular is a heavy one. The forests to which the industry looked for its supplies for many years to come were laid waste. From the burnt area it has been estimated that nine hundred million super feet of logs are recoverable. A plan to salvage these logs before other destructive agencies make further inroads on their quality is now a matter of urgency. A committee representing sawmillers, timber workers, timber merchants, the Forests Commission of Victoria and the Division of Forest Products has been entrusted with the formulation of this plan.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

NORTH QUEENSLAND KAURI.

North Queensland Kauri is the standard common name of the timber known botanically as Agathis palmerstoni. It is the most important of three Kauris which grow in Queensland, the other two being Agathis robusta and Agathis microstachya.

The native habitat of the tree is in northern Queensland in regions with a 50 to 80 inch annual rainfall where it is found on the more exposed sandy, gravelly or stony soils. It is found chiefly in the highlands of the Cairns-Ravenshoe tableland at 2000 to 3000 feet elevation. The tree is large, averaging 12 to 14 ft. girth breast-high and a total height of over 100 ft. An outstanding characteristic is the more or less cylindrical shape of the trunk, the taper being much less than in most trees. The timber ranges in colour from almost white through cream to pale brown. It is usually evenly grown and does not show definite growth rings. The density at a moisture content of 12% ranges from 20 to 36 lbs per cubic foot, with an average of approximately 30 lbs.

It seasons satisfactorily in well ventilated stacks under cover. In drying from the green condition to 12% moisture content, backsawn boards shrink 3 to 4% in width and quartersawn boards 2 to 3%.

The timber is generally similar to the well known New Zealand Kauri but is somewhat softer and lighter; and coopers consider it more porous. Its texture is fine and compact and for a pine it is fairly tough. It is readily worked being easy to cut, nail, glue, stain and polish.

North Queensland Kauri is used extensively for cabinet work, joinery, panelling, framing, shelving, internal sheeting and flooring of houses and railway carriages. It is also used for planking light boats, for marine buoys and floats, for butter boxes, pats, churns and moulds, for broom handles and turnery, while for pattern making and templets it has a high reputation. Coopers use it for staves in tallow barrels and casks. The timber makes satisfactory drawing and blackboards, and is used in the musical world for piano cases and bellies of violins.

The timber is available in seasoned boards, veneer and plywood.

Additional information about 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.

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PLYWOOD TRENCH SHEETING.

A recent issue of the American Timberman contains an interesting account of the method whereby concrete form panels of Douglas fir plywood have been used as sheeting material replacing the customary trench support of timber sheeting, wales and braces. The panels are held in place by special screw trench jacks. The new system was tried out over four large sewerage projects giving every satisfaction and effecting considerable savings due to reduction in trench width, ease in handling and elimination of wales. Savings in labor costs of up to 50% and in material costs 80% have been recorded by the use of the sheeting.

The plywood used was all of concrete form grade, manufactured with a special water-resistant glue and is designed for repeated re-use.

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BREVITIES.

The meetings of the Australian and New Zealand Association for the Advancement of Science held in Canberra in January were attended by Dr. W.E. Cohen, Mr. H.E. Dadswell, Miss D.J. Ellis and Dr. T.M. Reynolds of the staff of the Division of Forest Products.

Mr. W.L. Greenhill, officer-in-charge, Section of Timber Physics, Division of Forest Products, returned to Melbourne after spending 10 months' study leave overseas. While abroad he renewed contact with forest products research activities in laboratories in Canada, United States of America and England, and also presented a paper at the Fourth International Conference on Timber Utilisation held in Brussels in September, 1938.

Mr. A.J. Thomas, Assistant, Section of Utilisation, Division of Forest Products, spent some weeks in January enquiring into timber utilisation activities in Tasmania.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.86.

1939##086 1st March, 1939.

WOODEN VERSUS STEEL WINDOWS.

The wisdom of using for a particular purpose the material best suited to that purpose cannot be denied. Mere substitution of a newer material, however, does not always imply acceptance of this principle but rather a concession to the dictates of fashion or of modernism. Many substitutes for timber have come into use only because they are better advertised and better serviced. Their claims give prominence to their newer features and overlook the records of service by the material they are displacing. Many of these new ideas find a wide market not because of greater efficiency or cheapness, but because some organisation is prepared to spend money in popularising them.

When the merits of rival materials are compared critically, it is frequently found that timber can more than hold its own and one of the instances in which an excellent case can be made out for the wooden article is in connection with the use of timber for wooden windows. Such a case has been prepared by the Timber Merchants' Association of Western Australia in conjunction with the Forests Department of that State, and in it the following virtues of wooden construction are elaborated:- Wooden-framed windows are stated to cost up to 33% less than the cost of equivalent steel-framed windows exclusive of the cheaper cost of glazing and fixing. A longer life is claimed for the wooden frame especially in a country where they are constructed of a particularly durable timber. The wooden frames are easier to repair and occasional breakages can be dealt with by a carpenter without removal of the wall. Lower maintenance is claimed and also freedom from the rust problem which is a serious factor in causing rapid depreciation of steel frames in many buildings. Greater safety in case of fire, less air leakage, better heat insulation, quietness in operation, greater ease in cleaning, greater ease in fixing blinds and screens are among the formidable list of advantages which are quoted and supported by letters and references.

STRENGTH OF AUSTRALIAN TIMBERS.

The Division of Forest Products is actively engaged in determining the mechanical and physical properties of Australian timbers. These tests are carried out on small clear specimens generally according to the method adopted in English-speaking countries and standardised by the British Standards Institution and the American Society for Testing Materials. The results are therefore directly comparable with those on overseas species, and one of the most valuable features of the tests is that they enable the properties of a species to be compared with those of other species with which it may come into competition.

This part of the Division's work is carried out by the Section of Timber Mechanics. The general procedure is to select trees from sources representing the climatic range of the timber, to convert these into test specimens in the Division's sawmill according to a standardised plan, and to subject the specimens to a systematic series of tests to determine their bending, compressive, shear and cleavage strengths together with their toughness and hardness. Half the material is tested in the green condition and half after air-drying to 12% moisture content. A complete investigation for one timber involves the preparation and testing of over 2,000 specimens followed by computing and mathematical analysis to determine the species average properties and the significance of variations.

Strength figures have to date been published for karri, hoop pine, brown mallet and radiata pine. Testing has been completed on cypress pine and is proceeding on jarrah, red tulip oak and spotted gum. In order to facilitate comparison of these results with the strength of imported timbers commonly used in Australia, a useful summary of their properties has been prepared. This information is available on request to the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne.

RESIN TREATED PLYWOOD.

The success of plywood for outdoor purposes depends largely on the development of treatments to prevent cracking, splitting and weathering. When such treatments become effective an economically practicable plywood should prove a highly satisfactory outdoor material that may be used without requiring paint. Realising the immense practical significance of such developments, the Forest Products Laboratory at Madison, Wisconsin, U.S.A., has for some years included in its research program a study of plywood treatments.

The method followed at the Madison Laboratory is to form synthetic resins within the fine capillary structure of wood veneers. If green, the veneer is first soaked in a mixture of phenol and formaldehyde, together with a catalyst (sodium hydroxide) dissolved in water; if dry, the veneer is placed in a treating cylinder and impregnated with a similar mixture. The phenol-formaldehyde solution has a great affinity for wood, as is shown by the fact that the wood swells more in it than in water alone. The green veneer is allowed to stand in the resin-forming solution a sufficient time to allow it to diffuse into the cell walls. With dry veneer, the wood remains in the solution in the treating cylinder only long enough for the coarse capillary structure to be impregnated. The veneer is then removed from the cylinder and stacked under non-drying conditions for several days so that the resin-forming solution can diffuse from the coarse capillary structure into the cell wall. The wood is then cured at about the boiling point of water. This heat treatment causes the phenol and the formaldehyde to react to form a resin which is water-insoluble.

The treatment appears to impart permanent non-checking and non-shrinking properties to the wood and the wood can be subsequently cut and nailed without affecting the treatment. Plies that have been treated by this method have been successfully assembled with the different types of commercial glue, also unfinished resin-glued plywood with treated face plies shows a marked decrease in face checking under exterior weathering conditions as compared with standard resin-glued plywood. Treated fancy crotch veneer also shows less tendency to crack and check.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

Messmate stringybark.

Messmate stringybark is the name proposed for standardisation for the timber known botanically as *Eucalyptus obliqua*. It is also well known by the names of brown-top stringybark, stringybark, messmate, and Tasmanian oak.

This timber is widely distributed in eastern Australia, being found in Tasmania, Victoria, New South Wales, and to some extent in South Australia. In Tasmania, it is found throughout the whole forest area except parts of the west coast. It is the principal eucalypt of the north-west coast and with *E. regnans* forms the bulk of the timber in the south. In Victoria it is well distributed on the lower elevations of the highlands. In New South Wales it occurs in the eastern side of the southern tableland and on the eastern edge of the northern tableland to near the Queensland border.

The tree itself is often large, attaining a height up to 250 ft. and a butt diameter of 10 to 12 ft. in some localities. The stringy bark, thick and fibrous in the trunk, extends right out to the branchlets.

The timber is generally pale brown to brown in colour, the sapwood being paler than the truewood. It is of open texture, usually straight grained, although sometimes interlocked, and its growth rings are fairly well defined. Its properties are generally similar to those of mountain ash (E. regnans). Its figure is not prominent, but may sometimes be fiddleback ed. It is one of the lighter-weight eucalypts, ranging in density after reconditioning from 34 to 52 lb./cu.ft. and averaging 43 lb./cu.ft. at 12% moisture content. In drying from the green condition to 12% moisture content, the shrinkage after reconditioning averages 7% for back-sawn widths and 4% for quarter-sawn. Seasoning requires similar care and longer time than mountain ash and boards are generally quarter-sawn to minimise degrade. It responds to a reconditioning treatment. The species is considered to be somewhat more durable than mountain ash, but its sapwood is more prone to infestation by the powder post borer. It is slightly harder and stronger than mountain ash. It is readily worked with hand or machine tools. It is readily glued, stains well, can be fumed to a greyish colour and takes a good polish.

Messmate stringybark is suited to a wide range of uses in both the construction and manufacturing fields. In general building practice it is used for studs, bearers, rafters and joists. In its higher qualities it is valued for flooring, weatherboards, interior trim, panelling, cabinet work, motor bodies and furniture. In Tasmania it is popular for posts, poles and piles, for wharf construction and railway sleepers. It is in active demand for palings and fencing. It is used also for mine timbering. Considerable quantities of the timber are manufactured into cases and it has been successfully used for export wine casks. It makes excellent wood wool. It has been successfully manufactured experimentally into newsprint paper.

The timber is available in a wide range of scantlings, boards, joinery sizes and milled products. Stocks are held by most timber merchants in Tasmania and Victoria and to a lesser extent in New South Wales.

Additional information on this timber is available from the forestry authorities in New South Wales, Tasmania and Victoria, and from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne.

BREVITY.

Mr. C. Ellis, B.E., Officer-in-Charge, Investigations Section, Queensland Forestry Sub-Department, is spending several weeks at the Division of Forest Products inquiring into research activities relating to Queensland timbers.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.87.

1939##087 3rd April, 1939.

TIMBER SALVAGE.

The salvage of fire-killed timber made necessary by the fires in January, 1939, in the Victorian "ash" eucalypt forests is a problem of considerable magnitude. Some 900 million super ft. of logs, it is estimated, are recoverable from the burnt-over country. This is equivalent to approximately six times the normal annual cut of the Victorian sawmilling industry prior to the fires and, even if this cutting capacity were restored immediately by rehabilitation of razed mills, it is more than likely that destructive agencies will seriously reduce the recoverable volume of timber unless special measures are employed to fell quickly and to preserve the burnt trees. No undertaking of corresponding urgency or magnitude has previously been necessary in Australian sawmilling history. The past, therefore, cannot reveal a fully adequate program, although the experience of those who have milled tracts of timber affected by various destructive agencies can contribute to planning the details of salvage operations.

It is interesting to mention that similar problems have at times been faced in countries overseas. Particulars have just come to hand of the damage caused by a hurricane which swept through the north-east of United States of America in September 1938. This confronted the New England timber industry with the problem of salvaging 1500 million super ft. of timber, representing five times the total annual cut of the region. The danger faced after this hurricane was due to the immense fire hazard in the wind-thrown forests, haste being necessary to reduce this hazard and to re-open communications and fire detection systems, as well as to salvage the timber before desiccation, stain, borers, fungi or other destructive agencies reduced the value of the timber. An administration was quickly set up to organise essential activities and in three months a labour force of some 17,000 was working under its direction. The administration in co-operation with the Forest Products Laboratory, Madison, Wisconsin, also prepared a statement of "Pertinent Facts on Salvage of New England Timber". This statement refers to many subjects related to timber salvage and states:-

> "The length of time that logs can safely be held after cutting depends upon the season and the method of storage. During a normal winter in New England there is no danger from insects, stains or decay, but hardwood logs held into late spring or early summer may deteriorate seriously unless preventative measures are taken.
>
> Submersion.
>
> Complete submersion in fresh water is the surest way to avoid deterioration; logs and timbers can be kept in sound condition for many years in this manner. Submersion in tidal or brackish water is unsafe because the wood may be damaged by marine borers. For worthwhile results, the logs must be submerged before they begin to deteriorate. Submersion will soon halt the progress of insects, decay or stains that may have started but it cannot undo any damage that has already taken place. Deep water submersion involves high cost of raising and recovery. Only shallow water submersion can be considered. With floatable softwoods

additional difficulties are introduced for forcing the logs underwater, anchoring them or of keeping the top logs protected.

Dry Storage.

Hardwood logs stacked as cut are considered unable to stand dry storage over a summer, as American hardwoods stain in the sapwood in that period. End checking, which will also occur, and stain can be minimised by suitable treatment.

Water Sprays.

Logs may be stacked and kept in green condition free from deterioration from stain, decay and insects for an entire summer and probably longer if the stacks are kept wet by continuous water sprays. Experience with pulpwood storage and with log storage has shown that the logs should be stacked in rows so that both ends of each log are exposed to the direct action of the sprays.

At one plant which used this method successfully for several years on birch logs, sprays of water were directed diagonally downward upon the ends of the stacks from fixed spray heads located well beyond the stack ends. Spray nozzles such as used in spraying trees were found to be suitable. Enough water must be used to keep the stack enveloped in a light mist, otherwise drying will take place from surfaces not directly exposed to the action of the sprays.

Chemical Log Sprays.

In the absence of severe insect infestations, spraying the ends and barked or peeled areas of freshly cut logs with a 5% solution of Dowicide H, Santobrite or Permatox, or a 2% solution of Lignasan, should substantially retard the occurrence of blue stain in the sapwood during storage periods as long as 3 months. Insects are a major source of blue-stain infection and in the event of their attacks becoming prominent it is unlikely that a spray treatment would pay.

It is very important that the spraying be done within 48 hours after the logs are cut or peeled. Logs having splintered ends should be cross-cut to fresh wood before spraying. Spraying over the bark is not worth while.

The chemical solution may be applied with an ordinary garden spray of medium capacity.

End Coating.

To control end checking in logs certain coatings may be used. To be worth while, coatings must be applied before the logs have begun to dry out and end check. After checking has advanced beyond the hair-check stage, there is little value in end coating."

The Special Committee which has already formulated the salvage proposals in Victoria has based its recommendations on principles substantially in accord with the foregoing statement. It has proposed submersion of logs in all locations where this is practicable and considered dry storage, spraying and coating.

"VENEER TRIMMED MOTOR CARS."

A number of American journals have given prominence recently to a new and unique use for veneer, namely, in the trimming of motor cars. As yet the new development has been confined to cars in the higher price range, e.g. Lincoln, Packard and Cadillac, but

the opinion is advanced that the idea will soon be extended to cars in the medium price range.

The new material is known as "Feltwood" and has been developed by "The Smith Veneers Inc." Chicago, U.S.A. "Feltwood" comprises one, two, or three-ply, resin bonded to a layer of hair. The two-ply type with the grain of the plies running parallel has been used in automobile work. This panelling material is exceptionally light in weight, 3 square feet, weighing less than one pound. Thus the additional weight is negligible and the fastenings need not be of great holding capacity. Being resin bonded, the material is naturally waterproof. The bonding operation is carried out in a standard type hot press.

This material offers many advantages from the aesthetic point of view as it is available in a variety of colors and classes of veneer (including Queensland walnut). Thus the right quality can be selected to harmonise with various colors and types of upholstery. It also has a definite utilitarian value as it possesses excellent sound-deadening qualities for little noise can be transmitted through the layer of hair felt. It also insulates against cold on the outside. It can be readily bent to a small radius and is easily applied to a flat surface. It possesses a peculiar degree of resilience and will withstand hard wear and knocks. Altogether it appears a material well suited to the purpose under consideration.

RECENT PUBLICATIONS OF THE DIVISION.

The Division of Forest Products has recently issued the following publications:-

C.S.I.R. Bulletin No. 124 "The Wood Anatomy of some Australian Meliaceae with Methods for their Identification" (Division of Forest Products Technical Paper No. 31, by H.E. Dadswell,M.Sc., and Dorothie J. Ellis, B.Sc.)

The woods discussed comprise the mahogany family which supplies a large variety of cabinet and furniture timbers.

C.S.I.R. Pamphlet No. 86 - "A Study of the Pulping Properties of Three Trees of Euc. sieberiana using the Sulphate Process" (Division of Forest Products Technical Paper No. 29) by J.C. Cavanagh,B.Sc., H.E. Dadswell, M.Sc., A.W. Mackney, M.Sc., and T.M. Reynolds, M.Sc., D.Phil.

C.S.I.R. Pamphlet No. 87 - "The Mechanical Properties of South Australian Plantation-grown Pinus radiata (D.Don)" (Division of Forest Products Technical Paper No. 30) by Ian Langlands, B.E.E.

Trade Circular No. 43 - "Figure in Timber".

No. 87.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

BLACKBUTT.

Blackbutt is the standard common name of the timber known botanically as Eucalyptus pilularis. This name, which is used throughout the range of its occurrence, is suggested by the charring by bush fires of the fibrous bark at the base of the trunk.

This species is distributed along the coastal belt of eastern Australia. It extends from the Victorian-New South Wales border northwards to Fraser Island in Queensland. It is one of the most common trees in these coastal forests and flourishes best on well drained sites within the continuous rainfall belt.

The tree itself attains a height up to 150 feet and has been recorded as attaining an extremely large butt diameter of 14 feet. Ordinarily its butt diameter is about 3 feet. It is a fast growing and sturdy tree. Its bark is coarse and fibrous at the butt changing above this to smooth white gum-type which then extends throughout the trunk and branches.

The timber is light-brown to brown in colour but when freshly cut sometimes has a pinkish tinge. It is of open texture and is usually straight grained, or sometimes slightly interlocked. Small gum veins are characteristic. It has no special figure. It is of medium density ranging from 43.5 to 62 and averaging 53 lb./cu.ft. when dried to 12% moisture content. Seasoning may be carried out without much difficulty although some checking of backsawn material is difficult to avoid. It may be kiln-dried green off the saw but partial air-drying followed by kiln drying is more economical. Collapse is not common but a final steaming treatment is beneficial in reducing warping. In drying from the green condition to 12% moisture content its shrinkage averages 6% across backsawn widths and 3% across quartersawn. It is ranked about equal to spotted gum in durability. It is somewhat hard, strong, stiff and tough. It is readily worked with hand or machine tools.

Blackbutt is most useful as a timber for general construction. It is largely used for bearers, joists, plates, studs, rafters and battens in dwelling construction. It is in good demand for flooring and weatherboards. It is recommended for general house carpentry. In tram cars or railway carriages it is used for body framing and pillars. It finds some market for bridge planking, sleepers, electric transmission poles and cross-arms. It is sought after for splitting into posts, rails, and palings. It has been used satisfactorily for paving blocks. It is a source of charcoal in Queensland. It makes satisfactory wood wool.

The timber is relatively plentiful and is likely to become increasingly important among the hardwoods of eastern Australia. It is available in a full range of scantling sizes, as boards and as milled products. Stocks are held by most timber merchants in New South Wales and southern Queensland.

Additional information on this timber is available from the forestry authorities in New South Wales and Queensland, and from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne.

No. 87.

BREVITIES.

Mr. I.H. Boas, Chief, Division of Forest Products, visited South Australia during the month on Divisional business.

Mr. S.A. Clarke, Deputy-Chief, Division of Forest Products, has been granted leave of absence in order to undertake investigations relating to a realisation plan for plantation softwoods in New Zealand. His program embraces a study of timber utilisation practices in American and European centres followed by organisation of conversion practice in New Zealand.

Mr. H.B. Wilson, Assistant, Section of Preservation, Division of Forest Products, has been awarded a senior research studentship by the trustees of the Science & Industry Endowment Fund. He left Melbourne on 27th March on the "Mariposa" bound for United States of America. After spending 8 months, principally at the Forest Products Laboratory, Madison, Wisconsin, he will proceed to England and complete the tenure of his 12 months' studentship at the Forest Products Research Laboratory, Princes Risborough, and in various European centres. His studies will be directed towards timber preservation practice.

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.88.

1939##088 1st May, 1939.

THE REMOVAL OF BROWN STAINS FROM PAINTED WEATHERBOARDS.

The Division of Forest Products was recently consulted regarding the cause, removal and prevention of brown stains which had disfigured painted weatherboards on houses in the suburbs of Melbourne. The staining had developed after the heavy rains which marked the break of the dry conditions of the summer. As similar staining has occurred in various localities, it is possible that the remedy found in this case might prove widely applicable.

The chief occurrences of the stain were on houses whose walls were covered with hardwood weatherboards milled from "ash" eucalypts which had been nailed in position on the walls of the houses before painting. Investigations revealed that the staining was due to the deposition on the paint of a water-soluble extract from the hardwood weatherboards. Evidently water had penetrated between the overlaps and had been able to dissolve some of the soluble tannic substances from the overlapped surfaces unprotected by paint. The deposition of this extract on the painted surfaces gave rise to the disfiguring brown stain.

Other houses with walls of baltic weatherboards were affected occasionally by similar stains derived from hardwood. The most common of these were found when hardwood mouldings were used under window sills, and much less seldom by stains derived from hardwood studs.

Removal: In many instances the stain can be removed by washing with soap and water, but to say the least, this method is laborious. It was demonstrated that a brush treatment using a 5% solution of oxalic acid in water removed the stain readily, and this is the treatment recommended.

As oxalic acid is somewhat poisonous, it is advisable to wash the boards with water to remove the acid from the wall. This washing would be necessary, however, to remove the dust from the surface of the paint, otherwise a blotchy appearance would remain after the oxalic acid treatment.

Further staining may occur on the houses already affected, when conditions are suitable for the penetration of water between the overlaps of the boards and cause trouble until all the substance which causes the stain has been leached out.

Prevention: As a means of prevention of the stain, it is recommended that the priming coat of paint should be applied to the face, ends, and a strip at least two inches wide at the lower edge of the back of each weatherboard before it is fixed in position on the wall. This coat should protect the boards from the solvent action of water on the staining substances in the wood. Observations for the occurrence of staining on houses whose weatherboards have been so treated will be made by the Division of Forest Products, and results will be recorded in future news letters.

Note: Oxalic acid may be obtained from chemical suppliers at about two shillings per pound.

A 5% solution consists of five parts of oxalic acid in 100 parts of water by weight, e.g., 1 lb. oxalic acid in 2 gallons of water. The use of warm water will facilitate the solution of the acid, and the stain will be removed somewhat more readily.

ANTI-WOOD PROPAGANDA CONDEMNED BY FIREMEN.

Timber's indisputable record as a structural material is the sole barrier to those proponents of fire prevention laws which would compel builders to construct on the principle of a stove. Such proponents seek laws requiring materials that will permit the entire combustible contents to be destroyed by fire without serious structural damage to the building, utterly disregarding the presence of adequate fire fighting facilities on the one hand and the resultant heavy increases in building costs on the other.

This statement comes not from a timberman, but from an official publication of a Firemen's Association, which contends that the fire hazard in wood construction is exaggerated. They claim that all firemen know there are a number of types of timber construction which meet all practical tests of fire protection and are at the same time an economy to the builder. Firemen know that a one-hour cribbed wood partition will give all the time they need to control a fire. They also have scores of records where buildings have been saved by structural timbers which stood up while steel girders and trusses gave way.

"Incontrovertible evidence bearing on the action of wood under actual fire conditions has been made available", says the Fire Station Digest, "by a committee that studied fires in tenement houses in New York City, using the records of the fire department as a basis. Their study determined that wood was responsible for the spread of only nine (9) out of every 10,000 fires and they concluded that the limited use of natural untreated wood involved a fire hazard so imperceptible as to be incapable of definition and that for all the practical purposes it involved no fire hazard whatsoever."

Recently the California State Harbor Commission in San Francisco credited laminated redwood roofing and Douglas fir structural timbers with definitely checking what might have been a disastrous water-front fire. Original loss estimates £750,000 were reduced to a bare £150,000 when a final appraisal showed the roof to be relatively undamaged and the timbers containing 80 per cent. salvage. Surrounding property was undamaged.

Again at Eureka, California, a £50,000 wholesale bakery fire was checked within laminated 4 x 2 redwood firewalls, with adjoining jewelry and wholesale automobile supply companies suffering only water and smoke damage. Despite the extreme heat within the fire area, firemen reported that the redwood firewalls could have held the fire for at least another hour before breaking through.

Considering these and many other similar circumstances, it is pointed out that it is the duty of firemen whenever their building laws are formulated or amended, to guard against extremes in too little protection and too expensive demands in fire resistive construction. Every unnecessary expense put into fire protection is a burden on the entire community.

Timber meets a real construction need in every city and unnecessarily barring or limiting its use deprives taxpayers of an economical building material and penalizes a great industry.

GRADING RULES FOR MILLED FLOORING, LINING AND WEATHERBOARD.

In 1934, the Standards Association of Australia published under one cover Australian Standards No. 0.3 - Milled Flooring, No.0.4 - Milled Lining and No. 0.5 - Milled Weatherboard. The scope of the original grades has since been expanded and, as additional parts have been added and others revised, it has been decided to issue all three sets of grading rules as separate publications. The revised 1939 editions are now available gratis at any of the offices of the Standards Association.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

SILVER ASH.

Silver ash is the common name of a group of timbers belonging not to the true ash genus Fraxinus, but to the genus Flindersia. The chief species of the group are described botanically as Flindersia bourjotiana (Queensland silver ash), Flindersia pubescens (northern silver ash) and Flindersia schottiana (Southern silver ash). The last named is also known as bumpy ash in Queensland, and as cudgerie or stavewood in New South Wales.

Southern silver ash is distributed in the coastal scrubs ranging from the Hastings River, New South Wales, northwards to the Herberton district in Queensland. Northern silver ash and Queensland silver ash occur in the jungles of north-eastern and south-eastern Queensland.

A moderately large tree, silver ash has a hard smoothish grey bark which when cut with an axe has a definite raspberry odour. It attains an average height of about 100 ft. with a breast high diameter of about 2 feet 6 inches.

The timber varies in colour from a very pale brown to a light yellow brown. The grain generally is straight but may be somewhat interlocked or wavy. There is very little figure in silver ash, although when present it is ribbon like or wavy, due to grain variation. In density it ranges from 29 to 56, averaging 43 lb. per cubic foot when dried to 12% moisture content. It is similar in strength to mountain ash and is slightly tougher. Silver ash seasons well and quickly without tendency to warp or twist. When dried from the green condition to 12% moisture content, its shrinkage is low, being 5.5% in back-sawn boards and 3.5% in quarter-sawn boards with a possible increase up to 1% due to collapse. It is easy to work with hand or machine tools. It bends well. It peels and slices readily, glues easily and finishes well in its natural colour, but filling and staining require care.

Silver ash has a wide range of uses, its light colour, toughness and flexibility being special advantages. In general building it is highly favoured for linings, ceilings, partitions and indoor finishing and it makes excellent flooring. In railway carriage construction it is used for body-framing and internal fittings, and it is used for the heavy framing of agricultural machinery. In motor bodies it is used for roof and hood sticks and bows and for seat legs, backs and pillars. It has found some utilisation in air-craft construction for body framing. It is highly regarded for ribs in boat building and is said to give long life in masts and spars and to be used for sail slats It makes excellent oars and sculls. The cooperage industry has found it suitable for staves of tallow and meat casks. Handle manufacturers use it in the production of small handles, such as for hammers and mallets; for handles of shovels, spades, hoes, rakes and forks; and to a lesser extent, it is used for handles of scythes, axes, adzes and picks. Various items of sporting equipment such as tennis racquet frames, baseball bats, shafts of billiard cues, and cricket stumps are made in silver ash. It is used for tripods of instruments. It is an excellent timber for interior decoration as it contrasts effectively against the darker coloured woods. Being a fancy wood and suitable for inlay work it is worked into jewel boxes, glove boxes, desk supplies, including paper weights, rulers and inkstands, pin trays, serviette rings, umbrella handles and walking sticks. It is suitable for pegs. It is a good cabinet timber and makes attractive furniture. In joinery it is used for window sashes, doors, panelling and detail work.

The timber is available in the form of boards, planks and scantlings and as veneers and plywood. Plywood door panels ready-cut to size are marketed.

Additional information on this and other Australian timbers is available on application to the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne, S.C.4, or to the Queensland and New South Wales Forestry Departments.

AN AUSTRALIAN TREE ABROAD.

The establishment of extensive plantations of coniferous trees has been an important forestry activity in many parts of Australia, especially in the last decade. These plantations, it is hoped, will largely meet future demands in Australia for softwood timber. The most promising species and most commonly planted are of overseas origin.

While our future needs are likely to be met thus by local growth of overseas softwoods, some overseas countries have planted our Australian hardwoods to meet their future needs for hardwoods. Various Australian eucalypts have been planted abroad. Perhaps the most widely used is Tasmanian blue gum (Eucalyptus globulus, Labill).

A recent description of timbers used in the Republic of Ecuador, South America, makes known the success that has been attained there with this timber. Eucalyptus globulus was introduced by President Garcia Moreno in 1865 and is now perfectly acclimated in all the Sierra del Ecuador region between 6500 and 7200 feet above sea level. The original tree is on a country estate in Ambata. This species is the timber saviour of the Sierra del Ecuador, supplying fuel, construction lumber, and material for making ordinary kinds of furniture.

BREVITIES.

Mr. I. H. Boas, Chief, and Dr. W. E. Cohen, Officer-in-Charge, Chemistry Section, Division of Forest Products, are at present visiting Tasmania on business associated with the Division's investigations on pulp and paper making.

Mr. S. A. Clarke, Deputy-Chief, Division of Forest Products, left Australia on April 13th on leave of absence to undertake investigations abroad on behalf of New Zealand Forest Products Ltd. His investigations, which are expected to last over twelve months, will be related to the formulation of a plan for the realisation of plantation forests.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.89.

1939##089 1st June, 1939.

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PRIMING FOR JOINERY.

Timber has lately been threatened by substitutes in some fields of use. In joinery, for instance, substitutes claiming superiority over wood have attained a certain popularity and, as yet, the timber industry has not generally adopted manufacturing practices which would improve its products in the characteristics most commonly challenged. Although silent regarding their own liability to rust, their expansion or contraction with changes in temperature, their poor insulating properties and their availability in only a restricted range of designs, these substitutes actively publicise their immunity from the effects of humidity. But few are the wood joinery manufacturers who combat the challenge by adopting priming as a standard manufacturing practice, or who instruct their clients in its advantages or who are fully aware of its effectiveness in adding to satisfaction in service.

Priming is the coat of paint first applied to a surface. In the past it has been regarded as the first bond between the wood and the subsequent coats of paint and there has been recognition of the part played by this bond in preserving the integrity of the whole outer paint system. But its benefits are wider. It is also a protection against the action of humidity.

Two essentials of satisfactory joinery are, firstly, adequate seasoning and, secondly, proper priming. Until wood reaches a moisture content in equilibrium with its environment, it yields up or absorbs moisture, and changes correspondingly in width and thickness For most timbers in different parts of Australia, the equilibrium condition indoors is between 10 and 15% moisture content. Once it has reached equilibrium over its whole section, wood changes only slightly with weather conditions.

In building practice, however, conditions more severe than those of the weather have to be guarded against. The concrete and masonry in a new building are practically saturated with water for some time. Where poor construction methods are adopted, the frequent lack of efficient damp courses or the inadequate provision of devices for shedding water from the eaves may keep the brickwork damp, so that it will act as a constant reservoir of water for the timber and the frames and sills may be fitted in a manner conducive to the collection and infiltration of water. Contact with wet ground or exposure to heavy rain must also be reckoned with. In these circumstances, unprotected wooden surfaces will absorb moisture, the rate of absorption being most rapid along the end grain, and swelling will result. This movement will damage joinery fittings and its effect may become more unsightly and troublesome after the affected fittings re-dry to their final equilibrium condition. It is therefore necessary if timber is to be protected from these hazards which are beyond the control of the timberman, but which influence the satisfaction given by his products in service, to take steps to preserve the standard attained by proper seasoning and good workmanship. A priming of high moisture excluding efficiency should provide the necessary protection

A priming coat, properly formulated and applied in the joinery factory, should be most advantageous. Once door frames, window frames panelling and other fittings have been built in position, the backs a ends of the timber cannot be given further paint coats, and the only resistance to the passage of moisture into the wood is provided by the priming coat. Premature paint failure, especially with coniferous softwoods, often is attributed to inefficient back priming before fixing in position.

The priming paints to be successful should therefore:-

1. Offer and maintain resistance to the passage of moisture so as to reduce to a minimum the variation in moisture content induced in wood by contact with rain or with wet constructional materials during and after erection.

2. Adhere well to the surface of the wood and maintain that adherence through the life of the paint system.

3. Provide a good surface for subsequent paint coatings.

4. Be sufficiently strong and elastic to accommodate any dimensional changes in the structure, such as must inevitably occur as a result of seasonal variations.

Where knots are present in joinery timbers, two coats of knotting varnish should be applied to both the face and back of the knot to prevent ingress and egress of moisture, as conduction is effected more easily through the longitudinal elements of the knot than transversely through the face of the timber.

Priming paints are of various kinds and those commonly used may be classified as follows:-

(a) Lead priming - consisting mainly of white lead, with or without red lead, in linseed oil.
(b) Zinc priming - consisting mainly of zinc oxide incorporated in a suitable oily medium.
(c) Inert pigment priming - containing inert pigments as lithopone, titanium dioxide, or barytes in different types of oily media.
(d) Flake pigment priming - usually aluminium in oil varnish.
(e) Mixed priming - consisting of two or more of the above in admixture.

Experiments conducted overseas carrying out tests on the effectiveness of various priming paints on coniferous softwoods indicate that for exposed situations and back priming well prepared lead and flake priming paints are most satisfactory. The importance of using properly seasoned wood is stressed if flake priming paints are used since the moisture movement caused by drying out under flake primed wood will lift the film from the wood and cause blistering of the paint system.

Recommended Procedure.

1. Timbers for joinery stock should be properly seasoned -

Exterior situations - Moisture content 12-20%.
Interior " - " " 10-15%.

Kiln drying is preferable with resinous timbers.

2. After dressing and cutting to sizes before fitting every knot and an area about one inch around it should be covered with two coats of knotting varnish. Each end of a knot should be treated.

3. Immediately before assembly a coat of priming should be applied to all surfaces. Particular attention should be given to ends of pieces which should receive two coats. The second coat should not be applied before the first is dry. Well prepared priming as under headings (a), (d) or (e) above should be used for joinery timbers which may be subjected to wet conditions, but for interior situations any class of priming will be suitable. Application by brushing is preferable, sufficient time being allowed to work the paint well into crevices and pockets. Spraying is not recommended, but if adopted, two or three even thin coats should be applied.

4. When the priming is dry, the pieces should be fitted together erected, and painted as soon as possible.

THE DURABILITY OF WATER-RESISTANT GLUE JOINTS.

Controlled exposure tests on birch plywood have been conducted for several years at the Forest Products Laboratory, Madison, Wis., U.S.A., in investigating the durability of glue joints. Results of this work now published afford a clear picture of the capabilities of modern types of glues. The following is a summary of the experiments and conclusions:-

Previous tests have shown that:

(a) Age, in itself, is not a cause of failure of well made glue joints.

(b) The commonly used woodworking glues are capable of producing joints that are permanently durable so long as the conditions of service do not exceed certain limits.

(c) When a well made glue joint fails in service, the cause may be chemical hydrolysis of the glue itself, destruction of the glue by micro-organisms, or softening and weakening of the glue from absorption of water. These factors are usually combined with and exaggerated by the mechanical stresses developed on the joints as the wood changes dimensions because of changes in moisture content.

The common woodworking glues may produce strong joints in the dry condition, but soften to a greater or less degree when soaked in water. Artificial resin glues, however, give high joint strengths together with a very high resistance to softening in water and, consequently, a high degree of resistance to mechanical stresses.

In the present series of tests, 1/16" birch veneer was glued-up into 3-ply using artificial resin, casein, and blood albumen adhesives. After conditioning, the panels were cut into the standard plywood test specimens. Groups of specimens glued with the various adhesives were then submitted to the following tests:-

(a) Soaked continuously in water at room temperature.

(b) Exposed continuously to 97% relative humidity at 80°F.

(c) Exposed to a repeating cycle consisting of 2 days soaking in water at room temperature followed by drying for 12 days in 30% relative humidity at 80°F.

(d) Exposed to a repeating cycle consisting of 2 weeks in 97% relative humidity at 80°F. followed by 2 weeks in 30% relative humidity at 80°F.

Specimens from each group were then tested at intervals over four years

The following conclusions were arrived at:-

1. Joints made with artificial resin glues of the phenolic type will satisfactorily withstand four years of exposure to extremely severe test conditions. These glues do not appear to soften or hydrolyse on continuous soaking in water and the joints are not affected by moulds, although the presence of the mould resistant glue line did not protect the wood itself from the action of wood-destroying fungi.
After four years of soaking and drying the specimens still developed a high percentage of wood failure in test.

2. The vinyl ester resin appeared to be sufficiently resistant to hydrolysis and mould attack, but lacked the strength to withstand stresses caused by repeated wetting and drying.

3. The blood-glue formula containing paraformaldehyde was sufficiently resistant to moulds and hydrolysis, but lacked the strength to withstand indefinitely the mechanical stresses set up by repeated wetting and drying.

4. The casein glues were readily subject to failure from hydrolysis, mould action, and mechanical stresses when the glue was softened by absorption of water.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

Wandoo.

Wandoo is the standard common name of the timber known botanically as Eucalyptus redunca var. elata. At one time, the tree was known as white gum, but owing to confusion of this name with that of other Australian species, the distinctive aboriginal name of "wandoo" has been standardized for this Western Australian timber.

The species occurs mainly in open savannah forests on the fringes of the jarrah forest, or more frequently mixed with jarrah and marri in the south-western portion of Western Australia.

Wandoo develops best in rich and deep soil, attaining a height of 120 feet, but in poor ground, sometimes over considerable stretches of country, remaining of shrubby growth, though still continuing to flower copiously. It has a bole of 30-40 feet and a diameter of about 4 feet.

The timber is brown to reddish brown in colour. It is fairly close textured. Its grain is usually wavy or interlocked, with which some figure may be associated. Growth rings are not prominent. It is one of the heavier eucalypts, ranging in density from 64 to 73 and averaging 68½ lb. per cubic ft., when seasoned to 12% moisture content. In drying from the green condition to 12% moisture content, its shrinkage is 3½% across back-sawn faces and 2½% across quarter-sawn. The seasoning of the timber in large sizes is accompanied by little degrade and satisfactory schedules for kiln drying of boards have been determined. It is one of the most durable Australian hardwoods. It is very hard, exceedingly strong and stiff, and very tough. With hand tools, it is somewhat heavy to work, but it performs satisfactorily in machining.

Wandoo is best suited to uses where strength and durability are of importance. It is used in considerable quantities for sleepers, and is in great demand for poles. It is a first class structural timber and in the construction of bridges and wharves finds use for beams, girders, joists and storey posts. For railway purposes it is used for truck underframes and has proved eminently satisfactory for top planks in truck siding where it is subject to heavy service conditions. It is sought after in the wheelwright trades for naves, shafts, cogs, spokes and felloes; and from it various implements are made. It should be particularly suitable for flooring subject to heavy wear and to various purposes in building construction where durability, strength or hard wearing qualities are desired. The wood and bark are sources of tannin and are used at the rate of many tons daily for the production of tannin extracts.

The timber is available in round, hewn and sawn from Western Australian timber merchants.

Additional information on this timber can be obtained from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne, or from the Forests Department of Western Australia, Perth.

ASSISTANCE TO A NEW AUSTRALIAN INDUSTRY - FLAX FIBRE INVESTIGATIONS.

Linen flax (Linum usitatissimum), the flax of the old world, as distinct from New Zealand flax (Phormium tenax) has been grown in relatively small quantities in Victoria during the past 50 years, but it is only during the last two or three years that scientific control has been introduced. The industry is now about to expand considerably, a planting programme of some 2,000 acres for the coming season being proposed. Appreciating the value of fostering flax growing and processing in Australia, the C.S.I.R., in 1937, initiated work to aid its development and provided personnel and laboratory facilities within the Division of Forest Products.

Flax fibre has many unique qualities which include high tensile strength, great softness and fineness, resistance to abrasion, ability to be spun into extremely fine threads, resistance to water and weathering, gloss and pleasing appearance. In addition to its well known use for linen, it also finds application in the manufacture of tarpaulins, tents, sewing thread, blind cords, string, fishing nets and lines, fire hose and in a host of ropes and cords needing special strength and weather resisting qualities. It is a fibre of high value, realising in the scutched state £120 per ton approximately on world-wide markets.

The flax plant is grown as a crop on well cultivated land, needing a rainfall of not less than 20". The crop can be cut with a standard reaper and binder, a yield of 2 tons per acre being commonly obtained. Through seed selection, strains have been developed to give uniform quality and a high fibre content. The fibre is produced from the straw by processes called "retting" and "scutching". Retting consists of breaking down the substances binding the fibre in the stalk, and scutching is a beating process which mechanically removes the straw or "shive" from the fibre.

Formerly all flax straw was "dew retted" or allowed to remain spread out on the ground exposed to dew, rain and sun. Retting took place, but with so great an irregularity that the fibre was never uniform in quality, and Australian grown flax treated in this way came into disfavour. Dew retting has now been superseded by retting in tanks wherein a bacterial action, carefully controlled by temperature and dilution, is set up to destroy the materials binding the fibre in the straw. Great experience is needed to determine when retting is complete, technically called the "end point". An incomplete ret would lead to trouble in scutching as the shive would not come away readily from the fibre, and a ret carried too far would weaken the fibre itself. The investigations in C.S.I.R. are related to the control of this retting process. At the same time, improved methods are being explored, especially in developing chemical methods of retting. Thus, by scientific processing applied to material grown scientifically from pedigree seed, the future success of the flax industry in Australia may be regarded as assured and the production in the near future should run into large figures.

BREVITIES.

Mr. I. H. Boas, Chief, Division of Forest Products, is visiting Sydney and Brisbane on Divisional business.

Mr. J. E. Cummins, Officer-in-Charge, Preservation Section, Division of Forest Products, attended meetings of the Australian Chemical Institute held in Sydney during May.

Mr. J. T. Currie, Assistant, Seasoning Section, Division of Forest Products, is at present in Tasmania, making tests of kiln installations at the request of commercial firms.

Mr. C. E. Dixon has recently been appointed to the position of assistant research officer in the Seasoning Section, D.F.P. Mr. Dixon holds a degree of M.Sc. from the University of New Zealand, and is an Associate of the Auckland School of Engineering. Before joining the Division, he was for some years in New Zealand State Forest Service, and has had some years experience with commercial kiln drying firms and with agents for woodworking machinery.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.90.

1939##090 1st July, 1939.

DURABILITY.

Scientific investigation in the last half century has undoubtedly advanced the standardising of methods of production and materials. The determination of the properties of structural materials and the introduction of new units of measurement have enabled physical and mechanical properties to be expressed numerically, so that it is possible to compare one material with another simply and quickly.

There are some properties, however, for the measurement of which no standard unit has yet been devised and all that has been possible is to compare on an empirical basis one material with another. As pointed out in the English journal, "Wood", one of the important properties of timber which falls into this class is durability and in this case, the fact that the term has never been satisfactorily defined, opens the way to even wider confusion, so that quite commonly the word is used in the different senses of hardness, resistance to wear and resistance to decay.

In early times when wood, stone and a very limited number of metals were used, there was some justification for associating hard wearing qualities with hardness. As applied to timber, however, hardness, as such, cannot be regarded as an unfailing guide to resistance to wear. If all timber were of like structure, then, indeed, this might be safely assumed, but experience has shown that in wood, with varying amounts of hard and soft tissue arranged in many different ways, hardness as generally measured by resistance to indentation is not always synonymous with resistance to hard wear.

The use of the word "Durability" to mean resistance to decay is wide-spread, but there is no direct connection between the hardness and wear-resisting properties of any particular wood on the one hand and its ability to withstand the attacks of decay on the other. In the first place, resistance to decay depends as much on extraneous conditions as on any inherent quality of the wood, so that almost any kind of timber will remain sound in one set of circumstances, while the most resistant wood cannot be relied upon to remain free from decay indefinitely in another.

The fungi, which are the direct cause of rot in wood, are plants which need moisture for germination and growth and are only capable of activity when they are not subjected to very high or very low temperatures. Unfortunately, climatic conditions over a large part of the earth's surface, excluding polar and torrid desert areas, are fairly suitable for fungal growth, so that only the more resistant timbers can be relied upon to remain reasonably sound for any length of time, unless they are given a preservative treatment. Obviously, thorough seasoning of timber before use, to get rid of surplus moisture, is the first step in the prevention of rot. If the timber is subsequently employed in situations where it is unable to re-absorb water, the risk of decay developing, no matter what kind of timber it is, is negligible. Again, if used under conditions excluding air as, for instance, entirely submerged in non-tidal water or deeply buried in wet earth, any timber is likely to remain sound for many years. As to the inherent power of resistance arising from some constituent of the wood itself, some timbers are much superior to others, but it is equally certain that hardness is not to be relied upon as an indication of the power of withstanding decay.

In view of all this well-founded evidence, it is quite clear that hardness, hard-wearing qualities and resistance to decay are not inter-related and that to use the term "durability" indiscriminately in connection with all of them, is likely to lead to confusion.

WEATHERING TESTS ON PLYWOOD COMPARED WITH CYCLIC TESTS IN THE LABORATORY.

Last month's issue of the Monthly News Letter contained an article entitled "Durability of water resistant glue joints". This was a summary of a report on experiments carried out on birch plywood at the Forest Products Laboratory, Madison, Wisconsin, U.S.A. A further report recently received indicates that this work has been extended in an attempt to determine, firstly, how plywood glued with different water resistant glues, with different species, with different thickness combinations, and protected by different coatings withstands prolonged exposure to the weather and, secondly, whether any correlation could be found between behaviour on prolonged exposure to weather and short term laboratory tests that could be included as a part of specifications.

Test panels were glued up and exposed continuously on a test fence facing south. Trimmings from each panel were cut into standard test specimens and tested wet and dry and after exposure to several varying cycles of boiling or soaking followed by drying at 150° or 212°F. The tests have now been in progress for two years, but the summarised results which follow apply only to the panels exposed without surface or edge protection of any kind.

(a) The bulk of the panels glued with artificial resin adhesives show at the most, only a very slight opening of the glue joints along the edges or corners. No resin bonded panel has failed completely.

(b) Of the panels bonded with casein glue, 22% have failed completely and 70% have failed in the glue lines to a marked degree. No panel came through the two years weathering without failure in the glue joint. Of the casein-glued panels showing only slight failure, the majority were of species low in density and possessing high decay resistance, such as redwood and western red cedar.

(c) Blood albumin glued panels, as would be anticipated from laboratory tests, are intermediate between the artificial resin and casein glued panels.

(d) Phenolic resin glued panels were in slightly better condition than those glued with urea-resin. Urea-resin glued panels bonded by heat are in somewhat better condition than those bonded cold.

The conclusion reached after comparing the laboratory tests on the plywood specimens and the weathering tests after two years is that a high degree of wood failure in the test specimens after a soaking and drying cycle should indicate that the glue can withstand any stresses that the wood itself can exert. In other words, by the use of a cyclic test in the laboratory and a proper selection of the amount of wood failure it would be possible to eliminate most of the panels that are not showing satisfactory service in the first two years of the weathering tests.

To sum up:- (a) Only the panels well bonded with artificial resin glue should be considered for the more severe service conditions.

(b) If plywood specimens show 50% or more wood failure after undergoing a wetting and drying cycle, the plywood from which the specimens were taken may be expected to have high resistance to weathering conditions.

A NEW MATERIAL FROM CELLULOSE.

A so-called "sixth fabric" has recently been announced by an American manufacturer. The material is reported to be a chemically pure cellulose which comes from the machine as a finished fabric, without the necessity for processing or weaving. Economy of manufacture makes it available at or under the cost of laundering other fabrics, either in white or in any colours and designs which can be printed. It is therefore a "disposable" product, which can be discarded when soiled.

It is now appearing in department and chain stores in curtains, draperies, table cloths, pillow cases, aprons, dustcloths, napkins, dental bits, fishing creels and cosmetic bags, and will shortly be used in lamp shades and in buffing wheels for industrial work. The curtains retail at 59 cent a pair and are said to be selling at the rate of several thousands of dozen pairs weekly.

TERMITE (WHITE ANT)PROOF CONSTRUCTION.

In some coastal and many inland districts in Australia termites, commonly termed white ants, are a serious pest. Even where they are not particularly active, fear of their appearance and misgivings as to the possible extent of their depredations are generally in the minds of the architect, builder and to a varying degree the home owner. Consequently it is not uncommon to find other materials taking the place of timber in construction and where timber is used, to find a species chosen which has a reputation for termite-resistance.

Various methods of treatment have been used in attempts to reduce the possibility of damage by termites. Some of these methods, consist of spraying or brushing the foundation timbers with various preservatives, and some of applying chemical powders. Soil poisoning has also been practised and, in other cases, a layer of lime or cinders has been placed inside the foundations to cover the soil. In spite of these methods, termite damage still exists and undoubtedly the original effectiveness of the treatments so far used is lost after a period of time. It has also been observed that ventilation, although reducing the probability, will not prevent infestation.

The development of a termite colony is dependent upon the supply of food material in the form of woody substance. The termite that builds a mound above ground and the termite that lives in colonies under the soil both require continuous contact with the ground for their existence. Consequently, if devices can be used to prevent the termites from maintaining contact with the ground, the protection will be effective. In positions above these termite barriers, any timber can then be safely used without danger of termite attack. Termite-proof construction, therefore, makes available for general use timbers, which, under present conditions, are not acceptable in the building industry or which, if used, are subject to termite attack.

The principles of termite-proof construction for brick buildings have recently been described in the Division of Forest Products Trade Circular No.44, which is now available for distribution. The circular clearly illustrates the design and application of termite shields and should prove a valuable contribution to the problem of preventing termite attack.

METAL FINISH APPLIED TO WOOD BY "WELDING".

This process involves the use of a device, somewhat resembling a pistol, known as a "gun" through which a metal wire is fed. This wire melts as it reaches an oxyacetylene flame and particles of molten metal are blown with considerable force on to the surface to be coated. The adhesion between the metal and the wood is said to be excellent. The metal will not chip or flake off. Any metal can be used. Aluminium and bronze, in particular, give very pleasing results. There is no tendency to burn the wood and it is even possible to spray the metal on to the flesh or the thinnest tissue paper.

A fine matt surface is obtained if the sprayed finish is left untouched, but attractive variations are possible by burnishing.

Any type of wood can be treated as long as the surface is not highly polished.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

SATINAY.

Satinay is the standard common name of the timber which, botanically, is known as Syncarpia hillii. This timber has been given the name Fraser Island Turpentine due to a certain resemblance to the turpentine of New South Wales and Queensland, but it has merited the more appropriate trade name Satinay, after the Satine wood of French Guiana, which it resembles.

The native habitat of the tree is Fraser Island, a sand reef about 80 miles long, off the Mary River in Queensland. Odd trees may be found on the sandy mainland of Tin Can Bay nearby.

In its best development, the tree has a shapely bole and attains a height of about 130 feet and a large diameter at breast height of nearly 5 feet. The bark is thick and stringy, fibrous in nature, extending from the base of the tree to the branch ends.

The timber is reddish to reddish-brown in colour and is of fine and uniform texture. Generally interlocked in the grain, it exhibits a ribbon or wavy figure on the quarter-cut faces. It is moderately heavy, ranging from 46 to 58 and averaging 52 lb/cu.ft., when seasoned to 12% moisture content. In drying from the green condition, to 12% moisture content, it shrinks 9½% across back-sawn widths and 4½% across quarter-sawn before reconditioning. The seasoning of the timber requires care owing to a tendency to twisting and to checking when back-sawn. It responds well to reconditioning, the treatment decreasing its weight by approximately 3 lb/cubic ft. at 12% moisture content and reducing its final shrinkage to 6% and 3% for back- and quarter-sawn widths respectively. It is fairly durable in exposed situations and is reported to be resistant to termites and borers. It is a hard timber, moderately strong, tough and stiff. It is somewhat difficult to dress but cuts cripsly and cleanly in other wood-working operations and carves well. Little filling is needed in finishing and the timber takes a high polish. It takes stains well and is specially suited to fuming by means of which it can be given a greyish plum coloration.

Satinay has a wide range of uses. It makes an excellent timber for high class furniture, cabinets and fittings, its hardness making it resistant to indentation. For railway purposes, it has been found very serviceable for the vertical framing of carriages and also for decorative panelling. Its resistance to decay and insects leads to its use for poles, fence posts, survey pegs and its availability in long lengths renders it additionally suitable for piles. In general building construction it is particularly suited to use in stumps, joists and studs and, when properly seasoned, makes excellent flooring in exposed or indoor positions. It is used in the cooperage trade for cask heading. It makes very satisfactory chisel handles, plumber's dressers, and mallet heads. It is used commonly for the handles of fishing rods. Its ripple figure and the smoothness with which it can be finished make it particularly attractive for walking sticks and novelties.

The timber is available in furniture sizes, in milled lines and as scantlings in long lengths. It is marketed by saw-millers and timber merchants in South Queensland.

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

BREVITIES.

Mr. I. H. Boas, Chief, Division of Forest Products, recently visited Sydney and Brisbane to seek the support of various timber organizations for the publication of a Handbook of Structural Timber Design, which has been prepared by the Division. The support promised was such that it will now be possible to issue the handbook free of charge to those concerned with the use of timber for structural purposes. The publication is now in the hands of the printer.

Mr. I. H. Boas, Chief, and Mr. J.E. Cummins, Officer in Charge, Preservation Section, Division of Forest Products, recently visited Adelaide for the purpose of conducting demonstrations of details of construction to guard against termite attack in buildings.

Mr. A. J. Thomas, Assistant, Utilisation Section, Division of Forest Products, spent some days in Sydney on work associated with the standardisation of trade and botanical names for Australian timbers.

Mr. R.S.T. Kingston, Assistant, Timber Mechanics Section, Division of Forest Products, visited Canberra to co-operate with officers of the Commonwealth Forestry Bureau in field work to study stresses in living trees.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.91.

1st August, 1939.

TIMBER NAMES.

An event of outstanding importance to the Australian timber trade is the publication by the Standards Association of Australia of the proof issue of a handbook titled "Nomenclature of Australian Timbers". Up till the present, the timber trade has laboured under disabilities due to the lack of standardisation of timber names. The trade's customers have often expressed themselves unfavourably - and with some justification - at the multiplicity of names by which timbers are known. To become familiar with the number of timbers available in Australia is difficult enough, without the confusion added when one individual timber is named differently by different sections of the timber industry. The bushman's habit of calling a tree 'blue gum' when his method of recognizing it is by the bluish tints on its bark or its leaves can be tolerated, even though we, familiar with the red colour of the timber, call it 'red gum'. But when another timber is called 'scented satinwood', 'coachwood' and 'rose mahogany' by different timber-men, we begin to doubt whether there is any reasoned connection between names. Confidence is further shaken when alpine ash, Australian oak, gum-top stringybark, red mountain ash, Tasmanian oak, white-top stringybark and woollybutt are declared one and the same timber. If, in addition, it is necessary to remember that plywood sold as canary ash must be referred to as 'yellow walnut' when discussed with manufacturers, patience may be exhausted. All who have been exasperated by such needless multiplicity of names, and those of cooler temperament whose business it is to learn the many alternatives, must agree upon the desirability of simplification and standardisation of timber names. The first purpose of the publication "Nomenclature of Australian Timbers" is to fix one name as the standard trade name for each of the most important timbers and economic plants in Australia.

Another important purpose is to link the trade names with the botanical names so that each timber may be related to a tree which can be accurately identified by reference to a botanist's description. A Standard Reference Name has therefore been fixed for each tree. This is a name of the botanical type that will remain unchanged despite any change which may be made in the botanical name by botanists. By means of Part II of the present publication, it will be possible to ascertain the standard reference name of a tree if its botanical name is known, even though its botanical name may be revised from time to time. For this reason, it is intended to revise the publication whenever botanical names are changed.

The present lists have been prepared by the Timber Sectional Committee of the Standards Association. The work involved has been immense and has been carried out by officers of the Division of Forest Products, C.S.I.R., the Inspector General of Forests and the staff of the Commonwealth Forestry Bureau, and the N.S.W. Forestry Commission's Division of Wood Technology, who did most of the work with the assistance of foresters in other States.

It is fully appreciated that omissions may have been made in the lists, that they may not suit everybody or may contain errors. For this reason, the Standards Association, following its normal practice, has issued the lists in proof form for critical review by the public during the next six months. Comments and suggestions submitted to the Association will be appreciated, and as far as possible, acted upon when early next year the lists are being revised prior to their issue as an Australian standard.

THE REMOVAL OF COLLAPSE IN TIMBER.

Although the term may be unfamiliar to a blissful few, the phenomenon named collapse and the frequency of its development during the drying of timber, are only too well known to the majority of timber merchants and kiln operators. To the harassed timber merchant, collapse (which usually indicates its presence in timber by a severe and irregular form of shrinkage, or a pronounced "washboarding" in boards) seems to occur to a noticeable extent in a few timbers regardless of the care taken during drying. A brief discussion of the occurrence of collapse, of the factors in drying practice which tend to induce collapse or make removal more difficult and, as a corollary, of those steps by which recovery may often be made more complete, will therefore be of interest.

First, it should be recognised that collapse, although in effect a form of shrinkage, is entirely distinct from normal 'true' shrinkage. The latter, which occurs to a varying extent in all woods during drying, is caused by a moving together of the finely separated little threads of wood material which make up a cell wall, the total sum of all the movements in all the small cells collectively causing shrinkage. Throughout this consolidating, however, the open rounded shape of each wood cell remains unaltered. Collapse, on the other hand, is for all practical purposes confined to a comparatively few woods and is caused by a caving-in, or crumpling and flattening of the walls of the wood cells.

Unfortunately, Australia has more than her fair share of these woods which collapse appreciably and this collapse was a source of great loss until the reconditioning process became common practice. Credit for the discovery and initial development of this process is due to Mr. James Grant, late of Warburton, Victoria, and to his son, Mr. George Grant of Alexandra, Victoria. From the start, the Division of Forest Products lost no opportunity to promote the adoption of this process wherever it was necessary. It has proved an immense practical benefit to the timber trade and reconditioning chambers are now installed in practically all plants kiln drying "ash" eucalypts and at some other plants, either air drying these species or kiln drying other timbers.

Despite the general success of the treatment, there is still a great deal to be discovered about incidence of collapse in various timbers under different circumstances and the details of the most suitable treatment in each case. The Division of Forest Products has carried out a considerable amount of research in the laboratory and supplemented this with observations at commercial plants. Some of this information has been published by the Division of Forest Products in Trade Circular No.20 and Pamphlet No.75 and further information is on hand but not yet ready for publication.

As yet, little information has appeared in print regarding the likelihood of collapse occurring in any particular piece of wood. From investigations made with "ash" type eucalypts, evidence has been found, however, that:

(i) Timber from immature or young trees tends to collapse more than that from older trees.

(ii) Sapwood does not generally collapse to the same extent as truewood, although collapse in the sapwood of young trees has been observed.

(iii) Heart tends to collapse fairly readily.

In stock which is susceptible to collapse, there are several factors, particularly during kiln drying, which tend to induce collapse, and/or to reduce the chances of obtaining good recovery from a final reconditioning treatment. Broadly grouped, these are:-

(i) The use of high temperatures during the early stages of drying.
(ii) Lengthy drying periods.
(iii) The use of humid conditions.
(iv) Drying to very low moisture contents before reconditioning.

The last of these has a far greater effect than is generally supposed. To give one example, two matched timber samples showing collapse, one of which was dried to a moisture content of 11% and the other to a moisture content of 16%, were reconditioned at a temperature of 212°F. The recovery obtained from the former was only 46% (based on the collapse present). The recovery from the latter was, however, 86%!

Even when all precautions seem to have been taken, collapse will nevertheless make its appearance in some timbers. In such cases, attention to the following points should be of help in obtaining better results from reconditioning:

(i) Recondition at the highest temperature possible (up to 212°F.)
(ii) Allow any charge to cool thoroughly before reconditioning it.
(iii) Recondition at a moisture content of 14% or 15% and then redry as this will give far better results than first drying to 10% or 11% and then reconditioning.

WOOD IN THE HOUSE OF TOMORROW.

At the New York World Fair, a winding street has been constructed and around it are grouped 15 houses in a community called "The Town of Tomorrow". The houses strikingly illustrate the contribution of modern science and industry to the modern home to give the buyer more house for the money. There are several low-priced cottages as well as more expensive fully-equipped homes. Modern and traditional designs are attractively blended.

It is natural to expect such displays to be a little extreme in their tendency to discard present day materials in favour of others that have a potential, but as yet undeveloped, popularity. By the use of materials as much as by planning, a designer's conception of future trends is expressed. It is therefore most interesting to note that in this "Town of Tomorrow" timber is prominently featured. Out of 15 houses erected, timber framing is used for eight and in the remainder, five are of brick, one of brick and glass and one of concrete. For the exterior walls boarding is chosen for three houses, wooden shingles for one and plywood for one.

On this evidence it appears that even in U.S.A., where modernisation finds sympathetic consideration, timber is destined to hold a prominent place in buildings of the future.

INSURANCE RATES ON TIMBER HOMES.

One of the great achievements of the Timber Development Association of Great Britain on behalf of timber structures is the successful conclusion of activities to obtain recognition of the fact that timber construction does not represent an increase in fire hazards. Previously, Lloyds quoted as much as 10/- or 7/6 for a comprehensive house-holder's insurance policy, but largely due to representations by the Association, the rate has been reduced to 2/6 or 3/6, or even lower. The economic importance of this success is not to be under-estimated.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

SYDNEY BLUE GUM.

Sydney blue gum is the standard common name of the timber which is known botanically as Eucalyptus saligna. It is also known as blue gum and, in South Africa, as saligna gum.

The tree occurs in the coastal forests of Eastern Australia, extending from the latitude of Bateman's Bay in New South Wales northward to the McPherson Range in South Queensland. Under normal conditions the tree grows to a height of 120-150 feet with an average diameter at breast height of 3'9". Its bole, usually straight and symmetrical, is covered with a gum type bluish-white bark which is smooth except at the base of the tree where it is a little rough and flaky.

The timber is rose red in colour, but may vary from pink to red. Its grain is usually straight, but occasionally wavy, the latter producing an attractive rippled figure. Its texture is rather coarse and there is some tendency towards woolliness. It is of medium density, ranging from 40 to 64 and averaging 52 lb. per cubic foot when dried to 12% moisture content. It is fairly resistant to decay and borers. It is a hard, stiff and tough timber, similar in strength to blackbutt and karri. It is somewhat difficult to season, care being necessary since backsawn stock tends to check. In drying from the green condition to 12% moisture content, its shrinkage averages 9% across backsawn and 5% across quartersawn widths. It responds well to reconditioning treatment and this reduces the final shrinkages to 5% and 3% for back- and quarter-sawn boards, respectively. It is easy to work, nail, dress and finish and takes a good polish.

Sydney blue gum is a general purpose hardwood. It is used freely for building purposes for plates, joists and studs. Owing to its reputation as a non-slip hardwood, it is in demand for flooring, both strip and parquetry, and for steps. It is popular for weatherboards. It is considered one of the best woods for shingles and is often split into rails and palings. In the coach building industry, it finds considerable use, particularly for felloes, also for carriage framing and general wheelwright's work. Ship builders use it for keels, stem and stern posts, gunwales and planking. It has been used for railway sleepers in Queensland and to a considerable extent for road paving blocks.

The timber is available in a full range of scantling sizes, as boards, milled products and wheelwrights' stock.

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

SLEEPERS OF WOOD AND STEEL.

Most of the European railway systems employ wooden sleepers, the advantages of which over their competitors of steel and concrete are well known. There are few countries where the wooden sleeper is not used, but in Greece, there are many more miles laid with steel sleepers than with wood. About two years ago, the Forest Research Office made efforts to introduce wooden sleepers to a greater extent than hitherto, and as a result of aid given by the Comite International du Bois, it was not long before the Greek State Railways, previously favouring steel sleepers, were induced to carry out tests with wooden. They are now so satisfied with the result that they have decided to relay tracks on wooden sleepers.

BREVITIES.

Mr. J. T. Currie, Assistant, Seasoning Section, Division of Forest Products, is at present in Canberra, assisting in the initial running of a timber seasoning kiln at the Department of the Interior.

A recent addition to the testing equipment at the Division of Forest Products and a novel construction as far as Australia is concerned, is a large beam fabricated of 8" x 1" timber and ¾" thick plywood glued together. The beam is 21' long, 3' deep and 18" wide and is designed for use in the testing of large beams in the 600,000 lb. Southwark-Emery machine.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.92.

1939##092 1st September, 1939.

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TESTING THE DURABILITY OF AUSTRALIAN TIMBERS.

One of the lines of work of the Division of Forest Products is to investigate the relative resistance of various Australian timbers to attack by decay, termites (white ants) and borers, and to develop methods by which the service life of timbers may be prolonged. Besides compiling records of the experience of users with timbers in many situations throughout the Commonwealth, the Division has for nearly ten years conducted field investigations on durability. Its Section of Preservation has established experimental fence lines, sleeper tracks, and pole testing sites and laid down small specimens in many localities.

As early as 1930, three experimental fence lines were established in Western Australia; one at Pemberton in a wet climate where decay is a severe hazard, a second near Narrogin where both termites and decay are prevalent and a third, near the drier extremity of the wheat belt at Ghooli, where termites are active. Ten different timbers were installed, some in round and some in split form. Some were in their natural condition and others had been treated with preservative substances such as creosote and oil, arsenic, zinc chloride plus arsenic and sodium fluoride plus arsenic. Periodical inspections have been made of these fences and records of their deterioration accurately kept. At the present time, the timbers least resistant to decay and termites have failed and the relative benefits attributable to the use of the respective preservatives is being revealed. The creosote and oil mixture is outstanding in the results to date. In Western Australia, also, field tests on various sleepers are progressing. To determine the value of a preservative process known as 'fluarising' 2,357 sleepers have been laid in three different sites. Tests are also being made on jarrah sleepers to determine the influence of various defects which may be present at the time of laying. The more detailed investigation of the effect of various rots and other pathological defects is being carried out with small test specimens laid down in three sites differing in climatic conditions.

Radiata pine sleepers are being tested in South Australia, where 1,040 narrow and broad gauge sleepers have been laid down in six different localities. Some of these are untreated and others treated with creosote and other preservatives and they are being compared with untreated jarrah and red gum alongside which they have been laid. Tests are being made of the value of different preservatives in preventing decay and termite attack and also the value of different types of sleeper plates for increasing the mechanical life of the sleepers. Also, in South Australia, creosoted radiata pine poles have been set in service lines in various locations.

In Victoria, four test sites have been established to determine the life of poles of the less durable Victorian timbers in treated and untreated condition when exposed to decay and termites. These tests have been in progress since 1932 and to date, the creosote and oil treatments are proving generally the most satisfactory. Further sites are being used to test the value of the oxyacetylene charring process in arresting the development of pathological decay. A fence has been erected to test the durability of two of the least durable species in round and split form treated and untreated. Arrangements are in hand to test sleepers of the less durable Victorian timbers in treated and untreated condition against the timbers of established durability. In co-operation with the Railways Department and the Forests Commission of Victoria,

4,824 sleepers are to be laid down in five different localities. Also, in this State, about 3,000 small specimens of different timbers are being used to test the value of different preservatives which have been suggested for use in comparison with preservatives of established value.

In co-operation with the Division of Economic Entomology of C.S.I.R., field tests are being conducted in Canberra on small specimens exposed to termites. The technique followed has been developed especially by the Division of Economic Entomology for obtaining severe exposure against definite species of termites.

In New South Wales, three pole testing sites have been laid down, in which the less durable timbers of the State in treated and untreated condition are being compared with timbers usually accepted for poles. At another site, the value of two preservatives, namely, creosote and zinc chloride plus arsenic, are being tested to determine their value for treating the thinnings of three eucalypt timbers.

In co-operation with the Queensland Forest Service, marine piling is under test in several localities in Queensland. Also at Townsville, a field test site is being used to test small specimens treated with different preservatives against the attack of the giant termite.

Regular inspections are made at all the above test sites. Records are accurately kept of the failures as they occur and a fund of information built up as to the durability of Australian timbers and the value of preservative substances in increasing the life of timber. Already some of the results have been applied to general preservation practice, thereby increasing the efficacy of the processes compared with those used in the past and have lead to considerable economic savings.

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HOW LONG DOES TIMBER TAKE TO DRY?

When timber is being sold as "seasoned timber," the length of time it has been seasoning is quoted as proof of the fact that it is "seasoned." Indeed, the time factor has too often been the sole criterion upon which seasoning has been judged. This is unfortunate, because although it cannot be said that time is not a factor in the seasoning process, at least there is no absolute or definite relationship between the length of the seasoning period and the degree of seasoning.

Examples of extreme variation in seasoning time may be quoted from actual experience. In England recently when an old building was being demolished, beams found to be in a sound condition after having been in a dry position inside the building for 600 years were sawn up for further use. Their inner zones were found to be still wet and they had therefore to be seasoned for a further period before they were fit for use. Under some conditions a piece of timber may lose none of its moisture no matter what length of time elapses. Under different conditions it may dry from say 150% to 20% in six months and, under more favourable conditions still in three months or less. At the other extreme, certain types of dryers can fully season thin slices of wood in twenty minutes.

Such marked divergency clearly demonstrates that time is neither the sole nor the basic factor in the seasoning process. The seasoning time for even one species of timber cannot be gauged without reference to other factors. Some of the factors involved in the rate of seasoning are species of timber; the dimensions of the timber; the original moisture content and the final moisture content desired; the direction of cutting in relation to quarter or back-sawing; the particular climatic conditions such as relative humidity, temperature and wind at the seasoning site during the seasoning period; the exposure or sheltering of the stack against rain wetting; and the standard of air seasoning practice obtaining at the seasoning site.

This latter, the standard of air seasoning practice, deserves more attention than it usually receives. Although the weather cannot be controlled, other factors can. The salient features of good air seasoning are proper drainage of the seasoning yard, the raising of the bottom layers of the stack 18" to 24" above the ground, correct stacking methods and roofing of the stacks.

Too often, even with the best air seasoning practice, timber generally cannot be dried down sufficiently for satisfactory use for joinery and other indoor purposes. Air drying frequently ceases entirely before the timber has reached a moisture content low enough for indoor use and kiln drying is therefore necessary.

Actually, the consumer is not concerned with how long the timber has been seasoning or even whether it is kiln dried or air dried. The vital factor he is concerned with is its moisture condition. All the consumer has to do then in this respect is to specify the moisture content (or limits of moisture content) he desires for the timber and it then becomes the supplier's problem to determine how long and by what method the timber shall be dried.

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SCIENTIFIC PAPERS.

In the August issue of the Journal of the Council for Scientific and Industrial Research, officers of the Division of Forest Products have published further results of investigations upon which they have been engaged.

"A Reconnaissance of the Bending Qualities of Some Australian Timbers" is the title of a paper giving progress results in the first systematic study that has ever been made in Australia on the bending qualities of Australian timbers. Descriptions are given of the methods of selection, preparation and testing and results of tests on thirty-one species are presented.

A second paper discusses "The Influence of Certain Factors on the Physical and Mechanical Properties of Alpine Ash (Euc. gigantea"). The authors reach an important conclusion that, although specimens studied had grown at rates which varied considerably there was no correlation between the rate of growth and any of the physical and mechanical properties. Evidently, fast-grown wood showing only 3 growth rings per inch is equal to slow-grown wood showing up to 16 rings per inch.

Another paper on "The Physical and Mechanical Properties of Mountain Hickory (Acacia penninervis)" presents results of tests carried out in accordance with the standard methods of testing small clear specimens of timber. The strength and other properties of mountain hickory in the green condition and at 12% moisture content are compared with corresponding values for American hickory, American ash and spotted gum.

Two further papers come from officers engaged on research on the processing of flax. Results on "A Preliminary Investigation of the Losses of the Constituents of Flax Straw During Water Retting" discusses analysis of flax straw in relation to the retting process. Through the study of a considerable number of rets features common to all have been discovered and means developed for an accurate determination of the end point of the ret. This is described in "The Use of Hydrogen Ion and Acidimetric Determinations for Indicating the End Point of a Bacterial Ret."

All these papers are available as reprints and can be obtained by addressing the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne.

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THE PROPERTIES OF AUSTRALIAN TIMBERS.

HUON PINE.

Huon pine is the standard common name of the timber which botanically is known as Dacrydium franklinii. Other common names given to this species are white pine and Macquarie pine.

The genus Dacrydium is found in Australia and New Zealand, New Caledonia, Malay Archipelago, Borneo and Chili, but this particular species D. franklinii is confined solely to Tasmania. Here it is restricted to river banks, occuring in many swampy localities extending from the upper Huon River around the south-west coast and reaching the most northerly point in its range along the Stanley River, a tributary of the Pieman. From the west coast it extends up the Gordon River as far as the Serpentine River which is its eastern limit. Under normal development the tree attains a medium height of 80 feet with an average diameter at breast height of about 3 feet 6 inches.

The timber is pale yellow to yellowish-brown in colour. It is usually straight-grained with the growth rings fine and close. The figure is usually pronounced on account of the growth rings and sometimes exhibits a"bird's-eye" appearance. The wood is smooth and oily to touch. It has a characteristic odour and when distilled yields an essential oil. It is moderately light in weight ranging from 27 to 37 and averaging 32.2 lb. per cubic foot when dried to 12% moisture content. It is a very durable timber being noted for its resistance to decay borers and Toredo. It is a soft timber, fairly strong, not tough and fairly stiff. It may be seasoned readily without degrade. A kiln drying schedule has been recommended for 1 inch stock which would enable it to be dried in a commercial kiln in 4 to 5 days. In drying from the green condition to 12% moisture content little shrinkage takes place, back-sawn material contracting only 3% in width and quartersawn only 2%. The timber is soft and very easily worked with hand or machine tools and it turns well. It is also a satisfactory bending timber. It has good nailing properties and holds screws firmly. It takes a good finish, staining and polishing particularly well.

Huon pine is specially favoured for boatbuilding and for this purpose there is probably no wood superior to it. It is valued for cabinet work and also for doors, sashes and other house fittings. It is used largely for drawing boards on account of its softness and smooth surface finish. Wooden troughs in this timber have given years of satisfactory service. In the furniture trade it is widely used for drawer slides and drawer sides, its popularity being specially due to its clean cutting. It makes attractive ornaments when adorned with poker work to which it responds readily. Quite a quantity is distilled for the recovery of huon pine oil, the yield being 3% under commercial conditions.

The timber is available in a small but steady supply in all sizes of boards, joinery sections, and furniture stock from Tasmanian timber merchants.

Additional information on this timber can be obtained from the Forestry Department, Tasmania and from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne, Victoria.

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WOOD ANATOMY CONFERENCE AT DIVISION OF FOREST PRODUCTS.

On the 24th and 25th of August, a meeting of Australian Wood Anatomists was held in the Section of Wood Structure of the Division of Forest Products. The New South Wales Forestry Commission was represented by Mr. M.B. Welch, Senior Research Officer, and Miss W.J. Rosling, Assistant in Wood Technology, the Victorian Forests Commission by Mr. E.J. Semmens, Principal of the Creswick Forestry School, and the Commonwealth Forestry Bureau by Mr. C.E. Carter, Lecturer in Wood Technology at the Australian Forestry

School, Canberra. The Division of Forest Products was represented by Mr. H.E. Dadswell, Officer in Charge of the Section of Wood Structure, Misses D. J. Ellis, A.M. Eckersley, and Mr. H.D. Ingle, Assistant Research Officers.

The deliberations centred mainly around the workings of the newly developed card sorting schemes for the identification of timber which has been in use for some two years. Each of the State Forest Services co-operating with the Division and the Commonwealth Forestry Bureau receive a duplicate set of the identification cards prepared and in order for them to make the best use of these cards, it was necessary to discuss various points relative to the anatomical features used and to find out what additional commercial timbers should be represented. Further discussion dealt with methods for the identification of closely related eucalypt species and it was stressed that more research work was necessary in many cases.

The need for authentic material was referred to. While the Division of Forest Products has some 4,500 specimens of timber from different trees, this collection does not represent all the timbers of Australia and surrounding Pacific Islands. Many commercial timbers are sufficiently well represented while authentic specimens from New Guinea and the British Solomon Islands, for example, are very few. Identification problems cannot be solved satisfactorily without a large collection of authentic wood specimens and in certain cases the wood anatomists in Australia are working under a definite handicap. The only solution would be to send a collector to various localities so that representative timber samples together with botanical material can be obtained. This way out of the difficulty is, however, very expensive and unless there is some financial assistance forthcoming it will not be possible.

The study of any group of timbers such as the eucalypts cannot be completed satisfactorily without investigating both commercial and non-commercial species. It is the non-commercial species that are never well represented in collection of timber samples and it is these that are important to the wood anatomist.

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BREVITIES.

Mr. J. E. Cummins, Officer-in-Charge, Preservation Section, Division of Forest Products, visited Canberra during the month on investigations associated with termite resistance of treated and untreated timbers and methods of laboratory and field testing under investigation by the Division of Economic Entomology.

Mr. J.T. Currie, Assistant, Seasoning Section, Division of Forest Products, is at present in Sydney investigating problems in the seasoning of veneers.

Mr. I. Langlands, Officer-in-Charge, Timber Mechanics Section, Division of Forest Products, has been delivering a course of lectures in timber as an engineering material in Faculty of Engineering, University of Melbourne.

Mr. S. F. Rust, Officer-in-Charge, Veneering and Gluing Section, Division of Forest Products, is visiting New South Wales and Queensland to discuss problems which may be studied for the benefit of veneer and plywood producers.

Miss W. J. Rosling, Assistant in Wood Technology, New South Wales Forestry Commission, has spent three weeks in the Wood Structure Section of the Division of Forest Products. Miss Rosling has been mainly interested in identification problems, and photomicrography.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.93.

1939##093 2nd OCTOBER, 1939.

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LIGNIN.

Next to cellulose, lignin is the most abundant and most widely distributed organic substance. It is found in the cementing layer between the cells of the tree or plant and also as a reinforcement in the cellulose within the cell. Present day industrial chemical processes such as paper-making, the production of rayon and other artificial fibres and the manufacture of alcohol and sugar are based on the utilisation of the cellulose constituents, which are obtained in pure form by weakening the cementing action of the lignin and extracting it. Lignin is the unused or waste fraction in these chemical industries. From time to time, attempts have been made to market this waste or to produce from it other substances of commercial value. Research efforts are being directed to determine the chemical nature of lignin and its physical and chemical properties. These investigations should increase the uses for lignin and lead to more intensive utilisation of wood substance in chemical industries and possibly also result in the utilisation of woody material which, on account of its size, shape, structural defects or other characteristics, finds no use at present.

Since lignin is a cementing substance in its natural state, it has been regarded as a bonding substance when separated out, and certain trends in utilisation are developing to take advantage of this characteristic. In some countries where large quantities of wood are chemically pulped, the lignin is recovered from the cooking liquors and is successfully used for road surfacing. It is claimed that the lignin makes a dust-free road, that it binds aggregates such as gravel and mixes with the fines in such a manner as to stabilise the surface. Particular interest has also been manifest in the possibilities of adapting lignin to use for manufacturing articles by casting, stamping, pressing or moulding. An American firm manufacturing fibre-building boards by an explosion process now produces a moulded product on a commercial scale mainly from the lignin fraction recovered from the wood substance in the board manufacture. Last year, another American firm began commercial production of a plastic developed by the United States Forest Products Laboratory by the treatment of saw-dust. Success has also attended the use of lignin in storage batteries. Its incorporation in the negative plate enables the battery to maintain its maximum power in cold weather four times as long as formerly and also prolongs the life of the battery. Lignin has recently been shown to be an effective reagent for removing iron from water and it may be re-used for this purpose many more times than may the usual inorganic reagents.

Chemical research has revealed some interesting reactions and although commercial use has not yet followed their discovery, they may eventually lead to industrial developments. By oxidation with nitric acid, lignin produces oxalic acid. After nitration it can be combined with other substances to form dyes. It also polymerises easily and combines with other compounds to form resinous or plastic materials. By alkali fusion it yields small amounts of aromatic compounds such as pyro-catechol and vanillin and the production of the latter from pulping liquors is now carried out commercially in considerable quantity. When sufficiently heated lignin yields aromatic tars. Recently, it has been shown that lignin can be hydrogenated. Under certain conditions of high temperature and pressure in the presence of solvent dioxan, hydrogen and catalyzer, the brown powdery lignin can be changed into a liquid from which it is possible to separate methanol, two high

boiling liquids, a crystaline substance and a glassy solid. These products promise to be useful as solvents, fungicides, adhesives or plasticisers.

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VENEERED v SOLID FURNITURE.

The idea that veneered furniture is synonymous with cheap furniture is still found to be entrenched firmly in the minds of many people. Often buyers sigh wistfully and audibly express their wish that sufficient money was available to purchase a suite built up of "real solid timber." Such ideas, of course, are not well-founded, for veneered furniture is not necessarily cheap: it can be in many cases, far more expensive than "solid" furniture and in addition, it is not inferior to "solid" furniture. On the contrary, it possesses advantages which make it superior in many ways to the "solid" article. Examine these advantages one by one and the truth of this statement is at once apparent.

Furniture, to be readily saleable, must possess that appeal to the eye which results from the use of woods of attractive color and figure in combination with suitable designs. Veneered construction thus affords a medium whereby the most effective use can be made of figured timber. Veneer can be sliced in such a way as to obtain the most effective figure from the piece and in subsequent stages of manufacture the decorative effect due to the natural figure in the wood can be enhanced by the regularity or symmetry of the designs. A further advantage is that many timbers which could not be utilised in the solid form due to such characteristics as excessive weight or a tendency to split during seasoning can be successfully utilised in the form of veneer.

What of the interior or unseen portions of veneered furniture panels? Cheaper material is certainly used in the cores of the panels, but this fact does not make it unsuited for this purpose or render the finished article inferior in any way. Timber for cores is of specially selected species of low density, low shrinkage and uniformity in growth characteristics. Easy gluing is also an advantage. The core properly selected and treated thus provides a perfectly flat, stable base for the laying of crossbands and face veneers.

Glued joints are said to be a source of weakness in veneered furniture. This is not the case, for such joints when correctly made, are as strong, under ordinary service conditions, as the wood itself. Continual exposure to a humid atmosphere or immersion in water may weaken glued joints, however, but such conditions are just as fatal to "solid" furniture where the various members are joined together with glue. A number of manufacturers now overcome any troubles which may be traced to lack of water resistance in the glued joints by the use of artificial resin adhesives to give a bond which will even withstand boiling or prolonged soaking in water.

The method of construction of furniture panels, i.e., with the grain of adjacent veneers running at right angles is distinctly advantageous when compared with solid panels. Wood is 25 to 45 times stronger along the grain than across the grain. Crossing of the grain of adjacent veneers at right angles thus tends to equalise the strength in both directions. In addition, solid wood exhibits considerable movement across the grain, but generally negligible longitudinal movement. The balanced construction of plywood panels also tends to equalise stresses in the panel thus reducing shrinkage and swelling to a minimum and eliminating warping. Splitting is also prevented by the cross grain of the alternate plies.

Finally, modern design features smooth, curved surfaces. Curved panels are readily built up of plywood construction with the face veneer matching that of other panels in the suite. This would be impossible in "solid" construction.

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THE PROPERTIES OF AUSTRALIAN TIMBERS.

BLACK BEAN.

Black bean is the standard common name of the timber which botanically is known as Castanospermum australe. Being a member of the botanical family Leguminosae, Black bean was so-called on account of its large pea pod fruit and the black colour of its wood. This species was originally found in the vicinity of Brisbane, where it was given the name Moreton Bay chestnut.

The species is found in eastern Australia. The southern extremity of its range is in the tablelands of the Dorrigo whence it extends through the regions of continuous rainfall to the Atherton-Cairns district in north Queensland. In its best development, on the Atherton Plateau, the tree attains a height of 120 feet and a diameter at breast height of about 3 feet 6 inches, but in less favourable localities, Black bean is confined to a small short-boled tree. The bole is somewhat irregular at its base, but becoming cylindrical higher up. The bark is of medium thickness and is dark grey in colour.

The truewood of this timber is dark in colour deepening nearly to black, while the sapwood varies from a white to a yellowish colour. The grain is generally straight, but may be interlocked. The texture is coarse and figure is prominent due to longitudinal streaks of pale coloured tissue surrounding the pores. It is of medium density ranging from 37 to 51 lb. and averaging 44 lb. per cubic foot when dried to 12% moisture content. It is considered resistant to decay. The wood is moderately hard, moderately strong and stiff, but is somewhat brittle. Care is required in seasoning to avoid checking and final reconditioning treatment is advisable. In drying from the green condition to 12% moisture content, backsawn widths shrink 6% and quartersawn 2%. Response to reconditioning is marked and this treatment reduces these shrinkages to 3½% and 1½% respectively. The wood is not difficult to work with hand or machine tools. It finishes to a smooth and somewhat greasy surface and polishes excellently. It slices and carves well.

Black bean is a decorative wood of special merit for carved work, beamed ceilings and panelling. It is highly valued for high-class furniture, cabinet work and joinery. It is commonly used for plywood and flushdoors and panels. Because of its attractive figure, it is sought after for inlay work, exhibition pieces and small fancy articles such as jewel boxes and glove boxes, and for desk requisites such as inkstands, rulers and paper weights. For fancy turning it is particularly suited for the production of walking sticks, umbrella handles, pin trays, serviette rings, etc. It has been recommended for gun stocks. Its high insulating characteristic makes it specially suitable for switchboards and similar electrical fittings. It has given many years of satisfactory service in its native districts for house blocks and verandah posts.

The timber is obtainable in boards of average length and wide widths and in joinery sizes. It is also available as veneers, plywoods and flush panels.

Further information on this timber can be obtained on request from the Queensland Forestry Sub-Department, or from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne, S.C.4.

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EXHIBIT AT ROYAL MELBOURNE SHOW.

As the possible severity of borer attack in timber is so widely misunderstood, the Division of Forest Products made another attempt recently to dispel unwarranted fears. At the Royal Show, Melbourne, the Division exhibited in the pavilion of the Forests Commission of Victoria, various wood samples and wall charts illustrating the occurrence and types of damage caused by the pinhole, f[illegible]

and powder post borers. The methods for differentiating between these borers and the limits of their activities were shown clearly and demonstrations given of preventive treatments.

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PREVENTING THE GUMMING OF SAWS.

In sawing, a deposit not infrequently collects in the gullets or on the sides of the teeth where protected by the "set." This deposit has to be removed before gulleting a saw, otherwise the grinding wheel becomes clogged and tends to burn the teeth. Sometimes also, the gullets become so filled that they have to be cleaned out by hand several times before the saw is resharpened.

A common remedy for gumming, quoted in woodworking textbooks, is to wipe the saw with kerosene or some similar solvent. This method, however, is only effective for certain timbers such as pine and Douglas fir. It is useless for the gummy material left by many Australian hardwoods, especially the eucalypts. This difference is due to the variation in chemical nature of the deposits from the two classes of timbers. From pines and Douglas fir the deposits are resinous in nature and these can be dissolved in kerosene, spirits, turpentine and other solvents, but such liquids cannot dissolve kinos which are deposited by the eucalypts. The kinos can, however, be removed by means of caustic soda. If a rag or cotton waste soaked in a weak (½%) solution of caustic soda (1 oz. of solid caustic soda to 1 gallon of water) is applied to all affected parts of the saw, the deposit is weakened and can be rubbed off. Alternatively, all affected parts of the saw can be thoroughly moistened with the solution and the deposit then scraped off.

A weak solution of caustic soda of the strength referred to above is not dangerous to handle, but care should be taken to keep it away from the eyes; if it does tend to irritate the hands, slight burning can be arrested by applying a weak acid solution such as vinegar or boracic acid.

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PLYWOOD IN SHIPBUILDING.

Plywood has opened up a new avenue for the utilisation of wood in shipbuilding, and in the hands of skilful marine architects and designers many noteworthy decorative schemes have been created. The work in the modern luxury liners in the Atlantic service has exploited the possibilities in the natural figure in wood in a wonderfully artistic manner. These skilful examples have attracted the admiration of shipbuilders and have given great impetus to the use of plywood. In the case of the s.s. "Queen Mary" more than a million square yards of plywood were used and novel use was made of asbestos underlinings. The rooms of this floating palace are decorated with the choicest woods of the British Empire, more than 56 species being used to create a perfect example of interior architecture. Many agree that the effects surpass any previous creations in their artistically luxurious appearance. The latest ship added to the Atlantic service, the new s.s. "Mauretania," also features wood in its decoration.

The use of plywood in the construction of sailing, rowing and motor boats has increased markedly, due in no small measure to the developments in waterproof gluing. One striking example of this construction is in a racing boat 25 feet long, with a shell of ¼" plywood, which complete with sliding seats and outriggers, weighs but 25 lb.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.94.

1939##094 1st November, 1939.

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ARE YOUR KILNS RUN LIKE THIS?

The following list of reminders is reprinted from the August issue of "Furniture Manufacturer". We consider that the 'do's' which are implied of more importance than the 'don'ts' which are expressed. At all events, to how many of the following don'ts can you truthfully say, "that does not apply to my plant". Or don't you know?

DON'T consider kiln-drying as a necessary evil. If dry kilns are a necessity, don't be satisfied with antiquated or inferior equipment. And - after spending hundreds of pounds on up-to-date drying equipment - don't fail to be as careful in selecting your operator as you were in selecting the kilns. Get a well-educated, level-headed operator and encourage him to improve himself for the task. Give him confidence in himself by having confidence in him.

DON'T be satisfied that your kilns are doing their best. Be sure your kiln operator is always alert, endeavouring to improve previous records for speed and quality.

DON'T place your kilns in the hands of an employee for whom you can find no other place. When you do you acknowledge the inferiority of your drying equipment.

DON'T let anyone tinker with your kilns except the regular operator. Have confidence in him and hold him responsible for results.

DON'T ask the operator to dry all species by one schedule. He will be compelled to do so if you insist on drying several species and different thicknesses in the same kiln charge. Such a procedure is very unsatisfactory and risky.

DON'T expect your kiln operator to do the impossible. Adequate drying equipment and a competent kiln operator do not complete the circle. The power plant must do its part. It is just as essential that adequate steam be supplied to heat and humidify the kiln chamber and its contents properly as it is to keep sufficient petrol in your car.

DON'T load your kiln operator with too many tasks. The result will be that some of them will be neglected. The kiln will generally be the victim.

DON'T let anyone convince you that automatic operating devices will relieve you of the necessity of a kiln operator. Since the kiln operator generally has at least two jobs to look after, automatic devices are very essential today in lightening his kiln duties, but they need frequent attention by a competent man. An automatic device will do its appointed job provided the human element that cares for and operates it will do his part.

DON'T purchase kiln equipment merely on the appearance of what has already been built. A fine-looking battery of kilns is a great asset, but may be expensive to operate and can be guilty of poor circulation and very uneven heating. In selecting the proper type of kiln, the vital points are: Will the building withstand the strain of the years with high temperatures inside and very low winter temperatures on the outside? What are the operating costs as against the drying possibilities?

DON'T bluff and pretend you know it all. Action always boosts a man's value much faster than talk.

DON'T get married to an old idea. Associate with other operators, swap ideas and experiences, read everything possible having to do with dry kilns and their operation.

DON'T let waste matter accumulate on the heating pipes or in bottom of kilns. Such accumulations are not only fire hazards, but more or less retard the radiation of heat and proper circulation.

DON'T neglect heating pipes and other metal work used inside of kilns. A little oil and paint now and then is assurance of long life and low operating costs.

DON'T neglect valves. Keep a close check on the seats of all valves, making sure they are in perfect condition, and regrind or renew all worn seats and disks. A leaky valve, especially in temperature regulators, prevents proper regulation of desired kiln conditions.

DON'T forget to check steam traps once a month. A leaky steam trap is an expensive item; also, a slow-acting trap will hold back condensate and slow up the kiln heating.

DON'T neglect to report any damaged doors or other parts of the kiln building. Always bear in mind that a tight kiln chamber is the easiest to heat and in which to control the relative humidity and circulation.

WOODEN FLOORS OVER CONCRETE.

Several methods have been developed for fixing wooden floors over structural concrete and advantages are claimed for the respective systems.

Recently, a method of fixing flooring boards directly to the concrete without the use of battens was brought to the Division's notice. Two floors, one in a factory and one in an office, were inspected. The factory floor, comprising 5¼" x 1⅝" mountain ash flooring strips had been laid over a badly worn concrete surface and fixed with special expansion fasteners. These were countersunk in the boards, two across the face at 3 ft. intervals along their length and covered by wooden dowels. After three years of heavy service the surface was observed to be in a highly commendable condition and was easily kept clean. The men working on it remarked that it is more pleasant to work on and less fatiguing than the concrete. The office flooring, 4½" x 13/16" mountain ash, was laid in a similar manner over a well dried concrete floor which had not been subjected to traffic.

The estimates of installation costs based on quantities of fasteners used in the above floors indicated that this method of fixing would be limited to special purposes. It seemed possible, however, that flooring could be effectively fixed with fewer fasteners of smaller size, and through the generosity of the firm manufacturing expansion fasteners and a firm manufacturing end-matched flooring, material has been received for laying experimental floors in two positions in the Division of Forest Products. One of these will be 100 sq.ft. in area of end matched 5½" x 13/16" T. & G., and the second about 500 sq.ft. of 4½" x 13/16", also T. & G. and end matched. Fasteners smaller than those in the floors previously inspected will be used and spaced at various distances, so that their effectiveness in service can be kept under observation. The cost of materials and installation for these floors is comparable with the cost of fixing wood battens to the concrete and nailing the flooring to these, and only about half the cost of material and installation of parquetry floors of simple design.

The method of fixing flooring boards direct to concrete has a number of advantages. Compared with the use of nailing battens or joists, it avoids the raising of the floor level and the consequent reduction in ceiling height and does not require the use of sound absorbing or insulating materials which are usually placed between battens to lessen the resonance of raised floors. The support given by the concrete when boards are directly fixed also eliminates deflection and fatigue under heavy wheel loads and the use of the thicker floorings, usually specified for industrial floors laid on joists, is no longer essential. The cost of strip flooring is far less than that of end grain wood blocks. Because of these factors, this method of laying floors appears to offer great possibilities in Australia.

LOW COSTS WITH HOT PRESS RESIN ADHESIVES.

Resin glues now in use give far more water resistant bonds than can be obtained with cold press adhesives. The weatherproof and waterproof qualities of phenolic resin glues such as Tego film are becoming widely known and there is little doubt that adhesives of similar type, if available at lower costs, would find extensive application. Thus, other hot press glues, of the urea-formaldehyde type, applied as liquids, which can be broken down with extenders to cheapen the glue line cost, are coming to the fore.

Flour is commonly used as an extender in urea resin glues. The dry strength of the joint is reduced very little by using 2 parts of extender to 1 of resin. The wet strength under these conditions is superior to that obtained with casein glue, whereas the use of the extender and resin in a ratio of 1:1 gives joints of excellent moisture resistance.

The following tables, based on figures recently published in "Veneers and Plywoods" show the composition of several typical mixtures which are in common use in U.S.America, the costs of the various ingredients and the cost per 100 square feet of single glue line, assuming spreads of 2.4, 3.2 and 4.0 sq.ft. of glue line per lb. of liquid glue. Conversions from American to Australian currency were made on the basis of 3.50 dollars = £1.

Table 1.

Cost Calculation.

Glue Ingredients	A	B	C
	lb.	lb.	lb.
Mixtures:			
Liquid resin (urea)	100	100	100
Extender (flour)	70	100	150
Water	60	100	150
Catalyst	8	8	8
Total:	238	308	408
	s.d	s.d	s.d
Costs:			
Resin @ 11.2d. per lb.	93-4	93-4	93-4
Flour @ 1.4d. " "	8-2	11-8	17-6
Catalyst @ 10.5d. per lb.	7-0	7-0	7-0
Cost per batch	108-6	112-0	117-10
Cost per liquid lb.	5.5d.	4.4d.	3.5d.

Table 2.

Cost - On the basis of square feet of single glue line.

Adhesive per 100 sq.ft. (lb.)	A. (pence)	B. (pence)	C. (pence)
2.4	13.2	10.6	8.4
3.2	17.6	14.1	11.2
4.0	22.0	17.6	14.0

An examination of Table 2, Column A, shows that the cost per 100 sq.ft. of single glue line varies from just over 1/1d. to 1/10d. This is equivalent to 2/2d. and 3/8d. per 100 sq.ft. of 3 ply. In Column C, however, the variation is from approximately 8½d. to 1/2d., i.e., 1/5d. to 2/4d. per 100 square feet of 3 ply. Thus, in Column A (high quality water resistant glue line) the cost is higher than that of ordinary cold press casein glue while in Column C (more water resistant and durable glue line than casein glue), the cost is more or less comparable.

It is unfortunate that urea resins cannot be purchased in Australia at the present time. They are not made locally and a certain deterioration which takes place with age more or less prevents their importation. The data given are interesting, however, for they show the strides which are being made in the production of low cost resin adhesives in the U.S.A.

RESEARCH ON TIMBER BENDING.

A paper entitled "A Study of the Bending Qualities of Karri" is being published in the November issue of the Journal of the Council for Scientific and Industrial Research giving the results of a systematic study on the bending of this species. The paper describes the methods of selection, preparation and testing, and discusses the results of the tests. It is divided into two parts, one giving a non technical account of the results, whilst the other gives full details including the design and statistical analysis of the experiment.

PRESERVATION OF FIRE-KILLED TIMBER.

Recommendations for the preservative treatment of fire-killed salvage-felled mountain ash and alpine ash are published in the Journal of the Council for Scientific and Industrial Research November issue. These recommendations are based on preliminary investigations carried out by officers of the Division of Forest Products in two districts where mountain ash had been killed in fires in 1926 and 1932, and are advanced for the consideration of sawmillers in Victoria whose areas were swept by the fires in January, 1939.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

White Mahogany.

White mahogany is the name proposed for standardisation as the trade name of timbers described botanically as Eucalyptus triantha Link, syn. E. acmenioides, Schau, and Eucalyptus carnea Baker, and these species are so closely allied that for commercial purposes they are grouped under the standard reference name of Eucalyptus acmenioides group. This timber is well known in Queensland as yellow stringybark, the name being descriptive of the colour of the wood and the bark of the tree. It differs, however, from the timber known in Southern N.S.W. and Victoria as yellow stringybark. In New South Wales it is commonly named white mahogany and sometimes prickly mahogany.

Eucalyptus acmenioides group has a lengthy distribution in the coastal forests of eastern Australia, extending from about the latitude of Sydney in New South Wales northwards into Queensland, where it is common in the Brisbane, Maryborough, Gympie, Bundaberg and Cardwell districts and found also in the elevated Atherton plateau in the north. It is commonly associated in the southern parts of its range with blackbutt and tallowwood.

The tree attains a height of 120 feet and a diameter at breast height of about 4 ft., and has a rather small crown. Its bark is of the fibrous or stringy type.

The timber is pale coloured varying from yellowish or light brown to brown. The grain is usually interlocked and sometimes fiddle-backed and the texture close. It has at times a greasy appearance which is, however, less marked than in tallowwood. It is heavy to very heavy, ranging from 51 to 67 lb. and averaging 59 lb. per cubic foot when seasoned to 12% moisture content. It is ranked among the best of the eucalypts for its resistance to decay and termites and it is reported to be fire resistant. It is very hard, very strong, very stiff and tough. It seasons relatively slowly and has no great tendency to check. In drying from the green condition to 12% moisture content, back-sawn widths shrink 5½% and quarter-sawn 3%. Many users assert that it is one of the best hardwoods to work, chopping, splitting or sawing equally well and behaving satisfactorily under machine tools.

White mahogany is a structural timber of high quality. In round, hewn and sawn form, it fulfils many structural needs where both strength and durability are required. It is used for pitprops in small round form in the Queensland coal mines, and is in demand for electric transmission poles. For railway purposes, the timber is highly regarded for sleepers, crossing timbers, transoms; and for the underframing, framing, flooring and sheathing of wagons and carriages. In bridge building it is suited for use in sills, girders, beams, wales and braces. In general building it is a favourite for house stumps, plates, joists, studs, rafters, general framing, fence posts, rails and palings. It is highly regarded for flooring in exposed or sheltered positions and for weatherboards.

The timber is obtainable in boards and scantlings and in hewn or round sections from timber merchants in New South Wales and Queensland. The total supply is considerable, but smaller than that of such timbers as blackbutt and spotted gum.

Further information on this timber can be obtained on request from the Queensland Forestry Sub-Department, the New South Wales Forestry Commission, or from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne, S.C.4.

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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

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PRODUCER GAS FOR MOTOR FUEL.

The use of wood and charcoal for fuel for motor vehicles is at present receiving careful consideration in Australia. As oil and petrol for cars and transport vehicles are imported, substitutes will need to be developed if the rate of supply is disturbed and, apart from possible shortage, the rising prices of petrol naturally direct public interest towards alternatives. Knowing the developments overseas, especially in France, Italy, Germany and Russia in the use of small portable gas producers mounted on motor vehicles and realising that Australian manufacturers have already produced similar units and have facilities for far greater production, the Commonwealth Government has invited tenders for the supply of several hundred producer gas units which will be fitted to motor vehicles. This is an important development for the forest and timber industries. The anticipated demand for charcoal extends the value of the forest to the community and will probably provide a means of utilising some forms of wood substance for which there has not formerly been an economical use. The timber industry, having waste wood to dispose of, has in its possession a material now convertible into fuel for its own and the public's transport requirements.

Producer gas units operate by burning a carbonaceous fuel in the presence of some moisture, the resulting gases consisting essentially of carbon monoxide and hydrogen. A generator consists of a light steel cylinder, the fuel being loaded in through an opening in the top and fired near the base. Air is admitted into the zone of combustion and the gases produced are drawn off. There are several available types of generator; one group suitable for tarry fuels such as coal and wood, and other groups suitable for non-tarry fuels such as coke and charcoal. Within each group there are many individual designs differing in size and in arrangement of draught, burners, grate, etc. Their basic purpose, however, is the same, namely, to generate gases which, when mixed with the requisite quantity of air and ignited, will burn with explosive rapidity. Before reaching the engine the gases are cooled and freed from any particles of dust or tar before they are fit to use in the engine and for this purpose, coolers and various types of scrubbers are provided. The scrubbers require cleaning periodically. The cleaning is one of the chief disadvantages of the producer gas unit on a vehicle, as it is a dirty operation and must be done about every 400 miles.

A gas producer will not start as rapidly as a petrol engine, but the time required has been progressively decreased in modern designs. Lighting from cold is effected by holding the flame of a kerosene or petrol-soaked wick in the air inlet for a few seconds and inducing a draught with a blower. Seldom are more than five minutes required to start from cold and often the time is less than three minutes. In the case of private cars running on charcoal, petrol is often used for instantaneous starting, the generator lit and the engine switched over to producer gas after a brief period on the road. After halts of 15 minutes or less, the engine can be re-started immediately on the gas stored in the piping systems. After longer halts, up to 2 hours, there are enough glowing embers in the generator to permit generation of gas without relighting and generally, the operation of the blower for about one minute is sufficient for re-starting.

In the cylinders of an internal combustion engine, producer gas yields power in the same way as vaporised petrol.

Owing to its lower heat value, however, a cylinder charge of producer gas yields less power than a corresponding charge of petrol. A petrol vehicle operated on producer gas will therefore have less power and lower maximum speed than when run on petrol, the reduction being in the order of 40 to 50%.

An important consideration is the economy of operation on producer gas. In a motor vehicle, it has been established that 14 to 16 lb. of charcoal are equivalent to 1 gallon of petrol. From this relation it is possible to estimate the relative mileage costs with the two fuels and to compute the distance over which the cost of a producer gas unit would be recouped from savings in expenditure on fuel. At £3/10/- per ton, charcoal costing 6d. would give the same haulage as one gallon of petrol retailing at 1/11d. in suburban areas and considerably more in country districts It is also worth noting that the price of petrol rises as the distance from the main distributing centres increases and that in contrast to this increase, charcoal becomes more readily available and cheaper. The prospect of producing charcoal at any place where trees are found also emphasises the invulnerability of this source of fuel and the decentralisation of supply has many factors in its favour.

At the present time the cost of converting petrol vehicles to operate on producer gas ranges from about £60 to £100. The proposals of the Government to buy the units in appreciable numbers should allow some manufacturers to plan for mass production with reduction in cost. This prospective reduction in cost and reported policy of some State authorities to seek some reduction in licensing fees should commend producer gas units to the favourable consideration of the public.

A NEW GLUING TECHNIQUE FOR LARGE BEAMS.

Work is being carried out overseas on the gluing-up of large beams. Numerous difficulties have been encountered. To give one example - It is practically impossible to evenly surface long lengths of timber and wide boards to obtain the intimate contact so necessary for proper gluing. Experiments have shown that the strength of many of the beams built up was very low due to the presence of thick brittle patches of glue in hollow areas. The glue used (Kaurit, a urea resin) appeared to have crystallised. It was readily apparent that some means of strengthening the glue without interfering with other essential features would have to be found if success was to be attained.

After many trials it was shown that the addition of ground and softened Bakelite powder to Kaurit glue in the proportion of 1 : 5 gave a large increase in the strength of the adhesive. Test specimens were glued up in the normal manner with ordinary Kaurit glue and with Kaurit glue plus the Bakelite powder in a layer approximately 1/12" in thickness. The joint shear strength in the latter case was shown to be over three times that in the former case. There was also a large percentage of wood failure indicating that the strength of the glue was comparable to that of the wood itself.

The flange and web members of a number of I. beams were subsequently bonded up with Kaurit glue plus ground and softened Bakelite powder. The individual components were glued up direct from the saw no effort being made to surface the timber. Pressure was applied with ordinary screw clamps. The testing of these beams showed that the adhesion obtained was quite satisfactory.

One other point in connection with these tests should be mentioned - only timbers with an average moisture content of less than 20% can be successfully glued with Kaurit glue.

Kaurit glue is very water resistant. It can be used cold by the addition of a "cold setting" agent during mixing. Unfortunately it cannot be obtained in Australia at the present time. The new gluing technique is of interest, however, for it opens up new avenues for the utilisation of laminated materials.

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THE PROPERTIES OF AUSTRALIAN TIMBERS.

Alpine Ash.

Alpine ash is the trade name proposed for standardisation for the timber described botanically as Eucalyptus gigantea, Hook f. syn. E. delegatensis Baker. Eucalyptus gigantea is the standard reference name. The name of alpine ash is well known in New South Wales and in Australian Capital Territory, but in Victoria the timber is perhaps more commonly known as woollybutt or red mountain ash and in Tasmania as whitetop stringybark and gum-top stringybark. It is one of the timbers that may be present in shipments described in overseas markets as Tasmanian oak, Victorian oak or Australian oak. The multiplicity of names is unfortunate. Adherence to the standard name should result in wider recognition of the qualities of this timber and avoid much needless confusion.

The species has a relatively wide range of occurrence in south-eastern Australia. It is found in most parts of the eastern half of Tasmania at elevations of two to three thousand feet. It occurs in the central highlands of Victoria at elevations of 3,000 to 4,000 ft. and again at high elevations in the south-eastern highlands of New South Wales and the highlands of the Australian Capital Territory. On the lower elevations of its range it associates with mountain ash (Eucalyptus regnans) but generally it grows in pure stands.

Like mountain ash, its close relative, alpine ash is one of the giant eucalypts attaining extremely tall heights up to 300 ft. On favorable sites its diameter at breast height may measure 5 ft. The tree has a tall clean tapering trunk, the bark on the lower part being thick and woolly - somewhat resembling a stringybark. This type of bark ceases abruptly about halfway up the stem and above this point (which the bushmen term the junction) it is clean, smooth, very thin and light bluish-grey to white in colour.

The timber is usually pale brown in colour, but at times shows a definite pinkish tint. It is open in texture, usually straight-grained, sometimes with wavy grain giving rise to a fiddleback figure. Growth rings are generally prominent, the latewood being darker than the earlywood. Pores are numerous in the earlywood and occasionally absent from the latewood and this timber is consequently the eucalypt most nearly approaching to ring porosity. It is one of the lightest eucalypts, its density at 12% moisture content ranging from 33 to 49 and averaging 41½ lb./cu.ft. before reconditioning and 40 lb./cu.ft. after reconditioning.

The sapwood is seldom attacked by the Lyctus borer, but the truewood is not specially resistant to decay. It is moderately hard, strong and fairly tough timber. Seasoning requires care, preliminary air-drying prior to kiln-drying being advisable. It responds well to a "reconditioning" treatment at the end of the seasoning period and common trade practice is to kiln dry and recondition. In drying from the green condition to 12% moisture content backsawn widths shrink 8½% and quartersawn widths 6%, these being reduced to 5½% and 3½% respectively after reconditioning. It works easily under hand or machine tools, stains readily, fumes to a walnut colour, and takes a good polish.

Alpine ash is an excellent utility timber for use above ground. Similarly to mountain ash, its light colour and ease of staining renders it specially popular since it may be brought to any desired shade. It makes high class joinery and flooring and is in constant demand for mouldings, weatherboards, panelling, lining and all finish purposes. It is particularly suitable for furniture and cabinet work, office and household fittings. In dwelling construction it is widely used for framing in joists, studs, plates and rafters and for interior trim. It has many special uses such as for oars, handles, skis, baseball, bats and cricket stumps. It is one

of the most suitable eucalypts for motor body construction and is in some demand by coachbuilders and wheelwrights for light shafts, felloes and spokes and by agricultural implement makers. In the cooperage industry it makes satisfactory wine and tallow casks. Case makers use it in considerable quantities for cases for fresh fruit, canned goods, cleats for butter boxes, bottle crates and miscellaneous packaging.

The timber is comparatively plentiful and is available in narrow, medium and wide boards, in joinery and furniture sizes; in a full range of scantling sizes, and in long lengths if required. Stocks are held by most Victorian and Tasmanian timber merchants and by firms in the Riverina district of New South Wales. Additional information on its characteristics and uses may be obtained from the forest authorities in Tasmania, Victoria and New South Wales or from the Chief, Division of Forest Products, 69 Yarra Bank Road, South Melbourne.

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THE PREVENTION OF LYCTUS ATTACK IN VENEERS.

Although the Lyctus borer confines its attack to the sapwood of certain timbers, the sapwood in some species is sufficiently wide to make this attack a serious problem. Some of the susceptible timbers may be impregnated with chemicals that are toxic to Lyctus, but equipment for treating timber in log form on a commercial scale is not yet operated in Australia, nor is the problem of treating timber solved, although experimental work is now in progress.

For many years the veneer and plywood of New South Wales and Queensland have been seriously concerned with the Lyctus problem. Losses have been incurred due to the discarding of apparently susceptible material at the veneer plant as well as to claims from users who have manufactured articles from veneers whose susceptibility had not been detected. Rather than meet repeated claims the industry tended to abandon the peeling of troublesome or doubtful species.

The Division of Forest Products has conducted investigations on the habits of the Lyctus borer over a considerable number of years and has tested the effectiveness of various substances for its control. Tests showed that several different chemicals in low concentrations in wood prevent infestation by Lyctus. Further it was shown that these materials could be easily and satisfactorily introduced at relatively low cost into green veneer. Accordingly, the design of plant to apply this treatment in commercial veneer plants was prepared and with the generous assistance of members of the Veneer and Plywood of Brisbane a trial plant was erected. The commercial tests that followed showed that the treatment of green veneers with boric acid, the most suitable preservative tested, could be given at an approximate cost of 1/2d. per 100 sq. ft. of 3-ply (3/16" basis) and that the treatment had no effect on subsequent drying, casein gluing, French polishing or lacquering or on the final colour of the veneer. The successful demonstration of the practicability of the treatment led to its adoption in commercial practice in Queensland. It is being used on the portions of the logs that had not been utilisable and effected considerable economies in the use of log supplies and made possible the utilisation of some species not previously acceptable.

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BREVITIES.

Mr. I. H. Boas, Chief, Division of Forest Products, and Mr. I. Langlands, Officer-in-Charge of the Division's Timber Mechanics Section visited New South Wales and Queensland to make arrangements for the supply of timbers for testing purposes.

Mr. J. E. Cummins, Officer-in-Charge, Section of Preservation, Division of Forest Products, visited South Australia to carry out inspections of poles and sleepers laid down some years ago in test sites in that State.

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