NEWSLETTER

Forest Products

1933##012

MONTHLY NEWS BULLETIN NO. 12 FIRST PUBLISHED IN 1 JANUARY 1933

METHODS FOR TREATING FURNITURE INFESTED WITH BORERS

Judging by the numerous enquiries received by the Division of Forest Products during the last two months, many householders have been puzzled and alarmed by the appearance of little piles of fine wood dust in the vicinity of or on the furniture or other woodwork in the house. Closer examination has revealed the presence of small borer holes in the timber and these are a sure indication that the borers have been at work. It is commonly thought that the infestation is of recent occurrence and the only damage is the minute hole which is visible externally. Unfortunately, this is far from the truth. The hole on the surface is only the exit hole of the mature beetle; the grub or larva has been working inside the timber for many months.

The normal period of development from egg to mature beetle is usually about a year, so that infestation of the furniture or other woodwork has probably occurred during the summer months of the previous year. The eggs quickly hatch into grubs which immediately commence to bore into the wood. For many months these grubs bore away inside the timber changing the solid wood into a fine powdery dust. Finally as spring approaches, each grub hollows out a small chamber near the surface. In this chamber the grub changes into a chrysalis which itself in turn changes into a beetle. The beetle cuts its way to the surface of the wood and leaves behind the evidences of attack, namely, the small exit hole and the pile of fine powdery wood dust.

It is thus quite evident that the presence of exit holes and piles of wood dust indicate serious damage to the inside of the timber and, in fact, the article may simply consist of a sound thin shell with the interior a mass of dust filled tunnels made by the grubs. Moreover, exist holes mean that the beetles have emerged and there is the danger of their re-infesting the timber or infesting other timber by the deposition of eggs. Hence, at this time of the year, the householder or the owner of any wooden products is well advised to look carefully for evidences of wood dust and exit holes.

The common borers which prove serious pests are of two kinds: (i) the Lyctus or Powder Post beetles, and (ii) the Anobium or the Furniture Borer, and while methods for treating infested material are the same for each kind, there are wide differences in the incidence of attack. It is, therefore, necessary to distinguish between these two borers.

The Lyctus or Powder Post Beetle attacks only the sapwood of timbers such as the eucalypts, oaks, ashes, blackwood, etc. In fact the large majority of timbers which contain pores or vessels are susceptible, the sapwood only being destroyed. The Lyctus prefers freshly seasoned timber and does not attack old seasoned stock. Freshly felled timber is susceptible to attack as soon as the surface layers become dry. Softwoods, that is, woods without vessels, such as hoop pine, kauri, *Pinus radiata*, New Zealand white pine, etc., are not attacked since these timbers do not possess any pores or vessels into which the beetle can deposit eggs. Details of the life history and methods for eradication of this borer are given in Trade Circular No. 5, of the Division of Forest Products.

The Anobium or Furniture Borer does not confine its attack to sapwood and, for preference, infests timber which has been in use and seasoned for a number of years. Sapwood is generally attacked first, but ultimately the truewood may be severely damaged. There is no record of this borer attacking any of the eucalypts, but numbers of European and American timbers such as oak, walnut, birch, beech and maple are often badly infested. New Zealand white pine is particularly susceptible to attack, while the more important Australian timbers, known to be susceptible, are blackwood, Queensland kauri and hoop pine. This borer is fully described in Trade Circular No. 11 of the Division of Forest Products.

It will be realised that it is of importance to the householder to determine which of these two borers is causing the damage, so that the probability of spread of infestation can be determined and guarded against. A fairly certain method of distinction is obtained if the borer dust is rubbed between the fingers. Lyctus dust is fine and floury, while the Anobium dust is coarser and has a distinct granular feel.

The best method for eradicating of these borers is to force an insecticide not the holes by means of hypodermic syringe or a small glass fountain pen filler. Unpolished surfaces can also be painted with the insecticide. Creosote is recommended for all places where its colour and smell will not be deleterious. Kerosene and creosote in the proportion of 8 to 1, or kerosene and turpentine in equal proportions can be used where creosote is unsuitable. A chemical called paradichlor-benzene, a white crystalline solid obtainable from wholesale chemists at about 2/6d per lb, has also proved very effective when dissolved in kerosene - 1 part chemical to 20 parts kerosene. Small wooden articles may be completely immersed in a bath of preservative, and this is one of the most effective methods of treatment. These treatments, if carried out properly during early spring and summer, will kill the grubs remaining in the wood since at these times they are working close to the surface. After treatment a careful watch should be kept on the affected wood, and if any signs of life are apparent, the treatments should be repeated. It is advisable that infested furniture should be treated at least twice during the one year and also in the following spring.

Further information or copies of the Trades Circulations mentioned above can be obtained from the Division (address and telephone number printed at the foot of the page).

FIBRE BOARDS:- A NEW BULLETIN

One of the developments of the present century has been the increased use of lining materials in sheet form. Asbestos cement sheets, gypsum boards, and fibre boards are now well established features of the building industry. Asbestos cement sheets and gypsum boards are made locally, but fibre boards are all imported. Some six or seven years ago there was a rumour that fibre boards were to be made in Australia from sugar cane waste, but up to the present the industry has not been established.

A comprehensive publication describing the Australian position with regard to wall boards and other types of fibre boards has long been necessary and it is, therefore, interesting to note that a pamphlet will shortly be issued by the Council for Scientific and Industrial Research dealing with this subject. The pamphlet is Technical Paper No. 5 of the Division of Forest Products, and is entitled "*Fibre Boards, their Uses and the Possibilities of their Manufacture in Australia*". The author is R.F. Turnbull, B.E., Utilisation Officer of the Division.

The pamphlet describes in the first place the different kinds of fibre boards, and discusses their history and the processes of manufacture. The uses of fibre boards both abroad and in Australia are considered, and details of the present and probably consumption discussed. Useful tables on thermal conductivity and acoustical properties are given, together with details of moisture, adsorption, expansion and strength.

Of particular interest are the details of some experiments carried out on a semi-commercial scale in America using Australian timbers. A full description is given of a plant suitable for Australian conditions and essential requirements are indicated. Finally, costs of establishment and costs of production for three different quantities of output are given, and the possibilities of manufacture in Australia are considered.

The production is a very valuable one, not only as a handbook on fibre boards, but also as a concise statement of the position as to the establishment of this industry in Australia.

PRODUCER GAS

About 15 or 20 years ago the producer gas plant was a commonly encountered source of mechanical power, but the extension of electrical transmission lines from central power stations and the improvement of the crude oil engine have been, to a large extent, responsible for its disappearance. Within the last few years, however, there has been a definite development of producer gas as a source of fuel for self-propelled vehicles.

In France, this movement has been encouraged by Government assistance and by the holding of reliability trials. Like Australia, France is dependent on foreign fuel supplies for internal combustion engines, so that machines capable of utilising fuel readily available locally are of considerable importance from the defence standpoint. Hence, it is not surprising to find that there are many motor trucks in France operating on producer gas which has been proved to be an economical and reliable source of power.

Trials with vehicles driven by producer gas hav ebeen made in Australia and a motor truck was successfully operated over several thousand miles under Government supervision. A motor truck of French design has been in commercial operation in the south east of South Austalia, but details of its performance are lacking.

One of the difficulties in attaching gas producers to petrol engines is the necessity for increasing the compression ratio of the engine. This is usually acocmplished by fitting a special piston casting with reduced clearance volume, but an alternative method now being used is to fit special pistons. Another disadvantage is that an engine operated by producer gas has lower power than when operated by petrol. In the case of a motor truck the loss of power is not serious, but with some types of tractors, in which a large percentage of the power is employed simply in moving the tractor, a small reduction in power can mean a serious reduction in drawbar pull.

That these disabilities are not always serious and can be more than offset by saving in fuel cost is demonstrated by the increasing number of gas producers which are now being fitted to farm tractors. At the Adelaide Show held during September, there were no less than four stands advertising different makes of gas producer attachments for tractors. One of these was a producer using wood for fuel; a second was not actually shown, but was stated to be working in the Adelaide hills; the two remaining types were similar in design and burned charcoal. Of the two latter, one was designed for fitting to the tractor, the producer being located on brackets in front of the tractor and the scrubbers on the sides of the tractor; the other was a self-contained unit of producer and scrubbers for attaching to the plough or other implements being drawn by the tractor.

Obviously since the cost of installation has to be paid out of savings on fuel, it becomes the important. factor. It was stated in Adelaide that the cost of a charcoal producer fitted in front of the tractor and complete with scrubbers, carburettor attachment, and special pistons for the engine was approximately £80. At such a figure, the use of producer gas is an attractive proposition, since on the farm, timber is generally cheap and charcoal burning is a simple operatino. It is also claimed that engine maintenance with producer gas is not greater than with oil fuels, that carbonising is no more prevalent, and that there is the advantage of no dilution of crank case oil.

GREATER DEMAND FOR AUSTRALIAN TIMBERS ON THE ENGLISH MARKET

Recently there has been an increased demand for Australian timbers on the English market. One reason for this has been the fostering of the Empire spirit, but a contributing factor has undoubtedly been the improvement in marketing methods adopted by the Australian timber industry.

In a letter recently received by Mr I.H. Boas, Chief of the Division of Forest Products, from Colonel Mallinson of William Mallinson & Sons, an important London timber firm, the improvement in Australian flooring timbers was commented on. The opinion was expressed that the flooring was being received in a much better condition than anything they

had had previously, and that the influence of modern scientific methods was apparent.

AUSTRALIAN TIMBERS IN SOUTH AFRICA

Although many are aware that South Africa has extensive areas planted with Australian wattles, it is not generally known that there are nearly 250 000 acres of eucalypt plantations. Apparently there South African has a much higher opinion of the quality of our timbers than we have ourselves. The following extract is from an article in a publication of the South African grown karri.

> "Its physical characteristics make it particularly suitable for hardwood flooring, wagon building and similar purposes, where good appearance, hardness and strength are advantageous. It has been used successfully as strip flooring instead of imported maple or birch and is actually considered preferable by many on account of its attractive colour. its suitability for parquette blocks is well demonstrated in, among other plces, the new railway station at Johannesburg".

Karri timber has long been favourably regarded on the English and other markets. It has proved one of the finest timbers for wood pipe, and has now entirely replaced imported oregon in Australia for this purpose. Because of its superior qualities a thickness of 1" only is necessary for this purpose, whereas with oregon 1½" thickness is required. Yet in spite of this evidence of its value, it is not uncommon to find Australians who still deride its utility.

NAMES FOR AUSTRALIAN TIMBERS

Some time ago the Division of Forest Products, in one of its trade Circulars (No. 8), suggested that in some cases botanical names could be profitably used in place of common names, in order to overcome the confusion at present existing. Apparently, this has also been found necessary in South Africa for distinguishing their plantation grown eucalypt timbers. Thus, Sydney blue gum, the botanical name of which is *Eucalyptus saligna*, is called "saligna". This is an obvious advance on the Australian peculiarity of describing it variously as blue gum or Rose gum. The inconsistency of such names must be puzzling to the foreigner, particularly as there are several other blue gums which are totally different species.

POSSIBLE USES FOR SAWDUST WASTE

In a recent report prepared by the National Committee on Wood Utilisation in the United States, the following list of uses for sawdust is given:-

An obsorbent:- Butchers' shops, markets, packing houses, kennel bedding.

Cleaning (drying and polishing):- Aluminium utensils, metal products, tubing, and wire novelties.

Composition products:- Artificial wood, cast products, clay products, composition flooring, concrete roof tiles and slabs, concrete producs, floors (for sound deadening), moulded articles, plaster boards, stucco and plasters.

Fuel:- As points of production (sawmills, factories, etc.), briquettes, domestic purposes, gas products (producer gas), steamboat use.

Heat insulation:- Cars, ice houses and homes.

Miscellaneous:- Chemical purposes, cleaning and dressing furs, distillation, extracation (tans), fertiliser, fireworks, floor sweeping compounds, hand soaps, leather industry, meat smoking, oil fire extinguisher, protection of freshly poured concrete, wallpaper, waterproofing mixtures, wood flour, wood meal fodders.

Packing:- Grapes and fruit, ice, and miscellaneous products.

In the United States 28 000 tons of wood flour were manufactured from shavings and sawdust in 1929. Of this quantity, 67% is used in the

manufacture of linoleum, 15% in the manufacture of plastics and 14% in the manufacture of explosives.

PATENTED PROCESSES

Recently the Division of Forest Products has come into contact with a number of people associated with the timber industry who have suffered consdierable financial loss through purchasing the rights in useless patented processes. In spite of the fact that only a small percentage of the ideas patented prove profitable commercially, there seems to be a widepsread conception that the patenting of a process is a guarantee of its commercial value. This is far afrom being the case. A patent is only an indication that the idea is probably novel; it is no guarantee that the idea will work, or that if it does, it can be a commercial success.

All those contemplating purchase of the rights in some idea associated with timber seasoning, preservation or other branch of forest products are urged to obtain independent advice before committing themselves to expenditure. The Division of Forest Products will be glad to give a considered, unbiased opinion upon any idea submitted to them.

The Division has only one object, the furtherance of the utilisation of the forest products of Australia, and any new idea which may possibly assist will receive the most careful consideration. The staff of the Division consists of officers trained both in Australia and abroad, covering all branches of utilisation, and if on examination a proposition appears to be a favourable one they will be only too willing to say so, and to give any assistance they can to facilitate its adoption. On the other hand, if, as in the case of a number of instances recently encountered, the idea is unsound and will surely involve the purchaser in financial loss, the enquirer will be frankly advised of this.

BREVITIES

The collection of timbers in the museum of the Division of Forest Products is steadily growing. It consists now of some 820 species belonging to 80 genera. This collection is of very great value in the study of the structure of timbers, and efforts are constantly being made to increase the number of species represented. If a timber for a particular purpose is needed, one of the methods used is to examine the structure of the timbers which have proved most suitable for this purpose in other countries and then search among our local timbers for those with a similar structure. This is one reason why a good collection of timbers is a necessity in the Division.

WOOD TAINT IN BUTTER

In August of this year, a shipment of butter was sent to London packed in Hoop Pine boxes, some of which had been sprayed by the process developed by the Division of Forest Products. A report on this shipment has just been received. It discloses that the butter packed in sprayed boxes did not show any taint, whereas that packed in the unsprayed boxes showed definite taint. This report indicates the value of the method. A further shipment has by now reached London and a report should soon be to hand. If this confirms the previous results, it will be a clear indication of how future shipments of butter from Queensland or New South Wales should be packed.

A kiln seasoning plant embodying some of the most modern features has recently commenced oepration at the mill of J.S. Lee & Sons, Smithton, Tasmania. This consists of four internal fan kilns of the latest cross shaft type, a reconditioning chamber, a well laid out air seasoning yard and a Christensen lifting truck, for handling complete attacks throughout the combined air and kiln seasoning processes.

The plant was build to designs prepared by the Division of Forest Products, and tests just completed by an officer of the Division have indicated highly satisfactory results.

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1933##013
MONTHLY NEWS BULLETIN NO. 13 FIRST PUBLISHED IN 1 FEBRUARY 1933

TIMBER SEASONING

The Necessity for Seasoning

One of the most important factors in the utilisation of Australian timbers is the necessity for the timbers to be properly seasoned before use. Replacement of imported timbers for many purposes cannot, and will not, be accomplished until supplies of seasoned local timbers are available. It has been demonstrated time and time again that our local timbers are available. It has been demonstrated time and again that our local timbers are eminently satisfactory for some purposes for which imported timbers have been almost exclusively used. The great stumbling block in the way of their utilisation is the lack of sufficient supplies of properly seasoned material.

That this fact is being brought home to the industry is exemplified by the increasing interest in good seasoning practices and especially in kiln seasoning by means of which the time of drying is greatly reduced. This increasing interest has accompanied a gradual recovery of the timber industry and a number of old-established firms which have, heretofore, relied on air seasoning alone have recently sought the advice of the Division of Forest Products regarding kilns suitable for their requirements. Recent news from a sawmilling firm in the brush forests of New South Wales states that a battery of kilns designed by the Division is being erected. In these kilns they propose to dry all the important brush timbers. This is regarded as an important advance in New South Wales where kiln drying has not yet been widely adopted. It is hoped that the initiative of this firm will lead to an active interest in kiln seasoning amongst other New South Wales millers.

Model Seasoning Yards

The fine example shown by Messrs Christensen & Sexton of Moe, Victoria, in laying out their drying yards and kilns on the most approved lines and installing up-to-date kilns and handling equipment is already having its effect. Two other firms, Messrs J.S. Lee & Sons in Tasmania, and Mulhearn Bros. in New South Wales have installed yards on the same lines. These go-ahead firms will certainly reap the benefit of their acceptance of the doctrine that only the best is good enough, and will act as further centres to spread similar good practice in their States. The question is constantly asked, "What does kiln-drying costs?" The answer is that, if properly done, it not only costs nothing, but yields a handsome return. If Australian industries could be made to realise the price they pay for inefficiency and imperfect productions, their economic position would rapidly improve.

Assistance Available

It may not be generally known that the Division of Forest Products of the Commonwealth Council for Scientific and Industrial Research, gives free assistance and advice. This assistance has up to the present taken several forms, namely:

- Answers to all inquiries, either by letter or personal interview.
- Practical assistance at the plant - advising best methods of carrying out operations.
- Designing of kilns to suit specific conditions.
- Suggestions for yard layouts.

- Seasoning classes, which are held once a year.
- By the issue of a series of trade circulars pertaining to the fundamentals of seasoning - of these the following have been distributed to date:-

  No. 1 - Sound Practice in the Air Seasoning of Boards

  No. 2 - The Testing of Timber for Moisture Content

  No. 7 - Sample Boards: Their Use in Timber Seasoning

  No. 9 - Electrical Moisture Meters: For Measuring the Moisture Content of Timber

  No. 12 - Combined Air and Kiln Seasoning. Handling by Means of the Christensen Truck.

  (These trade circulars may be obtained free of charge from the address as the bottom of the page).

All the work of this nature is handled by a specially trained Seasoning Section, the officers of which have had considerable experience in the seasoning of timber both in Australia and abroad. The increased interest of the trade in proper seasoning methods has been demonstrated by the increasing number of requests for assistance. One of the seasoning officers of the Division, Mr W.L. Greenhill, has just returned from Tasmania where he spent over a month meeting members of the timber industry and advising on all matters pertaining to the seasoning of timber.

Kiln-drying Schedules

Experiments are being continually carried out in the small laboratory kilns of the Division of Forest Products with the object of developing suitable drying schedules for the more important Australian timbers. So many requests for such information have been received that all available results to date are being collected and will be published in the near future. In this pamphlet, about sixteen species will be dealt with; the publication being the first of a series in which suggested schedules, and notes on the drying characteristics of each species, will be discussed. In this manner, it is planned to build up a source of reliable and concise information concerning the drying of Australian timbers for the use of the practical man who desires to place in the market properly seasoned material.

IDENTIFICATION OF TIMBER BY MEANS OF SIMPLE CHEMICAL TESTS

For many purposes in the utilisation of timber it is very desirable to be able to identify positively the timber being employed. In a number of cases the more prominent characteristics of the timber reveal its identity at once to those accustomed to handling it and allied species. Such characteristics may be roughly compared to the fingerprints of a human being but, unfortunately, the possible combinations are not sufficiently extensive to permit the identification of all timbers rapidly and with a measure of certainty. Furthermore, some of the characteristics are such that they can only be detected by the aid of a microscope, and a rather complicated procedure is involved. This is out of the way for the practical timberman who could never prepare the thin sections necessary for microscopical examination. Thus it is impossible to expect a timberman to follow identification keys based on minute structural features. This is the job of a specialist equipped with the necessary laboratory and equipment.

In addition to the physical characteristics, however, there are other features which may be used as aids to identification. These are to be found in the chemical constituents of the wood. The main chemical substances, namely, cellulose and lignin, are common to all species, but there may be also present, in large or small quantities depending on the species, such substances as tannins, sugars, starches, acids, oils and mineral salts. In addition to the proportion the chemical nature of these substances may vary from species to species. Thus there are numerous types of tannins, some of which colour iron salts green, while others give a blue colouration; numerous kinds of sugars for each of which characteristic chemical tests are known; characteristic and readily detected essential oils, as in huon pine, the cypress pines, sandalwood, etc. The chemical nature of the mineral constituents is reflected in many cases in the way in which a timber burns. This has led to the development of the burning splinter test, which is the only

sure method of distinguishing between karri and jarrah. Thus, the chemical constituents of a timber may be used to provide simple tests which aid in its identification.

The majority of these tests are most conveniently carried out in solutions. Aqueous and alcoholic extracts can be prepared from sawdust in a short time and their preparation does not necessitate the use of expensive, delicate or complicated equipment. A complete kit for this type of work would consist of a set of test tubes, small bottles to contain the necessary reagents, a small spirit lamp, and a few accessories such as a wood rasp for obtaining the sawdust from the timber under investigation. This equipment is by no means complicated, and it may be that, eventually, a timber inspector will carry such a kit in the field.

For some time the Division of Forest Products has been engaged in developing simple chemical tests for the separation of numerous timbers which are very similar in general appearance and physical structure. These experiments have to date been confined to the more common coloured eucalypts and it has been found that tests involving the tannins and sugars present in the timbers can be developed and applied to the separation of a number of species.

A very interesting study has been that of the woods of Hoop and Bunya pines. The trees of these two species could never be confused, but their timbers when dressed cannot be distinguished and there is no structural difference so far as can be detected, which enables them to be readily separated. The Chemistry Section of the Division of Forest Products has, however, developed a very simple chemical test which, when applied to the aqueous extracts of these timbers gives such definite and distinctive colours that even an unskilled observer can distinguish between them.

A more complete account of this work of the Division of Forest Products will be published shortly.

BAD GLUEING PRACTICE

When inspecting woodworking factories, officers of the Division of Forest Products find that it is the exception for any attention to be paid to the details of glueing. In the great majority of cases glue is treated as if it needed no care at all. The result is numerous faulty joints which lead to complaints and losses. The usual reaction is to blame the glue and complain to the maker. By far the greater number of faulty joints are due either to bad treatment of the glue or faulty methods of application. Glue is rather a delicate material and needs care in its preparation and use. Recognition of this will save many a headache. To remedy this position, the Division proposes to issue shortly a Trade Circular setting out the various points to be observed in the preparation and use of animal glues. This will be followed by others dealing with casein and vegetable glues, and with waterproof glues.

TESTING OF CASES USED FOR SHIPPING BANANAS

The Council for Scientific and Industrial Research has been carrying on investigations into the best conditions for the transport of bananas and in the course of this work officers of the Division of Forest Products have inspected the cases on arrival in Melbourne. They report that the cases are not well designed and frequently are so badly broken as to spill the contents in the railway trucks. This was reported to Mr Francis, the Assistant Minister for Defence, who was representing the Federal Government at a recent conference of banana growers in Sydney. He asked the conference to allot a sum of money from the grant to be made by the Government from the duty on Fiji bananas, to enable the Division to carry out tests for the redesigning of the case. The conference agreed to do this, and plans are being prepared to carry out this work.

There is a growing recognition in Australia of the fact that more care is essential in the design of containers and the Section of Box design has a large programme of work before it. In the USA where this work was originally developed the results have been surprisingly good. Each year classes in box design are held at the Forest Products Laboratory at Madison and they are attended by representatives from all over the continent. Numerous industries have realised the big savings to be effected and no longer **put together** a case or crate that **will do**, but design it to give the best results in

service. Australian industries must learn to follow this excellent example.

TIMBER-DESTROYING INSECTS
White Ants

Termites, or as they are popularly called "white ants", are not true ants from the scientist's viewpoint. They, however, like true ants, live a social life and in each colony there is a definite division of labour, different work being performed by different forms or castes. In the central portion of the nest is the royal chamber, and in some cases there are several royal pairs. The queen is most prolific, enormous numbers of eggs being laid, from each of which one of three different forms may develop. These forms or casts are known as: (i) worker, (ii) soldiers, and (iii) nymphs or reproductive forms, which last become the well-known "flying ants" of the colony. The workers are soft bodied, white to grey in colour, blind and sterile. They are responsible for the damage done to timber structures. The soldiers are specially developed for the protection of the colony and they are equipped either with large jaws or else with a long snout from which they eject a sticky fluid at the enemy. The reproductive forms are generally seen in the spring or autumn, and can often be detected flying from the parent colony in large numbers. Those that escape the attack of birds and other insects mate and are capable of forming new colonies.

According to their nesting habits, termites may be broadly grouped into two classes, namely, subterranean and tree dwellers. The subterranean dwellers live in the soil, and often construct mounds on the ground. The tree dwellers never live in the soil or in mounds, and are generally found in galleries tunnelled in growing or dead trees. Both groups are found in Australia, the greater damage to timber structures being done by members of the subterranean group. The discussion which follows refers principally to this group, although some of the information may apply to the tree dwellers. The discussion which follows refers principally to this group, although some of the information may apply to the tree dwellers.

Termites of the subterranean group need a constant supply of moisture for their successful development, and, therefore, must have a constant contact with the earth. Because of this habit, it is possible to trace the entry of the termites to infested timber above ground. The termites always conceal themselves in the wood, in the ground, or in their communication or shelter tubes. To reach timber not in contact with the ground they may enter through cracks in cement floors or brickwork (as in a house) through heart pipes or cracks in wooden house foundation blocks, or else they may build their covered runways over any convenient surface. Damage above ground level may, therefore, be prevented by ensuring that no access, cracks, etc., are present, by periodically breaking down any runways that may be formed over the surfaces and by suitable treatment of the surrounding soil.

Special termite insulators can also be used to prevent the building of runways over exposed surfaces. In using these tin or iron insulator caps care should be taken that edges are bent over carefully and that there are no cracks or openings in the joints. Where caps are fixed to the top of wooden stumps by nails or screws the head of the nail or screw should be soldered so as to make it continuous with the top of the cap. Very often termites work their way up the centre of a stump and entry to the building is gained through small cracks in the top of the caps.

Timber treated with preservatives such as creosote and arsenic has been found to resist termite attack for long periods. The method of treatment of the timber varies somewhat depending on the species used, the size and conditions of use. Description of methods of treatment and the types of preservatives will be reserved for a later article.

Further information on timber preservation in Australia will be found in Pamphlet No. 24 of the Council for Scientific and Industrial Research, on "The Preservative Treatment of Fence Posts", By J.E. Cummins. This publication can be obtained free of charge.

BREVITIES

The Deputy Chief of the Division of Forest Products, Mr S.A. Clarke, is at present in Western Australia in connection with the finalising of reports on field grading studies carried out by R.F. Turnbull, Utilisation Officer of the Division, and F. Gregson of the

Western Australian Forest Service. Grading rules decided on by round table conference frequently break down in practical application. It is only by means of studies carried out in the field that the weak points can be found. For this reason, some considerable time has recently been spent in the field on the study of grading rules for the Western Australian timbers, jarrah and karri.

The accommodation for officers and equipment at the Forest Products Laboratories, East Melbourne, has for some time been severely taxed. To make more room available the existing temporary buildings have been extended. In this work only Australian timbers have been used and the greater part of the construction is of Victorian hardwood. The flooring consists of second grade seasoned mountain ash and it is proposed to watch the behaviour of this and of the framing timbers under actual service conditions.

Trade Circular No. 12 of the Division of Forest Products has recently been issued. This circular deals fully with the advantages of combined air and kiln seasoning of Australian timbers. Types of kilns, and the methods for an efficient yard layout are also discussed, while a full description and plans are given of the Christensen Lifting Truck, which has been recently developed in order to reduce handling costs in the modern timber yard.

Trade Circular No. 13 is in press and should be ready for distribution by the end of the month. This circular discusses the influence of sloping grain (a term which embodies cross grain, diagonal grain, and spiral grain) on the properties of timber. It is pointed out that in many industries such as those manufacturing sporting goods and handles, straight-grained timber is essential. This fact has not been fully recognised in the past. the influence of sloping grain on the strength of structural members is also fully discussed. This circular should be of considerable interest to engineer, architect, building and manufacturer.

CSIRO
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NEWSLETTER
Forest Products
1933##014
MONTHLY NEWS BULLETIN NO. 14 FIRST PUBLISHED IN 1 MARCH 1933

MODERN TRENDS IN TIMBER DESIGN

Timber has had to face, during recent years, severe competition from other building materials, and there can be no doubt that in many cases it has come off second best in the struggle for supremacy. It is becoming increasingly evident, however, that the reason for the displacement of timber has not been due to the actual inferiority of that material, but to the fact that full advantage has not been taken of its structural and physical properties in compensating for any deleterious attributes. In other words, design in timber has not kept abreast of the modern demand for economy in construction.

Perhaps one of the greatest disadvantages now existing in timber design is the fabrication of joints. With steel, various types of riveted joints have been developed to permit economical distribution of stress, and now, a further advance has been made by the adoption of welded connections. Reinforced concrete lends itself particularly to design in which adjacent members are of mutual assistance.

In the case of timber, however, methods of connection are similar to those developed centuries ago, when material was cheap and cost was not a prime factor. It is well-known, for example, that in timber structures it is extremely difficult to take advantage of the full tensile strength of members which are in tension, because of the trouble in obtaining suitable fastenings to transmit the stress without weakening the member. Indeed, so serious is this difficulty that it is not usually considered worthwhile to include data on tensile strength in tables dealing with the strength properties of timber. The position regarding connections of other timber members, while not so serious as in the case of tension members, is also far from satisfactory.

It is of interest, therefore, to note that in the United States of America comprehensive investigations are being carried out on timber fastenings in order to remedy this deficiency in knowledge. These investigations are partly the result of a report on modern German methods of timber construction, for in that country the relatively high cost of timber compared to other structural materials has necessitated more effective utilisation.

One of the arguments advanced in favour of structural materials other than timber, is that they have longer life. In many instances, however, this argument is erroneous. Where timber is used under cover, its life is indefinite and is likely to run into many hundreds of years. Where it is used exposed to weather conditions, precautions can usually be taken to make the life of the timber equal to the period for which the structure will be required. In these days of rapid development, it is difficult, in fact it is impossible, to predict the loading requirements of, say, a rail or road bridge more than 25 or 30 years hence. That this is so will be apparent in almost any state of the Commonwealth, where steel structures are to be seen replaced, not because they have deteriorated seriously in strength, but because they had not been designed sufficiently strong to meet the increased loading demands of today's conditions.

By proper precautions, timber can be made to give a life sufficiently long for most design computations of today. That, in some cases, it does not do so, is not the fault of the timber, but of the structural methods employed. It is safe to say that the majority of wooden structures, such as bridges, being built today are identical in design methods with those

built 20 or 30 years ago. The only changes are the use of heavier strength members, or a greater number of strength members to meet the increased loads now encountered.

That there is vast room for improvement has been shown by the modifications in design adopted by one of the State Government Departments concerned with bridge design. The engineers in this case have made a study of existing structures and have noted those portions in which decay is first apparent, and which ultimately are the cause of renewals either of members or of complete structures. These danger points have received special attention in new design either by more adequate protection from the weather in the case of exposed faces, or by the elimination of bad contact areas which are centres for the development of decay organisms. It will readily be appreciated that such methods are likely ultimately to result in the provision of structures which will last as long as the need for them exists. In other words: 'If timber is used economically in structures, timber will be found to be the most economical structural material'.

WOOD TAINT IN BUTTER
Favourable Reports on Recent Shipments in Treated Hoop Pine Boxes

In August last a series of experimental butter shipments was made. The butter was packed in the ordinary hoop pine box and also in hoop pine boxes which had been sprayed with the casein-formalin mixture developed by the Division of Forest Products. On arrival in London, these shipments were carefully inspected and the butter graded. Reports have now been received for three of these shipments and the results are entirely satisfactory.

In no single case was taint or smell noticeable when the butter from the sprayed boxes was examined; whereas, in two of the shipments the butter from every unsprayed box showed both taint and smell, and in the third shipment, while taint was absent, there was a noticeable smell in the butter from the unsprayed boxes.

These results are so satisfactory that it has been decided to send larger shipments in sprayed hoop pine boxes and arrangements are now being made to despatch 500 boxes from New South Wales. A few such shipments should dispose of, once and for all, the vexed question of wood taint caused by hoop pine boxes. The general application of the spray method will undoubtedly remove causes of complaint.

THE MOISTURE CONTENT OF SEASONED TIMBER

It is not, perhaps, generally realised that even thoroughly seasoned timber contains some moisture. This moisture is dependent on the relative humidity of the air in contact with the timber and varies form place to place and with climatic conditions. There is also a slight variation from timber to timber under the same conditions. Thus timber, wherever it is, will come to an equilibrium moisture content. For example, in Melbourne, mountain ash might contain 10% moisture in the middle of summer when conditions are particularly dry and 15% moisture in the middle of winter even though thoroughly seasoned and protected from rain. Thus, if this timber is dried to 10% in the summer time and stacked in unheated sheds, it may be expected to increase its moisture content to approximately 15% during the winter months and vice versa.

Obviously, it is of importance for the timber supplier and user to know to what moisture content timber should be dried. As a general rule it is desirable to dry to the mean moisture content for the locality of use. Thus, for Melbourne, where the range is approximately 10-15% the mean moisture content would be about 12%. Timber dried to this figure would have a minimum of shrinkage and swelling with variation in moisture content throughout the year.

Since the climate of Australia varies between wide limits the moisture content to which timber should be dried will also vary. Lack of appreciation of this factor has been responsible for many disappointments and failures in timber products. Furniture made in Melbourne form timber at a moisture content of 12%, quite suitable for Melbourne climate, often gives trouble due to shrinkage and cracked joints when supplied to a town of the dry interior where the equilibrium moisture content may be 8% or even lower. The Division of Forest Products has, in co-operation with various State and Federal Government Institutions, been carrying out

investigations to find the equilibrium moisture content for different timbers in the various capital cities. This test has been in progress for nearly 18 months, and will be continued for a further period before results are finally published.

In the meantime, in the absence of more definite information timber users can assume that the mean moisture contents desirable for all the capital cities is about 12% with the exception of Adelaide where it is probably nearer 10%. On the other hand, for the drier inland towns the mean moisture contents should be nearer 6-8% depending on the climatic conditions. By using a little judgment and by finding out the climatic conditions to be expected in any particular inland town it will be possible for the timber supplier to estimate the moisture content required.

METHODS FOR DETERMINING THE MOISTURE CONTENT OF WOOD

The difference between seasoned and unseasoned timber is well appreciated by those engaged in the handling, preparation and use of this material, for in the majority of cases improperly seasoned material must ultimately involve the manufacturer or user in increased expenditure. It is not always easy, however, to tell whether a piece of timber is seasoned or unseasoned and in order to know definitely it is necessary to determine the exact content of the piece. Variations in properties which accompany changes in moisture content are often used for estimating the degree of seasoning. Thus, for example, general appearance, feel, smell, toughness, weight and machining properties are features which are called upon either singly or in combination. While observations of this nature sometimes give a rough idea of the moisture content of a piece of timber, they are only very approximate since the normal variations in the properties of wood from piece to piece are so very great.

The most common way of determining accurately the moisture content of a sample of timber is by first weighing it, then completely removing all the moisture by drying, and finally reweighing the dried sample. Thus, from the loss in weight a simple calculation will give the amount of moisture that was originally present in the piece. It is obviously inconvenient to dry a large plank in an oven when it is necessary to know its moisture content. So the method adopted is to cut a small section from the piece and treat this section as described above in order to determine its moisture content.

Recently a more rapid method for determining the moisture content of timber applicable over a limited range - approximately 7-25% moisture content - has been developed. This method depends on the variation of the electrical resistance of wood with its moisture content. Special instruments known as electrical moisture meters have been designed to indicate directly the moisture content of the piece of wood under test. There are two types of these electrical moisture meters now being used commercially - (i) the Tag-Heppenstall Moisture Meter, and (ii) the Blinker Moisture Meter. The second type or Blinker, as it is commonly termed, is being manufactured in Melbourne in several different models and can be obtained at a comparatively low price, well within the reach of all timber users. Although the moisture content range is restricted to 7-25% it should be noted that it is in this range that precise knowledge of the moisture content of timber is chiefly required. It is not, for example, of interest to a timber merchant to know whether a piece of timber is at, say, 40% moisture content as against 35%, but it may affect him vitally if it is at 20% instead of 15%.

The great advantage of this method of determining moisture content is that it tells the operator immediately whether the timber is seasoned or unseasoned.

More detailed information on the determination of moisture content by either of the above described methods has been published by the Division of Forest Products in their Trade Circular Series - No. 2 - The Testing of Timber for Moisture Content, and No. 9 - Electrical Moisture Meters. Copies of these may be obtained on application to the Division, address at the foot of the page.

FOREST PRODUCTS MUSEUM

During its comparatively short life the Division of Forest Products has been making a collection of specimens which show the extreme diversity of uses of Australian

timbers. At the same time, specimens containing the various defects likely to be encountered by timber users have been collected. It has recently been possible to make arrangements whereby these specimens are available in a small museum for ready inspection. No such museum would be complete without containing hand samples of the more common commercial timbers of the world. Hence specimens of timbers from each State in the Commonwealth have been collected, labelled and arranged on shelves. In addition, the museum contains sets of commercial timbers from other parts of the world. These are representative of the timbers of Great Britain, Finland, Russia, India, Burma, Borneo, China, New Zealand, New Caledonia, South Africa, Canada, the United States of America, and Argentine. At the present time, the complete collection of timber samples, both Australian and foreign, are derived from 300 different genera and 820 different species.

THE CHRISTENSEN LIFTING TRUCK

In Trade Circular No. 12, issued by the Division of Forest Products, a new type of lifting truck is described. This obviates the necessity for restacking between air-seasoning and kiln-seasoning in the combined air and kiln drying process. The truck was developed by Mr Christensen of Messrs. Christensen & Saxton, Moe, Victoria, and, as a return for assistance given him by the Division of Forest Products in his kiln and plant design, he made the plans of the truck available to the timber industry.

Advice has now been received from Messrs. Mulhearn Bros. of the Dorrigo district, NSW, who are establishing a seasoning plant similar to that at Moe, that they have effected certain improvements to the Christensen truck by means of which its cost has been practically halved, reducing the price to approximately £70.

While affecting economies in the larger plants, this reduction in cost also enlarges the sphere of utility of the truck since it may now be within the range of the smallest kiln installations. The reduced cost of the lifting truck is no higher than that of the two sets of kiln trucks required for the continuous operation of a single kiln unit. One lifting truck, of course, will serve a large number of kilns.

Details of the new design are being forwarded to the Division of Forest Products, and it is hoped to make them available at an early date.

This steady improvement of an idea illustrates the substantial benefits to be gained by the new spirit of co-operation which is invading the timber industry and which is displacing the old policy of secrecy so reminiscent of the dark ages.

One of the objects of the Division of Forest Products is the dissemination of correct methods of timber treatment and the latest improvements in modern practice. To assist in this work the Division is training in its various sections a number of cadets who, in addition to attending technical schools to receive a sound theoretical knowledge, are given a good practical training. Some of these cadets are now reaching the stage when their services should prove of value to timber firms.

The Division also undertakes the training of operatives for short periods, in some specialised branch of timber knowledge. A number of men have already been trained in this way, the majority of them being particularly interested in seasoning methods and practices.

NEWSLETTER
Forest Products
1933##015
MONTHLY NEWS BULLETIN NO. 15 FIRST PUBLISHED IN 1 APRIL 1933

CREOSOTE AS A WOOD PRESERVATIVE

A large number of wood preservatives have been or are being suggested for commercial use. These, in general, may be divided into two main groups, namely, oil preservatives and water soluble preservatives. Some of these are simple in nature and can be sought openly on the market, while others are proprietary articles, the exact composition of which may or may not be stated. In this and subsequent articles some of the preservatives which are of particular interest and value in Australia will be discussed.

Among the oil preservatives, creosote oil is by far the most important. It may be produced from either coal tar, as a by-product in the gas industries, or from wood tar, as a by-product from plants in which wood is destructively distilled in order to produce such products as alcohol, acetic acid, wood charcoal, etc. For wood preservation purposes, coal tar creosote is generally used, although some wood tar creosote has been used. Coal tar creosote is a dark, viscous, oily, liquid, certain grades of which are more or less solid during cold weather. It is made up of a complex mixture of chemical substances, the most common of which are tar acids of the nature of carbolic and cresylic acid, etc.; tar bases; and hydrocarbons such as naphthalene, anthracene, etc.

There are several types of coal tar creosotes, the two main ones being:

(i) that produced during the distillation of coal in horizontal gas retorts, and

(ii) that produced during the distillation of coal in vertical gas retorts.

These oils differ in chemical composition and in various physical properties such as density and viscosity, but a suitable grade of either type will give very good results as a wood preservative.

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Extensive tests and years of experience have shown that coal tar creosotes are excellent preservatives and that good quality oils, when properly applied, will adequately protect timber from decay and termites (white ants). The use of a good quality oil is specially emphasised, and firms or individuals using creosote should insist that the oil purchased conforms to a recognised quality. To assist them in this way the Division of Forest Products has prepared a tentative specification for Australian creosote oils which are mainly derived from vertical gas retorts. This specification is given below in detail. Creosote complying with this specification can be relied upon to give satisfactory results when used correctly.

Tentative Specification for Australian Creosote Oils for Use as Wood Preservatives

1. The oil shall be a distillate of coal tar and be free from any admixture of petroleum or similar oils.

2. The specific gravity of the oil at 38°C, compared with water at 15.5°C shall not be less than 0.94.

3. The oil shall not contain more than 3% water.

4. The oil shall not contain more than 0.5% of matter insoluble in benzol.

5. The distillate based on water free oil shall be within the following limits:-

   Up to 210°C not more than 10%
   Up to 235°C not more than 35%
   Up to 315°C not more than 85%.

6. The residue above 355°C, if it exceeds 5%, shall have a float test of not more than 50 seconds at 70°C.

7. The amount of tar acids shall be not less than 5% by volume - there shall be no upper limit to the amount of tar acids.

8. The foregoing tests shall be made in accordance with the standard methods of the American Wood Preservers' Association (details of these methods will be supplied on application to the address at the foot of the page).

Some of the items above are more or less self-explanatory. Item 4 is important from the aspect of penetration and cleanliness of handling. The presence of free carbon or other insoluble matter seriously interferes with the penetration of the oil into the wood. The small particles of carbon are deposited near the surface in the minute pores of the wood, thus preventing oil passing through. The precipitation of this insoluble matter also makes the surface dirty.

Item 5 controls in a large measure the degree of permanence as a preservative. If there is a larger proportion than 10% of the oil distilling below 210°C, it has been found that the results in service may not be satisfactory. A very high percentage of the lower boiling fractions indicates that some of the oil will evaporate relatively soon. After evaporation the proportion of the different fractions in the residue is different and these will not be so permanent as when a good grade oil is used initially.

Item 6 provides that the residue from a high boiling oil shall be of an oily nature and be free from a large proportion of pitch which has little or no value as a preservative.

Creosote oil is the best general preservative at present in use commercially. It has some disadvantages, however, such as its dark colour, its distinct odour which to some people is objectionable, and the fact that wood treated with it is difficult to paint or finish in other ways. Its chief use, therefore, is for external application or in a residue or building where the timber is not exposed or in contact with plaster.

The Division of Forest Products will be glad to furnish additional information, and will supply, on request, the names of creosote suppliers in Australia.

EXPERIMENTAL WORK IN THE PRESERVATION SECTION

The Section of Wood Preservation of the Division of Forest Products is at present carrying out tests on the impregnation of *Pinus radiata* and *Pinus maritima* sleepers with creosote oil. Full size sleepers are being treated in a cylinder in which pressure up to 200 lbs/sq. in. is used to force the preservative into the timber. The best conditions for rapid and effective treatment are being determined and it is already apparent that *Pinus radiata* can be readily impregnated. *Pinus maritima*, as would be expected from its structure and physical properties, is slightly more difficult to treat, but is not likely at present any serious difficulty in commercial operation. Other experiments are also being carried out using the open tank treatment.

At the conclusion of these tests it is proposed to treat several hundred sleepers which will be used for service tests in railway lines. This series of experiments is being carried out in co-operation with the South Australian Woods and Forests Department, which is supplying the material.

The Division of Forest Products is also erecting a plant for the impregnation of poles by the open tank process. As the portion of a pole which decays is that part at or near the ground line the butt 6 ft only will be treated. The plant consists of a mild steel tank with furnace and smoke stack for heating, and also

handling devices for up-ending the poles in the tank. Poles up to 30 feet long will be treated.

Tests have indicated that the most effective treatment for poles is to leave the sapwood on but to treat it with creosote. The sapwood, unlike the truewood, of our pole timbers, is easily impregnated with preservatives and it then forms a rot proof cover around the outside of the pole. Previously it was the practice to remove the sapwood and paint the pole with tar or some such compound, but this treatment was not effective and bar and other paints have now been almost entirely replaced by creosote.

WOOD WOOL AND ITS USES

On of the industries in which Australian timbers may be utilised is that of wood wool manufacture. This is produced from billets or logs by means of rapidly moving knives and spurs or fine steel teeth passing over the surface of the wood and thus consists of very fine parings of wood. The spurs slit the wood and are followed by the knife which pares the slitted material off the piece.

Machines for this purpose are of two types - (a) vertical and (b) horizontal. The essential features of both types are of crosshead fitted with knives which is transversed past the face of the block. Automatic feed advances the block after each cut. the Accessory machinery provides for splitting and cleaning the wood prior to paring, and for drying, pressing and baling the product.

Overseas, such woods as cottonwood, aspen, basswood, yellow pine (USA and Canada), and spruce and Scots pine (England and Sweden) are used. Australia imports on the average some 275 tons of wood wool annually.

For some years it has been manufactured in this country, there being about nine factories in Tasmania, one in New South Wales and one in Victoria. The total production of these plants is not definitely known, but it has been estimated at 2000 tons annually. Australian timbers used are mountain ash (*Eucalyptus regnans*), messmate (*E. obliqua*) and locally grown willow. Some species of wattle and exotic poplars have also been tried. The timber is used in the green state and the wood wool dried after manufacture.

The desirable qualities in a timber to be used are straight grain with soft resilient nature, lightweight, lack of odour, freedom from resins or gums, and ability to yield non-brittle parings. The colour should be distinctive - either pale (nearly white) or artificially coloured.

The Australian timbers mentioned above have been found very suitable for manufacturing purposes, hence there is no question of supply, but it is necessary to find new or increased outlets for the potential production. A review of the uses of this product is therefore of value in considering marketing possibilities.

The bulk of the wood wool production is used for packing purposes. Overseas, in countries producing large quantities, the trade can be roughly divided into two classes, namely, (a) lower grades for all packing requirements, and (b) the softer wool of medium fine qualities for use in industries requiring a superior type of packing and in the upholstery trade. In some countries wood wool is the staple article used by upholstery, carriage, automobile, mattress and furniture manufacturers, and for packing miscellaneous articles that are susceptible to breakage. It is also used for packing applies, pears, grapes, fancy goods and eggs. The finest grade is used for filtering purposes and for the manufacture of the better grades of mattresses and other specialised products, such as woven mats for floor coverings and absorbent lint.

THE THICKNESS OF FLOORING

It is probably not generally known that there are today, in use throughout Australia, four different thicknesses for 1" nominal hardwood flooring. These are $^{7}/_{8}$", $^{27}/_{32}$, $^{13}/_{16}$" and ¾". The recognised thickness for 1" nominal flooring used to be $^{7}/_{8}$", but for several years it has been realised that it is ridiculous not to take advantage of the superior strength and stiffness of hardwoods by reducing flooring thicknesses.

The ¾" flooring has been widely used in Melbourne for several years and its behaviour has definitely proved the contention that for all ordinary purposes it is quite thick enough. In

Tasmania flooring as thin as 5/8" has been milled and has been found quite satisfactory for cottages, although it was thought advisable in this case to reduce the joist spacing from 18" to 15".

It will be obvious that there is a very strong case for a single standard thickness for 1" nominal flooring and that this thickness should be less than 7/8". Victorian experience has shown that ¾" material is quite satisfactory, but because demand always lags behind ideal practice, it has been necessary for millers to run both ¾" and 7/8" flooring. The existence of two thicknesses has proved most unsatisfactory so that millers in Victoria after two or three years' experience are quite willing to sacrifice the ¾" ideal for the present and adopt a 13/16" flooring providing that there is only one thickness.

It would appear, therefore, that there are strong arguments in favour of making 13/16" flooring the Australian standard for 1" nominal flooring. This means a eduction of only 1/16" from the old standard of 7/8" and from consideration of strength and stiffness compared with softwoods, it can be more than justified.

Some architects and builders have expressed the opinion that hardwood floors are often so irregular in thickness and matching that the heavy sanding required for a good finish needs a greater thickness in the floor. These irregularities are due to bad seasoning practice and the way to get a good floor is not to use thicker boards and sand heavily, but to demand and get properly seasoned material in the first place. There can be no excuse for the acceptance of improperly seasoned material in these days when a cheap electrical moisture meter is obtainable which will detect almost instantaneously insufficiently dried material.

Some millers no doubt feel that the ideal of ¾" flooring should not be lightly sacrificed, but every reduction in thickness, no matter how small, tends to simplify seasoning problems and make the supply of more uniform material easier.

WHAT IS KILN DRYING?

In spite of the greatly increased adoption of kiln drying throughout Australia during the past few years, it is surprising to find that there are many people who still believe that seasoning in a kiln has a deleterious effect upon timber. The old bogies are still raised that kiln drying takes the 'nature' out of timber and that kiln-dried timber will not stay put.

It would be expected that all users of timber would by now have realised that seasoning consists simply in removing the moisture from timber. "Sap" or any mysterious solid substances are left behind in the timber, no matter what the seasoning process. The important factor then is to remove the water from green timber in such a way that stresses which cause warping and external and internal checking are reduced to a minimum.

That properly kiln dried timber has not lost its 'nature' is evident from the fact that much airplane timber will only be accepted if kiln dried. Obviously this timber could not have been reduced in strength. Similarly, the finest face veneers used throughout the world are kiln dried before gluing, so that the kiln cannot have any deleterious effect upon gluing and polishing properties.

It must be admitted that it is possible to ruin timber by bad kiln drying. But there is no necessity for this. The best drying conditions for many of our timbers are known, and for any timber, drying conditions can be given which, while not perhaps giving the fastest drying, will ensure the production of a satisfactorily seasoned material.

BREVITIES

From time-to-time the Division of Forest Products has received requests for assistance in seasoning problems from sawmillers and others in New South Wales. Sometimes it has been possible to assist kiln operators and others out of serious difficulties by correspondence. the position has now been reached, however, when the number of seasoning matters demanding attention in New South Wales has grown to alarming proportions, and it has been decided that the Senior Seasoning Officer of the Division, Mr.

C.S. Elliot, shall spend several months in that State. Mr Elliot will visit any part of the State where there is a seasoning problem, so that anyone with such a difficulty or one involving allied features is urged to get in touch with the Division of Forest Products at the address below, as soon as possible. This will facilitate the preparation of a programme of work. Mr Elliot will leave for Sydney shortly after Easter and following a week or two in the city will proceed to the Dorrigo district. His later movements are at the present indefinite, but will include a short visit to Brisbane.

The thesis on "Some Sap Staining Organisms of *Pinus radiata*, submitted by Miss A. Eckersley, B.Sc., for the requirements of a Master of Science degree at Melbourne University has been accepted. Miss Eckersley is Assistant Wood Anatomist in the Division of Forest Products.

Mr A.B. Jamieson, M.Sc., Assistant Chemist in the Division of Forest Products, has recently been awarded the Mollison Scholarship in Japanese by Melbourne University. This scholarship is awarded every three years and the holder is required to spend six months at the Tokyo University, Japan. Mr Jamieson will be leaving for Japan later in the year.

In co-operation with the Department of Commerce, the Commonwealth Research Station at Merbein, and several of the dried fruit packing sheds, the Division of Forest Products is arranging a large scale service trial of the new nailing schedule developed for the dried fruit box by means of laboratory tests. The first shipment of 160 boxes was forwarded to London by the S.S. "Ceramic", which left Melbourne on April 1st. The boxes of this shipment will be examined in London by the representatives of the Department of Commerce, the Princes Risborough Forest Products Research Laboratories, and the consignees. Arrangements have been made for further shipments during the next few months.

The Division of Forest Products has been carrying out preliminary tests on a large number of Australian species to find substitutes for hickory. This timber is noted for its toughness or shock-resistance. Among the samples forwarded to test was one which gave figures even superior to those of hickory. The timber in question is a little known tree and apparently not of great size. It remains to be seen whether further tests of representative samples will confirm the initial test, and whether quantities of a suitable quality are available for commercial purposes.

During the last apple packing season, the Division of Forest Products, in co-operation with the Division of Plant Industry, carried out some preliminary investigations on the design and packing of apple cases. These tests are being continued on a more comprehensive scale during the present season, and it is hoped that the results will clear up a number of the points relative to cases which have been responsible for much controversy.

CSIRO
AUSTRALIA

NEWSLETTER
Forest Products
1933##016
MONTHLY NEWS BULLETIN NO. 16 FIRST PUBLISHED IN 1 MAY 1933

THE STANDARDISATION OF THE APPLE CASE

Towards the close of the 1932 apple season, experimental work was initiated at the laboratories of the Division of Forest Products to determine the strength and protective value of the various apple cases. The problem of the standardisation of wooden containers in general had been considered by the Special Committee on Fruit Cases of the Standards Association of Australia under whose direction the first steps towards the investigation of the possibilities of standardising the export apple case were taken. By the end of the season 78 cases of apples had been subjected to various tests in order to compare: (a) the strength and, (b) the protective value against bruising of cases manufactured under exact commercial specifications and packed in an approved manner. These tests enabled a testing technique to be developed and laid the foundation for more comprehensive tests to be carried out in 1933.

Australian apples are exported principally in the Australian (dump) cases and the standard bushel (Canadian) cases. The internal dimensions of the former are 18" x $8^{2}/_{3}$" x 14¼" and of the latter 18" x 11½" x 10½". The dump case is flat sided, while the Canadian case has a bulged top and bottom. Usually the dump case is made with native Australian timbers, namely, karri (*Eucalyptus diversicolor*) in Western Australia, mountain ash (*E. regnans*), messmate (*E. obliqua*) or Gum top Stringybark (*E. gigantea*) in Victoria and Tasmania. The standard bushel case is constructed principally of hemlock imported form Canada, and to a lesser extent of Swedish spruce and pine, and some plantation grown *Pinus radiata*. In recent seasons the standard case has been manufactured from mountain ash, messmate and gum top stringybark.

Every variation possible is found in these cases, from a properly seasoned, well dressed, and exactly constructed case to an unseasoned, rough sawn, misshapen one. The thickness and width of each part vary greatly from their intended sizes. Consequently, a standardised case does not exist. The merits of the two main types, the dump and the Canadian, have been compared on the basis of weight, amount of fruit carried, case of packing, ability to keep the fruit packed tightly, and effectiveness against bruising. These comparisons have been based on general observations and, as yet, have not resulted in one type being uniformly adopted in Tasmania or Victoria.

The work of the Division of Forest Products, carried out in co-operation with the Division of Plant Industry, is to examine, systematically, the comparative merits of the two main types of cases when each case is manufactured with similar care and packed to contain a minimum weight of 42 lbs of Jonathan apples. A Victorian hardwood timber is being used in the construction of the dump case and in one series of standard bushel cases for comparison with the standard bushel cases made from hemlock. The timbers used are all seasoned except in one test in which the behaviour of cases in the green condition is being compared under cool storage conditions with cases made up from kiln dried timber.

Strength tests are being carried out in the box testing drum on dump cases, and on standard cases wired and unwired. Determinations have also been made on the extent of bruising occurring during packing and after dropping the cases on sides, tops, bottoms and ends. The bruises for each separate apple are recorded according to its position in the case and by the analysis of such results the bruises developed

between the fruit and the case and between the fruit and fruit can be demonstrated. Summaries of these figures should show the relative protection given to the fruit by the different cases.

The experiments are being continued till the close of the present apple season, by which time some 30,000 apples will have been examined. It is hoped that the data obtained will eventually lead to the elimination of unnecessary variations in the apple case. The importance of the problem is demonstrated by the fact that, in a good year, about 13,000,000 super feet of timber are required for the Australian export apple trade alone. To have this quantity of timber properly prepared and used in the most efficient case is an ideal of both the timber and fruit industries.

REDRYING ROOMS FOR FURNITURE MANUFACTURERS

In the course of their investigations into the seasoning of timber and allied problems, the officers of the Division of Forest Products have visited a number of furniture factories and other wood working industries in which small kilns or heated rooms have been installed for the drying of stock before and after gluing. Almost without exception these drying rooms are faulty in design and are giving unsatisfactory results.

The prevalent ideas seem to be that, if a small room is built and heated by steam radiators or other means, stock can be indiscriminately stacked inside it and that such stock will be satisfactorily dried. Unfortunately, these ideas are erroneous. In a redrying room, just as in an ordinary commercial seasoning kiln, there must be a reasonably even circulation over each and every piece of timber, and there must be some control of temperature and humidity. In existing plants, these necessary conditions are rarely obtained, and the usual result is that a few pieces at the tops of stocks or near radiators are dried - in fact often over-dried - while in the bulk of the stacks little or no drying takes place.

Further, many rooms are so designed that they are extremely wasteful of heat. Apart from increased uniformity in drying, the money wasted in excess fuel costs would more than pay for a properly equipped room. It cannot be over emphasised that, if it is worth while installing a room at all, it is worth while installing a properly designed unit. It is no use over-drying some stock, drying a little properly, and leaving the bulk undried. In the majority of cases a properly designed room can be built for the same or even a lower cost than the majority of rooms in operation while the fuel consumption can be greatly reduced.

A common fault is that the air inlet and outlet ventilators are wrongly placed so that the top half of the room is extremely hot while the bottom half is quite cool. It is not uncommon to find a temperature of 140°F near the ceiling, while that at the base of the stacks is 70-80°F or even less. This fault can be readily detected by holding the hand first near the ceiling and then near the floor. Another fault is that the inlet and outlet ventilators are so placed that the air, coming into the room, is heated by the coils and then passes directly to the outlet ventilators without passing through the stack. A further fault is that the timber stacks are sometimes built so that they baffle the air flow.

The Division of Forest Products will be glad to suggest remedies to anyone experiencing difficulty with a drying room and, if possible and desirable, a personal visit will be made by one of the officers of the Division. Timber manufacturers who propose to install drying rooms are also urged to get in touch with the Division and plans can be forwarded for the cheapest and most economical installation for any particular case.

THE GUMMING OF SAWS

When using a circular saw, or a band saw, a gummy deposit often 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, or 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 needs resharpening.

The usual remedy for the removal of gum given in woodworking text books is the use of kerosene or some similar solvent, but this is only effective on gums from certain timbers such as pines, oregon, spruce, etc. It is useless

for the gummy material left by many Australian hardwoods, especially the eucalypts. The gummy substances from the pines, etc., are resinous materials which are soluble in spirits, kerosene, turpentine and other solvents, but those from the eucalypts are of a different chemical nature and are technically known as kinos.

Strangely enough, a method for their removal from saws was suggested by a problem connected with the chemical analysis of various eucalypts. Some of them, such as jarrah, the various ironbarks, red gum, red mahogany, etc., contain quantities of kinos in the wood cells and these materials so interfered with one of the analyses that it was necessary to develop a way of removing them before analysis. This was accomplished by treating the ground wood samples with a very weak caustic soda solution (0.5%). Thus, when requests were received for methods of removing the gum from saws used in cutting eucalypts, the same solution was tried. It was found to be effective. the gum may be rubbed off with a piece of rag or cotton waste previously dipped into the solution (about 1 oz solid caustic soda to one gallon of water) or, all the affected portions of the saw may be thoroughly moistened with the solution and the deposit when scraped off.

A weak solution of caustic soda at 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, the slight burning can be arrested by applying a weak acid solution such as vinegar or boracic acid.

TRADE CIRCULARS

Trade Circulars Nos. 13 and **14**, prepared by the Division of Forest Products, have just been made available. Copies have been forwarded to all firms and individuals on the regular mailing list of the Division.

Trade Circular No. 13 deals with the influence of cross, diagonal and spiral grain in timber and its main object is to assist people concerned in the selection of timber for special purposes. Although this circular may appear to many a little difficult to follow, a great amount of thought has been devoted to the subject matter in an attempt to simplify the description of the occurrence and effects of the various forms of sloping grain. The importance of this type of defect in timber is very great and the experience of the Division has shown the need for the proper understanding of this often puzzling study and both sawmillers and manufacturers using wood would do well to master the subject matter for it will help them to overcome many difficulties.

Trade Circular No. 14 deals with the preparation and use of animal glues, and contains a concise list of twelve laws of good gluing practice which should be posted up in the glue room of every factory in which timber is glued.

Owing to the demand for **Trade Circular No. 3** on **"The Growth and Structure of Wood"** it has been necessary to print a second edition. The opportunity has been taken to revise and amplify the original text and additional photographs showing the structure of Australian woods have been included. This revised edition will not be sent out on the regular mailing list, but will be available to those interested who can obtain it free of charge by application to the address at the foot of the page. This also applies to Trade Circulars 13 and 14.

MOISTURE CONTENT CHANGE IN TIMBER DURING SEA TRANSIT

It is generally recognised that there are many advantages to be gained by kiln drying timber for export, at the source of supply, but one of the factors to be considered is the change in moisture content which takes place during the sea voyage. It was at one time thought that the increase in moisture content during the long period in a ship's hold would prevent timber from arriving at its destination in a satisfactorily seasoned state, but from work already carried out, it is now realised that the pick-up in moisture content is comparatively small. What little there is can be offset by drying to a slightly lower moisture content in the country of shipment. Just what this degree of over drying should be has yet to be determined by experiments, some of which are now in progress.

The first series of tests was initiated by the Canadian Forest Products Laboratories and in

this timber was shipped both in England and Australia. The Australian consignments, of which eight have now been received, were examined and tested at the laboratories of the Division of Forest Products, and results obtained returned to Canada for analysis. The last consignment, a mixed one consisting of ¾" T. & G., 4 x 1 dressed, 8 x 1 and 4 x 2 rough timber, was of particular interest due to certain unusual circumstances. It was nearly three months from the time of loading to the time of resting, owing to a collision of the steamer in the Brisbane River, and the consequent delay while repairs were being affected in Sydney.

Of greater interest, however, are the tests on kiln dried timber sent from Australia to England. The first consignment was forwarded some 12 months ago, while a further shipment was made in November last. The latter shipment consisted of kiln dried and reconditioned milled mountain ash flooring and was consigned in attractively prepared bundles, square in cross section, neatly docked to length and fastened with strapping, according to the standard procedure of the plant supplying the timber. The samples for testing consisted of three similar bundles of flooring, but were only 3 ft in length, the ends being painted to prevent excessive absorption along the end grain.

Each board was weighed and measured at the time the bundles were prepared, and on arrival in England further weights and measurements were taken together with the determination of actual moisture content. The latter part of the work was carried out by the Forest Products Laboratory, Princes Risborough, England. The average change in moisture content was very small, amounting to only 0.2% in bundle 1, nothing in bundle 2, and 0.2% in bundle 3. These changes are within the limits of accuracy imposed by the weighing methods. The maximum change in any board was 2%. Shrinkage measurements showed virtually no dimensional change.

The results of this test must be regarded as very satisfactory, but it so happened that the stowage conditions were almost ideal. The timber was in an insulated hold, which also contained wood, and every care was taken by the ship's officers during the voyage. Thus, the experiment is of value in showing that shipment of timber is possible with little change of moisture content.

BREVITIES

Some idea of the importance which creosote is assuming as a wood preservative can be gained from the fact that during recent months tenders have been called for about 150,000 gallons. All this has been specified as complying with the specification for creosote laid down by the Division of Forest Products. Creosote has definitely replaced tar and similar preparations as a preservative for wood against rot and white ants.

The Chief of the Division of Forest Products, Mr I.H. Boas, is at present visiting Queensland. Mr Boas, who is also Chairman of the Timber Sectional Committee of the Standards Association of Australia, will discuss timber grading standards while in Queensland, in addition to the work of the Division, which affects the Sub-department of Forestry, timber merchants and others.

The Senior Seasoning Officer of the Division of Forest Products, Mr. C.S. Elliot, is at present visiting New South Wales, where he will be stationed for several months.

About 50 electrical moisture meters are now in use throughout Australia. They are to be found in every State. The demand for 'Blinker Sorters' is increasing, and, in addition, a number of mulitipoint 'Blinkers' are being employed. the latter are somewhat more expensive than the sorters, having spare condensers, but are

more convenient in dry kiln installations or similar plants, where the actual moisture content over a fairly wide range is often desired.

NEWSLETTER
Forest Products
1933##017
MONTHLY NEWS BULLETIN NO. 17 FIRST PUBLISHED IN 1 JUNE 1933

IMPACT STRENGTH (OR TOUGHNESS) AND ITS RELATION TO THE BETTER UTILISATION OF AUSTRALIAN TIMBERS

One of the most desirable properties of wood for many purposes, and one which is often overlooked, is its shock resistance or ability to withstand a blow. This property is of obvious importance for such articles as sporting goods and tool handles and is also desirable in timber to be used for many other purposes.

In practice it is seldom that a load is applied to an article or structure gradually. It is usually applied suddenly or with impact and consequently the timber must have the ability to resist the forces set up by the sudden application of the load. Unfortunately, there is no definite correlation between the strength of a piece of wood when the load is applied gradually and steadily (static strength) and its ability to withstand a sudden blow (impact strength or toughness). This also applies to other materials. For example, hardened tool steel may have a much higher static strength than ordinary mild steel and yet have a very much lower shock resistance. Hardened tool steel is therefore said to be brittle, while mild steel is tough.

In general, timber having a high static strength has a high impact strength and vice versa; but there are many important exceptions to the rule. Hardwoods (porous woods) generally have a higher shock resistance than softwoods (non porous woods) of equal static strength. The poor correlation between static and impact strengths has led to many disappointments in the substitution of Australian timbers for the imported for such purposes as tool handles and sporting goods. American hickory and American or English ash are the species most commonly used for these purposes as both have a very high shock resistance (toughness). Hickory also has other valuable properties such as hardness and high static strength and is therefore favoured for the most exacting uses, namely, in first grade axe and tool handles, skis, lacrosse racquets, etc. The high price and growing scarcity of these two timbers, as well as the desire to use local timbers, have led to the attempts to substitute Australian timbers.

Unfortunately, in many cases, on the theory that static strength only is required, Australian woods which have static strength the same as, or greater than, hickory have been tried with disastrous results to the reputation of Australian timber. The point that has been overlooked is that many of our timbers, although having a higher static strength than hickory, are inferior in shock resistance. This does not mean that no Australian timber is equal to hickory to shock resistance, but it does mean that a substitute for hickory cannot be obtained merely by comparing static strengths.

Until recently very little information was available with regard to the shock resistance of Australian woods, practically all the tests to date having been carried out to determine the static strength are unimportant - they are extremely important and are of the utmost value in the design of structures, buildings, etc., but in addition to determining static strength, the impact strength or shock resistance of our timbers must be determined before the most suitable timbers to replace hickory and ash can be selected.

Arrangements have been made by the Division of Forest Products to carry out an extensive series of tests on the shock resistance of Australian timbers. This work entails thousands of tests and will take a considerable time as it is necessary to test a large number of specimens from each species in order to obtain reliable information on the properties of the species. This work is in progress and already some interesting results have been obtained.

Another important factor being investigated is that of the best methods for the selection of the toughest timber. The great variation in toughness within a species and even within a tree is well known, but it is not definitely known how to select the toughest material. Experienced men have widely differing views on the question and the need for a complete scientific study of the problem is evident. By long experience aided by exhaustive scientific tests the overseas suppliers of hickory and ash have developed very efficient methods of selection with the result that only the best grades of the respective species are exported. It does not pay to export the lower grade stock which is used for purposes where high toughness is not important. Quite a lot of hickory and ash is brittle and useless for tool handles or sporting goods, but the greater part of this material is eliminated before manufacture.

On the other hand, in Australia, there has been insufficient time to develop the same experience and scientific information regarding the various timbers with the result that brittle, low strength material is often used for purposes where only the highest grade and the toughest material should be employed. The user then condemns the whole species as useless, whereas, if methods for selecting the best material were known, the same species might prove highly efficient. In many cases, proper methods of selection are undoubtedly more important than the species used.

In an endeavour to overcome this lack of knowledge, the Division of Forest Products has embarked on a programme of exhaustive tests on selected species. Western Australian karri is one of the species selected for this work as this timber grows on a fairly compact area and is readily accessible. Numerous requests have been received for advice as to the best methods of selecting first grade material of this species for the purposes where strength and toughness are important.

The Western Australian Forests Department is co-operating with the Division of Forest Products in this work and the Western Australian State Saw Mills and Messrs Millars' Timber & Trading Co. have agreed to cut the timber required.

As opportunity permits it is planned to continue the extensive series of tests on the toughness of the Australian timbers such as spotted gum (*Eucalyptus maculata*), Red ash (*Eucalyptus gigantea*), and others in order to determine the best methods for the selection of the toughest material of these species. Arrangements are now being made to obtain material from throughout several trees of spotted gum.

FLOORING PROFILES

Is it desirable to plough grooves in the underside of flooring? This is a debateable question and many views are expressed on the subject. Until recent years grooving of the underside was almost universal. It was claimed that this was an advantage because, in the event of absorption of moisture by the underside and consequent tendency to swell, the grooves took up the expansion and prevented the face of the board from cupping. For this same reason also, one or both edges of a board are not milled square, but are undercut slightly so that the back of the board is narrower than the face.

It is difficult to see how these measures can prevent a board from cupping. On the contrary, one would rather expect them to have the opposite effect.

Until recent years the standard of drying of flooring in Australia generally was so poor that flooring boards after laying almost always shrunk. Hence it really did not matter whether grooving or under cutting was advantageous or deleterious. However, the high standard now possible as a result of improvement in air seasoning practice and the adoption of kiln drying has brought about a position in which flooring is delivered at a moisture content which precludes the possibility of shrinking or swelling if laid under proper conditions. Unfortunately, there are those inevitable cases

when time is the essence of the contract. The flooring is laid in buildings with insufficiently dried foundations, walls, concrete or pugging and in such cases considerable reabsorption does take place. Inspection in a number of cases of this nature has showed that the grooving of the back and the undercutting of the edges do not prevent the trouble entirely, if at all, and may in fact accentuate it.

It is, therefore, essential that the question of the influence of flooring profile on behaviour under adverse conditions should be accurately determined. With this object in view the Division of Forest Products has commenced a series of experiments with different types of flooring.

A NEW MARKET FOR TIMBER

It has not been realised in Australia that there is a potential timber market well worthy of attention in the new craze for jig-saw puzzles. This pastime is at its height in Europe and America and is already arousing interest in this country. Calculating on a population basis and assuming that the craze becomes as widespread here as in America the weekly expenditure on these jig-saw puzzles may be as high as £10,000. A considerable portion of this amount will be for the timber used in backing. Hoop pine three-ply or any of the local timbers which cut cleanly and do not readily split when cut into odd shapes should prove suitable and a factor of importance is that dockings or other small pieces can be utilised.

CHRISTENSEN LIFTING TRUCKS

Six lifting trucks for combined air and kiln timber seasoning plants have been built and these are now in use in four States of the Commonwealth. Two of the trucks have been so constructed that the lifting mechanism can be operated from either end. One of these employs a mechanical and the other a hydraulic system to meet this requirement.

RESEARCH STUDENTS

The Trustees of the Science and Industry Endowment Fund have granted two Senior Research Studentships in Forest Products. For the studentships in Timber Utilisation, Mr W.R. Ferguson has been selected. Mr Ferguson is a graduate in Engineering of the Adelaide University and is an Associate of the Royal Institute of Architects. He has recently been engaged at the South Australian Woods and Forests Department Mt Burr Sawmill, the organisation of which is nearing completion. This plant is of a type unique in Australia, for the breaking down of the logs is carried out by a Swedish gang saw which converts the whole log into boards ready for edging in the one operation.

The other studentship, in Timber Preservation, has been awarded to Mr S.F. Rust of the Victorian Forests Commission. Mr Rust is a Bachelor of Science of the Melbourne University and also holds the diploma of the Forestry School, Creswick, Victoria.

Both graduates will commence their studentship with a preliminary three months' training in the laboratories of the Division of Forest Products, after which they will proceed to England and America for the balance of their two years' period of training. Upon their return to Australia they will join the staff of the Division of Forest Products which already includes five members who have received specialised training abroad under similar studentships.

BREVITIES

Mr C.S. Elliot, Senior Seasoning Officer of the Division of Forest Products, has been visiting the mills cutting Alpine ash in Tumbarumba, Tumut and Batlow districts of New South Wales, advising on seasoning and allied problems. After a short stay in Sydney he will proceed to the North coast forest areas and to Brisbane. Anyone with a problem in timber seasoning or timber utilisation wishing to get in touch with Mr Elliot, can do so by writing either to the Division of Forest Products, or the Secretary of the Associated Country Sawmillers of NSW, Union House, George Street, Sydney.

A modern three unit battery of internal fan kilns has recently been erected in Innisfail, Northern Queensland. This plant was built for the drying of the valuable scrub timbers of this district and will be extended later. It is provided with a Christensen lifting truck for the economical handling of the timber through the combined air and kiln drying process.

The number of electrical moisture meters in use continues to increase steadily. In one week, last month, five new instruments were ordered. The list of timbers for which blinker sorter correction figures are available is growing and now totals fifty-four. In addition, correction figures over the range 8-24% have been prepared for nine timbers. The third list of correction figures is published in the current issue of the Journal of the Council for Scientific and Industries Research and reprints of this list are available.

PUBLICATIONS OF THE DIVISION OF FOREST PRODUCTS

The Division of Forest Products has in the press two important technical publications. The first is a *"Guide to the Seasoning of Australian Timbers"* with supplementary notes by C.S. Elliot, Senior Seasoning Officer of the Division. This publication discusses the seasoning characteristics of 17 different species, gives recommended drying schedules on all available data, and considers a number of problems puzzling to kiln operators, such as, when and how long to steam during the drying process.

The second publication deals with the grading of Western Australian timbers and has been prepared jointly by F. Gregson, Forest Utilisation Officer of the Forests Department, Western Australia, and R.F. Turnbull, Utilisation Officer in the Division of Forest Products. It describes the results of an intensive grading investigation in Western Australia, during which over 30,000 pieces of jarrah and karri were individually examined and were listed according to the defects present. Grading rules for different classes of timbers are suggested.

Although this pamphlet deals with Western Australian timbers only, it covers matters affecting the whole of the Commonwealth. The principles of grading are clearly demonstrated, and the influence of many clauses apparently of little import, often included in grading rules, are indicated in some striking comparisons.

Trade Circulars Nos. 15 and **16** are also in press. The first of these consists of the *Draft Terms and Definitions* used in timber grading as laid down by the Timber Sectional and Sub-Committee of the Standards Association of Australia. These are being published so that the use of standard terms may be extended as widely as possible, and there may be opportunity for as extensive a criticism as possible, with the ultimate effect of removing any imperfections.

Trade Circular No. 16 also deals with terms, and is entitled *"Term used in Timber Seasoning, Part 1"*. This circular, however, is more than a set of definitions for the terms are describes in connected series to form explanations of simple seasoning principles. For example, under the terms 'Collapse' and 'Reconditioning', is explained just what collapse is, how it takes place, how it is removed, and why reconditioned timber does not collapse again in service.

CSIRO
AUSTRALIA

NEWSLETTER
Forest Products
1933##018
MONTHLY NEWS BULLETIN NO. 18 FIRST PUBLISHED IN 1 JULY 1933

SOME OIL PRESERVATIVES USED FOR PROTECTING WOOD

In a recent issue (1 April, 1933) the values of creosote oil as a wood preservative was discussed and a tentative specification for use in purchasing or producing oil of the desired qualities was given. The present article deals with oil preservatives other than creosote and with mixtures of the two.

For certain purposes creosote oil can be used diluted with crude oil. The quantities of each can be varied from equal parts to, say, 4 parts of creosote to one part of crude oil. The mixture is a very good preservative and may be used in a similar manner to creosote alone. Its extra value lies in its lower cost. For some timbers which are very easily treated and which give a high absorption, or for purposes in which mechanical life is the deciding factor, its use is economical and is preferable to creosote alone. The reason for this is that for the same expense the mixture provides a better distribution of the creosote in the wood.

Tar oils may be classed as a low grade creosote. They are produced from the tar in a similar manner to creosote and they are the lower boiling fractions of the oil distilled from the tar. They generally contain large quantities of hydrocarbons such as benzol, tuluol, or xylol and tar acids such as carbolic and cresylic acids. They are poisonous to fungi and insects, but on account of their low boiling points they are not permanent and the treated wood does not remain protected, soon losing the introduced preservatives by evaporation and leaching.

Tar is often used, particularly for the brush treatment of fencing posts, poles, stumps, etc. Field tests carried out in Europe and the United States of America on tar treated posts have shown that tar has only a slight value as a wood preservative and in general its use cannot be recommended. Tars are much less poisonous to decay fungi and to insects than creosote. Also tars do not penetrate the wood as well as creosote or creosote and oil mixtures: the fine carbon particles in the tar clog the small openings in the wood cells and thus prevent penetration. Under certain conditions it has been found that tar treated posts gave a shorter life than untreated posts.

Bitumens, which include both natural bitumens, e.g. Trinidad, and the artificial or blown bitumens, obtained form the residues of crude oil after the distillation of petrol and various oils, have been used as preservatives. When applied either as thick or thin coatings practically no penetration into the wood results. Actually the two main types of bitumen are not poisonous to fungi or insects and the wood is surrounded merely by a mechanical coating. This coating is not permanent and particularly in the case of the blown bitumen becomes denatured and breaks down. White ants have been actually observed making their way through the coating. Although the coating reduces the rate of seasoning, cracks sometimes develop after treatment and even if these do not continue through and make a separation in the coating they do permit the entrance of moisture into the area surrounded by the bitumen. This moisture becomes more or less trapped and conditions suitable for the development of decay are set up and remain in existence because the bitumen coating prevents drying. The result is that the wood generally rots faster

than if no coating had been applied. The use of such bitumen treatments is not advocated.

Petroleum oils or crude oils are not sufficiently poisonous to decay fungi to warrant their use alone and they are generally used in conjunction with creosote. Their value in preventing insect attack is not known and investigations are at present being carried out to determine their value for preventing white ant attack.

Various proprietary preserving oils are available. Some are good and some are of doubtful value. In general they are more expensive than creosote and careful injuries should be made before adopting them for use.

PAPER FROM RESINOUS PINES ?

Proposals are constantly being put forward which depend upon the conversion of pines grown in plantations into paper of various types. Most of these pines, such as *Pinus radiata* (insignis) are resinous and present very great difficulties in the making of a white paper. It is desirable that a clear statement of the present position should be made to avoid misunderstandings.

These resinous pines can be converted into good quality "kraft" pulp suitable for the manufacture of brown papers for wrapping. The process used for cooking such timbers to form pulp is known as the sulphate or "Kraft" process. The liquor used is alkaline and dissolves the resinous matter. The pulp formed is dark in colour and so far no reasonably cheap method of bleaching it has been devised. It is a good strong pulp and if it can be bleached would be used in making various grades of good quality paper. Many methods for bleaching have been worked out and patented, but so far none of them has proved a commercial success although a few mills are said to use such processes, details of which are kept secret.

The other methods of cooking the wood use acid liquors and these do not remove the resins. The consequence is that not only is the colour of the pulp unsatisfactory for white paper, but small spots of resin or pitch cause serious trouble on the papermaking machine. Here again numerous patents have been taken out, all alleged to overcome the difficulties. The fact remains that, so far, in the principal papermaking countries these pitchy pines are not used for the manufacture of white papers.

In the Southern States of the USA, where the pines are of this nature, a large amount of research has been, and is being, carried out to overcome the difficulty of pitch. So far all that can be said is that some interesting results have been obtained and the workers are hopeful.

The point to remember is that it is not impossible, but economically unsound, with present knowledge, to convert the resinous pines to a white paper. In some patented processes this can be done in two stages, but at a considerably increased price.

The importance of all this for Australia lies in the fact that the exotic pines we are growing cannot be converted into high grade papers unless newer methods can be developed. As Australia only needs at present about 18,000 tons a year of brown papers the quantity of pine that can be used for this purpose is very small. Consequently, claims that paper mills are to be established to convert these pines into paper need to be carefully examined.

There is a great need for research into this problem which is not insoluble, but remains unsolved. Meanwhile, it is unsafe to depend on paper manufacture as a means of marketing the huge volume of pines which before many years will be forced onto the market in Australia and more particularly in New Zealand.

HAVE HARDWOOD SAPLINGS A VALUE?

Recently the Division of Forest Products carried out preliminary kiln seasoning tests on thin case stock cut from fire killed mountain ash (*E. regnans*) saplings of approximately 5-6" in diameter. Contrary to the general idea this material was not particularly difficult to season and the samples used in the test run dried rapidly to a satisfactory product.

Although it might appear, at first sight, that such saplings are too small to make conversion profitable, it is interesting to compare them with thinnings of similar size from softwood plantations. Where the latter are available

reasonably close to centres of consumption (i.e. of case material), they are in great demand and in some instances command a comparatively high stumpage value. The timber from the mountain ash saplings is, in many respects, superior to that from softwood thinnings. It is as light in weight, if not lighter, than the softwood (samples tested weighed only 32 lbs/cu.ft.); it is attractive in appearance, and such knots as do occur are usually firm and of small size.

The Division of Forest Products is co-operating with the Victorian Forests Commission in an investigation which has for its purpose:-

(i) The determination of the sizes and quantities of young mountain ash which are available as a result of forestry activities.

(ii) The best methods of converting and seasoning.

(iii) The probable markets which could use material of this nature.

Mountain ash is not the only timber worthy of study in this connection and investigations will later be extended to include other Victorian species and timbers from the other States.

THE IDENTIFICATION OF AUSTRALIAN TIMBERS

The Division of Forest Products offers facilities for the identification of the various commercial Australian timbers. This side of its work is, perhaps, not as widely known as it should be. Many timber users have forwarded samples of timber for correct identification, but there must be many others who use or who desire to use timbers, the identification of which would materially assist them in their particular line of business. Such timber users are invited to get in touch with the officers of the Division.

Identification is primarily carried out in the Section of Wood Structures which is at present engaged on the development of methods for the ready identification of Australian timbers. In this work the wood is subjected to macroscopic and microscopic examination, the results of which are nearly always sufficient to solve the problem of an unknown timber. For comparison a wide collection of authentic timber samples is available. This collection at the present time comprises nearly a thousand different species and includes the majority of the commercial timbers of Australia as well as the more important foreign timbers.

It is sometimes found that two closely related species are difficult to identify by such macroscopic and microscopic examination and in these cases the chemists of the Division are called in to make a chemical examination of the wood. The two main lines of attack are used by the chemist. The first consists of a proximate analysis of the wood and a study of the relative importance of certain constituents of the wood. The other depends on the use of tests in which the various materials extracted from the wood are treated with numerous reagents. An interesting example of this is found in the test for tannins which are frequent constituents of wood as well as of bark. There are two distinct kinds of tannins common in wood and, in some cases, in the two timbers difficult to distinguish the tannins present are different. Thus, on testing the extracts from the timber with ferric chloride, the tannin present in the extract from the one timber gives a blue black colour, while the tannin present in the extract from the other gives a green colour. In such cases identification can be easily accomplished.

FOUR INCH PINE FLOORING

One of the problems in the utilisation of pines from plantations in Australia is the need for a market for the narrower boards. These pines make excellent flooring, but softwood flooring has chiefly been 6" wide and the demand for 4" boards has been negligible. Unless this prejudice in favour of a 6" board can be overcome, the problem of marketing comparatively young pine will be seriously affected.

The 6" board has no particular advantage except in the slightly lower cost of laying. The 4" board has a far nicer appearance when down. It is gratifying to note that in South Australia this has finally been recognised and large quantities of 4" *Pinus radiata* flooring has now been sold. That State is a long way ahead in its softwood plantations and is right up against the marketing problem. The

adoption of the narrower board is one step towards its solution.

ELECTRICAL MOISTURE METERS FOR PLYWOOD

Recent tests in the laboratories of the Division of Forest Products have shown that the Blinker Moisture Meter which has proved so successful in testing the moisture content of boards is not suitable for testing 3-ply. The reason for this is that in the preparation of the casein glues used in the manufacture of plywood certain substances are included which give the glue a comparatively high electrical conductivity. Thus, when the hammer blades are driven into the 3-ply, they penetrate the films of glue between the veneer sheets and the electrical current takes the line of least resistance, that is, along the glue film instead of through the timber. The result is that erratic readings of the blinker are obtained, giving results often considerably higher than the actual moisture content of the 3-ply. Blinkers should not, therefore, be used for determining the moisture content of 3-ply.

BREVITIES

There are seventeen kiln installations in Melbourne and its suburbs alone. The total number of kilns installed or under construction in this area is forty-five. the total sum of their capacities is over 300,000 super feet of timber or an annual drying capacity of approximately 15 million super feet. At the present time building operations are proceeding at three installations and at four plants new installations or additions are projected.

A small open tank treating plant for impregnating bed logs with creosote has been established by the State Electricity Commission of Victoria.

Eight Christensen lifting trucks for the handling of timber throughout the combined air and kiln seasoning process without restacking are in use or under construction. These trucks are applicable to large or small plants, are low in cost, and result in considerable economy in seasoning operations.

The Postmaster General's Department in South Australia has erected an open tank treatment plant for the butt treatment of poles with creosote. A number of poles have been treated and complete penetration of the sapwood has been obtained.

NEWSLETTER
Forest Products

1933##019

MONTHLY NEWS BULLETIN NO. 19 FIRST PUBLISHED IN 1 AUGUST 1933

THE CAUSE AND PREVENTION OF SUNKEN JOINTS IN FURNITURE BOARDS

Both in Australia and abroad manufacturers of high-grade furniture have frequently been confronted with a defect known as a "sunken joint", which reduces the attractiveness and market value of their products. This defect is doubly serious because it develops slowly in the finished article so that in many cases it is not detected until the article has left the factory.

Many first-class furniture woods are obtained from small trees, from which wide boards are not procurable. Consequently, boards of the desired widths are made by jointing a number of narrow boards. If the timber is matched in grain and colour and the workmanship is good the joints may be practically undetectable when first made. Unfortunately, in many cases the joints do not remain inconspicuous, especially if the surface is highly polished. In the course of time a depression may form along each joint thus revealing the fabricated nature of the board.

Although one of these depressions may be only a few hundredths of an inch deep, it may be conspicuous because light is reflected differently than from the polished surface as a whole. On the other hand, if the surface were given a flat finish the depressions would be scarcely discernible.

In accordance with custom the trouble has usually been attributed to the "peculiar nature of the timber", particularly if the timber has only been introduced recently in the trade. Experience has shown that this view is incorrect and that the defect may be overcome if a suitable seasoning procedure is followed.

This problem has been met recently in Victoria and New South Wales at several plants using Coachwood. In every instance but one the "nature of the timber" was blamed. Since this timber is becoming increasingly popular for high-class furniture and interior trim, the problem is an important one.

The steps in the usual factory practice, which lead to sunken joints are as follows:-

1. The timber is dried to a suitable moisture content.
2. The edges are shot on a jointer.
3. Animal glue is applied to the edges and the boards are cramped together and allowed to remain in the cramps for an hour or so.
4. The glued boards are flat stacked, using thin spacing strips, and allowed to stand on the factory floor over night.
5. Next day the boards are planed and sanded on both sides, and then used for manufacturing purposes.
6. Subsequently the manufactured article is polished and transferred to the show rooms.

In many of the boards, after a period depending on the atmospheric conditions, a depression at each glue joint gradually develops.

The explanation of this behaviour lies in the fact that the wood in the proximity of the joint absorbs water from the glue during stage 3 of the process, and consequently swells. If the wood is dressed, before this absorbed water

dries out, then a portion of the swollen wood will be removed, and subsequent drying and shrinking will form a depression at the joint.

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Clearly then glued boards should be re-dried before they receive their final dressing. In order to achieve this, suitable re-drying rooms have been installed at the factories concerned. As a further precaution the policy of gluing boards some days before they are to be dressed has been adopted. In every instance satisfactory results are now being obtained.

The "sunken joint" is also a common defect in veneered panels which are made by gluing together narrow boards to form a core stock upon which cross-banding and veneers are laid. The panel may be quite smooth at first and may remain so during the finishing operations, but if the moisture absorbed by the wood from the glue had not evaporated before the core stock was surfaced, then in the course of time these joints will sink, and irregularities of the polished surface will result.

THE DESIGN OF INTERNAL FAN KILNS
Right- and Left-Handed Fans

With the type of timber-seasoning kiln generally recommended by the Division of Forest Products, that is, the cross-shaft internal fan kiln, it is common to build the kilns in pairs, each fan shaft serving the two kilns. There are three reasons for this:-

(1) Three bearings can be used instead of the four that would be necessary if each kiln had its separate fan shaft.

(2) One set of driving pulleys, belts, etc., can be used for the two kilns.

(3) A right-handed fan can be placed in one kiln on one end of each shaft and a left-handed fan in the other kiln on the other end of the same shaft. In this way the thrust of the fans is taken up in the shaft and it is unnecessary to provide special thrust bearings.

In connection with the latter use of right- and left-handed fans a case was brought to the notice of the Division where an engineer proposed to make the same fans for the two kilns but to turn one lot end for end when mounting them on the shaft. He expected in this way to obtain the same results as would be obtained with the use of right- and left-handed fans. The fallacy of this reasoning will be apparent to anyone who has had experience in the design of fans, screws etc., but superficially it sounds so logical that anyone who has not thought the matter out carefully could easily be misled.

Probably the best way to test the contention is to take an ordinary office fan and note the angle of the blades; then unscrew the fan and without changing the motor, reverse the fan and replace it on the motor shaft. It will then be seen that the angle of the blades has not been altered.

Actually right- and left-handed fans differ in the same ways as right- and left-handed screws, and the blades in the two types of fans are off-set in opposite directions.

THE PROBLEM OF SHORT LENGTHS

One of the principal forms of waste in the timber industry is in short lengths. From time-to-time suggestions have been made for the disposal of these and in some quarters a marked improvement has resulted. Purchasers who require pieces three feet in length persist in ordering, say, twelve foot lengths and cutting them in the smaller sizes themselves. Meanwhile, the mill floors are littered with such pieces bound in due course for the fire-heap.

If purchasers, wherever possible, would specify the minimum lengths suitable for their requirements, an appreciable amount of useful timber would be saved and the miller would be able to deliver higher grade stock because he would have a chance to dock out defects when preparing the order.

One of the difficulties attendant upon the use of short length stock is the expense of

transporting and handling a large number of small pieces. this can be and is being readily over-come by fastening a number of pieces together into parcels of convenient size. Fastening is carried out by using either the wire tying or strap fastening machines ordinarily used for boxes.

INSTRUCTION IN TIMBER SEASONING

The importance of proper seasoning in the preparation of timber for consumption needs no stressing. Many of the difficulties, into which the Australian timber industry has, in the past, fallen, were due to faulty seasoning methods and a lack of appreciation of the necessity for turning out a thoroughly reliable product.

The simplest way to find out how to season timber rapidly and economically is to study the fundamental principles involved. The old days of rule of thumb methods are past, and scientific methods of seasoning should be adopted. It is, however, not easy for anyone to find out about such methods since text books on the subject are rare. However, from time-to-time, the Division of Forest Products conducts instruction classes on the seasoning of timber. Up till now these classes have been held only in Melbourne, the demand for instruction not yet warranting the holding of classes in other States.

For the benefit of those who have been unable to attend such classes a corresponding instruction course has been introduced. In this course there are two divisions, namely: (i) the preliminary course, and (ii) the ordinary course.

The preliminary course, which is brief, covers the elementary details of seasoning and is adapted to the requirements of all timber users and will be supplied free of cost. The lessons for this course have been prepared and a number of students are enrolled.

The second or ordinary course is more detailed and is being prepared especially for kiln operators who have completed the first course and who wish to extend their knowledge. A small fee will be charged for this course.

Those anxious to enrol for either of these courses should communicate with the Division.

BRANDED TRADE MARKS

Recent trade news from the USA states that a burned-in trade mark is becoming one of the smartest and most attractive means of identifying wooden articles, ranging from hammer handles to telegraph poles.

A signature burned in lasts as long as the product and is comparatively inexpensive. One American firm uses a special air press for branding curved chair backs before assembly. For branding in smaller quantities or where the impression is to be applied on finished merchandise a hand torch is used. Recently an electric branding iron has been placed on the market in the United States.

A word of warning, however, is necessary about branding practice. it has been noted that some Australian manufacturers have been branding axe and other handles in such a way that this part of the article is impaired. The brand should not be placed on the part of the handle of reduced section or on any portion where failure tends to occur during use.

It must be remembered that, when considering the strength of a piece of wood, small nicks such as burn marks have a very much greater influence than would be expected simply from their reduction of the cross section. Concentration of stress occurs in the neighbourhood of the nick so that a failure, which ultimately extends to a complete fracture is induced.

TIMBER VERSUS STEEL IN WINDOW SASHES AND FRAMES

Timber is a building material of such longstanding that all its deficiencies are common knowledge. Hence, in many spheres of its utility, it is at a disadvantage from a sales standpoint with newer substitutes. That, however, these may have even more serious deficiencies than timber is shown in the case of steel window sashes and frames by the findings at two inquests on victims of accidents in Melbourne.

The first occurred in August 1932, at the Caulfield Racecourse where a spectator was killed by a steel window weighing 56 lbs which feel from a grandstand. In recording a finding of accidental death the coroner stated prophetically: "I think the fracture of the window fastenings was due to want of use and a recurrence of this accident will follow if they are not attended to".

Recently the same coroner presided at the inquest on the death of a window cleaner who, overbalancing as a result of a weakened metal window frame, fell from the fourth floor of the Bank of Australasia, Melbourne. The metal window was only two and one half years old, and in recording his finding, the coroner stated:- "It is perhaps too much to say that such frames are inherently defective, but in my opinion it is not satisfactory that so soon after its installation this metal window frame should have given way".

PUBLICATIONS OF THE DIVISION OF FOREST PRODUCTS

The following publications of the Division have been issued during July 1933:-

(i) A guide to the seasoning of Australian timbers, Part 1.
by C. Sibley Elliot, B.Sc.

This deals with kiln drying schedules for seventeen Australian timbers, and includes supplementary notes on problems encountered during kiln operations.

(ii) Trade Circular No. 15.
"Draft Terms and Definitions Used in Timber Grading Rules".

These were prepared by Timber Committees of the Standards Association of Australia and have been published to facilitate their introduction into trade use.

(iii) Trade Circular No. 16.
"Terms Used in Timber Seasoning, Part 1".

This circular explains twenty terms commonly used in timber seasoning. These terms are so arranged in related series that they form connected explanations of common seasoning features.

The above publications can be obtained, free of charge, from the Division.

BREVITIES

Mr I.H. Boas, M.Sc., Chief of the Division of Forest Products, has been appointed Chairman of the committee on Botanical Nomenclature, recently formed by the Australian National Research Council.

Mr S.F. Rust, B.Sc., one of the research students recently appointed by the Trustees of the Science and Industry Endowment Fund for training in Forest Products research has sailed for the United States. He will proceed to the US Forest Products Laboratory, Madison, where he will remain for some months making a special study of methods of wood preservation. Later he will visit the Forest Products Research Laboratory, Princes Risborough, England to continue his course of training.

Miss I.H. Robertson, M.Sc., a graduate of Melbourne University, has recently joined the staff of the Division of Forest Products as Assistant Chemist, and will be carrying out chemical investigations on timber. Miss Robertson who graduated in 1931 and obtained the Diploma of Analytical Chemistry in 1932, has been engaged since the beginning of this year in metallurgical laboratory work under Sir Herbert Gepp.

Mr A.B. Jamieson, M.Sc., who recently resigned from the staff of the

Division of Forest Products, has sailed for Japan to continue his studies in Japanese under the terms of the Mollison Scholarship of the Melbourne University.

NEWSLETTER

Forest Products

1933##020

MONTHLY NEWS BULLETIN NO. 20 FIRST PUBLISHED IN 1 SEPTEMBER 1933

WOOD PRESERVATIVES - MATERIALS SOLUBLE IN WATER

There is available a comparatively large number of water soluble wood preservatives. some of these, such as zinc chloride, have been used for nearly 100 years and, under certain conditions, have been found to give good results. Others such as zinc meta-arsenite, Wolman salts, etc., are of more recent development; while a number of others are only in the experimental stage. Modern research in timber preservation has led to the development of new chemicals which are designed to overcome the disadvantages of the older types of water soluble preservatives.

In general, water soluble preservatives are not satisfactory for use under wet conditions or in areas of high rainfall since it has been found that the preservative chemical can be leached out of the wood. For this reason efforts have been made to develop special mixtures in order to reduce the loss by leaching and so to make the preservative of more general use. Water soluble preservatives have one advantage not possessed by creosote or oil preservatives in that painting of treated timber does not in general present any difficulties and there is no objectionable odour or discolouration of the wood. Some of the water soluble chemicals are, however, corrosive to iron and steel and their use is consequently restricted.

When timber is treated with water solutions it is naturally re-moistened and in certain cases it is necessary to allow timber so treated to re-season before use.

Some of the more common water soluble preservatives are listed below:-

(i) **Zinc chloride.** This can be purchased in the solid form, or as a very concentrated solution containing about 50% of the pure chemical. It is readily soluble in water and the solid absorbs moisture from the atmosphere so that it is necessary to keep it in air tight containers. It is very poisonous to fungi, but not to termites (white ants), although wood effectively treated can be expeced to have increased resistance to termite attack. Numerous tests to determine the relative termite resistance of wood treated with zinc chloride are now in progress.

A satisfactory solution for use in treating wood can be made by dissolving 3-5 lbs of the solid zinc chloride in 10 gallons of water. In these concentrations the solution is only slightly corrosive to iron and steel and can be used in metal containers with perfect safety.

(ii) **Sodium fluoride.** This chemical can be purchased in the form of a white power which is not very soluble - approximately only four parts of weight dissolving in 100 parts of water. It does not absorb moisture from the air and can therefore be easily packed and handled. It is practically non-corrosive to iron and steel and is safe to handle, although care should be taken to keep it away from food materials as it is a stomach poison. In its preservative properties it is similar to cinz chloride and may be used in a solution containing 2½ to 3½ lbs of dry powder to 10 gallons of water.

(iii) **Copper sulphate.** This chemical has been used for a number of years in Europe as a wood preservative, but is not so good in this regard as either zinc chloride or sodium fluoride. It is more expensive and as it attacks iron and steel cannot be used where it is likely to come in contact with metals. For this reason special non-corrosive treating apparatus is required. There are no indications that this particular chemical will be of any value as a wood preservative in Australia.

(iv) **Mercuric chloride (corrosive sublimate).** This preservative has been used in Europe for several hundred years. It can be purchased in the form of white crystals and is soluble in water. The solution is extremely corrosive to iron and steel and is, moreover, **very poisonous**, hence special care is needed in handling. It is undoubtedly a good preservative against decy and termites, but on account of its cost, and its corrosive and poisonous nature it is not advocated for general use.

(v) **Arsenious oxide (white arsenic).** This is a white powder which is slightly soluble in water approximately two parts by weight dissolving in 100 parts of water at ordinary temperatures. Solution in water is difficult as the white powder floats to the surface and is difficult to wet. Vigorous boiling is, therefore, necessary to obtain required solutions. Experience over a large number of years has shown that this chemical is a very effective poison against termites. Its value in preventing decay is not definitely known, but experimental results indicate that under certain conditions it is not very effective. Where the treated timber is exposed to the attack of both termites and fungi and water soluble preservatives are to be used, a solution containing white arsenic together with either zinc chloride or sodium fluoride is recommended. White arsenic can be used in water solutions containing 1-2 lbs of solid per 10 gallons of water. Higher concentrations may be obtained by the addition of about 2 lbs of caustic soda or washing soda and increasing the amount of white arsenic to 5 lbs. Arsenic is **very poisonous** and care should be taken to keep it away from food materials. The soda-arsenic solution or the wood treated with such solutions should also be kept away from animals which are likely to lick the treated material.

There are several patented or proprietary water soluble preservatives on the market. These are generally available in powder form, but sometimes in the form of a solution. In most cases the chemical composition of the preservative is not indicated. Some consist of two or more of the chemicals listed above with the addition of special constituents. Some may be relied upon to give good results, but on the other hand others are of little value and anyone proposing to use them should first investigate their efficiency as wood preservatives.

A THERMO-COUPLE POTENTIOMETR AIDS THE WORK OF THE DIVISION

The Division of Forest Products has recently added to its equipment an electrical instrument known as a thermo-couple potentiometer. This instrument is used for determining temperatures in places where ordinary thermometers cannot be conveniently used. Its action depends on the fact that an electric current is set up in a closed circuit consisting of two wires of different metals when one junction of the two wires is at a different temperature from the other. The greater the difference in temperature the greater is the current, but even with the greatest differences met in practice the current set up is so small that very sensitive instruments known as potentiometers must be used to detect it.

One of the chief uses to be made of this instrument will be to determine temperatures at various positions within timber seasoning kilns. To do this, it is necessary to take a pair of wires to each of the positions where the temperature is to be measured. These temperatures can then be measured from the outside of the kiln, one at a time, but all within a few seconds. Such a procedure is obviously much better than that adopted previously, where it was necessary to enter the kiln often at temperatures so high that accurate observations were almost impossible. The value of being able to check the conditions throughout a kiln will be apparent when it is remembered that the temperature read by the operator on a thermometer at one end of the kiln is sometimes far from indicative of that elsewhere and consequently of the drying conditions throughout the kiln.

There are a number of other uses to which the instrument can be put. It is sometimes desirable to know the temperature actually inside a piece of timber or inside the well of a building or at some other more or less inaccessible position. For all such purposes the thermo-couple method is eminently suitable.

HEAT CONDUCTIVITY OF WOOD

Some very interesting work on the thermal properties of various woods has been carried out in the Experimental Engineering Laboratories of the University of Minnesota and reported at a meeting of the American Society of Heating and Ventilating Engineers by the Director, F.B. Rowley.

The thermal properties of wood are of great importance in building construction in cold climates, where central heating is adopted, as the conservation of fuel in such climates is an important economic factor in an ordinary household budget. There is another aspect, however, which is of far greater importance in Australia, viz., the use of wood as a heat insulator in refrigerating plants. Previously very little work has been done in this field. None of this work was of such a nature that the results could be applied to species other than those tested.

For some years a comprehensive series of well planned tests has been carried out at the University of Minnesota, USA and certain definite principles are now well established.

Some thirty species of timber were tesed and the effect of moisture and density on the thermal conductivity was examined. The main results are as follows:-

(1) The conductivity within a species varies proportionately with the density of the sample tested.

(2) Conductivity is somewhat greater tangentially than radially in species with marked annual rings.

(3) In species of uniform grain, no consideration need be given to the position of the annual rings.

(4) Small crevices such as occur between the boards in ordinary construction do not materially affect conductivity, though in the absence of suitable precautions such crevices may permit air infiltration.

(5) Conductivity varies proportionately with the moisture content expressed in terms of the weight per volume of wood, i.e. as lbs of water per cubic foot of wood.

Selecting timber for a refrigerating plant, taking the above into consideration, one would insist upon well seasoned wood, and as low in density as can be obtained in the species used. A full report of the work is published in the June number of "Heating, Piping and Air Conditioning".

FIRE RESISTANCE OF TIMBER

Fear of fire is frequently responsible for the decision to substitute other materials for timber. The inflammability of wood has been so accepted by the public, and insurance companies in particular, that steel, reinforced concrete and brickwork are often much more favoured than wood as building materials. This persistent belief in the inflammability of wood can be attributed to the almost universal use of wood domestically and industrially as a fuel. However, it will be recognised that in order to consume wood rapidly it is necessary to cut it into comparatively small pieces. Large pieces of wood burn very slowly because timber is a poor conductor of heat and while the outside may be glowing characoal the central portions may be unaffected.

It is not surprising to find, therefore, that timber constructions have certain pronounced advantages from the fire standpoint. It is now recognised that, practically, there is no such thing as a fireproof building, for, even although the building shell itself may be constructed of non-inflammable material, there is usually sufficient inflammable material in the fittings and contents of the building to give disastrous results. Modern fire control therefore aims at localising outbreaks by preventing or retarding their spread to all portions of a building. It is in this connection that the slow burning properties of timber show to advantage. Unprotected steel and many other materials of construction rapidly lose strength under the

high temperature conditions obtained during a fire, with the result that upper floors and roof structures collapse and fire-fighting activities are retarded. It has been demonstrated throughout Australia in a number of fires that structural timbers, although badly charred, continue to function in supporting the floors, partitions and roof' of the building and by thus localising outbreaks prevent complete gutting.

The results of recent tests, reported in "The Southern Lumberman", demonstrate rather strikingly the comparative fire resistance of timber.

Full size structure assemblies, such as doors and partitions, were subjected to fire conditions approximating those met in practice. Under the test, one side of the door or partition was exposed to a controlled fire and the other side to the atmosphere. According to American practice the classification of protective doors is based on the period of time during which it will withstand the effects of a fire increasing in intensity by given temperature increments up to 1700ºF. at the end of one hour, without having transmitted through the door temperature of more than 250ºF. To pass the test successfully the door must not only withstand the effect of the fire, but must also prevent the passage of smoke and flame either through the door itself or through the openings between the edges of the door and the frame. The character of the gases given off is also of importance since they may be poisonous to those seeking to escape from a burning building or to firemen fighting the fire.

One report concerns a fireproofed veneered door subjected to test. The temperature on the face of the door exposed to the fire ranged from 1230ºF. at the end of 5 minutes, to a maximum of 1720ºF. 45 minutes and on average of 1700ºF. for 60 minutes. Most of the surface veneer and cross banding on the furnace since was consumed or curled up and fell off within the first 10 minutes. The temperature of the unexposed face of the door remained at the air temperature of 45ºF. for 30 minutes and reached a maximum of only 110ºF. at the end of 60 minutes. During the entire test no flame or smoke passed the door. The outer face was not affected by the fire at any time no warping, charring or abrasion being noticed. Observers were able to hold the palms of their hands on the outer face throughout the test. The insulating value of wood in this test was amply demonstrated.

Further evidence of the fire resistant qualities of Australian hardwood generally and of Western Australian jarrah in particular was afforded at a flour mill fire in Adelaide early in August. The top and bottom floors. were damaged most. The fire apparently traveled along the chutes, but did not gain a hold on the intervening floors. It is considered that had the machinery casing been made of anything but jarrah the spread of the fire would have been more rapid and the mill would have been completely gutted.

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LEAD PENCILS

Although there has been a steady increase in the use of mechanical lead pencils, and wooden pencil factories are said to be only working at 20% capacity, the quantity of Pencil Cedar (*Juniperus virginiana*) or Incense Cedar (*Libocedrus deccurens*) used is still very great. According to the "Timberman", in a normal year in the United States factories alone 20,000,000 super feet of this timber are consumed, of which 90% comes from the State of California. In the early days of lead pencil production Florida and other Southern States were large producers of pencil cedar; but the supply is practically exhausted and now only amounts to 500,000 ft. per annum.

The American factories export pencil slats to Japan, Germany, China, England and practically every country in the world. The annual consumption of wood pencils per head of population in U.S.A. is about 10. In Europe it is about 2.5 and in the Far East about 0.5. If Australia is on the same footing as Great Britain it should need about 16 million wooden pencils a year, and if a suitable timber could be found, this would mean quite a valuable industry. So far, however, no timber equal to the pencil cedar has been found, though one or two show possibilities for second grade pencils.

TRADE CIRCULARS OF THE DIVISION.

Two additional Trade Circulars, Nos. 17 and 18, are at present in the course of preparation and will be issued shortly.

Trade Circular No.17 on "Types of Timber Seasoning Kilns", discusses the different types of kilns with particular reference to those moat suitable for use in Australia. Kilns are divided into two main

classes, namely, progressive and compartment and examples of both classes are illustrated and described. Perhaps of the greatest interest is the description of the cross shaft type of internal fan kiln, which is the type generally recommended by the Division, and which is now in use practically throughout Australia.

Trade Circular No.18deals with the Prevention of Decay in Building Foundations, This circular should be of interest, not only to architects and builders, but also to house owners and householders. A great deal of damage is done to the flooring, wooden foundation stumps and linings by the growth of rots. These are really fungi or low forms of plant life, of which the common mushroom is an example. Frequently the Division of Forest Products is consulted by owners of houses or by architects for advice on what is to be done where rot has developed so badly as to be serious. It is usually possible to give advice for remedying the damage but it is far better to avoid it in the first place. This can be done if proper attention is paid to the efficient ventilation of the foundations of the house and to details of design which prevent the ready growth of the fungi. There seems to be a lack of appreciation of these facts and to help overcome this, the Division is issuing Trade Circular No.18.

The demand for Trade Circular No.9 – “Electrical Moisture Meters for measuring the Moisture Content of Timber” has been so great that it is necessary to publish a second edition. Opportunity is being taken to include more detailed information on full range blinker moisture meters which have proven very popular. In addition, all available correction figures for different species have been included. The figures given for eleven species are over the range of 7-24% moisture content (full range of the instrument), together with fifty correction figures for blinker sorters measuring moisture content in the neighbourhood of 12 to 15%.

NEWSLETTER

Forest Products

1933##021

MONTHLY NEWS BULLETIN NO. 21 FIRST PUBLISHED IN 1 OCTOBER 1933

NOW IS THE TIME TO TREAT FOR WOOD BORERS

Where did that little pile of fine wood powder come from? Many householders throughout Australia will be asking this question during the next few months. The time is approaching when the beetles in wood will bore their way to the surface and reveal their presence by a small hole and a little heap of dust.

Throughout the winter the grubs (larvae) have been persistently working away in security in the inside of timber. The infested piece may be in flooring, furniture, or any other wood work, and the householder may be quite unconscious of the presence of the wood borers.

In the spring most of the larvae change into the pupal stage and lie near the surface of the wood. When the final change to the adult form occurs the beetles bore their way out. The beetles mate soon after emerging and the female proceeds to infest new timber or reinfest previously attacked material.

If there is any reason to suspect woodwork of harbouring borers this is the right time for treatment. Penetration of wood with treating solutions is sometimes difficult, but when the insects are near the surface, as they are in early spring, it is easier to poison them.

There are important types of wood borers which cause serious trouble in Australia. One is the powder post borer which attacks the partly seasoned or seasoned sapwood of many of the timbers containing pores (Eucalypts, Flindersias, Acacias, and many brush timbers). This borer does not attack non-porous timbers (such as the pines, oregon, cedars, spruces, firs). The second is the furniture borer which attacks old seasoned timber, such as the pines and a number of imported furniture timbers, but there is no record of its attack on the truewood of Eucalypts.

Both the types of borers make comparatively small holes in the wood $^{1}/_{32}$" to $^{1}/_{16}$" in diameter. Their holes should not, however, be confused with those of the pin hole borers, which work only in the living tree or the freshly felled log and which are not of importance to the householder. The tunnels of both the powder post and the furniture borers contain a powdery frass (finely powdered wood), while those of the pin hole borer are free from frass or contain only a little stringy material. The wood around the holes of the pine hole borer is usually somewhat darkly stained.

If any woodwork was invested with borers last summer, it is now the time to treat it, even though it has been previously treated. A treatment now, and then in a month's time may free the woodwork entirely and prevent the spread of infestation. If beetles are already emerging then the necessity for treatment is even more urgent.

The following solutions are suitable for use in treating for both powder post and furniture borers:-

Creosote - This has been found to be the most satisfactory for killing the borers, both the oil and its vapour being effective. However, it stains the wood and also affects stains and polish, and wood to which it has been applied is difficult to finish. Used alone, it is thus only suitable for interior woodwork such as flooring, joists, rafters, posts, etc.

Creosote and kerosene - By the addition of kerosene the staining effect of the creosote can

be reduced until, with a mixture of one part of creosote to eight parts of kerosene, it is almost negligible in white woods. In any case, the effect of staining can be first investigated on the particular timber to be used. This mixture is not so good as creosote and it is slower in its action. It would be suitable for all ordinary furniture, but it is likely to affect high finishes slightly.

Para-dichlorbenzene - This is a white crystalline solid which can be
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(nearly a line is illegible from the original)
which is very poisonous to borers and does not stain the wood. The pure chemical can be purchased for about 2s6d per lb.

Kerosene or turpentine - Both of these are advocated for use and in the case of small infestations in the home they will probably give satisfactory results. The use of a mixture of kerosene and turpentine in equal parts has been advised as being more satisfactory than either one alone. Both act slowly and a number of treatments will be necessary.

Sometimes the use of mercuric chloride (corrosive sublimate), arsenite of soda, carbon bisulphide, and hydrocyanic acid has been advised. These are all dangerous poisons and their use inside a house is not recommended, particularly as equally effective results can be obtained with less dangerous materials.

All the above solutions should be painted no the wood or, better still, forced into the borer holes by means of a hypodermic syringe or a fountain pen filler. Sufficient holes should be treated to insure that all the borer galleries in the timber are thoroughly penetrated. If further information is required the Division of Forest Products has published two trade circulars, namely:

> **Trade Circular No. 6** - Wood Borers in Australia, Part 1, Lyctus or Powder Post Beetles
>
> **Trade Circular No. 11** - Wood Borers in Australia, Part 2, Anobium or the Furniture Borer

which can be obtained free of cost from the Division.

THE PROGRESS OF TIMBER STANDARDISATION IN AUSTRALIA

One of the difficulties of the Australian timber industry has been the lack of standardisation of timber products. This has been done to the absence of uniform grading rules which defined exactly the quality permissible in any grade of timber desired for a particular purpose.

The task of removing this difficulty fell initially upon the Standards Association of Australia, whose function is to organise the community to help itself. In this case the organisation consisted in forming a central body, the Timber Seasonal Committee, under the chairmanship of Mr I.H. Boas, Chief of the Division of Forest Products, and containing representatives of all interests concerned with the preparation and use of timber. Similarly constituted sub-committees were formed in each State.

The first work undertaken by the Timber Committees was the preparation of a standard set of terms and definitions used in timber grading. This enabled members in all States to speak a common technical timber language and obviated many of the misunderstandings which have arisen in the past purely from different meanings being given to the same word or from different words being used with the same meaning in different States or even within the same state. This set of terms and definitions has been published by the Standards Association of Australia as a draft so that any objections to the terms can be raised and anomalies adjusted before they finally pass into use as Australian standards. To facilitate the dissemination of the proposed terms the Division of Forest Products has also published the Draft Terms and Definitions as **Trade Circular No. 15**, and copies of this can be obtained from the Division.

The second step taken by the timber sectional committee was the preparation of uniform grading rules for floorings, linings and weatherboards made from Australian timbers. It was soon realised, however, that the variation in the properties of these timbers and the variation in the types of defects which occur are so great that it is impossible to obtain one grading rule applicable to all timbers. It was found, however, that the timbers fell into well defined groups, viz.,

Western Australian timbers; Victorian and Tasmanian timbers; and New South Wales and Queensland timbers. In addition, there was *Pinus radiata* grown chiefly in Victoria and South Australia. Grading rules were, therefore, drawn up by the individual State Committees concerned, and these were made as uniform as possible throughout the Commonwealth. These grading rules are being submitted to a meeting of the Timber Sectional Committee early in October, for final consideration.

In addition, agreement has been reached on the thickness to which nominal one inch flooring should be milled, namely, $^{13}/_{16}$". Standard profiles to which flooring in each State will be milled have also been decided. Thus, although those Committees have been in existence nearly four years, and progress has at times been very slow, there has been a steady forward movement to a worthy national objective.

THE MIXING OF TIMBERS

Often in logging a forest the bush foreman comes across occasional trees which, while yielding timber very similar in appearance to that obtained from the main species being felled, belong to an entirely different species. These occasional trees are felled, the logs are cut up and the timber mixed indiscriminately within the rest of the mill production.

Such a practice proves quite harmless in many cases, but it should not be indulged in without careful consideration because it may lead to serious trouble and financial loss. The difficulty lies in the fact that timbers which are much alike in appearance may have varying properties and may behave differently during seasoning. It sometimes happens that the timber from the occasional tree of a different species is very difficult to season, and when scattered through the seasoning stacks dries much slower than the remainder of the timber. Such boards are still very high in moisture content, when the timber is unloaded from the kiln trucks or air seasoning stacks, although the rest of the material is quite dry. These odd boards are likely to cause serious trouble because they may be unsuspected or even, if suspected, they are difficult to detect.

Several cases of this type of trouble have recently been brought under the notice of the Division of Forest Products. In one of these cases the financial loss was considerable. The advice of the officers of the Division was sought in connection with a floor which has been condemned by an architect and which had to be relaid. Examination showed that the behaviour of the floor was due to a number of boards of another species which had not dried at the same rate during seasoning. These boards were at too high a moisture content when the floor was laid and had subsequently shrunk. The over-zeal of the bush foreman in this case was rather an expensive form of economy.

PARQUET FLOORING FOR SHOP WINDOWS

With the present trend towards the modernisation of shop fronts, parquet floors of high decorative value are coming more and more into prominence. One distressing feature, however, is that after such floors are laid, the individual pieces often shrink so that a few months later the floor, instead of contributing to the beauty of the window ensemble, actually detracts from it.

This shrinkage fault is not confined to local timbers; it is just as prevalent in imported material. The cause is undoubtedly insufficient seasoning. In other words, the moisture content of the timber, when laid, is too high. It is not generally realised that the conditions in a shop window are often conducive to low moisture contents in timber. This is particularly the case when the window is exposed to the direct rays of the sun, or when it is fitted with a bright lighting system. In the latter case, it should be remembered that the high power electric globes radiate a considerable amount of heat as well as light and should, in fact, be considered as small radiators. This heat, reflected directly onto the floor surface, gradually reduces the moisture content of the timber in the floor with the subsequent shrinkage of each board.

For satisfaction in windows parquet flooring should be kiln dried or stored in a heated room at least during the wet months. The moisture content when laid should not exceed 10% and where conditions are particularly severe, should even be lower. It is rather extraordinary that such care is taken in the machining of flooring strips - working to an accuracy of

$^{1}/_{100}$". Yet, by neglecting moisture content, the timber may change in width, after laying, anything up to $^{1}/_{10}$".

An electrical moisture meter of the "Blinker" type for checking the moisture content of boards should be regarded as essential by the shopfitter carrying out this class of work.

KILN DRYING SCHEDULES FOR QUEENSLAND TIMBER

There is an increasing number of timber seasoning kilns in Australia and a growing realisation of the advantages of well-seasoned stock for the great majority of purposes for which timber is used. As a result of these developments many timbers are being kiln-dried which previously were air-dried only, and for each of these timbers it is necessary to determine suitable temperatures and humidities for use in the kilns. A set of temperatures and humidities at which to hold the kiln conditions during various stages of the drying is known as a kiln schedule. Not only does the most suitable schedule for use depend in the particular timber, but it depends also on the size in which the timber is dried. the Division of Forest Products has three small experimental kilns in which trial runs, each of a few super feet of timber, are carried out to determine satisfactory drying schedules. Schedules so determined are first tried out on a commercial scale before they are finally recommended. In this way it is possible to arrive at satisfactory drying conditions for any particular size and species of timber with only a very small waste of material.

The Division has recently commenced an extensive programme of work of this nature in co-operation with the Queensland Forest Service. The object of the work is to find kiln drying schedules for a number of Queensland timbers. What are considered satisfactory schedules are first to be obtained by trial runs in the small laboratory kilns and these will later be tried out on a commercial scale by the Queensland Forest Service in its modern cross-shaft lateral-fan kiln. The timber for the trial runs is being shipped to Melbourne in the form of flitches so coated as to prevent their drying during transit, and ensure their arrival at the Laboratory in the green condition. These flitches are then sawn up into boards of the desired sizes for testing.

The first consignment of material for this work has been received from Queensland and consists of a number of flitches of each of the following timbers; blackbutt (*Eucalyptus pilularis*), rose gum (*Eucalyptus saligna*), and satinay (*Syncarpia hillii*). Tests on these timbers are to be commenced immediately. Other timbers on which similar tests are to be made in the near future include red cedar (*Cedrela australis*), red stringybark (*E. resinifera*), red tulip oak (*Tarrietia peralata*), Spotted gum (*Eucalyptus maculata*), and Hoop pine (*Araucaria cunninghamii*).

PUBLICATIONS OF THE DIVISION OF FOREST PRODUCTS

Two technical papers of the Division of Forest Products have recently been published.

Technical Paper No. 9 covers a continuation of the work on the chemical composition of Australian timbers and forms the third part of a series. The timbers examined were derived from the four species, *Eucalyptus gigantea* (Alpine ash or red ash), *E. regnans* (mountain ash), *E. obliqua* (messmate) and *E. sieberiana* (silver top). The knowledge of the chemical composition of these timbers is of particular interest since they have proved to be the most suitable for papermaking in Australia. This paper also discusses the use of chemical results for purposes of identification and though the keys developed are not as clear cut as could be desired, they have a definite value and have already proved of value in the work of the Division.

Technical Paper No. 10 discusses the Australian Export Apple Cases and the results of investigations carried out by the Council for Scientific and Industrial Research at the request of the Special Committee on Fruit Cases of the Standards Association of Australia. The two main types of apple case in use, the Canadian and the Australian dump, are described and the disadvantages of using more than one type are stressed. The merits of each type of case are discussed and it is shown that the dump shape gives better protection to its contents than the Canadian shape. Unduly tight packing is found to be a source of bruising and all round corrugated strawboards are effective in reducing bruising. It is

recommended that a standardised dump case, not less than 18" x 9" x 14½" in internal measurements be adopted as the standard export apple case.

Copies of these publications can be obtained from the Division.

BREVITIES

From time-to-time the Division of Forest Products has received inquiries concerning the ash content of Australian timbers. Information on this point has in the past been lacking, since the few published figures have reference mainly to the potash content and consequently figures for total ash content are not available. During the course of studies on the chemical composition of Australian timbers, the Division is collecting reliable data concerning the ash content of a number of samples of each species.

The Museum of the Division of Forest Products is steadily growing. Recently 300 samples of timbers were received from different parts of the world. These comprised 100 samples from the Dutch East Indies, 127 from the Philippine Islands, 48 from Borneo, and 25 from Surinam. the timber samples represented in the collection of the Division are now representative of 1136 different species, and 430 different genera.

Mr F. Gregson, B.E., Forest Utilisation Officer of the Western Australian Forests Department, will be arriving at the laboratories of the Division of Forest Products early in November for a visit of several months. The Division has in hand a number of projects concerning Western Australian timbers, the chief among these being the comprehensive investigation of the mechanical strength of karri.

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A WARNING TO THE TIMBER TRADE

Recently, the Division of Forest Products received a letter from a sawmiller stating that he understood the Division to have passed as satisfactory a new vacuum kiln for seasoning timber. The Division of Forest Products wishes to warn the timber trade that it has never classed any vacuum kiln as satisfactory, nor does it recommend any such kiln to be built generally by the trade. All its experience with vacuum kilns to date have shown them to be unsatisfactory for Australian timbers and Australian conditions, and in the opinion of the Division, all evidence both theoretical and practical indicates that they are not a commercial proposition.

It will be remembered that some three years ago, sawmillers were promised the millennium of seasoning with the advent of a foreign vacuum kiln system. The Division collected all available information on vacuum kilns both in Australia and abroad and as a result pointed out that there was little possibility of such a kiln proving a commercial success here. However, one unit was established and attempts were made to live up to the extravagant claims which had been made for this drying system. Needless to say, these were unsuccessful.

In the meantime, the Division carried out vacuum drying experiments in the preservation plant of the Division which is in effect kiln, while one of its officers carried out similar experiments in a small vacuum kiln plant at the United States Forest Products Laboratory, Madison, and later another officer made tests on the commercial plant established in Australia. All these tests confirmed the conclusions which had been arrived at from theoretical considerations, namely, that vacuum kilns are not a commercial proposition.

In spite of the warnings issued by the Division, a second vacuum kiln was erected by another company for the drying of case stock. Recently a letter was received from a representative of this company who stated that the vacuum kiln erected at a cost of some £2500 would not dry case stock as they required, and that, as a result, the company was forced to cease activities.

The Division is extremely anxious that this unhappy experience should not be repeated by other firms attracted by the magic of the term vacuum drying, and members of the timber trade are, therefore, warned against the purchase of expensive vacuum kilns before these have been proven a commercial success.

There is something fascinating about the idea of vacuum drying and most people have the conception that a vacuum will suck the water out of timber. This is, of course, entirely incorrect. All that a vacuum does in helping drying is to enable water to boil at a lower temperature. But heat is still necessary to boil water under a vacuum just as it is necessary to boil water under atmospheric conditions, and it is here that the difficulty of a vacuum kiln arises. A vacuum will not conduct heat; that is why it is used in a vacuum flask. Hence, the vacuum has to be broken to heat the timber, so that vacuum drying consists of a series of cycles of drawing a vacuum, breaking the vacuum, drawing the vacuum again, and so on. Such a process is expensive and cumbersome.

Usually, the main selling point in a vacuum kiln is that the vacuum pump is of a new design and is highly efficient. But vacuum

kilns have not failed in the past because their pumps were inefficient. The weak spot is not the equipment, but the timber.

Timber will not give up its moisture faster than a certain rate without warping and cracking, and it is not the equipment but this which rules the maximum rate of drying. Incidentally, it may be mentioned that the Forest Products Division used in its experiments a high grade, mechanically operated, equalising value, two stage vacuum pump rated to within $^{1}/_{50}$" of a perfect vacuum, but even this pump would not make vacuum drying a success. Further, the pumps used in the two commercial plants already mentioned gave a very high vacuum for commercial machines and failure of the kilns was certainly not due to inefficiency of the pumping equipment.

It has been claimed from time-to-time that the Division of Forest Products has been out to condemn vacuum drying without a fair trial. This is obviously incorrect. The Division feels that the timber trade has already lost sufficient money through backing opinions unsupported by actual facts and advocates that anyone who wishes to sell vacuum kilns should first erect a commercial unit, and prove that vacuum drying can do what is claimed for it and that it is a commercial proposition. The Division is willing to co-operate by acting as observer during a test run and preparing and publishing an impartial report on the test. Until such a test has been carried out and has proved the vacuum kiln a success, the Division reiterates its warning to the trade not to risk money on the installation of vacuum kilns.

WHAT IS THE FUTURE OF WOOD?

In the programme for a forestry exhibit in Berlin in 1932, the following statement was made:-

> "... within the last decade German industry has been turning to steel, iron and cement as a substitute for wood in manufacture, construction and building. While this subtle change has been going on practically nothing has been done by foresters or others concerned to counteract it."

These words are equally appropriate for this and other countries. Several American writers have also stressed this point.

Cartwright, Chief Engineer of the National Lumber Manufacturers' Association, Washington, USA, has proposed two lines of attack:

(1) Properties of wood can be influenced by physical or chemical measures or more closely controlled by selection to offer the user a greater variety of choice or a more uniform product for his purposes.

(2) The user can be shown how to adjust the material more economically or more effectively to his purpose.

These two methods are directly applicable to Australian conditions, especially as information is lacking on the majority of Australian timbers. The Division of Forest Products has, during its five years of existence, established a number of facts about Australian timbers, but, as might be expected, has been unable in this short period to carry out all of the wood technology research that is necessary on the physical properties of our woods. Even in the United States of America, where forest products research has been going on for many years, **full** information on the properties and best uses of timber is only **partly** available. It is only by the accumulation of data that wood can begin an offensive against other materials.

In this regard, the Division of Forest Products is publishing a series of pamphlets dealing with available information regarding Australian timbers and the first of these, on the timbers of the ash group of eucalypts, will shortly be available.

The second way of combating the inroads of substitutes is by means of better utilisation methods. Here again, research is needed, but at the same time the manufacturer can help himself by improving his selection methods and the quality of his materials. By developing of new uses and by the greater education of the user, it is possible to regain some of the ground lost to other materials. That this is being done is shown by the following examples:

(a) German wireless towers, unstayed and over 400 feet high, have been built entirely

of wood because of non-conducting property.

(b) Motor car bodies made entirely of plywood have been exhibited.

(c) Wood, because of its insulating value, its replacing metal as an interior finish for Canadian Pacific air conditioned Pullman cars.

VISIT OF FOREIGN SCIENTISTS TO THE LABORATORIES OF THE DIVISION

It is of interest to note that early in November the Division of Forest Products will be visited by Mr A.T.J. Bianchi, Officer-in-Charge of the Technology Section of the Forest Research Institute, Buitenzorg, Java. This Institute proposes to erect experimental seasoning kilns and commence a series of investigations into the kiln seasoning of the timbers of the Dutch East Indies. While at the laboratories of the Division, therefore, Mr Bianchi will make a comprehensive study of the seasoning research being carried out here as well as of the types of kilns in commercial use in Australia.

Accompanying Mr Bianchi, will be one of the engineers of the Royal Packet Navigation Company, Mr C.J. Andriesse, who will take an active part in the erection and operation of a trial kin which is to be erected at a commercial plant in addition to one or two laboratory kilns at the Research Institute.

It is particularly gratifying to find that the standard of kiln seasoning in Australia is now such that overseas organisations consider it of value for their officers to visit this country for the collection of information regarding latest seasoning methods.

RECENT PUBLICATIONS OF THE DIVISION

Technical Paper No. 11 of the Division of Forest Products (C.S.I.R. Pamphlet No. 46) on "*The Holding Power of Special Nails*" has just been issued. This publication has just been issued. This publication should prove of wide general interest as it emphasizes the importance of the proper design of the nailed joint on the serviceability of containers and it indicates the various methods by which the holding power of such joints may be increased. In the investigations described, over 4000 nails, representing fifteen types of special nails and two types of plain nails, were tested for static and impact holding power. The tests definitely indicate that certain types of nails have a decided advantage over plain nails, and it is of great importance to have such information available since it has been found that by far the commonest cause of failure in wooden cases is due to the pulling of the nails from the wood.

Trade Circular No. 17 on "*Types of Timber Seasoning Kilns*" is now available. This trade circular gives brief descriptions of some of the main types of kilns which have been used commercially, and for this reason should prove of value to a large number of timber millers, merchants and users of timber who are at the present time considering the erection of some type of kiln to deal with their particular problems of seasoning. After conviction of the need for a kiln the first question which arises is the type of kiln best suited for a particular set of conditions. There can be no general answer to this question since each case needs separate consideration, however, Trade Circular No. 17 gives certain notes which are of use when the matter comes up for decision and also indicates that the Division of Forest Products is willing to advise anyone desirous of installing kilns.

WOO BORERS

In the last issue of the Monthly News Bulletin a warning was issued with reference to borer attack. It is of interest to record that the first emergence of the powder post beetles from infested timber in the laboratories of the Division was observed on October 7th. Already numerous requests for the best methods of treatment have been received by the Division. It is strongly urged that any timber suspected of containing borers should be inspected frequently during the next few months.

SPECIFICATION FOR CREOSOTE

A technical Committee of the Australian Standards Association has been considering the preparation of an Australian specification for creosote oil for wood preserving purposes. All interests have agreed on a tentative specification similar to that issued by the Division of Forest Products as an appendix in **C.S.I.R. Pamphlet No. 24** on "*The Preservative Treatment of Fence Posts*". Two further clauses are proposed and details of one of them are now being prepared. It is expected that the draft specification with full details of standard analytical methods will be issued as a tentative standard early in 1934.

BREVITIES

On Friday, November 17th, at 7.45 p.m., a broadcast of more than ordinary interest to the timber trade will be put on the air by station 3AR, Melbourne. This will take the form of an actual visit to the laboratories of the Division of Forest Products and listeners will have an opportunity of hearing, if not seeing, the activities of the Division. Amongst the items of special interest will be (i) the operation of the smallest papermaking machine in the world, (ii) the enabling of listeners to hear the moisture in wood, (iii) the running of an automatically controlled seasoning kiln, (iv) the impregnation of timber preservatives in a high pressure treating cylinder, (v) the sawing and preparation of timber specimens for strength tests, (vi) the actual failure of timber under load as applied by a testing machine, and (vii) the working of the box testing drum to determine the strength of a box.

Mr J.E. Cummins, Senior Preservation Officer of the Division of Forest Products, will be visiting Western Australia during December. The Division is carrying out a number of investigations in co-operation with the Western Australian Forests Department, and amongst these is one on the preservative treatment of fence posts. Four years ago, posts treated by different methods were placed in position in several parts of the south-west of Western Australia, the sites being chosen to give a range of climatic conditions. Inspections already carried out have shown that the test conditions can now give an indication of the efficacy of the various treatments, and while in Western Australia, Mr Cummins will make an examination with the idea of preparing a progress report on this interesting experiment. During his stay, Mr Cummins' headquarters will be the Forests Department, Cathedral Avenue, Perth.

Towards the end of October, Mr C.S. Elliot, Senior Seasoning Officer, returned to Headquarters after six months spent in visiting sawmills and other timber plants throughout New South Wales and Southern Queensland.

This visit has enabled the Division to establish a much closer contact with the New South Wales timber industry, and it is hoped that, as a result of the relations so established, timber men in that State will make greater use of the Division, which seeks to be of assistance to the industry wherever possible.

While Mr Elliot's main object was to discuss with millers and others the latest trend in the seasoning of timber, and the need for improving the standard of seasoning if the Australian market is to be captured and retained for local timbers, he has been able to gather considerable experience of milling conditions, etc., that will assist the Division in its efforts to meet the particular needs of the industry in New South Wales.

STANDARDISATION OF TIMBER

One of the most important meetings of the Timber Sectional Committee of the Standards Association of Australia was held in Sydney during October. At this meeting standard grading rules for milled flooring from all States of the Commonwealth were submitted and after consideration were recommended by the Timber Sectional Committee for publication. Further profiles to which flooring shall, in future, be milled to secure as much uniformity as possible were decided upon. A number of new problems in timber standardisation came up for consideration and

prominent among these was the question of the grading of plywood which has already been submitted to the Queensland sub-committee for the preparation of an initial draft specification. Consideration was also given to the standardisation of window and door sizes, stock sizes for joinery, and profiles for mouldings. The Committee considered this work would be of considerable value to the timber industry generally.

It will be remembered that recently **a draft list of terms and definitions used in timber grading**, agreed upon by interests throughout all States of the Commonwealth, was published and distributed widely so that all could become familiar with their use and so that any constructive criticism could be offered. The Committee had before it a similar draft of the British Standards Institution concerning terms applicable to softwoods (non-pored woods). The two drafts were submitted to a small panel to see how far they could be brought into line.

One matter that has worried all concerned in the timber trade is the confusion of common names. For example, there are many different timbers in Australia called blue gum, dozens of white gums, and so on. Further there are very few timbers which have not at least three or four different common names depending on the State or the district of milling. An attempt will be made to find a way out of the present unsatisfactory position by drawing up a list of standard common names.

NEWSLETTER

1933##023

MONTHLY NEWS BULLETIN NO. 23 **FIRST PUBLISHED IN 1 DECEMBER 1933**

SHORTAGE OF SEASONED TIMBER

About two years ago, the Division of Forest Products pointed out that when the condition of the building industry improved, there was a strong possibility of a shortage of seasoned Australian hardwoods. In pre-depression years, it was the practice for sawmillers and merchants to hold large stocks air seasoning. The last few years have, however, forced many to liquidate their assets and air seasoned stocks have been seriously depleted. Moreover, the losses sustained as a result of selling at low prices timber, cut at boom rates, have made many millers disinclined to build up large air seasoning stoacks again until they feel that a strong demand for timber has definitely been re-established.

With the gradual improvement in the building and other timber consuming industries, a stage is being reached when a definite shortage of seasoned timber will occur. In Victoria, where kiln drying hs been developed to a greater extent than in other States, kiln plants generally are busy. Further, there is a growing shortage of stocks of kiln seasoned hardwood in the thicker sizes, such as 1½" and 2" thick for joinery, door stock, etc. This class of material generally requires 6-12 months air seasoning followed by kiln drying, so that as the demand is increasing, there does not appear to be any possibility of the market becoming overstocked.

The danger of the present position lies in the fact that if the demand for timber improves still further, the disaster of the post-war boom will be repeated. Seasoned stocks will be exhausted and green hardwood will be supplied. If this happens again, it will be fatal to the Australian hardwood timber industry. The struggle of hardwood to recover its prestige has been slow and tedious, and a further set back must have very serious results.

The obvious safeguard is the expansion of kiln seasoning. This is the only sound method of meeting a fluctuating demand. Many sawmillers, however, are of the opinion that it will be safer to wait because improvement will be gradual, and there will be ample time to erect kilns when more definite signs of trade improvement are to be seen. Such an attitude is dangerous. While it may seem likely that future improvement will be slow, the possibility of a rapid uplift cannot be disregarded. In less than a year the wool outlook has gone almost from one extreme to the other and it is not improbable that similar reactions may occur in other industries.

The Division of Forest Products can advise millers and merchants on the installation of seasoning plants and the probable cost of treatment. If necessary, plans and specifications for the selected type of kiln will be forwarded free of charge. In this connection the division has issued a **Trade Circular No. 17**, "*Types of Timber Seasoning Kilns*" and copies of this are available free on appllication to the Division.

COMPRESSION WOOD AND ITS PROPERTIES

The term "compression" wood is not familiar to Australian timber users, but they should be familiar with the wood to which it refers. Compression wood has been found fairly commonly in various softwoods, i.e. coniferous woods (woods without vessels) such as the spruces, firs, pines, hemlocks, etc.

In other countries it has been called variously, "proud wood", "hard grain", "rot holz" (redwood), "timber bind", etc. All these are descriptive names in which some featue of the wood is represented. They apply to dense bands of abnormal wood which are found in the lower or compression side of leaning trees. Trees from exposed positions are especially liable to contain this abnormal wood. Seen on an end section of a log or board it is generally recognisable by rather wide growth rings containing a large proportion of dense late wood which is darker in colour than the surrounding wood. This dark wood with wide growth rings is accompanied by eccentric growth, that is to say, on the compression side of the log the distance from pith to bark is greater than on the other side.

In the Australian pines, hoop pine and bunya pine, this type of abnormal wood is also found, and the millers recognise it by the name "brown wood" or "brown pine". It is also found in New Zealand Kauri and New Zealand White Pine. Imported softwoods often show quite a large percentage of this same type of wood. Thus it is important that both millers and users should know some thing of its properties.

The most striking property of this compression wood is its tendency to shrink along the grain (longitudinally) to a much greater extent than normal wood, thus causing bowing, splitting and twisting in boards containing it. In general it is denser than the normal wood of the same growth ring and in comparison with such normal wood its mechanical properties are variable. As far as can be judged, on available information, compression wood is deficient in modulus of elasticity, i.e. it has a low stiffness in comparison with normal wood and it shows a brittle or carrotty failure when tested in cross bending.

Under the microscope there are several features that can be used to distinguish compression wood. The individual cells in the cross section are found to be nearly circular in shape, whereas in normal wood they are more nearly rectangular or polygonol. Moreover, the rounded cells are often separated by what are termed intercellular spaces instead of being completely joined one to another. Examination of the longitudinal sections of compression wood also reveals numerous spiral checks in the cell walls. Such spiral checks or striations are not found in the normal wood.

In America, where the amount of softwood timber containing compression wood is a considerable proportion of the total amount milled, that causing serious trouble in utilisation is readily recognisable. Thus it is eliminated as far as possible in building construction or in other places where its excessive longitudinal shrinkage may cause trouble (such as in the bowing or sagging of beams, in bending, splitting and twisting of boards, or in any product where the use requirements are exacting).

In Australia the properties of compression wood are not well known and users of both imported and locally grown softwoods (pines, etc.) should reject timber containing it when such timber is to be used for exacting purposes.

The majority of millers of hoop and bunya pines do reject the "brown wood" or "brown pine" as they call it, and relegate such material to the fire heap or to second grade stock, but it is sometimes encountered in milled material with unfortunate results. One such an instance which came under the notice of the Division of Forest Products was in the case of blind rollers made from hoop pine. These were cut from second grade material and contained varying amounts of compression wood. The result was that many of the finished rollers showed a distinct bend due to the abnormal shrinkage of the compression wood which was on one side of the rollers. By means of careful inspection at the source of the material, the compression wood was eliminated during the manufacture of the rollers and in this way the trouble was overcome. This is an excellent example of the difficulties likely to be encountered by the use of this abnormal wood for purposes where the requirements are fairly exacting. On the other hand, however, the presence of compression wood does not prevent the use of the timber for low grade purposes such as case material. Quite a large amount of the imported softwoods used for case making contains compression wood, which does not materially affect the strength or usefulness of the case.

The Division of Forest Products has published an article on the occurrence of compression wood in Australian pines, in which the properties of this abnormal wood are

discussed. A reprint of this article may be obtained by those interested, on application to the Division.

A NEW END COATING FOR LOGS AND TIMBER

A paint manufacturer, in co-operation with the Division of Forest Products, has developed an end coating for logs or timber. This coating is very effective, is easily applied by means of a brush at ordinary temperatures without heating, dries quickly, is hot easily chipped off and, furthermore, remains effective under conditions such as are used in kilns.

The value of end coatings will be appreciated when it is realised that, other conditions being equal, green or wet wood will dry more rapidly from the end grain than from the side grain and end checking or splitting is apt to occur unless end drying is retarded.When the end grain is more exposed than the side grain the tendency for end checking is materially increased. Logs, for example, are protected more or less by the bark on the sides, but the end grain of the wood is fully exposed unless special efforts are taken to protect it. In timber stacks the ends of the boards are usually exposed to sun and wind while the other faces of the boards are protected within the stack. Coating with materials that retard end drying is one of the best methods of reducing the waste which results when end checking occurs in logs and timber.

The end coating most widely used by the timber industry in Australia today is a cheap petroleum jelly known, among other names, as Petrolatum. This is sold by large oil companies, and appears to be quite effective as an end coating for logs or air-drying timber. A factor to be considered, however, is that the petroleum jelly does not dry out, but leaves the ends of the timber sticky and in certain cases this is a distinct disadvantage. Furthermore, the jelly is somewhat difficult to apply unless it is heated when it can be brushed on. It is quite unsuitable as an end coating for use in kilns.

These disadvantages have been eliminated from the newly developed end coating which is known as Timber Coating Gloss Oil Black No. 3370, and is retailed at approximately 8/- per gallon in four-gallon tins. It is understood that this timber coating oil can be obtained from paint retailers in the various capital cities. If there is any difficuilty in obtaining supplies, further particulars will be given by the Division.

KILN DRIED TIMBER AND "RINGING IN"