Print this page

Forest products newsletters

1932- 1975

Dr V (Bill) Balodis
Guest Research Fellow
CSIRO Ian Wark Library
Tel. 9545 2318
Home address
27 Pascoe Av.
Strathmore Vic 3014
Tel. 9374 1106
vbalodis@mira.net

Preface

The purpose of the Forest Products newsletters is outlined in the first issue. It is, to report, in concise form, the results of recent work at the Division. In retrospect, the 1800 pages of the newsletters provide a history of DFP from 1932 to 1975.

The newsletters started as typewritten leaflets with short anonymous articles. In the early 1940s some of the longer articles had author's initials. The newsletters were first printed in 1946. Their format also changed, now they could be illustrated with drawings and photos. Although author's names were included for major essays, captions to photos of research activities didn't include names of the operators.

The newsletters are in the CSIRO Clayton, Ian Wark Library. They can be viewed, but the archival copies are not available for loan. Another problem is that library space is at premium and internal historical publications may, in the future, have low priority for shelf space. In digitized form the newsletters could be preserved and distributed without occupying library shelves.

Digitization of the newsletters was initiated in 1994 by Dr Jugo Ilic. At that time digitizing was a very tedious job. Pages from the printed newsletters (139-401) were individually scanned, processed with OCR* software, saved as MS Word documents, without illustrations, and corrected for spelling errors. The images of the first 138 newsletters (duplicated from stencils cut with a typewriter) could not be processed with OCR. Mrs Sarah McQuarrie in 1997 retyped and formatted newsletters 1-70.

In 2005 the tools for digitizing had undergone major changes. Photocopiers with automatic feed facility can scan a hundred pages in minutes and save the photocopy images as a PDF file. It can be processed with Adobe Acrobat character recognition software to create a searchable text layer for each image. This text can be indexed with Acrobat software and the index embedded in the PDF file.

The result is a PDF file with images of the original newsletters that can be rapidly searched for words and phrases with Acrobat version 8 & 9.

The FPnewsletters.PDF file was assembled from the retyped newsletters 1-70, and scanned copies of the 71-401 issues. The latter were scanned in bitmap format to optimize text quality and in greyscale to maintain photo quality. The master file, FPnewsletters.PDF, was assembled from the two files.

On each page of the newsletters are four icons, called buttons, for initiating actions. In the top-right corner a single click on the central button prints the page (be careful because a double click will print two copies). The associated left and right arrows will open the previous and the next page respectively. The (Content) button in top left corner will open the content page.

V. Balodis.
CSIRO Melbourne
2009

* OCR stands for Optical Character Recognition software for converting images of scanned text to MS Word document.

Searching contents

The FPnewsletters.PDF file is a collection of 401 files, the newsletters. The search of the PDF master file is fashioned on Windows search for files and file content.

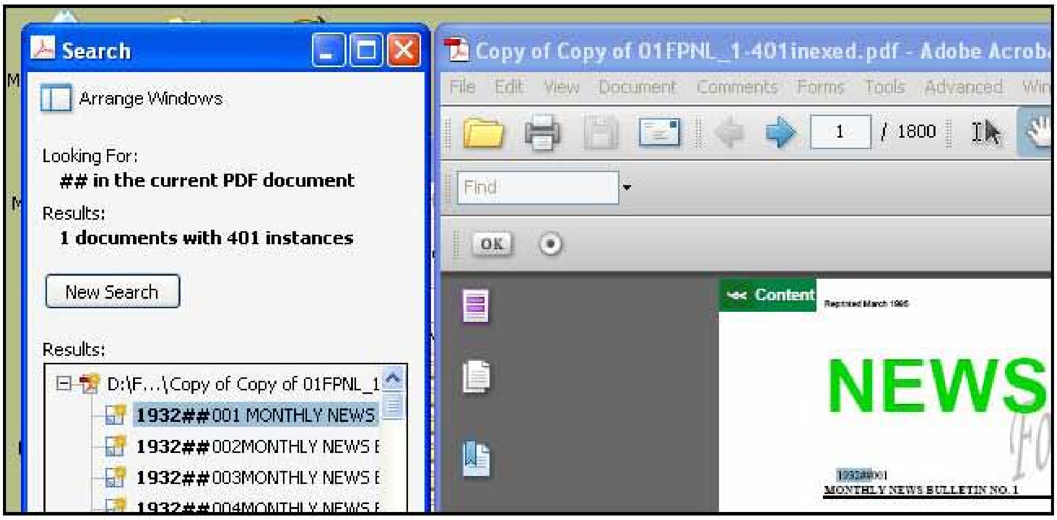
The file names of the newsletters combine the issue number and year of publication. This information has been recorded on each title page as [**year##issue number**]. The searchable text layers generated by Acrobat OCR software contain the content.

The Acrobat search facility is in the edit menu. Click on **Edit** to open the menu and select **Search.**

To locate files, i.e., newsletter issues

A search for ## creates a list of the 401 newsletters

The following image shows the first few entries from the complete listing of the 401 newsletter issues. The title page of a chosen newsletter can be opened with a single click on its name.



Other search codes:-

1950## lists all newsletters published in 1950

##099 opens newsletter number 99

Here are some interesting topics that can be opened with the double hash code:-

No. 064 - Official opening of FPL South Melbourne 1937

No. 100 - Centenary issue of FPNL 1940

No. 139 - The 1st Forest Products Conference March 1946

The twenty year DFP review was published in the 1947 newsletters.

Searching for text

The retyped newsletters (1-70) present no problems for searching, but for the scanned newsletters words and parts of words may be missing from the text layers. This could be a particular problem for some of the fuzzy pages in the 71-138 series (1937-1945).

The optional search restrictions of 'whole word' and 'case sensitive' should be used sparingly. For example, the hit rates when searching for Dadswell improve markedly with reduced restrictions:-

Whole word and case sensitive search for	Dadswell	63 hits
Restrict to Whole word	dadswell	72 hits
Without restrictions	dadswell	75 hits
Using only a critical part of the word	dads	82 hits

However, the whole word option is needed for some search, e.g. for Mack

Whole word	mack	25 hits
No restriction	mack	40 hits

The latter includes Mackney, Mackay and Macklin.

The important point to remember is that searchable text layers are not perfect. The best text layers are for images of the printed newsletters. At present it is not possible to correct text layers, but such option may be included in later versions of Acrobat.

Appendix

The **searchable layers** can be viewed when imported in MS Word. Open FPnewsletters.PDF and select the searchable layer of any page with Ctrl-a; copy selection to clipboard with Ctrl-c; open a blank Word page and paste the selection with Ctrl-v. The following examples illustrate a range of qualities of the searchable layers (errors underlined).

Newsletter #139, page 2, start of paragraph 1, a high quality printed newsletter.
2 FOREST PRODUCTS NEWS LETTER
A NOTE ON SAWDUST AS A BUILDING MATERIAL
Sawdust has received some attention as a possible bUilding
material for a number of years. This attention has been given
more especially overseas, but also, to a limited extent, in
Australia. In general its use has met with only a limited degree

Newsletter #137, page 2, start of paragraph 1, fair quality gestetner duplicate.
Naturally, owing to the pr'essure of expansion
only the most urgent pi";oblems have so far received attention
if the industry is to be an efficient one, continuation of
investigations is necessary. At present only about 5010 of
the fibre in the straw is roco\"urGdin the form of long fibre.
The balance is lost or recovered onJ.y as tow which is much less

Newsletter #137, page 5, start of paragraph 1, poor quality gestetner duplicate.
ThOfJO U1TG1'(;:'.tUc. i31oG},)(.crs '.YCi""C ntt2.cked J:Cl.3Jidly Py
deca;r with some i.U:;\3Dci;:.l"!:,urJ. tcrridto attacJ'.:. 'l'he treated
sleepers fu.ilcd pl"incj.l)8..1J.'l :t'I'O;"C ti'w 8,J:~;K~ C8.U130 thOll.gtc in some
sections where deony riaza:cd wn.F3 low, n~j ChFJJlj.cal f.'sJ.lu:ce cLue to

(PS A kind person may volunteer to retype newsletters 71-138.)

NEWSLETTER

Forest Products

1932##001

MONTHLY NEWS BULLETIN NO. 1 **FIRST PUBLISHED IN EARLY 1932**

DIVISION OF FOREST PRODUCTS

The Division of Forest Products is one of the Divisions of the Council for Scientific and Industrial Research* and as such deals with all problems connected with the utilisation of timber or other products of the forest. At the present time it is engaged on research into a number of problems and it is essential that the result of its investigations should be known as widely as possible among all who use timber in any form.

In order to disseminate information the Division issues a series of Trade Circulars, Pamphlets and Reprints (from the Journal of the Council) and in numerous other ways attempts to spread the information it has collected, either from its own researches or from those of timber research stations in other parts of the world.

It is realised that, even with these various methods of publicity, there are many users of timber who would be interested, but who are not aware of the activities of the Division. The object of the News Bulletin, which will be published monthly, is to make contact with such people and to place before them in a concise form the results of recent work.

The first point to be stressed is that the Division exists to assist the timber industry in all its branches and desires to be of service. It has specially trained officers for each section of its work. These officers are graduates of Australian Universities and many of them have been specifically trained abroad in timber research stations in England and America. At the present time, the work is largely advisory - that is to say, much of the time of officers is devoted to assisting the timber producer and the timber user and helping them to take advantage of latest research developments.

The work of the Division comes under several main sections. Of these, the seasoning section advises on the drying of timber, the design and operating of drying kilns, and the correction of seasoning faults. The preservation section is occupied with the study of rots and timber destroying insects, and with methods for reducing or preventing losses due to them. The timber mechanics section is investigating the design of wooden boxes and crates and special equipment for testing, these has recently been installed. Trade Circular No. 4, which can be obtained free of cost sets out more fully the functions of the individual sections.

This monthly News Bulletin will deal with various aspects of timber research and some of the many problems encountered, but if readers have any particular problem or desire special information on timber utilisation, etc., they are invited to communicate with:-

The Chief at the Division of Forest Products (address printed at the foot of the page).

A NEW MACHINE FOR TESTING BOXES

In an endeavour to reduce the very considerable economic loss that occurs in Australia because of faulty and wasteful containers, the Division is undertaking an extensive investigation into the design of boxes and crates.

The most practical method yet devised for testing containers is the revolving, drum test which was developed by the United States

* Now the Commonwealth Scientific & Industrial Research Organisation (CSIRO).

Forest Products Laboratory and which is now used in investigations of this nature all over the world. A standard box testing drum (illustrated) has recently been installed by the division. This drum which was built by the Division's own staff entirely of Australian material, is a hexagonalsided machine, seven feet in diameter, and revolves slowly at the rate of two revolutions per minute. Upon the six internal faces, hazards and guides are arranged in such a manner that, as the drum revolves, the box or crate slides and falls, striking on its ends, sides, top bottom, edges and corners thus simulating the stresses, shocks and rough handling of actual transportation. On one face of the drum is a projection upon which the container falls to encounter a puncture hazard similar to that undergone by a box upon which another has dropped cornerwise.

Laboratory tests bring, out very clearly weaknesses in the design or construction of the box or crate, and on the basis of the observations made it is possible to build up a container that for all practical purposes is equally serviceable in every feature; i.e. balanced in construction. A balanced container will show an equal resistance. against failure due to nails pulling from the wood, to wood pulling from the nails, and to splitting and breaking of ends, sides, tops or bottoms. Most containers are excessively strong in one or more parts and by balancing the design, it is usually possible to effect considerable savings in weight and cost for a given strength, or vice-versa, for a given cost to considerably increase the strength and protection to the contents.

A very important, part of the work to be carried out by the Division is the design of containers made of Australian grown timber. The timber used has a considerable influence on the design of a box or crate, and it is proposed to carry out tests to determine the best and most economical design for boxes and crates using locally grown woods, so that they may compete on equal term with containers made of imported material. If this line of work is successful, it will be of great value to the Australian timber industry, as more than £1,000,000 worth of timber is imported annually for the manufacture of containers.

Some idea of the importance of the work and the scope for possible savings may be gathered from the fact that Australia exports annually from 10 to 15 million boxes of commodities such as butter, egg, fruit (fresh, dried and preserved), tinned meat, etc., in addition to which well over 50 million containers per annum are required for domestic use. Thus, it will be seen that if even small savings could be made in the cost of the containers, important benefits would accrue to some of Australia's most important primary industries. Every penny saved in the cast of a case would mean a saving to the industry concerned of £4000 for every 1 million cases used. Improvement in box and create design with the consequent reduction in loss due to damage to goods in transit is also of great importance to the railways and to all industries making use of containers for shipping their goods.

FALLACIES ABOUT TIMBER - No. 1. Sap Up and Sap Down

It is a very human trait to find a scapegoat when anything goes wrong. Hence, when a piece of timber misbehaves or acts in an unexpected manner, it is usual to blame some inherent property of the timber or of the tree. This is quite safe as the timber cannot reply to any of the charges of disorderly behaviour made against it, and such charges do not have to be proved.

Unfortunately, charges have been accumulating over a long period and have been laid by generations of wood users, and if one were to believe them all, one would consider timber very unsatisfactory and unfaithful indeed.

In this manner many fallacious ideas have gained such a hold that they are quoted in text books on building constructions, included often in architects' specifications, and religiously taught to young artisans who will handle timber.

It is proposed to discuss one common fallacy each month, and so attempt to remove some of the prejudices existing about timber. These prejudices encourage bad practice for, by excusing faults on the grounds of inescapable deficiencies in the timer rather than lack of the proper knowledge on the art of the timber user, they prevent efficient use of the timber.

One extremely common fallacy is that wood must be cut at a definite time of the year depending on whether the sap is up or down in the tree. Sap is never up in the tree at one time and down at another; it doe snot go into the leaves and remain there during any season of the year, nor does it go into the roots and remain there. The sap is, in fact, **always up** in the tree; the only variation during the year is that at times of vigorous growth the sap is moving more rapidly than at times when growth is practically negligible.

It is not generally realised that the portion of a tree influenced by the flow of sap is very small, and in the case of most of our Australian timbers, discarded in milling. The sap moves up through the cells in a thin layer of sapwood just inside the bark. it passes to the leaves and is then enriched by food from material manufactured in the leaves by means of energy derived from the sun. This enriched sap then passes down the inside layers of the bark, and feeds the growing layer of the tree which exists between the bark and the sapwood. The main bulk of the wood of the tree, namely, the truewood (distinct from the sapwood and the rotten heart), which is in the part used in timber production in Australia is quite unaffected by the sap flow.

There are, in some cases, certain advantages in cutting at definite timbers during the year. These advantages are, however, due to other causes. In the first place, one period of the year may be more suitable than another for seasoning, and, secondly, wood destroying rots and insects are more active at some periods.

If a sawmiller, who has trouble at one time during the year decides erroneously that his difficulty is due to the sap being up or down, he has simply placed a bar in the way of his own progress, for, if his assumptions were true, he could do nothing. If, however, he traces his trouble to its true source, he will find that it is controllable, and that is some way out of his difficulty.

RECENT PUBLICATIONS

A list of the publications of the Division is given in Trade Circular No. 4 - "The Functions of the Division of Forest Products". A slight alteration has been made in the titles of the trade circulars listed therein as in the course of preparation. That on Electrical Moisture Content Meters has been deferred pending the results of some tests at present in progress. The object of these is to determine if it is possible to produce an electrical moisture meter at a low cost, say, £12 - £15, suitable for the sorting of timber into material above and below a certain moisture content, say, 15%.

Trade Circular No. 6, just issued, deals in a practical way with the occurrence and elimination of Lyctus or the Powder Post Beetle. This circular is at present being distributed and will be of interest, not only to sawmillers and timber merchants, but to all timber users.

A news bulletin on the Preservative Treatment of Fence Posts is also being distributed at the present time. The results of the treatment tests given in this publication were obtained from tests carried out in Western Australia, but the general principles of treatment are explained and the information given can be generally applied.

All publications of the Division may be obtained free on application.

NEWSLETTER

Forest Products

1932##002

MONTHLY NEWS BULLETIN NO. 2 FIRST PUBLISHED 1 MARCH 1932

TIMBER WASTE

One of the main objectives in the plans of a Forest Products laboratory is the elimination of part of the tremendous waste which occurs at all stages in the conversion of trees into articles of use. It is estimated that under 20% of a tree is actually used. The waste beings in the forest in the tops and limbs which are left to rot or burn. It continues at the mill where 60-70% of the log is often wasted in the form of rotten heart, off-cuts and sawdust. Finally, in the factory where the finished article is made there is a further loss due to off-cuts and sawdust.

In the forest there is another source of waste in the form of misshapen trees and in the operation of thinning when the small logs have to be left in the bush as it does not pay to take them to the mill.

An enormous amount of work has been done to find economical methods of converting this waste into useful products, and many processes have been developed, of which only a few have been successful on a commercial scale. It is quite natural that the sight of burning mountains of sawdust and slabs should excite unfavourable comments about wasteful methods. It is, therefore, very desirable that every effort should be made to reduce waste to its lowest limit.

Elimination of waste may be done in two main ways. Firstly, by using the most efficient method sin the mills in order to reduce losses due to off-cuts, etc. There can be no doubt as to the desirability of this practice, but the possibilities are limited by the size of the mill. Small mills often cannot bear the necessary capital outlay involved. Secondly, there is the question of cutting waste ends, etc., at the mill into useful sizes for certain industries. The manufacture of small dimension stock has been carefully investigated in America. There are definite possibilities in this direction, but again a close study reveals many difficulties, some of which are insuperable under the special conditions existing at the mills. Thirdly, there is the method of conversion into a number of products such as paper pulp, wall boards, cattle foods, artificial silk, etc. In this conversion great care must be given to consideration of the economic factors governing the industries concerned. In each case it is found that certain factors are essential to success, and these only occur in certain localities.

In other words, much of the waste of timber is inevitable, and to hope for 100% conversion, futile. It is very important that this should be realised. A great number of schemes to start industries using waste timber are constantly being placed before the public. The figures quoted seem very tempting, and the investing public too frequently is persuaded to put money into such propositions, which are doomed to failure before they begin.

The Division of Forest Products is constantly being asked to advise on such proposals and it is necessary to warn the public against what looks like a certain success. It is necessary that emphasis be placed on the fact that many substances can be made from wood, but that there is no assurance that money can be made in the process.

There is one feature which often has an important bearing on such proposals, viz., the fact that the raw material is waste can be obtained at little cost. This is a fallacy. As soon as there is a use for the material it ceases to be waste and acquires a definite and growing value. Many a promising venture has been wrecked on this rock.

It is proposed in future notes to discuss some of the methods of waste utilisation, to point out the factors which need to be studied and to indicate the directions in which research is being undertaken to find new methods.

AUSTRALIAN GROWN WILLOW FOR CRICKET BATS

Although some years ago it was shown that high grade cricket bats could be made from the true cricket bat willow grown locally, the greater portion of Australian bat requirements is still met from overseas. Thus we find that in 1928-9, about 45 300 bats, valued at about £31 300, were imported into the Commonwealth. In 1929-30, the numbers increased to 88 500 valued at about £46 000.

These imports presumably include blades to which handles are fitted in Australia, but this does not alter the fact that their value is that of material produced and work done outside the Commonwealth. However satisfactory the local product, there will always be a certain demand for imported bats; but it should still be possible to divert to the locally produced article sufficient of the annual expenditure to develop a healthy minor industry: provided, of course, that there is enough locally grown willow of satisfactory nature to ensure a continuous supply.

The Division of Forest Products has not been surprised, therefore, to receive a number of enquiries on the seasoning of locally grown willow. The species to be used is not the true cricket bat willow (*Salix coerulea*) but another species which is also used in England for cricket bats and which is to be found in practically every State of the Commonwealth. It is claimed that excellent cricket bats can be made from this species, and the meagre strength data that are available seem to support this claim.

The Division has been informed that it is at present the unvarying practice in England to air season willow cleft stock, but tests are being carried out there to determine suitable conditions for kiln drying the timber. As far as Australia is concerned, the present economic conditions have resulted in an immediate demand for seasoned clefts from the locally grown species, and there has been, therefore, a desire to kiln dry so that seasoned material may be available in a short time.

The Division has carried out a number of preliminary experiments on the seasoning of willow clefts and while these have not been sufficient, as yet, to indicate the best and most economical methods, they have provided useful information for stipulating conditions whereby clefts may be properly seasoned. It should be understood that no care in seasoning will compensate for poor selection and cutting of the clefts. The following precautions are advisable:-

(1) Clefts may be split or sawn, but in either case the grain must be straight and parallel to the length.

(2) They must be cut full on the quarter.

(3) Attention must be given to certain special features such as the number of growth rings per inch, proximity to heart or to limbs, and position in the tree from which leg is taken. These factors all have a direct bearing on the quality of the bat produced.

(4) If logs are not to be cut immediately into clefts, the ends must be coated to prevent rapid end drying. If this is not done, serous end checking may occur. When the logs are to be cut immediately the ends need not be coated, but the ends of the clefts must then be treated with a satisfactory end coating without delay.

    Suitable end coatings are described in Trade Circular No. 7 to be issued shortly. Lime or lime mixed with petrolatum is useless.

The kiln drying of clefts green from the saw is not recommended. It has two disadvantages - (1) if drying conditions are imperfect discoloration may occur, and (2) there may be set up stresses which will weaken the timber. The seasoning procedure recommended is preliminary air drying to a moisture content of approximately 50% followed by kiln drying to a moisture content of 12%.

In the air seasoning, it is necessary that the following precautions be observed:-

(1) All stacks must be covered to protect the timber from sun and rain.

(2) Stacks foundations must be well built, the bottom layers of timber being at least 18" above the ground. Foundations must also be constructed in such a way that there is a free movement of air beneath the stack, and to this end they must be kept free from weeds and rubbish.

(3) There should be plenty of space between stacks, and the clefts must be spaced in such a way that free air movement through each stack is possible.

If these precautions are taken, the air drying period will probably be from 2-4 months. In kiln drying a mild schedule is recommended. At temperatures above 120°F, the timber may become brittle. The following schedule should dry clefts from 30% to 12% moisture content in 10-14 days:-

Moisture Content %	Dry Bulb Temp. °F	Wet Bulb Temp. °F	Relative Humidity %
Above 25	120	110	72
25-12	130	115	62

While it may be possible to dry under a more severe schedule without apparent degrade, it is not advisable to do so. It is equally important that the clefts should not be overdried. After removal from the kiln, they should be allowed to stand under cover for approximately seven days before being worked.

SEASONING

FALLACIES ABOUT TIMBER - No. 2
The Removal of Sap in Seasoning

There is a common idea that the shrinkage and the swelling of timber are caused by substances dissolved in the "sap" and that if these substances are not removed in seasoning, the timber will misbehave. This idea is entirely erroneous.

The "sap" or liquid in timber is almost entirely water, and the substances dissolved in the water have no appreciable effect on the seasoning properties of the wood. The shrinkage and the swelling of wood are due to the tendency of the actual wood substance to decrease or increase in size as water is taken from it or added to it respectively.

Seasoning is simply the removal of water from timber - nothing more. The substances included in the term "sap" are not removed during seasoning - they remain in the timber. For example, there is an idea that for timber to season properly, it must be sacked in the open, so that rain can beat on the stacks and wash the "sap" out. This idea is wrong. It is not necessary to have rain beating on the stacks. In any case, only the outside boards of a stack receive any direct washing by rain; this occurs only on the extreme surface layers of these boards.

It is sometimes claimed, that the proper way to season timber is to place it in a stream with the butt end upstream or the butt end downstream (preference varies). This procedure is supposed to wash the sap out of the log and so make the timber easier to season. Such practice is of no value. It will not improve the seasoning of timber. The structure of timber is so close knit, that it is impossible for water to flow through it, as would be suggested by this idea. If timber could be so easily washed out, then wooden tanks and casks would leak like sieves.

Probably, this idea of water seasoning has arisen form the old oriental idea of placing timber under water before using it in temple furnishings, etc. It must be remembered, however, that such timber was left under water for hundreds and even thousands of years, and when a piece was removed, it was placed by another to be used centuries hence. A lot of changes in wood, other than removal of "sap", can take place in hundreds of years, so that this oriental method of treating timber is interesting, but it is scarcely of practical value to the Australian sawmiller.

It should be remembered, then that the seasoning of timber simply means the removal of moisture from the timber.

PINUS RADIATA - AN UNDER-VALUED TIMBER

The timber of *Pinus radiata* was regarded, for many years, as of poor quality and unfit for anything but case-making. Opinions were based largely upon the behaviour of improperly seasoned timber from hedge-grown trees. Now that the marketing of *Pinus radiata* from managed plantations approximates 5 000 000 super feet annually, and is destined to increase as additional growing stock attains mill log size, the time is opportune to review some of the qualities and applications of the timber.

Conditioned by a carefully considered policy of drying and manufactured by modern methods, *Pinus radiata* is beginning to take its place as a good quality timber for many purposes. As casing it is suitable for concrete moulds, crates and packing cases; and it has been found it split less readily than some imported hemlock as a cheese crate and nearly the equal of spruce. In building construction, it is being used for flooring, lining, moulding and weather-boarding. Excellent samples of joinery are to be seen in doors and sashes constructed by South Australian departments for service and demonstration tests. So convincing were the latter in a demonstration house constructed at the Adelaide show grounds that *Pinus radiata* is being used by the Architect-in-Chief in the construction of semi-portable schools in country districts in South Australia.

The furniture trade has also exhibits of *P. radiata* kitchen furniture and bedroom suites. Providing care is taken in polishes, as used by modern fabricators, should broaden still further its application in furniture.

Minor industries making bread boards, chair backs and panels, hair-broom heads and handles, rolling pins, clothes pegs, cotton reels, spools, awl-handles shoe spreads, and rat traps, etc. suggest uses that are by no means insignificant.

The timber has a pleasing appearance and clear stock finishes well in wood-working machines giving firm, clean-cut edges and corners. As produced form small trees or "break" trees, boards *P. radiata* are often knotty, but the knots are generally sound and tight. Through selection it is possible to obtain clears, or stock in which the knots are decorative.

The uses of the timber are expanding and an appreciation of its true qualities is expected to lead into markets at present supplied by imported softwoods.

RECENT ADDITIONS TO STAFF

Several members of the staff of the Division have recently returned from aboard. They have each spent a period of two years training at the USA Forest Products Laboratory, Madison, and the Forest Products Laboratory at Princes Risborough, England.

Mr W.L. Greenhill has specialised in problems connected with seasoning and seasoning practice, and has made a special study of different electric moisture meters.

Mr I. Langlands has been studying timber mechanics, which aspect of forest products work is related to the strength properties of wood. He has also specialised in box and crate construction and the methods employed in testing these containers. He will be in charge of the box testing work described in the last issue of this bulletin.

Mr R.F. Turnbull has made a study of sawmilling and timber utilisation with special attention to problems of waste. During his stay in the United States he supervised a series of tests in which several Australian woods were used in the preparation of insulating and pressed wall boards. The results of these tests will be described in this bulletin at a later date.

NEW EQUIPMENT

As a result of numerous trade enquiries, the demand on existing experimental kilns has been such that it has been necessary to erect another unit. The addition of this kiln will speed up the work now being carried out in the development of schedules for the drying of Australian hardwoods.

In addition to the box testing drum described in the last issue of this bulletin, the section of Timber Mechanics is procuring two testing machines for the testing of timber. These machines - a toughness machine and a Universal testing machine - will enable the Division to investigate problems relating to the use properties of Australian timbers for certain purposes.

TRADE CIRCULAR No 7

This trade circular, at present in the press, deals with the question of "Sample Boards" which are necessary adjuncts to the processes of air drying and kiln drying. The information given should prove of interest to all sawmillers and timber merchants. The circular will be available for distribution shortly, and will be forwarded to all those on the mailing list of the Division. Copies may also be obtained from the Division on request.

CSIRO
AUSTRALIA

NEWSLETTER

Forest Products

1932##003

MONTHLY NEWS BULLETIN NO. 3 FIRST PUBLISHED 1 APRIL 1932

WHAT IS WOOD PRESERVATION?

No. 1. DURABLE AND NON-DURABLE TIMBERS AND THE REASONS FOR DURABILITY

It is well known that for certain purposes and with certain classes of timber, some preservative in the form of a paint, oil or water solution, is necessary in order to give the timber a longer life in service. Sometimes preservatives are painted on with a brush, sometimes sprayed on, sometimes absorbed by the wood during immersion in cold or hot solutions, and sometimes forced into the timber under high pressure treatment. In Australia the last method is not practiced commercially.

In the present article no attempt has been made to analyse relative values of different treatments and different methods of treatment, but an attempt has been made to explain the underlying principles on which successful treatments depend.

The practical man well knows that certain woods, for example, ironbarks, cypress pines and others, are durable. That is, when used under conditions where they are exposed to decay, termite (white ant) or other insect attack, they will resist such attack for long periods of time. Other timbers such as *Pinus radiata* (insignis or monterey pine) and mountain ash (*Eucalyptus regnans*) are, on the other hand, non-durable in comparison and under adverse conditions may be rapidly destroyed by decay or organisms or by insect attack.

All wood, independent of kind, whether hard or soft, dense or light, coloured or not, is composed essentially of the same chemical substances combined in varying proportions. The two main substances are known to the chemist as cellulose and lignin. Besides these two materials there are present in wood smaller amounts of carbohydrates (materials of the nature of sugar and starch) and variable quantities of gums, kinos or resins. The gums or kinos occur either in the form of gum veins or pockets or scattered throughout the structure of the wood. The organisms of decay and insects depend for their food supply on the cellulose, lignin and other carbohydrate material. They vary in their preferences for these materials, e.g. white decay rots prefer lignin, while brown rots prefer cellulose.

Timbers, therefore, do not derive any of their resistance to attack from these substances, nor do colour, differences in weight hardness and other physical properties affect the durability. It follows that it is necessary to examine the gums, resins and such like material (usually referred to by chemists as "extractives") to see if any or all of these are responsible for durability. Numerous investigators have shown that, when durable woods in the form of sawdust are treated with hot water, and the water extract removed, and examined, some of the poisonous materials are removed from the wood and these materials in water solutions have been shown in the laboratory to be poisonous to wood destroying organisms. On the other hand, when non-durable woods are so treated, the water extracts obtained have been shown to have none of these poisonous properties, or the latter are so slight that they cannot impede the progress of decay or insect attack. Numerous timbers are intermediate, and cannot be classified as definitely durable nor yet non-durable. Extracts from such woods do not completely prevent the growth of decay organisms, but are somewhat poisonous in that they retard such growth and so give a longer life to the wood than in the case of non-durable species. The durable cypress pines have been investigated in this manner by the Division and it has been possible to extract from them by treatment with alcohol and water various materials, some of which are present in only small amounts. Certain of these materials have been shown in the laboratory to be poisonous to decay organisms, while others have been shown to be distasteful to termites (white ants). In the latter experiments small pieces of *Pinus radiata* sapwood were treated with solutions of the poisonous materials and these pieces of treated wood were exposed, together with some untreated, to termite attack. The treated timber resisted the attack of the termites while the untreated was readily attacked and destroyed.

The extractives of which the poisonous materials of durable timbers form part are present only in the truewood (heartwood). The sapwood even of very durable species does not contain these materials and, consequently, it is found to be non durable in service. Decay organisms and insects readily attack and destroy it.

Nature therefore points out the way in which the usefulness of non-durable timbers and of sapwood can be increased, that is by introducing into such wood chemicals poisonous to decay organisms, and other insects. The selection of suitable chemicals as preservatives and the methods of introducing these into the timber often present great difficulties, and these will be discussed in later articles in this series. It is sufficient to say that nature has supplied to durable woods chemicals which effectively protect the wood for long periods of time, and in the search for satisfactory preservatives for non-durable timbers, much can undoubtedly be accomplished by the study of the nature and composition of these chemicals. It is of interest to note that the losses due to decay and insect attack of poles and sleepers alone in Australia are conservatively estimated at £500 000 annually. When losses occurring in buildings, furniture, marine structures, etc., are also considered, this sum would be more than doubled.

TIMBER WASTE
Utilisation by Conversion into Paper

One of the commonest suggestions for utilisation of waste timber is to convert it into various kinds of paper. The paper industry is, of course, well established and draws its main supplies of raw materials from the forest. For many years only softwoods were used for this purpose and supplies were plentiful. The enormous growth in the paper industry has, however, led to rapid depletion of supplies. The United States of America alone use 11 million cords of timber per annum to supply their paper mills. Long ago, they ceased to be able to supply all their own timber for this purpose, and quantities of pulpwood have been imported form Russia and Canada.

This led to three methods of eking out supplies. Firstly, there was the investigation of species of softwoods hitherto regarded as unsuitable. The work of the United States Forest Products Laboratory resulted in many of these species being brought into use. Secondly, there was the utilisation of hardwoods. These were previously only used to a small extent in the manufacture of soda pulp for addition to book and magazine papers to give them capacity. the work carried out in Australia by the Council for Scientific and Industrial Research* demonstrated the value of many of our hardwoods for this purpose and the eucalypts are now largely converted into paper in Brazil, France and Spain. In the United States of America also many hardwoods are now used for all types of papermaking. Thirdly, there was the study of the possibilities of using mill waste. This has also led to considerable saving of material, and the author if this note has seen a Canadian mill with a huge destructor formerly used to burn the mountains of waste in the form of ends, slabs, edgings, etc. Now this destructor lies idle.

Conversion into paper seems to be an ideal way of utilising timber waste, but there are many difficulties in the way. Where there is an established paper industry, it is certainly possible, but to establish the industry to use the waste is a different problem. Paper can only be successfully produced where the following conditions obtain:-

* Now the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

1. Large supplies of suitable raw material.
2. Plentiful supply of water.
3. Cheap power and fuel.
4. Cheap transport to a port or to the main centres of consumption.
5. Cheap land of r the mill and its accessories.

A combination of all or most of these conditions is essential to success and it is only in a few favoured localities in Australia that they can be found so combined. Finally, the capital outlay is large and for quite a moderate output a complete plant will mean the expenditure of, say, three-quarters of a million pounds.

Possible as it is to find sites where there is a possibility of establishing a paper industry, it is clear from the above that this industry does not hold out a solution of the timber waste problem, though it may make some contribution.

It is important to remember that there are no technical difficulties in the conversion of our hardwoods into paper of various types from newsprint to the finer printing and writing papers. The investigations of the Council for Scientific and Industrial Research and large scale experiments by a commercial concern have definitely shown this and also that in favoured localities the industry shows every hope of being an economic success.

FALLACIES ABOUT TIMBER - No. 3
Is Sapwood as Strong as Heartwood?

The idea that the sapwood of a tree is much weaker than the heartwood is extremely common. This idea is, however, quite erroneous. A little reflection on the way in which timber is produced in a tree will indicate why there is no difference in strength between sapwood and heartwood. The trunk of a tree grows by the laying down of successive rings of growth so that the tree is continually increasing in diameter. The actual growing portion is confined to a very thin layer between the bark and the wood and this layer produces new wood and new bark by a process of cell division. Once the new cells are formed their development is rapid and by the time the tree has grown only a few layers beyond them by the continued formation of further cells, they are structurally complete and fully developed. Thus, with the exception of a very thin outside layer, all the cells of the sapwood are in their final form and do not alter structurally throughout the life of the tree.

In any tree the heartwood of today was once sapwood and the sapwood of today will eventually become heartwood. Actually the only practical difference between sapwood and heartwood is that the latter has become a repository for numerous gums, resins, tannins, etc. produced during the life processes of the tree. Certain of these materials are responsible for the greater durability of heartwood, and it is this greater degree of resistance to wood destroying fungi and to insect attack that has caused the fallacious idea that heartwood is stronger than sapwood.

If fungus and insect attack are prevented by proper care in seasoning, and by employing protective measures, sapwood is as strong as heartwood. For example, tennis racquet frames are made of ash sapwood in preference to heartwood because of the lighter colour desired. In fact, it is safe to say that this fashion or tradition for white racquet frames is so strong that most tennis players would reject one mode of heartwood. Handles of hickory sapwood are also universally preferred because of the lighter colour and it is only of recent years that axemen and others could be persuaded to use heartwood handles.

Although sapwood has a strength value equivalent to that of heartwood it is not suggested that it should be indiscriminately pointed out that it lacks those substances which render heartwood durable. Thus, it is often liable to deteriorate rapidly and is rightly rigidly projected in milling certain timbers. On the other hand, the idea that sapwood decays rapidly and is especially subject to insect attack because the materials present attract bacteria, fungi and insects is also erroneous. It is the lack of those substances of a preservative nature, which are present in the heartwood of many species, that renders sapwood more susceptible to attack. It is possible, by suitable impregnation with preservatives, to make sapwood as durable or even more durable than heartwood. This fact is of considerable importance in wood preservation, since sapwood, not being blocked with resinous materials, is much more easily penetrated by preservatives.

TIMBER FOR LEAD PENCILS

A Sydney manufacturer recently began the manufacture of lead pencils using, at the outset, imported cedar. He was, however, anxious to use an Australian timber and enlisted the services of the Division in the search for a suitable one. The search covered timbers of every state and a large number were examined, but so far with somewhat unsatisfactory results.

The best pencils are made with Virginian cedar. The supplies of this wood, however, are now so scarce that old fence posts, out houses, etc. in the United States of America are being eagerly sought. At the present time more than 90% of the American pencil woods come from the Pacific Coast States, while high prices are paid for genuine pencil cedar.

Many substitutes have been used. Of these, the most important are East African or Kenya cedar, Western red cedar and western juniper Cedar, the latter two coming from the west coast of America. None of these are the equal of the pencil cedar and they are mainly used in the manufacture of second or lower grade pencils.

The trade at the present time demands in a first class pencil timber the following qualities: straight grain, reddish brown colour, softness and cleanness of cutting, no marked variation in texture, and the timber should not fur or tear when cut with a pencil sharpener.

Australian timber found so far to have possibilities in this industry are the New South Wales niggerhead beech and the Tasmanian King William Pine. The former, being a little too hard, needs some such softening treatment as is used in Germany in the manufacture of the lower grades of pencils. The latter is somewhat light in colour. The insistence of a reddish colour so as to imitate that of the genuine pencil cedar seems absurd, but such trade prejudices are common and have to be met. Here again, German pencil makers use methods of dyeing the timbers they use. In many cases this gives the wood a very artificial appearance. The expert user of a high grade pencil naturally looks for appearance similar to those of the best pencil he has tried. The colour and other properties of the wood are a guarantee of quality to him. Yet it might be possible to remove prejudices by a campaign of education. If this were done, it would greatly simplify the search for an Australian substitute for the imported article.

BOOKS ON SEASONING AND SEASONING PRACTICES

The Officer-in-Charge of the Seasoning Section of the Division recommends the following books to those interested in seasoning:-

"The Kiln Drying of Lumber"
by H.D. Tiemann.
Publishers, J.B. Lippincott Company.

"The Kiln Drying of Lumber"
by Koehler and Thelen.
McGraw-Hill Book Co., Inc.,
London and New York.

"Kiln Drying Handbook"
U.S. Dept of Agriculture Bulletin 1136
Obtainable from the Superintendent of Documents, Government Printing Office, Washington, D.C. Price 30 cents.

"The Seasoning of Western Australian Hardwoods"
by Stanley A. Clarke
Bulletin No. 40, Forests Dept, Perth, WA.

CSIRO
AUSTRALIA

Forest Products

NEWSLETTER

1932##004

MONTHLY NEWS BULLETIN NO. 4 FIRST PUBLISHED 2 MAY 1932

THE NATURE OF TIMBER - A CHEMICAL PROBLEM

During the recent century there have been great changes in all fields of utilisation of timber and forest products. In that of general construction, for example, there have been changes which have brought into prominence many rivals of timber. New building materials such as concrete and steel have invaded the field in spite of many disabilities, and have moulded design to suit their capabilities. Structural wooden beams have been replaced by reinforced concrete or steel, wooden linings by fibrous planters and asbestos cement sheets, wooden flooring in many cases by composition floorings, and so on.

Strangely enough many timber substitutes are undoubtedly less suited in many essential respects than the timber displaced. Whey then has timber not retained its position in all the field? It is the oldest construction material known to man and has behind it a long tradition of satisfactory service under many conditions. But those concerned with its production have not kept pace with the march of time and have not met the modern demands.

All present trends indicate that the use of timber in the future will be very different from that at the present time. The demands of industry are for production on a large scale of more or less standardised products, for low production costs, and for elimination of waste. At the present time, not 10% of the timber produced by the tree passes into actual service, due to waste in forest, sawmill and factory.

It is however, possible to visualise the future in which a large percentage of the timber produced by the forest will be first disintegrated into fibres and then moulded into the shape and consistency desired. There will still be some demand for timber in its present form, but the enormous reduction of waste by conversion into moulded products will assist this demand by allowing the production of first grade timber at low cost. Today, we can see the start of this movement in the development of fibre boards, the production of which has increased enormously during the last five years. Fibre insulating boards with their light weight, ease of working, pleasing appearance and resistance to temperature changes are playing an increasingly important part in design. Hard pressed boards made from the same raw material, but subjected to high pressure are also increasing in importance. These timber products are not only recapturing fields of utilisation lost to timber substitutes, but are invading new fields. It is quite possible that hard pressed boards made from pulped or disintegrated wood fibres will become an important manufacturing material. Imagine boxes made of smooth water-proofed material which does not shrink, check, nor split, and which can be procured in any width and can be sawn and nailed with ease.

Again in the last few years wood has become the raw material for those industries producing such articles as artificial silk, cellophane wrappings, duco type paints, etc. In those industries the wood is first converted into cellulose by means of chemical treatments.

The user of a timber substrate, on questioning, will explain that the timber most suited for his purpose has some disadvantage. As an extreme example the durability of an ironbark may be required, together with the ease of working and the light weight of a mountain ash. As it is impossible to obtain timber with such diverse properties, a substitute is used. But why cannot timber be modified to meet requirements of this nature? Up to the present time it has only been marketed in its natural condition and in such condition often fails to meet all requirements. The whole trouble appears to be that although timber is our oldest structural material we know but little about it. If we knew the reasons for the durability of some species, or why other species resist the attack of marine borers, or the best methods of disintegrating various woods in order to manufacture moulded or synthetic products or the best ways of introducing preservatives into non-durable species, then we could be certain that timber would hold its own against all competition. Such knowledge can only be gained from a study of the chemical composition of our timbers, and of the chemical processes needed for their conversion into useful products, and without it we cannot hope to advance in the field of timber utilisation.

It is for these reasons, therefore, that the Section of Wood Chemistry of the Division of Forest Products is making a study of Australian timbers. These investigations will greatly assist towards the solution of many of the problems encountered in seasoning and preservation, and at the same time indicate which timbers are the most suitable for such manufacturing processes, as the production of paper pulp, artificial silk, cellophane, etc.

Again, the fact that some timbers are naturally durable while others are not can only be explained on the basis of differences in chemical composition. Since cellulose, lignin, and other carbohydrates are present in all woods, they cannot have any influence on durability. This has been shown to be due to the presence in the wood of certain extraneous materials (gums, resins, tannins, oils, etc.) which are either poisonous or at least distasteful to the wood-destroying organisms. Such substances have been extracted from durable woods and used to preserve non-durable woods from the attack of white ants and rots. The poisonous properties of these materials are intimately related to their chemical nature. The ideal preservative, then, for non-durable woods would be a material similar in composition to those poisonous materials present in durable woods, yet capable of being produced cheaply and in large quantities. By the chemical investigation of the various extraneous materials occurring in durable woods, together with the use of suitable tests for determining their poisonous properties, it is hoped that such an ideal preservative will eventually be discovered.

In all recent advances in industry and chemist has worked hand in hand with the manufacturer. The iron founder can give not only the chemical composition of the steel he is making, but its crystalline structure. The cement maker can provide a slow or rapid hardening cement by changes in chemical composition of his materials. But what does the timber industry know of the chemistry of wood? There has been in the past no need for concern about the chemical composition of the product. The time has come, however, when this knowledge is essential if the utilisation of timber is not to be threatened by the greater use of timber substitutes.

FALLACIES ABOUT TIMBER - No. 4
Timber seasons rapidly when stacked on end because the sap runs out

It is surprising how many people believe that the seasoning of timber takes place more rapidly if it is stacked on end to allow the sap to run out. Such a belief is quite erroneous, and is generally based on the observation of a single board leant against the side of a building. Such a board often seasons rapidly, but this is due to the excellent air circulation around it. A **single** board laid horizontally in a similar location would dry as rapidly.

The cavities in the cells which make up the structure of the timber are so small that water will not flow along them under the influence of gravity. This is due to capillary attraction. It is well known that a liquid, drawn up into a glass tube with a very fine bore will not fall out under the influence of its own weight. Even in a comparatively large tube, such as the tip of a fountain pen filler or an eye dropper, the capillary attraction is sufficient to prevent the last drops from falling.

While many have been ready to believe that water will run out of a piece of green timber stacked on its end, few have stopped to consider that such a belief is contrary to what happens when a piece of dry timber is placed upright with its bottom end in water. In this case the capillary attraction is such that the water is gradually drawn into the timber and it becomes wet some distance above the portion actually in the water. If, then, dry timber placed on end will soak up water, why should it be expected that water will run out of green timber placed similarly?

Advocates of the theory of sap running out of timber stacked on end sometimes draw attention to the fact that in vertical racks the top ends of boards are much drier than the bottom ends, and thus try to prove their point. This comparatively rapid drying of the upper portion of end stacked boards is due, of course, to the better air circulation around these portions and often it will be found that there is only a limited amount of air circulating around the bottom ends of the boards. Where vertical racks have been built with foundations well clear of the ground and in such a manner as to provide a free air circulation throughout the length of the boards, experiments have shown that there is practically no difference in the drying rate of the top or bottom ends of the boards.

WASTE UTILISATION
Small Dimension Stock

Prevention of timber waste by the utilisation of off-cuts and dockings at the mill appears at first sight to be ideal. Many people have been misled by apparent simplicity of overcoming such a serious source of loss and have rushed in to put their schemes into operation, only to find themselves involved in an added loss of actual cash.

In case the above statement appears to be a condemnation of attempts to use off-cuts for the preparation of small dimension stack, it is as well to state at once that there are definite possibilities in this direction. The warning is intended only to prevent too rapid development of any such proposal. The greatest care is necessary in the planning of any small dimension stock operation.

It is definitely wasteful to cut ordinary timber into small pieces for chair legs or any of the other numerous small units which enter into many wooden articles. Such small units can be cut from waste ends and small pieces of timber at the mill. The first consideration at a mill is the quantity and nature of the off-cuts produced, and the cost of converting those into pieces suitable for particular uses. This cost is, of course, increased by the need for such handling in drying and bundling for shipment. The second consideration is the market for these pieces. If this can be found and is stable, then the chance for profitable business is good. One of the biggest bugbears of the industry is that patterns alter. Articles of furniture, etc. are subject to the dictates of fashion and makers of small dimension stock are frequently left with large stocks cut to definite sizes for which there is no demand owing to changes in the factory.

Some time ago the United States Forest Service initiated a **Wood Waste Exchange**. this body sent out questionnaires to producers and uses of small dimension stock and as a result was able to place those who produced a certain size in contact with those who needed that size. This process operated with considerable success. It must be remembered that the price of the small dimension stock should be such that the purchaser is tempted to buy and as the cost of handling is relatively high the margin of profit can never be great.

Those who wish to try this method of reducing waste can be carefully converted to the mutual advantage of manufacturer and consumer.

THE DURABILITY OF TURPENTINE TIMBER

Turpentine timber (*Syncarpia laurifolia*) from the coastal districts of New South Wales and Queensland is noted for its resistance to the attack of the teredo (marine borers). For this reason it is used in the Eastern States of Australia for wharf and bridge piles, and its fame is spreading to other countries. Turpentine piles are usually driven with the bark on, supposedly because the bark contains a resinous material which is considered to increase the resistance of the pile to attack. Apart from the bark, however, the wood itself has a strong resistance to attack and there are differences of opinion as to whether the sapwood or the heartwood is the more resistant.

The Division of Forest Products is carrying out a chemical investigation of this timber. Bark, sapwood and heartwood are all being investigated for the presence of any materials poisonous or distasteful to wood destroying organisms. Such an investigation should eventually indicate exactly where the material responsible for resistance exist in the wood, the quantities present, and their chemical nature. This investigation is one of a series which has been planned to discover the chemical nature of the substances which are present in certain of our Australian woods renowned for their durability. The ultimate object is the commercial development of these, or like substances, for use as preservatives of non-durable wood.

CONTAINERS FOR DRIED FRUITS

An interesting series of experiments on dried fruit boxes has recently been carried out by the Division of Forest Products, using the box testing drum. These experiments have demonstrated clearly that much of the present nailing practice is bad, and that as a result the contents of the boxes have not obtained the full protective value possible. In other respects, the box has been shown to be well designed and strong. However, when insufficiently nailed, the nails pull from the ends with handling, allowing the sides, top and bottom to gape, and this failure exposes the fruit to contaminating influences. a well nailed box stood up to a far greater number of drops in the drum than did a poorly nailed box of the same design.

A further interesting point brought out by these tests was the deleterious effect of using green timber in the making of the box. Not only did the boxes made from green timber show objectionable gaps between boards due to shrinkage, but on testing in the drum, they failed quickly in comparison to those boxes which were made from dry timber. Failure was again due to nail pull as the holding power of the nails was weakened by the shrinkage of the timber A complete report on these tests is in the course of preparation.

A RECORDING AND CONTROLLING INSTRUMENT OF ENGLISH MANUFACTURE TO BE USED WITH LABORATORY KILN

The Division of Forest Products has just received from England a new instrument which will be used in the recording and controlling of drying conditions in one of the laboratory kilns. This instrument is of standard commercial design and can, if required, be used to control conditions in a full sized commercial kiln. **Control** refers to the close automatic control of both temperature and humidity in the kiln. At the same time, the conditions are recorded on a chart which is operated by a mechanism similar to that of a clock and which can be renewed every 24 hours. Such close automatic control is desirable when many timbers are kiln dried.

While instruments of a similar nature are in use in kilns in Australia, it is believed that the one, just imported by the Division, is the first of British manufacture to be used.

TRADE CIRCULARS OF THE DIVISION OF FOREST PRODUCTS

The issue of Trade Circular No. 7 has been delayed by the addition of a third appendix. The seasoning officers of the Division have noticed that the calculation of; moisture content of moisture sections and of sample boards is a laborious process to kiln operators and others who are unfamiliar with the use of logarithms or the slide rule. To simplify these calculations a chart has been drawn up and is being included in Trade Circular No. 7 as an appendix. By means of this chart moisture contents of sections or of sample boards can be rapidly determined direct from weighings without any calculations whatever.

Trade Circular No. 8 is at present in press. This circular is more theoretical and points out the confusion at present existing in the naming of many Australian timbers and describes the work at present being carried out by the Division to make this possible.

Trade Circulars 7 and 8 will be issued together early in May.

For the information of those who are not familiar with these publications of the Division, the following is a list of circulars already published:-

Trade Circular No. 1 - Sound Practice in the Air Seasoning of Boards
Trade Circular No. 2 - the Testing of Timber for Moisture Content
Trade Circular No. 3 - The Growth and Structure of Wood
Trade Circular No. 4 - The Functions of the Division of Forest Products
Trade Circular No. 5 - Vacuum Kilns
Trade Circular No. 6 - Wood Borers in Australia - Part 1
Trade Circular No. 7 - The Use of Sample Boards in Timber Seasoning
Trade Circular No. 8 - Identifying Australian Timbers - The Value of Structure, Composition and Precise Names.

These circulars may be obtained, free of charge, from the address at the foot of the page.

CSIRO
AUSTRALIA

NEWSLETTER
Forest Products

1932##005

MONTHLY NEWS BULLETIN NO. 5 FIRST PUBLISHED 1 JUNE 1932

WHAT IS WOOD PRESERVATION?

No. 2. THE CAUSE AND NATURE OF DECAY

(a) The Cause of Decay

Decay in wood, variously known as wet rot, dry rot, doze, dote, etc. is caused by fungi, which are forms of plant life. some common examples of decay due to these fungi are:-

(i) The heart rots which are prevalent in the wood of the eucalypts particularly and which are present in the growing tree.

(ii) The peculiar condition of the surface of some decayed wood - the surface has the appearance of having been divided not a large number of small squares with narrow open spaces or cracks between them.

(iii) the appearance of white pockets in the decayed areas of wood, such as poles and sleepers.

(iv) The reduction of the wood to a condition in which it is very light in weight and can be easily crumbled to a fine dust-like powder.

Fungi differ from ordinary plants in that they contain no green colouring matter and, therefore, are unable to obtain from the air the carbon and oxygen which all plants require in some form or other. As a result, fungi live on vegetable or other matter in which the carbon and oxygen have already been converted into a form suitable for them to assimilate. Wood destroying forms can thus develop on sawn timber or in the living tree.

The mushroom is a common fungus, although not of the wood-destroying type. When developed fully it appears above ground in the form of a stalk with an umbrella shaped fleshy portion which is the fruiting body. Below ground the stalk proper disappears, but a careful search reveals large numbers of thin white threads which run out in all directions from the underground portion of the stalk. These threads can be likened to the roots of an ordinary plant, as they extract the food material for growth from the vegetable matter in the soil. The extensive root system is well-developed before the mushroom appears above ground.

Wood-destroying fungi are, in general, very similar to the mushroom with the exception that the place of the vegetable matter in the soil is taken by the wood. The fine threads, or as they are called collectively, "mycelium", penetrate the wood in all directions, sometimes passing through the cell walls, and sometimes through the minute openings which connect cells. The wood substance is absorbed and eventually changes considerably in chemical composition. The normal structure is broken down as a result and the wood ultimately becomes soft and friable. At times the fine threads grow together and form thick white or pale-coloured sheets generally of a leathery texture. Sometimes, also, the threads develop on the surface or in a crack and from there the masses known as fruiting bodies. These may be shaped like mushrooms or like brackets, or may be quite irregular. If their under surface is examined, there will be found gills like those of a mushroom, or innumerable numbers of small oval shaped pores. Each fruiting body produces an enormous number of spores either on the gills or in the pores. These spores are similar in purpose to the seeds of ordinary plants, but are much smaller and more numerous. The fine dust formed by the breaking of a ripe puff ball is composed of millions of these spores. Each spore can germinate under suitable conditions and set up a new fungus plant capable of starting decay. On account of their extremely small size - they cannot be seen by the naked eye - they are easily transported by the wind end by air currents inside buildings. They are invariably present in the air and in the soil, particularly in the neighbourhood of decayed timber, and thus when conditions of growth are favourable, it is not long before the fungus commences its destructive work on the timber.

Fungi can also spread by means of special spores developed in the threads and by means of infected wood or the threads themselves. In the latter case they are similar to plants which can be propagated by cuttings or slips. Fungus threads in infected wood will spread to adjacent pieces of sound wood and if the conditions are suitable will penetrate and finally destroy the new source of food. Fungi of the so-called "dry rot" type can spread from moist wood in contact with the ground for long distance by means of special tissues to sound dry timber 30 to 40 feet away, which is moistened and eventually destroyed.

FALLACIES ABOUT TIMBER - No. 5
Does Air Rise in the Flues of Air Seasoning Stacks

In strip stacking timber for air seasoning it is common practice to leave a space four to six inches wide in the middle of a stack to act as a flue and thus ventilate the stack. In some cases these flues are made right to the bottom of the stack and connect with the air space around the stack foundations. They are, in these cases, very desirable and considerably assist in rendering the drying throughout the stack more even. In other cases the flues may be confined only to the top half of the stack, or may be a horizontal passage running the length of the stack. These types of flues serve little useful purpose and show that there is a lack of appreciation of the way in which air moves in a stack of timber.

The idea is prevalent that the air passes up the flue and out through the top of the stack, the flue acting in much the same way as a chimney. Such an idea is quite wrong. In a chimney, the inside air is hot, while the outside air is cold; thus the heated air rises. In a stack, on the other hand, the conditions are the opposite. Anyone who has been near stacks of green timber on a hot day must have felt the cold air in and around these stack. The air is cooled as it evaporates moisture from the timber, the principle being the same as that exemplified by the behaviour of water cooling towers, water bags and Coolgardie safes. Thus, it will be realised that as far as air movement is concerned a flue in a timber stack is quite of the opposite of a chimney. The air inside the stack is colder than that outside and when a flue has been left, the air will flow **down** it.

If this principle that air tends to move downwards in a seasoning stack is kept in mind, many mistakes in stacking will be avoided. If the timber is stacked so that the downward air movement is assisted, then the air will be continually drawn in from the sides and top and discharged at the bottom, thus assisting drying even when there is no wind.

It will be realised, therefore, that the foundations are the most important part of the stack. The air, having absorbed moisture from the timber and having been cooled in the process, has lost its drying power. Because of the downward movement it tends to collect in the lower portions of the stack, and unless this accumulation is prevented, little or no drying will take place in the lower layers of timber. It is thus necessary to build stacks on high foundations, usually 18 inches off the ground, and to be sure that these foundations have a free air circulation in all directions by the use of pig sty or post construction. Then, no matter what the direction of the wind may be, it will clear away the used air from the bottom of the stacks and speed up the drying of the lower layers.

THE DIVISION OF FOREST PRODUCTS CONDUCTS CLASSES IN SEASONING

One of the means adopted by the Division of Forest Products for the spreading of information connected with the principles involved in seasoning timber is the conduction of classes for kiln operators and others interested in seasoning problems. The first of these classes was held in Melbourne in 1930, and about fifteen kiln operators, forestry students and forest officers from Victoria and

Tasmania attended. Proposed classes in other States have been postponed indefinitely owing to the expense involved, but during the last week in may the second Melbourne class was held. This class was exceptionally well received, over 30 members - kiln operators, representatives of the Timber Merchants Association of Melbourne and Suburbs, Tasmanian sawmillers, forest officers, forestry students and others - attending. It is interesting to note that two Tasmanian sawmillers came over from Tasmania especially to attend this class.

These classes last a week, approximately half of the time available being taken up with lectures on the principles involved in air and kiln drying, on the methods of testing timber for moisture content and stresses, and on instruments commonly used in kiln control. The remainder of the time was spent in practical work to give the members of the class experience in the various operations discussed in the lectures and in visits to commercial plants where air drying and kiln drying methods were examined. One of the special features of the class was the explanation and demonstration of an electrical moisture meter for the instantaneous determination of the moisture content of timber. These instruments are now being made locally at a reasonable cost and are proving of great value to those members of the timber trade who have them in use.

The value of these classes are indicated by the number of applications received from those desirous of attending the one just completed. Not only do they provide an opportunity for acquiring essential theoretical knowledge, but they also give members a grounding in sound practical methods.

KENYA FINDS NEW USE FOR AUSTRALIAN TREES

Although Australia is the home of the *Eucalyptus* tree, one is constantly finding evidence that other countries are planting our timbers and finding greater use for them than we do ourselves. The latest example is reported in the Bulletin of the Imperial Institute and deals with tests on the value, as motor car fuel, of charcoal made from the eucalypts Tasmaniana Blue Gum (*E. globulus*) and Sydney Blue Gum (*E. saligna*) and also Black Wattle (*Acacia mollissima*).

The trials were carried out with a one ton truck fitted with a portable producer gas plant, and this truck was driven over a measured test course under normal conditions. Tasmanian Blue Gum charcoal gave satisfactory starting and flexibility, and good power on hill and flat. After the test the gas cleaner was in a satisfactory condition and the filter was quite clean. Sydney Blue Gum charcoal behaved similarly except that a small quantity of fine dust collected in the filter. Black Wattle charcoal, although giving somewhat more smoke, behaved equally well. All fuels were described as being satisfactory for portable producer gas plants.

Considerable smalls and dust were given by the Sydney Blue Gum charcoal and it is suggested that these could be made into an excellent fuel by briquetting.

Some idea of the fuel economy possible by using charcoal as truck fuel can be obtained from the comparison of fuel costs for the one ton truck per 100 miles. With charcoal at £2 per ton the fuel cost of the producer gas operated truck is about 1/3d. A truck using petrol at 2/- per gallon would consume about 14/6d. worth of fuel under similar conditions.

The Division of Forest Products is carrying out an investigation into the resistance of impregnated timber to the attack of marine borers (teredo) in co-operation with the Queensland Forest Service. Logs of rose gum (*E. saligna*), brush box (*Tristania conferta*) and blackbutt (*E. pilularis*) were forwarded to Melbourne and seasoned for several months. At the end of this period they were treated with creosote under pressure in the experimental preservation plant of the Division. They have now been returned to the Queensland Forest Service which is arranging for their placement in teredo-infested waters.

TOBACCO PIPES

Two items of interest in Melbourne recently were "pipe week" and the shipment of a number of samples of Australian timbers to England for trial by a pipe maker. These seem to suggest that there is a possibility for a small industry in Australia making tobacco pipes from local timbers for home consumption at least.

The requirements of a pipe timber are that it shall be free from charring and unpleasant odours, that it shall turn and polish well and be of a suitable colour (usually dark red), and that it shall be sound and free from defects. Such requirements are most likely to be met by our small slow-growing trees or shrubs, and it would be surprising if, in our wide range of trees of this nature, there is not at least one species suitable for this purpose. Some of the Acacias, such as the mulgas and myalls, or the Hakeas, or perhaps even the mallee forms of eucalypts, may provide a suitable species.

Mr A.L. Baldocks, B.Sc., assistant chemist in the Division of Forest Products has been appaointed to the staff of Messrs. Plaimar Limited, Perth, where he will be associated with the manufacture of essential oils and tannin extracts. While Mr Baldock was with the Division he assisted in the investigations into the development of a good grade tannin extract from Karri bark, and the favourable results of these investigations have resulted in Messrs. Plaimar Ltd commencing manufacture on a commercial scale.

Before his departure Mr Baldock was presented with a polished blackwood cigarette box by the staff of the Division as an expression of their best wishes. Mr Baldock's position has been filled by the appointment of Mr A.B. Jamieson, M.Sc., a graduate of Melbourne University.

CSIRO
AUSTRALIA

Reprinted in April 1995

NEWSLETTER
Forest Products

1932##006

MONTHLY NEWS BULLETIN NO. 6 FIRST PUBLISHED 1 JULY 1932

FACTORS THAT INFLUENCE THE STRENGTH OF WOOD

The variability in the strength of wood, even within a species, is well known and is often advanced as an argument against its use for many purposes. Yet the extent to which this variation can be reduced by proper methods of selection is not generally realised. For this reason a knowledge of various factors which cause variation in strength is of considerable importance in selecting wood for particular purposes or in estimating the probable strength of structural members. For example, in the case of some species, the strength of a given piece can be estimated with fair accuracy merely by visual inspection.

The following are the principal factors that affect the strength of wood.

(1) Density - the best index of strength other than a mechanical test is specific gravity or density. In general, a dense piece of wood is stronger than a light piece, particularly if they belong to the same species, and mathematical relations between specific gravity and various strength properties have been determined. The relationship between the density and the strength of different species is also well defined, although there are many exceptions to the general law.

(2) Moisture Content - As a piece of wood dries it increases in strength. This increase depends on the dimensions of the piece and in the defects present. Drying will greatly increase the strength of a small clear piece, in some properties the strength at 12% moisture content being up to two-and-one-half times the strength of the green wood. Larger sized timbers, especially those containing defects, are not strengthened in drying to the same extent as small clear pieces, because the increased fibre strength may be very largely offset by the development of checks or other drying defects. In the extreme case of very large size members containing numerous defects, there may be no increase at all in strength after seasoning.

(3) Defects - The principal characteristics influencing the strength of Australian timbers are diagonal and cross grain, knots, checks, gum veins and decay.

In timber containing cross, spiral or diagonal grain the wood fibres are not parallel to the axis of the piece. In cross-grained timber the fibres have a varying inclination to the axis of the wood due to cutting from timber in which the straightness of grain is imperfect. Spiral grain results from a spiral arrangement of the wood fibres in the living tree. The fibres of diagonally grained timber do not run parallel with the axis of the piece, although it has been cut from straight grained timber.

Cross, spiral and diagonal grain all seriously weaken the strength of a piece of timber. This is due to the fact that the ratio of the strength of wood parallel to the grain to that at right angles to the grain is often as high as 45 to 1. The degree of weakening resulting from these defects depends on the angle the grain makes with the axis of the piece. Even a slight departure from straight grain is a source of weakness, although, in beams, it does not become very apparent until a slope of one in twenty-five is reached. It has been shown experimentally that a slope of one in twenty causes approximately 10% reduction in the strength of a beam, while a slope of one in ten is responsible for a reduction in strength of about 10%. The shock-resisting ability is reduced even more in sloping grain, and consequently in the manufacture of such articles as sporting goods and tool handles, great care should always be taken to ensure that the grain is absolutely straight.

The weakening effect of knots is due to the combined effect of the local cross grain which they produce and the checking which may develop in and around them during drying. The shape and other characteristics of a sound knot have little influence on the degree of weakening to be expected since the reduction in strength is dependent to a large extent upon the amount of grain distortion. There is little difference between the reduction of tensile or bending strength caused by knot holes or encased knots and that caused by intergrown knots. The injury from a lack of bond around an encased knot or from the absence of material in a knot hole is actually less than that resulting from the distortion of the grain around an intergrown knot and from the checking that accompanies it. In compression, the weakening effect of cross grain and checking is not so pronounced and the injury caused by a knot is somewhat less than that caused by a knot hole of similar size.

A common feature of Australian timbers is the presence of gum veins. Unfortunately, no comprehensive series of tests has been carried out to determine their effect on strength, but it seems likely that the injurious effect is confined almost entirely to a reduction of resistance to shear of quarter cut beams. Gum veins should also have no influence on the strength of straight grained quartercut boards or back-cut beams.

Decay is the disintegration of wood substance due to the action of wood destroying fungi. This action causes a breaking down of the cell walls which results in a weakening of the timber. In many cases there is no external evidence of the presence of decay. It is, therefore, a most important factor to be considered in relation to the strength of timber, but the determination of its total injurious effect is difficult because the amount of decay visible on the exterior is not a satisfactory indication of the extent to which the strength is affected. In the early, or incipient, stage of decay the wood is frequently brittle and tends to break suddenly under stress. In the advanced stages the strength of the wood may be virtually reduced to zero. Under unhealthy conditions the destructive action of wood destroying fungi may be continued after an infected timber has been placed in use, with a resultant gradual decrease in its strength. Infected material should, therefore, be rigidly excluded from any uses where strength is an important consideration.

Wood is also frequently attacked by another class of fungi known as the wood-staining or sap-staining fungi. These confine their activities largely to the sapwood and their effect on the strength of the wood is slight. Timber containing sap stain can be used when strength is an important factor, but it must be remembered that conditions favourable to sap stain are also favourable to wood destroying forms and the two types may occur together. Consequently stained wood should be examined thoroughly before being used under exacting strength conditions.

BATTERY SEPARATORS

In the construction of storage batteries for motor cars and other electrical purposes, timber plays an important part. The lead grids in these batteries are kept apart by thin slices of wood known as battery separators. For this purpose, the timber used must have certain definite properties and very few suitable woods have so far been found. The desirable properties are - (i) porosity, to allow passage of the electric current; (ii) mechanical strength, to give adequate support to the battery plates; and (iii) durability in sulphuric acid, and battery electrolyte. The timber must be uniform throughout and suitable for cutting into thin slices. It must be free from injurious gums and resins, and any other substance that might under service conditions react with the sulphuric acid to produce organic acids which have a harmful effect on the lead grids of the battery.

The timber most commonly used is Port Orford cedar (*Chamaecyparis lawsoniana*) and this has been imported into Australia in large quantities. A normal demand in the Australian battery trade would consume approximately 8 000 000 separators annually.

In manufacture, the timber is cut into slices 6" wide and approximately ½" thick, dried, and is then grooved and sliced. In the grooving and slicing operation a tolerance of only $^{2}/1000$" in thickness is permitted. The separators are then prepared chemically to develop their porosity and to remove constituents harmful to other components of the battery. Usually the process consists of steaming or boiling followed by a hot or cold treatment with a solution of caustic soda.

Treated separators, ready for use, were formerly imported into Australia but, in recent years, trials have been made with different Australian timbers substituted for Port Orford cedar. The Sydney Technological Museum has carried out observations on a number of timbers, some of which offer promise of success. Another aspect of the problem is the development of satisfactory treating schedules and the Division of Forest Products is now studying the chemical treatments of Australian woods. It is thus hoped that a suitable timber and a suitable treatment, which will give long life in service. will be found, so that further importations of wood for this purpose will be unnecessary.

FALLACIES ABOUT TIMBER - No. 6
Kiln Drying Takes the "Nature" Out of Timber

An idea, very prevalent among timber users, is that timber loses its "nature", but it is extremely difficult to find anyone who can explain exactly what is mean by the "nature" of timber. The commonest explanation is a negative one - timber which has **lost** its "nature" is described as being brittle and generally lacking in those properties usually considered necessary in sound timber. Wood can be in this undesirable condition as a result of two main causes - (i) attack by wood-destroying fungi, and (ii) prolonged subjection to high temperature.

In the early days of kiln drying, the necessity for controlling the rate of evaporation from the surface of timber was not realised. Hence, excessive drying of the surface layers of the timber occurred and the interior of the wood remained moist and enclosed in a hard case. This state is known as casehardening. Timber in such a condition is very difficult to season and such material was often subjected to high temperatures for long periods in order to remove the water from the enclosed core. Such unsatisfactory conditions naturally had a deleterious effect upon the timber and, in many cases, resulted in darkening of the wood and brittleness. Timber, so treated, in fact, had the appearance of having been baked.

Many timber users have been unable to dispel from their minds ideas associated with these early experiences of timber drying. Such an attitude is as unreasonable as judging the reliability of the present day motor car from the somewhat erratic behaviour of machinery 20 or 30 years ago. Kiln drying is now an exact science and the conditions necessary to season timber without deterioration have been carefully studied. In fact, there are many instances on record where materials, which misbehaved during air seasoning so badly that they could not be satisfactorily dried by this method, have yielded to careful kiln drying and have given a perfect product. Admittedly, cases of bad kiln drying in which timber is detrimentally affected still occur occasionally, but it is as unfair to judge kiln drying as a whole by these examples as it is to consider the behaviour of one individual typical of a nation in general.

That proper kiln drying does not affect timber detrimentally must be evident from the fact that many specifications for aircraft materials demand kiln dried timber. Tennis racquet frames, the highest grades of figured veneer and three-ply, and the woodwork of pianos are further examples which prove that kiln drying is not injurious. Finally, there are in Victoria alone some twenty kiln seasoning plants with individual capacities up to several millions of super feet per annum. The number of kilns operated by these plants is in the vicinity of 60. That many of these plants are being extended and that the total number is steadily increasing prove definitely that kiln drying does not destroy the "nature" of timber.

THE MOISTURE CONTENT OF EXPORT TIMBER

The Division of Forest Products is frequently approached for information as to the best moisture content for timber to be shipped to England. Working on such information as has been available it has been recommended, in general, that such timber should have a moisture content of approximately 12% when machined or shipped. Information, which confirms this as probably the most suitable moisture content, taking everything into consideration, has now come to hand from the Forest Products Laboratories of Canada[1], in the form of a progress report on investigations into the changes in moisture content of seasoned timber during transport. Parcels of seasoned timber have been shipped from Canada to London, California, South Africa and Australia, in each case being included with commercial shipments. The timber thus consigned to London and Australia has reached its destination with a moisture content of between 10% and 12% even when the initial moisture content was as low as 8%. While the tests are not complete the results to date indicate that if timber is shipped from Australia at a uniform moisture content of 12%, the variation from this should not be greater than 1% or 2% on its arrival in England.

TOBACCO PIPES

Since the issue of the last Monthly News Bulletin of the Division of Forest Products, Dr B.T. Dickson, Chief of the Division of Plant Industry of the Council for Scientific and Industrial Research[2] has kindly supplied some interesting information regarding tobacco pipes. In 1859 the first pipes were made from the root of the white heath (*Erica arborca*) which is known in France as "bruyere", and corrupted in English to "briar", although in no way related to the brier or briar. The briar pipe made from this root has become popular on account of its cool smoke and relatively long life.

In "*The Pipe Book*" by Alfred Dunhill the following reference may be found:-

> "A certain amount of Australian Myall wood is used in France and some hard "Congo" wood at Vienna, but neither of these is widely popular."

TRADE CIRCULARS 9 AND 10

These trade circulars should be ready for distribution during the month of July.

Trade Circular No. 9 deals with Electric Moisture Meters and discusses the various types that are on the market. The value of these moisture meters is that the moisture contents of a piece of wood can be determined directly without recourse to the longer method of weighing, oven-drying and subsequently reweighing, which involves a certain amount of calculation. This circular should prove of immense interest to timbermen all over Australia.

Trade Circular No. 10 deals with the Principles of Box and Crate Design. This is a practical circular covering a description of the various types of boxes and crates and discussing the relative merits of each type. Methods of testing both boxes and crates are described and numerous figures are included to illustrate the points discussed. The information contained in this circular has been carefully collected from the results of numerous experiments with containers both here and in other parts of the world and should prove of value to all interested in the boxing and crating of commercial goods for internal or overseas shipment.

Those who are already on the mailing list of the Division will receive these circulars in due course. All trade circulars are available free to anyone who may be interested, and may be obtained by application to the address at the foot of the page.

WOOD PRESERVATION

To those interested in the problems of wood preservation the following books and journals are recommended as the most suitable for studying the various methods employed:-

[1] Now Forintek Canada Corporation.
[2] Now the Commonwealth Scientific & Industrial Research Organisation (CSIRO).

"The Properties and Uses of Wood"
by A. Koehler.
McGraw Hill Book Company Inc., New York, 1924.

"The Preservation of Structural Timber"
by Howard F. Weiss.
McGraw Hill Book Company Inc., New York, 1917.

The Preservation of Wood"
by A.J. Wallis-Taylor.
William Rider & Son Ltd, London.

"Proceedings of the American Wood Preservers Association"
Published annually by the Democrat Printing Co., Madison, Wis., for the Association (Headquarters at 1427 Eye St., Washington, D.C.).

"Journal of the British Wood Preserving Association"[3]
Building No. 6, The Office Village, 4 Romford Road, Stratford, London E15 4EA, United Kingdom.

CSIRO
AUSTRALIA

[3] Now called the British Wood Preserving & Damp-proofing Association (address correct as of April 1995).

NEWSLETTER

Forest Products

1932##007

MONTHLY NEWS BULLETIN NO. 7 FIRST PUBLISHED 1 AUGUST 1932

BUILDING UP A KNOWLEDGE OF AUSTRALIAN TIMBERS

The better utilisation of our forest wealth and the replacement of imported woods, now generally used, can only be accomplished by the study of the physical properties and working qualities of our own timbers. Too little is known about many Australian woods, about their possible uses, their availability and their physical properties. It is all very well to argue that those of outstanding commercial value are already in everyday use, but Australia is a comparatively young country and in its short history a complete knowledge of all its timbers has not been possible. Moreover, there has been a tendency to exaggerate the qualities of many woods on the basis of insufficient evidence. Such an exaggeration is as detrimental as complete ignorance to the development of local and overseas trade.

The Division of Forest Products is interested in the building up of reliable information concerning all species. That such reliable knowledge is necessary has been demonstrated time and again by requests for information concerning local timbers for the replacement of imported woods in definite use. This type of inquiry has been met as well as possible under the circumstances and the Division has in many instances been able to recommend the use of Australian timbers for specific purposes. However, these enquiries have brought home the fact that there is insufficient information available at the present time regarding the properties and distribution of many of our woods. To collect all the necessary data about a large number of species is no simple task, but the position is not helped by delay.

The necessary information, to be of value, has to be based on the results of a great amount of fundamental research. The cry of today is for something of immediate practical value, something which the industry can use at once with profit, and in the timber trade the Division of Forest Products has been able in many ways to make definite practical suggestions. These have been based on the results of definite experiments carried out to overcome the particular difficulty, or on the experienced knowledge of members of its staff. And it desires to continue this assistance. But to be able to do so, it must be all the time collecting fresh facts and fresh information concerning our various timbers and tabulating this information in such a way that it will be readily available.

In all industries the path to prosperity has been paved by the research workers who are always gathering up threads of information about this property or that and so building up a store of knowledge from which the practical man can draw from time-to-time. Sometimes this gathering of facts is very slow and has no apparent value, yet what is not apparent today may be of importance after a few years. Hence in its organisation the Division of Forest Products has two main branches; the one, and the most important one at the present, dealing with the practical problems of the man in the trade, and the other, not always in evidence, but nevertheless slowly forging ahead gathering that fundamental information, without which the practical man is lost.

For this purpose of building up a reliable fundamental knowledge of our woods, the Division has been making a systematic collection of timbers from all parts of the Commonwealth. At the present time, there are in this collection over 2500 samples of wood taken from different trees and representing over 250 different species. The collection is by no means complete and there are many other species of which no samples have been obtained to date. However, it is slowly growing and it is hoped that eventually all the timber trees of the Commonwealth will be represented. These samples are authentic in that they have been named by virtue of the botanical material collected from the same trees. This material has in all cases been checked by competent authorities.

The wood samples thus collected form the basis for the investigation of the physical properties and chemical composition of the timber of the different species. The physical properties investigated are **density**; **structure**, a knowledge of which is essential in developing methods of identification and in making comparisons with other woods; **strength properties**, such as toughness, hardness, etc.; **durability**, by means of comparative exposure tests in which samples are exposed to the attacks of white ants and rots; **behaviour during seasoning**. On the basis of results obtained during these examinations it is possible to determine the methods of utilising any particular timber to the best advantage of both the timber and the timber user.

Most readers are aware of the Trade Circulars issued by the Division from time-to-time, giving information which is of considerable interest to the practical man. They may not perhaps know that results of some of the more interesting fundamental experiments are published as articles in the Journal of the Council for Scientific and Industrial Research (reprints of which are available for distribution) and in the form of Technical Papers. Two of the latter, namely, Nos. 4 and 5, are at present in the course of publication.

Technical Paper No. 4 deals with the "Chemistry of Australian Timbers, Part II" and gives the results of the chemical investigation of that group of timbers known as the ironbarks.

Technical Paper No. 5 deals with the results of the chemical investigation of that group of timbers known as the ironbarks.

Technical Paper No. 5 deals with the results of the investigation of the structure of 37 species of coloured woods of the genus *Eucalyptus*. Methods for the identification of these woods are outlined and key for their separation included. Although this work has no direct bearing on practical problems, it is of great value indirectly as it gives methods for the identification of many species in common use.

By means of these and other Technical Papers, the results of the more fundamental work of the Division are placed on record, and the wide circulation of these papers shows those interested in timber both here and abroad that Australia is tackling the problem of building up authentic information concerning her timbers.

TIMBER RESEARCH IN SOVIET RUSSIA

Recently a number of publications have been received by the Division of Forest Products from the Section of Testing Aircraft Materials, Central Aero-Hydro-Dynamical Institute, Moscow. These indicate that extensive research of high quality on the physical and mechanical properties of timber is being carried out into the Soviet Republic. At the same time an excellent set of wood samples, representing the commercial timbers of the Republic, has been received.

THE STANDARD EXPORT APPLE CASE

The standardisation of the apple case for export has for a long time been a problem. The use of cases of different shapes and sizes causes great inconvenience and adds to the cost of stowing. Moreover, the diversity is a disadvantage to the trade because the sawmillers cannot manufacture on standardised lines and the packers must perfect a different set of counts, according to the size of the fruit, for each type of case. In addition, repeated complaints have been received from overseas distributors about this diversity of Australian cases.

The Standards Association of Australia has referred the question of a standardised case to a special committee of which the Chief of the

Division of Forest Products is Chairman, and on which are represented the fruit growers and exporters, case makers, railways, shippers, the Commonwealth Department of Commerce and the Victorian Department of Agriculture. It has been decided in committee that certain facts must be established in regard to the two main types of case, namely, the Australian "dump" and the Canadian standard cases, as to their effectiveness as containers and the protection they give to their contents under the normal hazards of transport.

The experimental work is being carried out in the laboratories of the Division of Forest Products by Mr R.F. Turnbull, Utilisation Officer of the Division, in co-operation with Mr W.M. Carne, the Apple Expert of the Division of Plant Industry, and Mr B.P. Krone, Chief Packing Instructor of the Victorian Department of Agriculture.

This season the work has been confined to developing suitable methods of testing apple cases so that the results will have a practical significance. These preliminary experiments will provide a foundation for a more comprehensive set of tests in the 1933 season. It is hoped that sufficient data will be obtained to clear some current misconceptions and provide the evidence necessary for standardised apple racking.

POWER ALCOHOL FROM WOOD WASTE

It has been known for over 100 years that alcohol can be obtained from wood by suitable treatment, but only during the past 30 years have serious attempts been made to place the process on a commercial basis. During this period quite a large amount of work has been carried out and much capital expended. Plants, both commercial and experimental, have been erected in various parts of the world, but circumstances have always compelled these to close down.

The production of alcohol from wood involves two main processes: (1) hydrolysis, which results in the formation of sugars at the expense of wood substance, and (2) the fermentation of these sugars to alcohol. The first of these processes may be said to be brought about by two types of chemical treatment, (a) hydrolysis with dilute or weak acids, and (b) hydrolysis with strong or concentrated acids, or with acids in their gaseous state. In the past, both of these treatments have failed from the economic point-of-view. Dilute acid processes have not yielded enough alcohol, while strong acids, although yielding more sugars and, therefore, more alcohol, have required such highly technical and expensive equipment with excessive maintenance costs, that processes employing them have proved too costly.

Recent investigations have been carried out, both in Great Britain and Germany, with the object of increasing, by some means or other, the sugars resulting from hydrolysis with dilute acids. Sulphuric acid solutions of strengths ranging from 0.2 to 0.5% have been used successfully in processes which have a continuous percolation principle. The hydrolysis is carried out at temperatures of approximately 175°C and under pressure. As fast as the sugars are produced they are removed by the circulating acid liquor and the acid is neutralised, thus preventing further action on the sugars. By these modifications to the dilute acid treatments, the yield of alcohol has been increased from 25-30 gallons per ton of dry wood to 35-40 gallons in the British experiments and to over 50 gallons per ton in the German experiments. The Germans have evidently carried the process to plant scale, for they have given costs of production which work out at about 11½d per gallon of alcohol for a factory producing nearly a million gallons of alcohol per annum, with a daily consumption of 60 metric tons of dry wood. It is understood that power alcohol is produced extensively from wood on a commercial scale in Sweden.

The production of power alcohol from wood thus appears to have approached the stage where wood waste can be employed to produce a very essential material at a reasonable cost. It must be remembered, however, that, with the advent of such an industry, wood waste will automatically become a valuable material and, therefore, will not be obtainable gratis nor at a nominal price. Furthermore, the above-mentioned processes were applied to softwoods which contain far more cellulose than do most Australian woods, of which any appreciable quantity of waste would be available. Since existing evidence indicates that alcohol production is directly proportional to the cellulose content, the yields of alcohol from Australian woods would be considerably smaller and the costs of production consequently proportionately greater.

A CO-OPERATIVE PROJECT FOR TESTING PRESERVATIVE METHODS FOR POLES

As a result of a recent conference, called by the Chief, Division of Forest Products, and attended by officers of the Commonwealth Postmaster-General's Department, the Victorian Electricity Commission, the Victorian Forests Commission and the Division of Forest Products, a co-operative scheme has been planned for testing various methods of treating poles in order to increase their life in service.

The timber chosen for these tests is Victorian messmate (*Eucalyptus obliqua*). Two sites for the placement of the test poles have been selected; one, in an area where decay is prevalent, and the other in an area where white ants are common. Some three hundred poles will be treated using ten different methods of treatment. These, together with untreated controls, will be placed in the ground on the selected sites and kept under observation for a number of years. The costs of the various treatments used will be noted for later comparisons. A careful record of the degree of attack will be kept and results should prove of great value in deciding on the most effective and most economical method of treatment.

This project is an excellent example of a co-operative effort between various State and Federal Departments, which supply and use poles, and commercial interests.

R.F. Turnbull, Utilisation Officer of the Division of Forest Products, is proceeding shortly to Western Australia, where he will carry out field studies in the grading of jarrah and karri, in conjunction with F. Gregson, of the Western Australian Forest Service. This work will occupy several months and should result in the development of grading rules of great practical value.

KILN SEASONING IN AUSTRALIA

The Division of Forest Products has, since its inception, tried to keep in direct contact with the trade. In this connection, a survey of seasoning practice has been made and it is interesting to note that there has been a decided development in kiln seasoning in Australia. The latest available figures show that there are a total of 58 plants at which kilns are installed and the total number of kilns is 138. In Victoria alone there are twenty plants at which kilns are installed, and the number of kilns is 61, or approximately 45 of the total number of kilns in the Commonwealth.

It is possible that a few kilns have been overlooked in this survey, but the figures given show that kiln drying is attaining some importance in the timber industry. During the past twelve months, the Division has issued 23 sets of plans to 17 different concerns contemplating the building of kilns. There are at the present time several batteries of kilns in the course of erection, and these have not been included in the above figures.

A recently notable feature has been the greatly increased demand in Tasmania for assistance in kiln installations

The most general method employed in the macroscopic examination of the cell structure of wood is that in which very thin sections of wood are prepared and examined under the microscope by means of transmitted light. This method has not proved satisfactory for the examination of "collapse" in wood since the procedure necessary for the preparation of the thin section causes a more or less complete recovery of the collapsed cells.

The Division has recently purchased an attachment called the Ultrapak which can be fitted to the ordinary microscope, and by means of which a bright light is thrown on to surface of any opaque object, enabling it to be examined at high magnifications. This apparatus is eminently suitable for the study of wood, and the appearance of the cells of the wood can be examined at magnifications up to 500 times. By this means, it is possible to investigate the structure of wood and the shape of the cells before and after collapse, without recourse to the various treatments necessary for the preparation of thin sections.

CSIRO
AUSTRALIA

Reprinted in May 1995

NEWSLETTER

Forest Products

1932##008

MONTHLY NEWS BULLETIN NO. 8 FIRST PUBLISHED IN 1 SEPTEMBER 1932

AN INTERNATIONAL TERMITE EXPOSURE TEST

Termites or white ants are common throughout Australia and their depredations cause enormous monetary losses each year. Australia, however, is not the only country in which these pests occur and they cause extensive damage in the Untied States of America, Central America, South Africa, India, the Malay archipelago and other places. In 1928 the United States Forest Products Laboratory to institute a series of tests using various wood preservatives. A number of pieces of sapwood of western yellow pine (*Pinus ponderosa*) were treated with sixteen different preservatives which were used for, or were considered likely to be effective in, preventing termite attack. From the treated specimen, four complete sets containing equal numbers of treated pieces together with untreated controls were prepared, and one set was sent to each of the following: Australia, South Africa, Hawaii, and the Panama Canal zone.

The installation of the Australian specimens and the responsibility for the annual inspection and general reports as to their behaviour under test, was undertaken by the Divisions of Economic Entomology and Forest Products of the Council for Scientific and Industrial Research. The specimens were installed at Canberra, one-half being tested against one species of white ants shown as *Coptotermes lacteus* and the other half against another species *Eutermes exitiosus*. At first, all specimens were actually inserted into the termite mounds, but after one year's test, this method was found to be unsatisfactory. One half of the specimens (those tested against *Coptotermes*) was then removed from the mounds and placed in a circle around the mound, the circle being approximately 18-24 inches from the mound and the specimens 24 inches apart. The other half was set in a test plot in which a large number of mounds of *Eutermes* has been collected. After another year, it was found that the testing of specimens around the mounds was very satisfactory, but that the test plot was not. Specimens were, therefore, removed from the test plot and placed around mounds of *Eutermes* in a manner similar to that used in the case of *Coptotermes*. The third inspection which has just been completed indicates that the present method of testing is now satisfactory.

The tests have not been proceeding sufficiently long to enable definite conclusions to be drawn. But the sixteen treatments investigated, creosote oil, halowax (a proprietary article) and certain of the arsenical compounds are given satisfactory results.

The building of the new United States Forest Products Laboratory at Madison, Wisconsin, is well advanced. When completed, this structure will have cost approximately one million dollars.

Trade Circular No. 10, of the Division of Forest Products, on Box Construction, will be available for distribution within the next few weeks. Other Trade Circulars are in the course of preparation; of these, Nos. 11 and 12, will be issued shortly. No. 11, deals with the Anobium or furniture borer, and No. 12, with the problem of combined air and kiln seasoning.

THE QUESTION OF SUBSTITUTES FOR HICKORY

One important problem at present confronting the Division of Forest Products is the selection of a satisfactory substitute for hickory. The suitability of this timber for certain purposes is well-known. It has that property of resilience which is essential in tool handles, it has strength and wearing qualities and it is easily bent. It possesses. in fact, the majority of the most desirable qualities of timber. While many timbers may be stronger, they do not possess its resilience nor its power to recover after severe shock. These special qualities make it extremely difficult to find a suitable substitute.

Before suggesting any Australian timbers as substitutes, the Division of Forest Products considers it essential to carry out a number of tests to determine the quality of such timbers in those properties for which hickory is noted. It is unfortunate that there has been a tendency to use numerous local timbers as hickory substitutes without any consideration of their properties, or of whether they possess the necessary qualifications. Or again, no care has been taken in the selection of material. It is essential in tool handles, sporting goods, etc. to have perfectly straight grained material. Any cross grain present is disastrous and, in the case of tool handles, may lead to serious accidents. Such failures have led to prejudice against the use of certain Australian timbers. These timbers are not necessarily damned because of these cross grain failures. Tested under proper conditions and using only selected straight grained timber, they may yet prove satisfactory.

The Division of Forest Products wants to be sure, however, that any timber it recommends as a hickory substitute, possesses properties similar to those of hickory and that after recommendation it is given a fair trial.

THE BLUE STAIN PROBLEM

One of the effects of the Depression has been to increase the use of locally grown softwoods. Trees from plantations, hedges, and streets have been cut and converted into box timber and other products. One of the difficulties in such utilisation has been the tendency of the sapwood to become discoloured with a bluish stain.

This blue stain is caused by a fungus which grows rapidly on green timber under stagnant air conditions and its presence is usually an indication of poor seasoning practice. In most cases, the cure lies in cutting up the logs soon after felling, and ins tacking immediately into well-ventilated, well-stripped seasoning stacks, with foundations a foot or more clear of the ground. The danger from blue stain is present only in the early stages of drying, and the object should be to complete these early stages as quickly as possible.

Sometimes where blue stain conditions are particularly severe, it is necessary to dip the green timber in chemicals to prevent the growth of the fungus. The Division of Forest Products in co-operation with a Melbourne casemaker, is at present carrying out an experiment on the efficacy of this dipping treatment. A small supply of a chemical, Lignasan, which has been used successfully in the United States for this purpose has been procured.

RAPID SEASONING OF TIMBER FOR CASE STOCKS

Early in 1931, the Division of Forest Products carried out tests which proved that rapid kiln drying of Victorian mountain ash case material was practicable. Several plants subsequently installed kilns solely for drying this class of stock. Some of these plants are now drying mountain ash case sides green from the saw in thirty-six hours, and case ends green from the saw in 3-4 days.

Up to the time of those experiments there were no plants kiln drying this class of material. Now, however, this branch of the timber industry is making rapid progress in Victoria and Tasmania. The success with mountain ash has led to the experiments for the development of rapid kiln drying schedules for jarrah and karri. These experiments are now nearing completion and it seems evident that the kiln drying of jarrah case material green from the saw will also be commercially practicable.

Tasmanian Huon pine is commonly used for small articles of turnery. Besides being an excellent turning wood, this timber has the advantage of containing an antiseptic oil which has a pleasing odour. It is, therefore, particularly suitable for trinket boxes or for containers for articles subject to insect attack. Coachwood of New South Wales is another excellent turning timber of pleasing colour and grain. Although it has a most distinctive fragrance, its possibilities for small ornaments do not appear to have been fully realised.

When a cricketer is selecting a bat, he examines carefully those submitted to him, and looks for definite features. Primarily he demands straightness of grain, quarter cutting, freedom from defects and correct weight and balance. In addition, however, he examines the inherent properties of the timber itself, noting, for example, the rate of growth of the tree by the distance apart of the annual rings, the colour of the timber, and its general appearance. The laws which guide him here are, however, usually more of a traditional nature than the result of his own experience. Similarly when you ask why he oils his bat, you will probably find that he does so because "one always oils bats".

An extended investigation at present under consideration by the English Forest Research Board is, therefore, of general interest. The aims of the investigation are to determine the necessary qualities of the timber suitable for cricket bats and to investigate the possibility of making timber of varieties of willow now used for second grade bats more suitable for this purpose. Those tests will be of interest in Australia, especially as there are available considerable supplies of willow trees other than the true cricket bat willow.

It is estimated that there are already a dozen electrical meters for testing the moisture content of timber in use in Victoria. More than a dozen are in the course of construction.

Of late years, the feather weight wood from central America, has come into prominence as a substitute for cork board in insulated chambers, etc. It is probably more familiar as a result of its use in model aeroplane parts. It is not generally known that there are several Australian trees producing timbers the equivalent of balsa in density. Samples of these are at present being collected and prepared by the Queensland Forest Service, which will forward them to the Council for Scientific and Industrial Research for heat conductivity tests.

CSIRO AUSTRALIA

Reprinted in May 1995

NEWSLETTER

Forest Products

1932##009

MONTHLY NEWS BULLETIN NO. 9 **FIRST PUBLISHED IN 1 OCTOBER 1932**

THE DESTRUCTION OF WOOD BY INSECTS

Although no estimate has been made of the damage to wood by insects in Australia, it is obviously very large. As soon as one stops to consider the damage caused by termites (white ants) alone, it is immediately apparent that wood-destroying insects are causing enormous economic losses yearly. Although more or less spasmodic efforts have been made at different times to minimise such losses and although commercial concerns have promoted and are promoting various insecticides, little fundamental research has been carried out and no concerted effort has been made to prevent the damage. It should be emphasised here that a large amount of the damage can be prevented by wood preservation measures. In some cases the methods available are not completely satisfactory and research work is now in progress in the laboratories of the Division of Forest Products and other Forest Products Laboratories throughout the world to improve methods of treatment and to develop new ideas of prevention.

Insects which attack wood can be conveniently grouped according to the stage in the history and the condition of the wood which is attacked. Thus, there are four main groups as follows:-

(1) Insects which only attack the living trees of freshly felled trees (before the logs are converted).

(2) Insects which attack the freshly converted timber in the partly seasoned or seasoned condition.

(3) Insects which only attack timber which has been seasoned for a number of years.

(4) Insects which attack the living tree or wood in any state, green or dry - this group consists of the termites which cause the greatest damage of any insects in Australia.

In the present article discussion will be confined to those insects in group 1. These insects which attack the living or the freshly felled tree are placed into several groups by entomologists, but for practical purposes can be divided into two classes: (i) the pin-hole and shot-hole borers, and, (ii) the jewel or longhorn borers. These insects can particularly attack trees which are unhealthy or affected by decay

In the case of the pin-hole or shot-hole borers the beetles bore into the timber and the eggs may be deposited in specially prepared chambers fairly close together. The beetle holes are usually at right angles to the grain of the wood and are often stained black. This stain is caused by a fungus called "Ambrosia" and thus these insects are often called "Ambrosia beetles". It is believed that the fungus living in the holes made by the beetles constitutes the food of the young larvae which hatch from the eggs. It is often possible to recognise the points of entry of the beetles in the living trees by the presence of a long stringy frass projecting from the entry hole. The holes are approximately $^{1}/16$" in diameter and, except where they are grouped close together, they are not a serious defect although they affect the appearance of the wood.

The longhorn or jewel beetles generally deposit their eggs in the bark. Within a few weeks the eggs hatch into grubs who commence to eat their way into the wood in all directions. It is sometimes several years before they change into the beetle, particularly if the wood in which they are working has been dried. The holes of these grubs are more serious defects than the pin holes, firstly, on account of their size which may be up to 1" in diameter and, secondly, on account of the fact that in the tree or the log they may be the point of entry for wood-destroying fungi.

The damage caused by these insects of group 1 may be reduced by several means.- In the first place the insects develop and multiply in diseased trees or in tops and logs left in the bush. Cleanliness in the forest is, therefore, a prime consideration and, as the insects are most active in the grain and early summer, operations for the disposal of tops should be planned to ensure that there is a minimum of susceptible material available. Logging operations, particularly in spring and summer, should be designed to remove logs from the bush as soon as possible after felling. Removal of bark also reduces the damage considerably. If logs are left in the bush, reduction in the degree of attack can be obtained by spraying the logs, particularly the ends, with creosote. No really good spraying treatment for logs has yet been developed, but the use of creosote will be found to give much less damage, although it should be remembered that spraying will not be an effective protection for more than a short period.

If timber containing live pinhole borers or longhorn grubs is converted it will be found that the borers will die as soon as the timber becomes seasoned, but the grubs may continue to live and eventually will change to the beetle. However, in both cases the converted timber, whether seasoned or partly seasoned, is no longer susceptible to fresh attack, and, therefore, the infected timber should not be considered a dangerous source of future infection - this is more especially the case with the pin-hole borer. The damage caused by the pin-hole or shot-hole borers can be readily distinguished from that caused by the Lyctus or Powder Post beetle and the Anobium or Furniture borers and details for determining this have been set out in Trade Circular No. 5 of the Division of Forest Products, which may be obtained free of charge on application to the Chief of the Division.

Mr W. Higgins, Secretary of Hardy's Ltd, Wagga, NSW, has been visiting the laboratories of the Division of Forest Products to obtain information on the kiln seasoning of Alpine Ash and on the best type of kiln for his particular conditions.

THE INFLUENCE OF THE MOISTURE CONTENT OF CASE TIMBER ON THE RUSTING OF TIN CANS

An investigation recently carried out by the Canadian Forest Products laboratory will be of interest to case-makers and packers of canned materials. This investigation has as its object the study of the moisture content of case timber in relation to the extent of rusting of cans packed in such cases. In Canada it is usual to store empty tin cans for the fish canning season in the cases which are to be used for the packing of the filled cans. Often these cases and tin cans are held in store for months before the opening of the season. The test was, therefore, carried out by storing tin cans in cases made from timber varying from 8-18% in moisture content. After three months the empty cans were examined and all signs of rusting recorded.

The results showed that (1) the amount of rusting was negligible in the cases made from timber at the lower moisture contents, (2) increase in the amount of rusting was noticeable with increase in moisture content of the timber up to 14%, and (3) above a moisture content of 14%, the amount of rusting increased rapidly until at 18% it was serious.

While Canadian climatic conditions are very different from Australian, this investigation carries a warning to Australian case-makers and packers. It is desirable that timber for canned goods should be dried to a moisture content of 15% or less, if the possibility of trouble is to be avoided.

MATERIALS FOR USE IN KILN CONSTRUCTION

The requirements of a building material to be used in the construction of seasoning kilns are: (i) ability to withstand relatively high temperature and humidity, (ii) good insulation properties, and (iii) low maintenance costs. Provided the necessary precautions are taken, wood, brick or concrete can be used satisfactorily. The decision as to which is the most suitable for any particular plant should be based on a consideration of first costs and on the degree of permanence required. Whichever of the above materials is used a moisture retardant costing is necessary both to assist in retaining the insulating properties and to prevent depreciation. From the point-of-view of depreciation this costing is particularly necessary with wooden construction which, however, forms an excellent material for kiln construction provided suitable precautions are taken.

The Division of Forest Products is carrying out an extended survey of the behaviour of various types of construction over a long period and advice based on information already available can be obtained on application to the Chief of the Division, 314 Albert Street, East Melbourne. One interesting type of construction under observation is a timber framed construction lined inside and out with cost concrete slabs.

THE EUCALYPTS AS EXOTICS

The eucalypts are naturally indigenous to Australia although some are found in New Guinea and other islands. They were first introduced into countries outside their natural habitat in the early part of the nineteenth century. One of the earliest species to be thus introduced into Southern Europe was *Eucalyptus globulus* (Tasmanian Bluegum). Since that time they have been extensively planted in the Mediterranean region, in California, in Florida, in South Africa and in other sub-tropical regions of the world. Perhaps the chief reasons for their popularity as exotics are their rapid growth and their adaptability to a very wide range of conditions.

Of interest to the Division of Forest Products is the nature of the wood produced by these trees in other countries. Do the different soil and climatic conditions produce wood whose microstructure and physical properties are identical with those of the wood derived from the name species grown in Australia? in an attempt to answer this question, the wood structure of 30 different species of eucalypts grown in South Africa has been examined and compared with that of the same Australian species. The results of this examination indicate that, insofar as these samples from South Africa are concerned, there are no marked differences from their Australian counterparts.

AN EXPERIMENTAL WOOD PRESERVING PLANT

At the laboratories of the Division of Forest Products there is a fully equipped small scale experimental plant for the treatment of timber with preservatives. By such means the absorption of various preservatives and the degree of penetration into wood can be studied. The experimental plant consists of a main cylinder 4 feet in lengths and 18 inches in diameter. To this an extension has recently been added which permits the treatment of timber and it is necessary to be able to draw, at some times a vacuum, and at others, to use pressure. For these purposes the cylinder is connected with a high vacuum pump and a source of compressed air up to 250 lbs/sq.in. In order to obtain a measure of the quantity of preservative being absorbed by the timber under treatment or to determine the rate of absorption, a scales tank is fixed to a platform scale and is connected with the cylinder. There are in addition three storage tanks each of a capacity of 100 gallons connected with the cylinder. Provision is made for the heating of the preservative by steam coils in a working tank placed at a level just above the treating cylinder which is itself equipped with closed and perforated steam pipes for the maintenance of temperature during any treatment.

By means of this experimental plant the Division of Forest Products has carried out numerous treatment on Australian timbers both for experimental purposes and for commercial use.

ALUMINIUM COATINGS FOR MOISTURE PROOFING WOOD

Investigations by the United States Forest Products Laboratory have shown that, where it is desirable to insulate wood against changes in atmospheric conditions, aluminium coatings are particularly effective. Of a coating of aluminium leaf is best, but various aluminium paints are nearly as good and are more easily applied.

Some of the liquids that have been used as vehicles for aluminium paints are gloss oil, shellac, nitro-cellulose wood lacquer, oil varnish, boiled linseed oil, etc. Of these gloss oil is the cheapest and it dries rapidly. Shellac and nitro-cellulose wood lacquer are also fast-drying and more durable than gloss oil, thou not satisfactory for use out of doors.

The Division of Forest Products is at present carrying out a series of experiments to determine the relative efficacy of certain coatings, including aluminium paint, for preventing the drying of boards in air-drying and kiln stacks.

COLD SEASONING

The Division of Forest Products has been carrying out a preliminary experiment on increasing the rate of seasoning of Mountain Ash in the open air by artificially circulating the atmosphere without heating.

The replacement of wooden window frames and sashes by steel has been a feature of the trend of modern building design. It is of interest to note a peculiar accident which occurred at Caulfield, Victoria, in August 1932. A spectator at a race meeting was killed by a steel window weighing 56 lbs which fell 41 feet from a grandstand.

Through rusting, the sash had jammed and the efforts of two men to open it resulted in its breaking away. In recording a finding of accidental death the coroner said: "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."

CSIRO AUSTRALIA

NEWSLETTER

Forest Products

1932##010

MONTHLY NEWS BULLETIN NO. 10 FIRST PUBLISHED IN 1 NOVEMBER 1932

WOOD AND ITS IDENTIFICATION

What is wood? It is well known to everyone as a most useful article which can be sawn, planed, turned, glued and made into a thousand and one different articles of everyday use. Yet, on consideration, it is difficult to catalogue it in our minds, because its uses are so varied. The metals - for example, iron, lead, gold, silver, etc. - are readily catalogued because of their different properties and consequently their different values. Wood, on the other hand, has, in general, no great value, in spite of its many useful properties. However, the time has come when many woods have been found to possess value because of some special property. In the past, this possibility was not considered and many valuable woods have been used indiscriminately for firewood, fence posts, and the like.

The metallic articles of everyday use are derived from either pure chemical elements (Metals) or from mixtures of these elements. Wood is the product of the living tree and is of an extremely complex nature, being made from three chemical elements (carbon, hydrogen and oxygen) combined in varying proportions. As there are a large number of different types or species of trees, so there are an equally large number of different types of wood, no two of which are exactly the same. They differ in the physical arrangement of the cells; in the size, shape and nature of these cells; and in the chemical composition of the materials which fill the cells.

In some manner or other a tree impresses its identity on the wood formed during growth. Thus, it may be considered that the wood from any tree bears the "fingerprints" of that tree. Trees of the same species impart in general the same typical "fingerprints" to the wood from them, although varying conditions during life and growth may cause slight alterations in the pattern. In the forest, it is possible to identify a tree by an examination of its bark, leaves, fruits, flowers, buds, etc., but it is often very difficult to identify a random piece of wood unless familiar with its "fingerprints". The tree may be cut down and converted into timber. It is forgotten as a tree, but its identity is still preserved in the timber derived from it.

The value of the correct identification of any timber has been stressed in several publications of the Division of Forest Products and need not be repeated here, but it is necessary to remind readers that timbers very similar in outward appearances have quite different properties. This outward similarity has led to the indiscriminate use of timbers which do possess the desired properties in the place of a more valuable one.

For some time past the Division of Forest Products has been making a record of the different characteristics of many Australian timbers of commercial importance. This work is a long one and entails the examination of many timber samples, both by means of the microscope and in the chemist's laboratory, in order to find the typical structural and chemical characteristics of each species. Its value has been proved in numerous instances in which correct identification of a piece of wood has been necessary for the development of individual industries.

This branch of the work of the Division of Forest Products is not spectacular and is, for that reason, not widely known, but it does form one of the activities of the Division and here, as in everything else, the experience and results obtained are at the disposal of anyone who cares to use them.

EXPERIMENTAL DRY KILNS

The Division of Forest Products has three laboratory seasoning kilns in operation. These kilns are used for carrying out tests and for developing drying schedules for different Australian timbers.

At the present time, one kiln is being used in connection with experiments on the cause, prevention and elimination of collapse in timber.

RESEARCH STUDENT IN WOOD PRESERVATION

Mr H.B. Wilson, B.Sc., who was recently awarded a research studentship in wood preservation by the trustees of the Commonwealth Science and Industry Endowment Fund, has taken up his duties at the headquarters of the Division of Forest Products, East Melbourne. Mr Wilson is a graduate of the Western Australian University where he obtained final honours in botany, and completed a three years' pass course in chemistry. One of the main objects of research work in wood preservation is the development of methods to prevent the attack of white ants, borers and wood rot. Mr Wilson will be engaged on this work under the direction of the Senior Preservation Officer (Mr J.E. Cummins).

WOOD-MOISTURE EQUILIBRIUM

The moisture equilibrium survey, initiated in the various States by the Division of Forest Products to indicate the moisture content to which timber should be seasoned for indoor and outdoor use, has been in progress for twelve months. An interim report is in the course of preparation.

METHODS FOR THE PREVENT OF DECAY IN ROWING BOATS

The presence of decay in boats and oars means a serious monetary loss to any Rowing Club. For example, the total value of the boats of six Yarra River clubs is reported as being about £5000 and replacement of any boat or even parts of a boat is an expensive proposition. However, the position is not so serious when remedial and protective measures are known and are applied. The attention of the Division of Forest Products was first drawn to this problem by a Melbourne Rowing Club, who reported the presence of decay in four boats valued at approximately £300.

An examination of these boats showed that the decay was confined to the spruce keel plates and the spruce ribs in both the bow and stern of each boat. The red cedar planking was in good condition and appeared to be free from decay. The reason for a restricted area of attack is that both bow and stern are covered by a light three-ply timber decking. Then the boats are placed on the racks in an inverted position after use, the water form the inside drains readily from the central portion which can thus dry. However, in the bow and stern the water cannot drain away quickly, the wood does not dry, and the air in these regions being at a high humidity, conditions are favourable for the development of decay. It was also noticed that in such areas the wood is not well painted nor protected in any way.

There are two methods by which such damage can be prevented or at least considerably reduced. Firstly, the inside of the boat, particularly at the bow and the stern, should be painted with either:-

(a) a solution prepared by dissolving 10 parts of beta-naphthol in 100 parts of warmed linseed oil (apply the solution hot - at about 160°F), to be followed, after drying, by a coat of paint to which extra driers have been added (as the linseed oil solution may retard drying), or

(b) An oil paint to which 5% of weight of beta-naphthol has been added.
(Beta-naphthol is a preservative substance derived from coal tar and is a light coloured crystalline powder. It may be

obtained from any wholesale chemical supplier at a cost of 2/- per lb).

The first method is preferable since the linseed oil and beta-naphthol mixture will penetrate better and the subsequent coat of paint will tend to prevent the beta-naphthol from being washed out of the wood.

Secondly, provision should be made at the bow and stern for the drainage of the water. For this purpose a small hole about one inch in diameter should be made in the decking of each and at the lowest point when the boat is inverted.

In the treatment of infected boats the removal of the decayed timber is advised, after which the area may be treated as described in (a) above.

It is of interest to note that the boats, in which decay was found, were close to the west wall of the rowing shed - the wall being of galvanised iron. These boats were, therefore, submitted to relatively higher temperatures than others in the same shed. The rate of spread of the decay would be considerably increased by the increased temperature.

The possibility of infection is always present since the spores or seeds of decay (dry rot or decay being caused by the growth of low forms of plant life called fungi) are present in the air, soil, etc. and lodgement of these in a boat may easily occur either in or out of the shed. However, if the precautions mentioned earlier are taken and all boats are provided with drainage holes at bow and stern, thus reducing greatly the possibility of setting up favourable conditions for growth, there should be no cause for worry.

It is possible that Rowing clubs in other States have encountered similar or different problems in connection with their boats. In any case they are urged to make an inspection as a safeguard. If they desire assistance in overcoming such a problem, it may be readily obtained by communicating the Division.

TASMANIAN SPECIALTY TIMBERS

The opening of the West Coast Road in Tasmania has made available further supplies of King William Pine. This timber is similar in appearance to red-wood and western red cedar and is replacing imported timbers in certain special cases.

Further supplies of Huon pine are now available from the Gordon River district and the addition of a cut of some 500 000 super feet per annum is very welcome. This timber is so well known and so favourably regarded as to need no description.

AUSTRALIAN TIMBER IN THE USA

In the September issue of the "Furniture Manufacturer", a trade journal published in grand Rapids, Michigan, USA, there is an article dealing with fire cabinet woods from Australia. The timbers specially mentioned are maple, walnut, black bean, hoop pine, mountain ash, silky oak, blackwood, jarrah, and karri.

It was pointed out that the first consignments of timber from Australia did not meet with good reception owing to faults "rather in the manufacture, grading and preparation of the lumber and the shipment of it in an unsuitable condition" than in the woods themselves. It is further stated, however, that this "handicap" is now slowly but surely being removed for, with the results of experiments and experience before them, the producers are now preparing their exports on more or less definite and generally accepted grading rules - and, what is of the utmost importance, the lumber is properly seasoned before shipment."

This is both a sign of encouragement and at the same time a warning to Australian producers. It shows that Australian timbers can be compared with the best of timbers on the world's markets provided that care is exercised in their manufacture, grading and seasoning. That this is being done today is exemplified in the further statement concerning our timbers, that "the world has no need to fear, but can take advantage of vast supplies of new and interesting woods."

This is indeed excellent news to the Australian sawmiller.

ELECTRICAL MOISTURE METERS

The use of "Blinker" electrical moisture meters is rapidly extending. In Victoria these instruments are in use in both city and country plants and are now recognised as standard equipment in the timber industry. Instruments are also in use in Western Australia, South Australia and New South Wales.

CSIRO
AUSTRALIA

NEWSLETTER

Forest Products

1932##011

MONTHLY NEWS BULLETIN NO. 11 FIRST PUBLISHED IN 1 DECEMBER 1932

TESTS OF THE HOLDING POWER OF NAILS

In the study of the various types of wooden containers and of their relative efficiency in service, the Division of Forest Products has found that insufficient consideration is given to nailing. Although laboratory and service tests have repeatedly demonstrated that the strength of containers depends largely on the efficiency of the nailing, it is apparently not generally known that the nailing is the weak point in practically all commercial boxes and crates.

Nailed joints may fail by - (i) the nail heads pulling through the wood; (ii) the shearing of the wood from the nails; (iii) the nails breaking; or (iv) the pulling of the nails from the wood - the most common failure encountered.

The holding power of a nail depends on several factors, the most important of which are:- (a) the nature of the wood used; (b) the density of the wood used; and (c) the character of the nail itself. Tests have shown that the holding power of the wood increases with increase in density, and that, in general, the porous timbers (woods of the oak or ash type) have a greater holding power than the non-porous timbers (woods such as hemlock, spruce, or the pines). The characteristics of the nail which influence its holding power are the nature of the point and the character of the shank. In general, the sharper the point of the nail, the greater the holding power, provided splitting does not occur; but, on the other hand, the sharper the point, the greater the tendency of the wood to split, the consequent loss in holding power.

It is necessary to use a nail with a blunt point when working with woods which split easily in nailing. The extreme example of this type is the "dump" nail, which has no point at all. (The point of the common flat-headed nail has about the right degree of sharpness for most woods, being neither too sharp nor too blunt. If it were sharper, splitting would be likely to occur, whereas if it were blunter, its holding power would diminish).

The second characteristic affecting the holding power of a nail is the nature of the shank. The ordinary wire nail depends for its holding power on the friction between the nail and the adjacent wood fibres. Attempts have been made throughout the world to improve the holding power by increasing the frictional resistance to withdrawal, or by substituting (at least in part) mechanical for frictional holding. The principal methods used overseas are (i) cement-coating; and (ii) barbing.

Cement-coated nails are made by tumbling ordinary nails in a drum with a resinous compound, which forms a thin coating on the nail, and increases its frictional resistance to withdrawal. This type of nail is largely used in England and America, and is probably the most popular variety having increased holding power.

As the name implies, the barbed nails have barbs cut into their shanks - the idea being that the barbs catch in the wood and resist withdrawal. However, extensive tests by the United States Forest Products Laboratory have shown that the holding power of barbed nails driven into dry wood is less than that of plain nails, due to the fact that the barbs badly mutilate the wood fibres. On the other hand, the holding power of barbed nails driven into green timber, which has then been allowed to dry, is somewhat greater than that of plain nails treated similarly.

In Australia, several different types of special nails have been developed, all of which are claimed to have better holding power than the plain nail. The most common types are the twisted (or spiral) and the barbed (or jagged) nails. The shank of the former is twisted into a long spiral on the theory that the nail when driven will rotate like a screw, with resultant increase in hold power. The barbed nails made in Australia are rather different from those made overseas, being usually provided with notches or depressions rather than barbs, so that their behaviour is not necessarily the same as those tested by the United States Forest Products Laboratory. Cement-coated nails, although on the Australian market, have not come into favour. Other special nails produced in Australia are the chemically rusted nail and the sand-rumbled nail.

In its work in connection with the testing of wooden containers, the Division of Forest Products was quickly confronted with the lack of knowledge on the relative merits of the various types of nails made in Australia. It was necessary, therefore, to obtain this information, and a comprehensive series of tests is being carried out to determine the relative merits of eighteen different types of local nail. The nails for these tests have been supplied by all the principal makers in the Commonwealth.

It has been decided to determine the holding power of the nails under the following conditions:-

(i) Driven into dry wood and pulled immediately.

(ii) Driven into dry wood and pulled three months after driving.

(iii) Driven into green wood and pulled after the wood has dried.

(iv) Driven into green wood and pulled after the wood has dried.

(In all tests, nails are driven into quarter and back faces, as well as end grain).

Some nails, once they commence to yield, have very little holding power, and can be easily withdrawn. Others, even after they have started to move, still retain a firm grip on the wood, and considerable strain is necessary throughout the extent of their withdrawal. Obviously, these differences indicate important factors in the efficiency of the nails, and they also will be studied.

The results of all these tests when completed should prove of considerable interest to users of nails.

AUSTRALIAN TIMBERS FOR WINE CASKS

The Australian has an almost incurable tendency to prefer the product of any other country to that of his own. Probably no local industry has suffered more from this trait than the timber industry. One reason for this inferiority complex as regards Australian timbers is undoubtedly due to the fact that, in the case of the imported material, quality and method of preparation have been standardised by long usage, whereas, in the case of the local woods, the best methods of treatment have yet to be found. Unfortunately, failures during the period of experiment often cause a prejudice against the local article. Thus there are many Australian timbers which have properties rendering them suitable for specific purposes, but which will not be accepted because of prejudice arising from lack of knowledge.

The latest example of this is to be found in a report recently issued by the Imperial Economic Committee in the preparation for market and the marketing of wine. Since wood is so essential for wine storage and transport, a section of this report is devoted to wood supplies. It is pointed out that considerable difficulty is met in the wine trade of Australia owing to the shortage of local timbers considered suitable for wine casks. Considerable quantities of oak staves are imported and while there is an indication that the use of local timbers is increasing, there is still a strong prejudice in favour of the imported material.

It is interesting to note, therefore, the opinion of Mr Geoffrey M. Tait who, in his Practical Handbook on Port Wine, discussed the various merits of cask timbers. Baltic oak is placed first, followed by Adriatic oak - "Next in quality comes New Orleans oak, but *Eucalyptus*, although less known and more difficult to procure, is probably not inferior provided it is well chosen and very well "seasoned" ... it has been proved that it gives less taste to wine than New Orleans oak."

This authority lays great stress on the need for the wood to be well "seasoned". He states that a new cask is seasoned with steam and ammonia, after which it is washed with water and seasoned with young wine. The longer the process of seasoning with wine the better, as, even after some years, the wood imparts its particular flavour to the contents of the cask.

It will be evident, therefore, that the prejudice against Australian timbers for casks is not the result of inherent unsuitability of the timber, but of improper treatment. It is interesting to note that some of the large wine producing countries of the world have extensive plantations of Australian timbers. Unless a more rational outlook prevails, the paradoxical position will arise in which Australian wine will be exported in casks made from foreign timbers, while wine produced in Europe will be transported in casks made from timber derived from plantation eucalypts.

KILN-DRYING INFORMATION

Some of the recent seasoning investigations of the Division of Forest Products have been connected with the kiln-drying of Tasmanian timbers in the laboratory experimental kilns. In these experiments it has been found that leatherwood, sassafras, blackwood, and Huon pine offer no difficulties and can be readily kiln-dried without degrade. On the other hand, Tasmanian myrtle varies greatly in its drying characteristics; some stock dries quickly without degrade, whereas other material cannot be dried quickly and tends to misbehave badly. For this reason, the kiln drying of myrtle from the green condition will not be entirely satisfactory until some means of sorting the timber into different drying classes is evolved. Such a procedure offers pronounced practical difficulties; hence when drying myrtle, it is preferable to kiln dry partially air-dried material rather than attempt to kiln dry from the green condition.

The Division of Forest Products is preparing a practical guide for use in the seasoning of numerous Australian timbers. The first part, which deals with sixteen species of commercial importance, should be available for distribution early in the new year.

BUILDING CONSTRUCTION AND WHITE ANTS

By far the best way of preventing the destructive action of these widely spread pests is to use methods of construction designed to defeat their well known cleverness in finding their way into timber structures. As a first precaution it is essential to remove from the building site any tree stumps which may be on or in the ground. If left behind, these will provide centres from which the white ants (termites) can spread in all directions and attack a house some distance away.

If there are any signs of white ants on the site or in the vicinity, efforts should be made to locate the nests. When found, they should be opened out and creosote liberally poured into them and into the surrounding earth. Having in this way removed obvious centres of infection, it is possible to construct the building so as to prevent or greatly hinder the white ants from establishing contact with any wooden portions. In particular, all timber which is in contact with the ground must be thoroughly treated with creosote or with an arsenic solution.

Once the insects are well established in a building, it is not easy to remove them completely. The method of entry must be discovered and steps taken to prevent entrance at the same or similar places. Efforts should also be made to locate the nest and destroy the colony.

The Division of Forest Products proposes to issue a circular dealing with the details of construction which should be followed in areas where attack by white ants is possible.

BREVITIES

Miss Maisie Burnell, B.Sc. (Western Australia) has resigned from her position as Assistant Wood Anatomist in the Division of Forest Products. She is being married before the end of the year. During her three years with the Division, Miss Burnell has been associated with the development of methods for the identification of Australian timbers.

The results of the first part of this work have recently been published in the form of a Bulletin of the council for Scientific and Industrial Research. The vacancy caused by Miss Burnell's resignation has been filled by the promotion of Miss A. Eckersley, B.Sc., a graduate of Melbourne University, who has been acting during the past year as a part-time officer in the Section of Wood Structure.

Visitors to the Division of Forest Products during the month included Mr Mulhearn, Snr, Mr Burke, and Mr Mulhearn, Jnr from New South Wales. Mr Mulhearn, Jnr is studying the latest developments in kiln design and operation and spent several days in the laboratories of the Division. On his return to the Dorrigo district, NSW he plans to install the latest type of internal fan kiln for the drying of brush timbers.

The Chief of the Division of Forest Products, Mr I.H. Boas, is at present visiting Tasmania in connection with proposals for the development of the pulping industry. He is also meeting members of the timber industry to discuss the work of the Tasmanian Sub-committee on timber (of the Standards Association), and to arrange trade classes on the seasoning of timber.

The Division of Forest Products has received a comprehensive series of samples of brush timbers from the Dorrigo district, NSW, through the courtesy of Messrs Mulhearn Bros. There is a growing demand for Australian timbers to replace those imported for special purposes and the brush timbers of NSW cover a range of very useful species.

CSIRO
AUSTRALIA