NEWSLETTER
Forest Products
1936##048
MONTHLY NEWS LETTER NO. 48 FIRST PUBLISHED IN 1 JANUARY 1936

DEVELOPING THE PRE-FABRICATED HOUSE

In recent years the pre-fabricated house has been seriously considered by both the manufacturer and the house buyer. At the present time in the United States alone, the research workers and engineers of more than forty companies are actively engaged investigating the design and construction of a factory made house which can be erected at a lower price and yet meet the exacting demands of the purchasing public. These companies have realised that radical changes in accepted materials and construction are necessary before building costs can be appreciably reduced.

Aluminium and steel feature prominently in this development. Houses have already been erected in which ribbed aluminium or steel sheets are secured to a light structural framework of 16 gauge steel channel sections and bracing welded together. In another design a fabricating system has been exploited in which the various members slide together and are secured by clips so that bolts and welded joints are eliminated. In yet another design the structural framework has been entirely eliminated by using interlocking panels of a heavier gauge sheet of metal. Floor and ceiling joists are of trussed steel or light steel channel sections.

The possibilities of using concrete have also been investigated. Large pre-cast concrete wall panels have been fitted in between reinforced concrete studs which have been poured in situ. Attempts have been made to give the natural finish of these panels a decorative effect by using coloured aggregate in the concrete.

It is interesting to study the contribution that wood has made towards the satisfactory solution of this problem. The energetic research and advertising campaign to extend the market for cement and various sheet metals and alloys is due to the support of several immense manufacturing corporations. Unfortunately, until quite recently the various trade organisations representing the timber producers have not given wood the same amount of publicity. Besides having decorative and insulating properties, wood has many other properties which make it particularly well suited for use in a pre-fabricated house. In the majority of schemes which have already been prepared, plywood has been used for both the interior and exterior surfaces. The plywood panels are joined together by splines, bolts or else fitted into the flanges of a light structural steel framework. Similar units are used for both the floor and the ceiling where a flat roof is required and when the house has been designed having a sloping roof, light trusses and timber connectors have been used. The Forest Products Laboratory at Madison, Wisconsin, U.S.A., have recently designed and constructed a pre-fabricated house. It represents a system of construction which is still being investigated and its development was made possible only as the result of recent research into the uses of timber in construction.

The basic structural unit of the majority of pre-fabricated houses is the panel, and plywood is particularly well suited as a material to be used for the interior and exterior surfaces of the panel. Plywood gives a large unbroken surface which shrinks less and yet is considerably stronger than solid wood of the same size. Hot press synthetic glues can be used in the manufacture of the plywood which makes a joint which is waterproof. Each panel consists of two plywood faces glued to either side of an

inner structural framework to form a unit similar to a box girder. Contrasted with ordinary frame construction, stressed coverings give much higher strength and rigidity values with a minimum of material. For example, flooring boards are usually nailed to relatively deep joists and they do not materially increase the strength of the joists. Similarly, ceilings fixed to the underside of floor joists are additional dead weight. In the panel developed by the United States Forest Products Laboratory at Madison, the weight is distributed by the joists to the plywood faces so that the joists actually support only about one quarter of the load. This unity of action is due to the complete and continuous rigid joint formed by the glue between the plywood faces and the joists. Such a joint cannot be produced by nailing. The wall panels are constructed of ¼" 3 ply glued on to ¾" x $1^{3}/_{8}$" battens which gives a total wall thickness of $1^{7}/_{8}$". Vertical millions are used to secure the panels and they are set in a suitable mastic which protects the edges of the plywood from moisture and prevents the infiltration of air. The natural finish of the plywood is used for the interior wall surfaces and the exterior surface is given two coats of aluminium priming and then painted. The design of this all-wood pre-fabricated house is probably the most scientific and satisfactory solution to the problem that has yet been offered. However, at present, it appears that the pre-fabricated house is still in the experimental stage.

It must be appreciated that there are many difficulties which have to be overcome before the ideal pre-fabricated house is evolved. The problem is attracting a lot of attention in America and the Continent and it is reasonable to expect that in a few years the factory made house will be an accomplished fact.

THE TANBARK INDUSTRY IN SOUTH AFRICA

Many years ago experiments were started in South Africa growing wattles from Australian seed with the idea of establishing a new industry. In certain areas, notably Natal, these proved so successful that at the present time there are hundreds of thousands of acres under cultivation in the Union.

For a long time no great care was taken as to the methods of cultivation. There is an abundance of very cheap labour in South Africa and with an increasing demand for wattle bark and with the good prices then obtainable, the industry flourished. A large export trade was built up with England and the Continent. Later, manufacture of the tannin extract was established and the amount of extract exported has steadily increased.

Within recent years the research work carried out by the officers of the Forest Service in South Africa has showed that by early and vigorous thinning of the stands, by the use of manure and other devices, the rate of growth of the trees could be enormously increased. As a result of practical methods based on these researches, the yield of bark per acre has been multiplied several times and in addition there is a greater yield of larger sized timber. At the present time, the tanbark is at a very low price and the timber used mainly in the mines and for fuel is the main source of income to the industry.

A number of well designed extract plants are at work. These are of standard types and there is nothing new in the factories which turn out a solid extract containing about 60% of tannin.

The whole industry is an illustration of what may be done by the establishment of industries using trees as a raw material. The enormous improvement of tree covered slopes over bare areas where no wattles have been planted, is a feature of Natal. The results of the application of silvicultural research on the improvement of such an industry is also a valuable lesson.

South Africa has been helped very largely in the establishment of the tannin industry by its cheap labour, but much more than this was needed and the planters have showing great industry and persistence and above all an appreciation of the results of scientific research which is well worthy of imitation.

FAST OR SLOW GROWN TIMBER?

One question which created quite a lot of discussion at the recent Empire Forestry Conference in South Africa was the relative merit of slow and fast grown timber. The excellent results obtained by the application of very early and vigorous thinnings in the wattle plantations seemed to indicate that similar results might be obtained with pines and

eucalypts. At first sight it seems that it should be very desirable to increase tremendously the yield of timber per acre per annum especially in expensively established plantations where the problem of reasonable financial returns is of great importance.

The question, however, is not so simple as this would indicate and Forest Products delegates to the Conference were overwhelmingly of the opinion that there is a grave danger of so reducing the quality of the rapidly grown timber, that the final financial returns would be worse and not better because of the larger yield.

Fast grown timber is generally not as dense as the slower grown timber of the same species and correspondingly is not as strong. It is also softer and hence more liable to wear. Furthermore, it will not give so good a finish. There is no doubt that purchasers of timber are generally willing to pay more for the denser, slower grown material because of its better quantities.

Another factor which has to be considered is that the trees necessarily grown more openly for fast growth will have very large limbs above the portions of the stem which can economically be pruned. The total yield of usable timber is not, therefore, as great as would appear to be the case when total volume per acre alone is considered.

After a good deal of study of this question it was decided that there was insufficient evidence to support the establishment of large areas of fast grown trees, but that it was worthy of a reasonably large experiment.

In the consideration of the problem there was a very desirable co-operation between the silviculturist and those interested in the utilisation of timber and it was clearly shown that there is a greater need for such co-operation.

Incidentally, there arose the more fundamental question as to which was the proper method of procedure. Should the silviculturist devote their work to the production of such timber as was most economical or is the onus on the utilisation laboratories to show how profitably to utilise what silviculturists can best grow? Probably the truth lies somewhere between these two extreme views and proper co-operation will find this middle way.

MECHANICAL TESTS ON HOOP PINE

The Division of Forest Products is about to initiate an extensive series of tests on the mechanical and physical properties of hoop pine. Ten logs have been received from the Queensland Forest Service and these have been converted into test specimens half of which will be tested in the green condition, the other half being stacked for drying prior to testing. In addition to test on clear material which will enable the intrinsic properties of the wood to be determined, tests will be made on scantling sizes containing defects. These tests will enable natural grading rules based on structural principles to be applied, thus permitting better utilisation of this species for purposes where strength is required.

FAULTY GLUED JOINTS

The Division still has many enquiries in regard to faulty glued joints with requests for information as to how to avoid these.

It seems, therefore, opportune to refer once more to the need for exercising great care in gluing, especially in regard to cleanliness, temperature of the glue pot and such other practical methods of avoiding trouble. Trade Circular No. 14 of the Division of Forest Products discusses these points fully and a study of this will answer nearly all of the questions which are asked from time to time. Copies of this Trade Circular may be obtain free on application to the Division.

PLASTICS FROM WOOD WASTE

The utilisation of sawdust has always been a major problem and there have been numerous suggestions for its use as a binding material. It is of interest to learn that recent work at the United States Forest Products Laboratory has shown that there may be an extremely profitable outlet for this waste material in the formation of pressed or moulded products. In the methods employed, coarse sawdust alone has been treated, subsequently mixed with a

binding material and pressed at high temperatures and pressures. The product obtained has been so promising that more detailed investigations are in progress. The Division of Forest Products also hopes to investigate this method of the utilisation of sawmill waste and it is planned to carry out preliminary experiments in the near future.

NEWSLETTER
Forest Products
1936##049
MONTHLY NEWS LETTER NO. 49 FIRST PUBLISHED IN 1 FEBRUARY 1936

TIMBER HOUSES

There is a curious prejudice in many parts of Australia against timber houses which are regarded as being inferior to those built of brick. In some areas, the local authorities forbid the erection of wooden houses in the fear that they will lower the rateable value of the district. There is also a widespread opinion that wooden houses are far more liable to be destroyed by fire than are brick houses. As a matter of fact, the above mentioned objections are not justified and the wooden house has many advantages which should make it far more popular than it is.

Timber lends itself to very varied designs in cottages or large houses. In many American cities the visitor is struck by the beauty and variety of design in the wooden houses. In a recent publication, the Timber Commissioner for British Columbia discusses the advantage of wooden houses. He points out that a timber house is cheaper to construct and is more quickly built. That timber houses are durable is evident when one sees old timber houses in England.

One of the problems of modern civilisation is the demand for variation and the consequent rapid change of fashions. This is applying more and more to house design and one of the essentials in a house built today is that modernisation at some later date shall be readily and cheaply effected. Timber, because of the flexibility of design, has an undoubted advantage in this respect.

As to fire risk, statistics have shown that timber houses are not more liable to fire. The cause of fires in houses is almost invariably internal, and there is as much risk in one type of house as in another. A few years ago, the National Board of Fire Underwriters in the United States made a survey covering 1¼ million houses, of which 75% were timber and 25% brick. The results showed 1.65 fires for each 100 timber houses, and 2.43 fires for each 100 brick houses. The increased number in the case of the brick houses is considered to be due to the fact that, being colder, the heating plants were forced more. English insurance companies accept the wooden house at low rates, realising that it is not a greater risk.

There is room for a great development in the use of timber houses in Australia, and where low cost is of prime importance, the prefabricated house, to which form of construction timber particularly lends itself, seems to be the outstanding suggestion.

STORAGE OF SEASONED TIMBER

The proper handling and storage of timber after seasoning is one of the most important phases of the production of properly seasoned timber, as it is now recognised that not only must the timber be dried to the correct moisture content, but it must be so protected after drying that it leaves the seasoning plant at the correct moisture content. Timber may be properly dried in a kiln and yet be entirely unsuited for certain purposes by the time it is required, just because it was not properly cared for after it was taken from the kiln.

As soon as timber, dried to a moisture content below the equilibrium moisture content of the surrounding atmosphere, is removed from the kiln, it commences to absorb moisture from the surrounding air. Consequently, if the timber is to be kept in such an atmosphere, it should be placed in bulk stacks in a proper

storage shed. Any pick up of moisture in a bulk stack is very slow except on the ends and outside pieces.

Ordinary open storage sheds protect the timber only from rain and not from atmospheric changes. Ideal storage conditions would be found in a shed in which the temperature and wet bulb depression are so maintained that the stock is held at a moisture content consistent with that which it would attain in use. Such conditions are rarely available, but even the use of closed sheds which can be heated in the winter would solve many moisture content problems. If the timber has not been sufficiently dried, or if it has been re-conditioned and not re-dried, it should be left stripped out, preferably in a warm dry shed.

The change in moisture content when timber is transported either by rail or ship is negligible if the timber is properly cared for and adequately protected from rain and sea. Actual tests have shown this to be true even for transport to England or America.

Even after delivery to the user, care must be taken of seasoned timber. If it should become wet by rain shortly before use, either at the job or in a timber merchant's yard, it may not have time to dry out again before it is used. Exposure to even a short is undesirable, although the effect on interior moisture may be less than it would seem because absorption is slow and more water will dry off than penetrates the wood. A continued rainy spell or water in the crevices of closely piled stock where it cannot dry off again, may result in a very appreciable increase in moisture content. Seasoned timber which must be left out of doors even for a short period should be adequately protected by tarpaulins.

NAILS

Of all the wood fasteners, wire nails are those most commonly used, having the advantages of cheapness and ease of fixing. Their principal disadvantages are comparatively low holding power and tendency to split the wood in driving. In an endeavour to overcome these disadvantages, a considerable amount of research work has been carried out all over the world, and a great number of special nails have been designed and patented. Some of these have been very successful, while others have been no better than the plain nail, and in some cases, inferior to it.

The quest for greater holding power has been directed along three main lines:-

(a) Increasing the area of contact with the wood for a nail of given weight, e.g. using square nails, oval nails, and fluted nails.

(b) Increasing the friction between the nail and the wood, for example, by coating the nail with a resinous compound or by roughening the surface of the nail by chemical treatment or by sand rumbling.

(c) Obtaining a mechanical hold in addition to frictional hold, e.g. barbed nails, twisted (screw) nails.

Of the above, those coated with a resinous compound ("Cement-coated") and the barbed nails have been the most popular overseas, although tests by the United States Forest Products Laboratory showed that when driven into dry wood, the barbed nail used in the United States is not as efficient as the plain nail. In Australia, special nails claimed to have high holding power have been used to a considerable extent, particularly in the manufacture of wooden boxes. These nails may be divided into the following classes:-

(1) Barbed or jagged nails.
(2) Twisted or spiral nails (screw nails).
(3) Cement-coated nails.
(4) Rusted and sand rumbled nails.

Very extensive tests were carried out by the Division of Forest Products to determine the relative merits of these nails. The results of the tests showed that the twisted and rusted nails were definitely superior to plain nails in holding power, but that the other types of nails listed above were little or no better than plain nails. The most efficient nail of the seventeen types tested was a twisted nail made from square wire. This nail was developed in Australia. Information has recently been received that a Swedish firm has commenced manufacturing this type of nail, and that their tests confirm those carried out by this Division. Where high holding power is important, it is therefore recommended that either twisted or rusted nails should be used, their slight extra cost being more than offset by their increased efficiency.

The second objection to the use of nails as fastening, i.e. splitting of the wood, is particularly serious in the case of hardwoods which, as a rule, tend to split more easily than softwood. The best way to overcome the splitting is to drill a hole slightly smaller than the diameter of the nail, but for many purposes, this is impracticable because of the cost. Splitting can be greatly reduced, and in most cases entirely eliminated by blunting the point of the nail. It has been definitely demonstrated that a pointless nail has practically no tendency to split the wood. This may appear strange at first sight, but it is easily accounted for when the wedging action of a nail point is considered. With a blunt nail, there is no wedging apart of the wood fibres, the nail crushing itself through the wood. Of course, a blunt nail is much harder to drive than a pointed nail, and its holding power is also considerably less, but as a means of preventing splitting, it can be confidently recommended. Blunt nails are on the Australian market, being known as "dump nails". In addition to the completely blunted nail, a nail (called the "semi-dump") with a point much blunter than usual is available. This is often used as a compromise between the completely blunted and the pointed nail having some of the advantages of both.

PUBLICATIONS OF THE DIVISION

1. A recent publication of the Division of Forest Products is Technical Paper No. 19 (C.S.I.R. Pamphlet No. 61) which deals with "Special Tests on the Compressive Strength of Green Karri". In this paper, prepared by the Timber Testing Officer of the Division, Mr I. Langlands, the standard methods adopted in English-speaking countries for the testing of wood parallel to, and perpendicular to, the grain are discussed. The results of the tests showed that green karri (*Eucalyptus diversicolor*) will withstand greater stresses perpendicular to the grain when the load is applied to the tangential (back sawn) face than when it is applied to the radial (quarter sawn) face. The modulus of elasticity of karri is also much higher when the load is applied to the tangential face.

   Results are also given of a series of tests on green karri carried out to check the applicability to this species of formulae suggested by the United States Forest Products Laboratory for Northern Hemisphere timbers.

   Copies of this publication, which would prove of interest to all architects and engineers interested in wooden construction, may be obtained on application to the Division.

2. Trade Circular No. 29 has been prepared and will be issued shortly. This circular deals with Gluing Practice, and is the third part of a series. In it, Vegetable, Vegetable-Protein, Liquid and Blood-Albumen Glues are discussed. While these are not as widely known as animal and casein glues, many inquiries relative to their preparation and uses have been received by the Division, and these have led to the writing of this Trade Circular, in which essential information concerning them is given.

3. In the February issue of the Journal of the Council for Scientific and Industrial Research will appear an interesting paper on "The Preservation of Timber against the Attacks of the Powder Post Borer by Impregnation with Various Chemicals". This paper is the result of research work carried out in the Preservation Section of the Division of Forest Products, and is an account of the tests of certain chemicals used for the preservation of sapwood against the attack of the powder post borer. It was found that various inorganic chemicals, e.g. sodium fluosilicate, borax, sodium fluoride, and zinc chloride, gave protection against the powder post borer in low concentrations, that for sodium fluorosilicates being only 1/40th lb. of salt per cubic foot of sapwood. Various organic chemicals also appear to be very effective, but further work on these is necessary.

BREVITIES

Arrangements have been made for some publicity to be given to the work of the Division of Forest Products in the Ideal Home and Building Exhibition, which will open in

the Exhibition Buildings, Melbourne, on Friday, February 21st. The general public is not in touch with all the principles and advances in building construction, and the Division of Forest Products is taking this opportunity to exhibit some of the more important factors relating to the proper use of timber in house construction.

If trouble due to shrinking and swelling is to be reduced to a minimum, the timber must be at a certain moisture content when fixed into position. This fact will be clearly shown by two doors, one of which has been constructed with green timber and the other with timber at the correct moisture content. A working model of a cross-shaft internal fan kiln; an experiment to recondition timber, which has collapsed during drying; and a blinker electrical moisture meter, which is used for the rapid determination of the moisture content of timber, are included n the exhibit.

A small scale detail of a house foundation will explain what precautions are necessary to prevent the timber from being attacked by termites.

An exhibit showing the use of timber connectors will be included. A model of a roof truss which is constructed with split ring connectors and which represents some of the latest methods of structural timber design will be shown.

CSIRO
AUSTRALIA

NEWSLETTER
Forest Products
1936##050
MONTHLY NEWS LETTER NO. 50 FIRST PUBLISHED IN 1 MARCH 1936

IDEAL HOMES EXHIBITION

Keen interest is being displayed by the general public in the Ideal Homes Exhibition, which is being held at the Exhibition Building, Melbourne, from February 21st to March 7th. The show is noteworthy in all departments and the many exhibits provide a valuable collection of practical ideas from which the homemaker can select just those things which contribute to the comfort, efficiency and artistry of his or her ideal home.

There is no limit to the number of different materials which can be used for any one purpose. Organisations selling brick, steel, cement, plaster and timber have far-reaching claims to make about their own particular products. In this regard, it is of interest to note the contribution that wood is making.

The enterprise that the Timber Merchants' Association of Melbourne have shown has been amply rewarded by the interest which the public has taken in the four-roomed modern timber house. This exhibit has been carefully examined by many people and it will surely convince them that it is possible to erect a house which is both comfortable and attractive at a very reasonable cost. For outside walls, there is a wide choice of materials and of these, plywood has to be marked as the most attractive. There are some particularly beautiful exhibits of veneered panels which do credit to the Australian craftsman. The popularity of the veneered door is evidenced by the steadily increasing amounts of veneer and plywood which are being used in door manufacture. The vogue for this type of door indicates that the public is appreciating the superiority of laminated wood construction and the attractiveness of finely figured veneers.

Interior decoration has received plenty of publicity and, in fact, the elaborate furniture displays are the outstanding feature of the Exhibition. The furniture reflects great credit on those connected with its design and construction and indicates the trend of modern fashions. The furniture displayed is pleasing in appearance and original in design and shows that the lighter coloured woods are becoming increasingly popular. It also appears that the curve has returned to prominence in a form which is more pleasing than ever.

In recent years, a great amount of work has been carried out at the various Forest Products Laboratories throughout the world on the investigation of the properties of glues in order to improve gluing methods in the factory and to develop the design and construction of laminated woodwork. The results of this research work is reflected in the excellence of the furniture and veneer panels which have made such a material contribution to the success of the Exhibition.

THE EFFECT OF SMALL DEFECTS ON THE BENDING OF TIMBER

To bend wood successfully, the first consideration is the careful selection of the stock. It is far cheaper to select only good bending material than to go to the expense of attempting to bend material that should have been rejected only to be forced to discard it later because of failures. It is essential that straight grained material should be selected for bending work; sloping grain inevitably leads to failures in the bending operation in all but the simplest of bends.

Large knots are an obvious cause of failure, but small knots, if located on the tension or outside of the curve, are sometimes permissible if efficient strapping is employed. However, in a recent publication from the Princes Risborough Forest Products Research Laboratory, W.C. Stevens gives the result of experiments which showed that the presence of pin knots on the compression or inside face of the curve is fatal to success.

The samples were taken from a consignment of chestnut of excellent quality except for the pin knots. After suitable steaming treatment the pieces were bent to a semi-circle of 8 inches radius and in every case the pieces containing the pin knots failed to produce a good bend, although those free from knots bent very satisfactorily. The tests were carried out using both green and air-dry samples and both hack-sawn and quarter-sawn pieces with similar results. At each knot on the inner face of the bend there occurred a severe local bursting or splitting accompanied in many cases by a more distributed buckling of the inner surface and edges of the bend.

No pin knots, however small, appear to be harmless unless situated on the very outer face of the bend. This agrees with the earlier work of the United States Forest Products Laboratory which showed that any irregularities, such as saw marks, on the surface of the piece seriously affect the bend and may cause failure.

THE SAWING OF QUEENSLAND WALNUT

The sawing of Queensland walnut (*Endiandra palmerstoni*) has always presented difficulties owing to the rapid blunting of the saws. This effect has been attributed to the presence of fine particles of silica (similar to ordinary quartz) in the cells of the wood. This amounts to some 1% of the weight of the wood. The particles are very small, but apparently in ordinary sawing they are very effective in blunting the cutting edge of the saw teeth.

An importer of walnut in London some years ago complained that it had cost him £17 to cut up a log 10 feet in length.

When walnut logs are steamed and cut into veneers, no such trouble is experienced and the probable reason for this is that in the hot wet condition the wood cells are soft and plastic and the advancing edge of the saw tooth pushes the silica particles to one side. When, however, the timber is dry and the fibres set there is a considerable resistance to the displacement of the particles. They, therefore, are held against the edge of the saw and so blunt it. This is probably the reason why, at times, it is found that sapwood is more difficult to cut than truewood. The sapwood dries out first and may be dry enough to cause trouble while the truewood is still wet enough to cause trouble while the truewood is still wet enough to allow the particles of silica to be pushed to one side.

Fast sawing increases the trouble which further confirms the theory set out above. Consequently practice in Australia has developed on the basis of slower sawing with vertical saws and widely spaced teeth. In England, Spear and Jacksons', the well-known saw makers of Sheffield, spent several years and much money in trying to develop a circular saw with special tips to the teeth in order to saw Queensland walnut. Until comparatively recently they were not successful, but they have now made a saw with inserted teeth tipped with a special steel. This saw is doing remarkably well.

A well known firm of furniture manufacturers in Reading (England) installed one of these saws about twelve months ago, and it has been busy cutting walnut for several months and has given no trouble whatever.

It is interesting to see dry walnut boards being sawn as easily as any other hardwood timbers. There is none of the burning which one usually associates with attempts to saw this timber rapidly. If any one cutting this timber is interested, details of the saw to use could be obtained from Spear and Jacksons', Sheffield, England, or the Division of Forest Products will be glad to write on their behalf.

ELECTRICAL MOISTURE METERS SPECIES CORRECTION FIGURES

There are a number of different types of electrical moisture meters on the market. In the majority of these, the moisture content of the timber is determined by measuring indirectly the electrical resistance of the timber.

However, this resistance varies somewhat from species to species at the same moisture content and small corrections are necessary when a moisture meter is used on a number of different timbers.

List of such correction figures for a large number of commercial Australian timbers as well as for other imported species have been issued from time to time and forwarded to all those known to be using electrical moisture meters in Australia. An additional list of such figures is now completed and will be distributed shortly. If anyone who is interested or who is using an electrical moisture meter is not receiving these lists a complete set may be obtained on application to the Division.

TRACTOR LOGGING

The Senior Seasoning Officer of the Division, Mr C.S. Elliot, is at present in the United States studying the latest developments in timber utilisation. Amongst the features which have impressed him is the greatly increased use of diesel tractors. These, of course, are not known in Australia, but there appears to be great scope for their further use.

The tractors in general use are 75 H.P., working with an arch, and they are giving good results in fairly steep but not very rough country logging down hill. The opinion of the U.S.A. loggers seems to be that they are not very suitable for logging in steep country, although in British Columbia, by using special mill brakes, much steeper country is negotiated.

One system of logging is worthy of mention. In this cheap roads are made by a bull dozer up to the margin of a felled area. The caterpillar tractor goes to the limit of these roads and their anchors, using the winding drums for hauling logs to that point. For this hauling, the rope is run through a pulley on a low span and the hauling is similar to that employed at some Victorian mills with steam winches except that a much shorter haul is obtained with the tractor drum. At the tractor the logs are loaded on to trucks.

The more extensive use of selective felling has undoubtedly been a factor in bringing into prominence tractor logging because of the serious injury to the remainder of the stand inevitable with the high lead system.

POLE PRESERVATION EXPERIMENTS

The Senior Preservation Officer, Mr J.E. Cummins, left for New South Wales early in February to supervise the commencement of a series of field tests of commercial pole timbers. The supply of naturally durable pole timbers is decreasing, and cheap, efficient means are required to preserve the less durable species against decay and termite attack. The tests, which are on a large scale, will be carried out at two sites, one at Wyong and the other at Uffington.

Poles will be tested at Wyong against decay, while at Uffington they will be exposed to severe termite attack. One hundred and fifty five pole stubs will be installed on each site, of which 140 will be 10 feet in length and the remainder 20 feet. The pole stubs will be cut from sound trees of flooded gum, spotted gum, Sydney blue gum, blackbutt, and grey ironbark. Seven different preservative treatments of likely value will be used.

These will include treatments with creosote oil and zinc chloride and two patented proprietary methods.

The successful launching of this important series of tests is largely due to the co-operation of several of the principal New South Wales public departments. The Forestry Commission, Public Works Department, Postmaster General's Department, Railways Department, and the Sydney City Council have all joined with the Council for Scientific and Industrial Research in the promotion of this work. Inspections will be made at each test site annually, but a few years at least must elapse before a definite evaluation of the various methods can be made.

While in New South Wales, Mr Cummins will also inquire into the problem of the powder post borer with a view to the commercial application of certain control methods which have been found successful in small scale tests carried out in the Divisional Laboratories.

GUM VEINS

With the increasing attention being paid to the improvement of the grading of Australian timbers and the demand for uniform quality in parcels of timber, a consideration of gum veins in the Australian eucalypts is important.

A gum vein is a layer of degenerated tissue between two successive layers of normal wood. Instead of the cambium layer forming normal tissue consisting of wood fibres, vessels, medullary rays and soft tissue, in response to some stimulus, it forms bands of irregular soft tissue together with patches of kino. This irregular soft tissue connects the normal tissue of the previous growth layers with that of the succeeding layers. Such degenerative cambial activity may take place over an area varying from a fraction of an inch high and a fraction of an inch wide to one of twelve feet or more high (i.e. up the trunk) and almost completely encircling the tree.

The reasons for this abnormal activity of the cambium layer are not definitely known at present. It is certain, however, that wounding due either to insects or to mechanical means will lead to gum vein formation.

Not to be confused with gum veins are the gum pockets which are holes that have been filled with kino. These holes are due to some external agency, commonly borers. Gum veins always run with the grain, gum pockets may not.

When considering the use of timber containing gum veins, it should be remembered that for most purposes, they do not affect the strength of the wood, but under certain conditions, they may weaken a beam in horizontal shear and therefore should be limited in size.

1936##051

NEWS LETTER NO. 51 April 1st, 1936.

THE COMMERCIAL TREATMENT OF TIMBER TO PREVENT LYCTUS ATTACK.

Considerable loss and inconvenience is caused each year in Australia by the Lyctus or powder post borer which attacks the sapwood of a number of the principal commercial hardwoods. The borer lays its eggs in tae timber during the summer months. After hatching, the grub commences boring and may continue to do so for ten months or more. It then pupates and changes to the mature form, which is the common Lyctus beetle. The beetle cuts the familiar flight holes and emerges to infest fresh timber. Unfortunately, there is no external sign of borer attack until the emergence hole of the beetle appears. In consequence, timber can be made up during the early stages of infestation with disastrous results later.

The Division of Forest Products has carried out a series of experiments with a number of chemicals in an endeavour to find a cheap Fnd generally satisfactory substance to render the sapwood of the timber immune to Lyctus attack. Three chemicals have been selected, They are, in order of preference, sodium fluosilicate, sodium. fluoride and borax. They are cheap, non-poisonous to man, and do not affect the working or finishing properties of wood. It now remains to work out a method of commercial treatment.

Timber treatments can be divided into two classes:

(1) Surface treatments. In these, the timber is dipped, painted or sprayed with the preservative which does not penetrate but forms a surface coat.

(2) Impregnation treatments. The timber is actually penetrated by the preservative. These are much more satisfactory for most purposes than surface treatments which rely on the soundness of the surface coat which may easily be broken.

Types of impregnation treatments.

There are two main types. If the timber is seasoned, it can be treated by a pressure process, or a hot and cold bath process,
For pressure treatment the seasoned timber is placed in a metal cylinder and the preservative liquid is forced into it under high pressure. Special plant including a treating cylinder capable of standing pressures of 200 lbs/sq. inch and more, a vacuum pump, an air compressor and a source of heat is required for this method. The hot and cold bath process is really a modified pressure process. The seasoned timber is immersed in a vat of the hot preservative solution for some hours to dispel the air and water vapour in the pores. The preservative liquid is then allowed to cool down. During this cooling period the rarefied air in the timber contracts and the air pressure on the surface of the liquid forces in the preservative Handling gear for the timber, a large vat and a source of heat are required for this type of treatment.

Pressure treatments have many advantages, amongst the chief of which is the ability to vary the treating schedule with the type of timber and the penetration and absorption of preservative required.

Such control is not necessary, however, in impregnating timber with water solutions to prevent Lyctus attack. Provided the timber is thoroughly impregnated, the result will be satisfactory. It is not likely that the sapwood of any of the commercial Australian hardwoods will prove difficult to impregnate by the hot and cold bath process unless timber with a wide sapwood is treated in large sizes.

Treatments with green timber.

If it is undesirable to season the timber, it can be treated green by steeping in the cold or hot preservative solution. The chemical in solution then diffuses into the sap in the timber. It is more

difficult to secure satisfactory penetration and absorption by this method, particularly in large sizes, but in thicknesses of ½" or less, good results should be obtained fairly easily. A heating or boiling period of about 24 hours or more would be required. The quantities of the preservative chemicals required to prevent Lyctus attack are very small. Amounts ranging from one fortieth of a lb, per cu.ft. for sodium fluosilioate to one tenth of a lb. per cu.ft. for borax were found quite effective in laboratory tests. Higher absorptions would probably be safer in actual practice, but it should not be difficult to secure in the case of sodium fluosilicate, at least, satisfactory results with thin stock.

Merits of the various processes.

Treatments with seasoned timber have one great disadvantage. It is necessary to protect the timber against Lyctus attack during the seasoning period. There is at present no established method of doing this. It would also add to the cost of the timber. Treatment of green timber in small sizes appears more promising. The equipment required is a vat of sufficient size, fitted with steam coils, and handling gear for the timber. In actual practice, treatments could be modified to suit working conditions. In a veneer plant, the preservative chemical could be introduced into the boiling vat or it might be possible to immerse the veneers after they are cut. Impregnation of thin veneers would be very rapid.

THE DIVISION OF FOREST PRODUCTS EXHIBIT.

The Ideal Homes Exhibition which was held recently in Melbourne was acclaimed as a great success by all who visited it. Every stand received its full share of publicity - some because of the novelty or beauty of the display and others because of their essentially practical value, The display, which was arranged by the Division of Forest products can be classed in the latter, section. It attracted a considerable amount of attention and many people, both men and women, wanted some particular exhibit or specific problem explained.

The following is a brief description of the various exhibits. Two doors were displayed: The frame of one was constructed with properly kiln dried and reconditioned hardwood and plywood panels and the frame of the other was constructed with green timber and solid timber panels. The excessive shrinkage in this door showed clearly how necessary it is to use timber at the correct moisture content. The water contained by the timber in these two doors, before and after drying, was displayed in glass jars, and the majority of the visitors were surprised to learn the quantity of water present in green timber.

The moisture content of timber can be obtained readily by electrical means and a commercial blinker similar to the type being used by architects, builders and timber merchants was displayed. The operation of the blinker was explained by a diagrammatic layout and an illuminated panel.

Many people were interested to see the model timber seasoning kiln working and to learn how timber is dried.

The specimens showing sections of collapsed and reconditioned timber and a block of silky oak on which the structure of the wood was shown by means of magnified photographs also proved to be of great interest.

Various types of timber connectors, a model truss which had been fabricated with split ring connectors and a full size cut away connector joint were shown. Timber connectors are being used successfully in Europe and America for the construction of radio and fire towers, bridges and roof trusses. The first fire tower in Australia to be constructed with timber connectors was recently erected in Western Australia. A large number of inquiries were received from architects and engineers regarding the details of timber connector construction.

Prominence was given to a small scale wooden house foundation and the construction necessary to prevent termite attack was shown. What is a termite? This question was asked by many people who

probably did not associate the scientifically correct name "termite" with white ants. This ignorance may be fortunate because termites are not a serious problem in Melbourne, but in other parts of Australia they have caused and are still causing tremendous damage. There are various kinds of wood destroying termites in this country and one of the most destructive is the large Mastotermes of northern Australia.

In addition, questions were asked about borers, dry rot, gluing and pre-fabricated construction, but there was not sufficient space available to show exhibits for all of these. If any particulars are required on any of these subjects, enquiries may be addressed to the Chief, Division of Forest Products, 314 Albert Street, East Melbourne.

THE FUMING OF TIMBER *

Of recent years, fashions in wooden furniture and fittings have been changing very rapidly, and there has been a continual demand for new timbers or new arrangements of timbers. The utilisation of highly figured woods in the form of veneers has been the response of the timber industry to this demand, and all possible combinations of veneer have been used to give the requisite variation in appearance. Lately, colour has also received attention and the world has literally been combed for veneer timbers showing colours out of the ordinary.

While it is possible to stain timber with water, oil and spirit stains, such a procedure is not usually favoured because in this process some of the life of the timber is almost inevitably lost. There is an old method, however, which is not subject to this objection, but which has not of recent years received the attention it deserves. This is the fuming of timber with ammonia. Timber can be regarded chemically as consisting of three main constituents, cellulose, lignin and extractives. The cellulose and lignin Comprise the structure of the timber, and give it it strength and other properties. The extractives may be regarded as extraneous materials, and vary considerably from timber to timber.

Many pored timbers, however, include in their extractives a greater or lesser amount of tannins, and these tannins are affected by ammonia, so that when fuming, colour change takes place.

The fuming process consists simply of placing the timber in a gas-tight chamber and admitting either ammonia gas or placing in the chamber a tray of concentrated ammonia solution. With some timbers, penetration of the ammonia into the timber is very rapid and after a few hours, the colour of the timber will be changed to a depth of ⅛" or more. With other timbers, however, the penetration is much slower and several days may be necessary to obtain change in colour at depth. On removal from the chamber, the timber is ready for immediate polishing.

In Australia, fuming is probably best known with timbers of the Australian oak group. Here, the pale straw colour is changed to a rich nut broom. Often a slight greenish tint is present which greatly enhances the beauty of the timber. Fuming has also been used with excellent results with Queensland satinay, and there can be no doubt that many other Australian timbers should be fumed to produce new colour effects.

Fuming is of assistance also to the wood anatomist identifying timber. For example, two timbers closely allied in appearance, brush box and turpentine, can readily be distinguished by the fuming test, the former being unchanged and the latter changing from a reddish to a greyish colour.

There are other chemical methods of changing the colour of timber and the possibilities of these with Australian timbers would be well worth investigation,

TRADE CIRCULARS OF THE DIVISION OF FOREST PRODUCTS.

The timber industry has always suffered from the lack of text books covering all phases of timber and its utilisation. The Division of Forest Products has tried to remove this deficiency by issuing a series of publications called trade circulars. Thirty of these have been published to date, and they are

distributed on a wide mailing list of sawmillers, timber merchants, architects, builders and others associated with the preparation and use of timber.

These trade circulars have been written, keeping in mind the practical aspects of timber utilisation, and while they have been made as accurate as possible, scientific terms have been avoided so that technical training is not necessary for their comprehension.

From time to time, the Division receives requests from executives of large firms, asking for extra copies of certain trade circulars for the use of foremen or workmen, carrying out special work. The Division is only too glad to comply with these requests, for one of the objects of writing the circulars was to bring the man actually handling the timber more closely into touch with scientific developments with concern to the material he uses.

It is suggested, therefore, that firms on the mailing list should ask for the number of copies of trade circulars forwarded to them to be increased and that they should file complete sets for the use of their executives and distribute copies to such of their operatives as will be interested in particular numbers. For example, every man in charge of a glue room should receive copies of the series of circulars dealing with glues. A yard foreman should have the
trade circular dealing with air seasoning of boards, and soon.

THE WORKING OF WOOD.

The attention of the Division of Forest Products has again been drawn to the fact that there are still some architects and builders who do not clearly understand what is meant by the working of timber. A t least, if they have understood its real significance, this is not borne out in practice as seen by a recent inspection of several suburban residences.

The working of any laminated board, such as plywood or corestock, is considerably less than that of solid timber because in this form of construction, advantage is taken of the fact that the longitudinal shrinkage of timber is negligible. This has enabled architects and interior decorators to use large unbroken surfaces of wood for panelling, doors and furniture.

However, the use of plywood for such purposes has by no means captured the market for which, until several years ago, solid timber was solely used. For some articles, such as table tops, provision can be made for the working of timber quite easily, but it is impracticable to make the same provision for a solid panel in. a flush door.

Working in timber can be reduced, but not entirelyt eliminated, and this must be remembered in the proper design and construction of all wood work. Points to observe to reduce the working of timber are as follows:-
(1) The timber should be at a moisture content approximately half way between the two extremes to which it will come when in use.
(2) Quarter-sawn timbers with the least tendency to work should be chosen.
(3) Plywood and laminated wood work, provided they are made of properly dried material, provide an effective means of overcoming trouble from this cause,

This subject is described fully in Trade Circular No.24 - "The 'Working" of Wood", which has been published by the Division, and can be obtained free upon request to the Chief, Division of Forest Products, 314 Albert Stop East Melbourne.

BREVITIES.

The Deputy Chief of the Division of Forest Products, Mr. S.A. Clarke, will be absent in Western Australia during April. His visit to this State is connected with timber utilisation and work on

standards as applied to timber. While there, he will inspect the 100 ft, wooden fire tower recently erected with the use of timber connectors.

Mr. S.F. Rust, Preservation Officer of the Division of Forest Products, has recently returned from a visit to Queensland, where he has spent the past four months assisting plywood manufacturers with their gluing problems.

1936##052

NEWS LETTER NO. 52 May 1st, 1936.

RECENT DEVELOPMENTS IN FOREST PRODUCTS RESEARCH IN U.S.A.

The Forest Products Laboratory at Madison, Wisconsin, was the first in the field of organised research into the properties and uses of timber, and it has continued to lead the way in the general attack on timber problems. With its magnificient laboratories, splendid equipment, and very experienced staff, the laboratory, year by year, adds largely to the world knowledge of timber. The Annual Report of the Laboratory published in August, 1935, gives a brief account of many of its activities, some at least of which are of great interest in Australia.

Improvements in the field of wood construction is one of its major lines of research, and the system developed for the erection of standardised prefabricated wooden houses is an important contribution in this direction. The house; is built of units which are water-tight, and are easily fitted. The walls, floors and roof are built of panels fabricated by gluing plywood to suitable framing. These panels are very strong and rigid in proportion to their weight and form the main contribution to the solution of the problem of cheap, efficient, and comfortable wooden houses. The erection of a complete house required only 21 hours work by seven men. The laboratory has realised that plywood must be increasingly used in construction on account of its strength, nail-holding ability, uniformity of properties and because large, light weight units can be used, Plywood units were also employed in the construction of the roof and walls of the large storage buildings which are used to provide experimental data in many directions in connection with this new form of construction.

Glued laminated construction is another field in which the laboratory is interested, and the report shows that there have been material advances in this direction. The practical advantages of laminated wood arch construction were demonstrated by the use of solid and box type glued arches of 46 ft; span in the building referred to. This resulted in low cost, simple and rapid erection and considerable gain in interior working space.

Much work has also been done on the use of modern plate and ring connectors and information has been obtained as to their proper spacing, the number and sizes required for given loads, and other factors in design.

A splendid contribution to timber design has been the publication of r wood handbook which presents in a comparatively small volume then results of many years of patient work. It provides information which has previously only been available for those construction materials which compote with wood.

This excellent production can be obtained at a very low cost (25 cents) from the Superintendent of Documents, Washington, D.C., U.S.A., and will prove of immense value to architects and engineers. It should also prove a valuable factor in re-establishing timber in some, at least of its legitimate fields of use.

Another field of work to which the laboratory has greatly contributed is that of coatings and treatments to reduce the maintenance costs on wooden structures, The discovery of the great value of aluminium paint as the best primer to reduce to a minimum the absorption of moisture and later the addition of flake graphite to priming paints for softwoods (non-pored woods) to retard the disintegration. of paint coatings are-two of the many contributions to the solution of paint problems made by the laboratory at Madison.

Aluminium priming has been used in the construction of the new laboratories of the Australian Division of Forest Products in Melbourne. Its use in Australia is by no means common as yet, due to thc lack of knowledge of its value, but it is sure to come as this knowledge spreads.

Considerable development has been made in extending knowledge as regards the salt seasoning process for large size timbers and it has been shown, for example, that, by using this method poles and piles of Western red cedar, which have always seriously checked during drying, can now be seasoned to 12% moisture content without checking.

Other main directions on which advances have been made are in testing the machining qualities of timbers, in logging and milling studies, in pulp paper studies, and in the. development of plastic materials from sawdust.

Altogether, the story disclosed by this report makes most interesting reading and serves to indicate the tremendous field of work still awaiting exploration by workers in timber research. It also indicates the valuable practical results which can be obtained by the application of scientific methods of investigation on one of the most ancient materials of construction which has partly gone out of use because of the lack of knowledge of its properties, treatment and uses.

END MATCHING OF_ FLOORING.

One of the problems associated with the sawmilling of timber is the accumulation of short lengths. Many attempts have been made to find a profitable market for these, but the problem is yet far from solved. One of the most promising methods is the adoption of end matching of flooring.

End matching is a process used with ordinary tongued and grooved flooring, but in addition to each board having a tongue on one edge and a groove on the other, one end is also provided with a tongue and the other end with a groove. End. joints between adjacent boards, therefore, match in the same way as do the edge joints. The importance of end matching is that support is provided for the end joints and it is therefore not necessary to make a joint over a flooring joist as required in ordinary flooring stock. Considerable time and timber is, therefore, saved because the carpenter, when laying flooring, does not have to cut his timber to the exact lengths to fit or the joists and to square the ends to provide a neat junction. That this sawing of the ends by the carpenter on the job is a comparatively expensive process is well recognized and it is, therefore, usual to order flooring in reasonably long lengths to reduce such work to a minimum.

Since such labour and waste of material is no longer necessary with end matched flooring, it is not necessary to restrict the flooring purchased to long lengths only, and it is customary when supplying an order of end matched material to forward short and long lengths indiscriminately. It is generally considered that the saving to the timber merchant resulting from his finding a market for his short lengths compensates for the cost of end matching, while the labour of laying the floor is so much reduced that the builder is more than compensated for the larger number of pieces he has to handle.

Unfortunately, if long lengths of timber are to be end matched, comparatively expensive equipment is necessary and few sawmillers and timber merchants have felt justified in incurring this expenditure. A simple way out of the difficulty has been found in Western Australia. Here, end matching has been generally adopted, but short lengths only up to about 6 feet are treated. The short length end matched stock is then sold at about the same price as second grade flooring.

By dealing with only short length stock, it is possible for the miller 'to carry out his end matching with standard joinery equipment. A typical process is as follows. The short pieces of timber are sorted into length and graded at the hoed of the planing machine, and are then fed through the machine, a few pieces of each length at a time. They are then docked square on the cross-cut, the greatest length being obtained out of each board, and no attempt being made to dock the timber to any pre-determined size, such as even feet of length. After docking, one end of each piece is tongued on a tenoning machine and the final process consists of cutting the groove on the other end on a vertical spindle moulder. The end matched stock is then built up in stacks of some predetermined length and, say, a foot or two wide. It can be sold either by the 100 lineal feet or the 100 square feet. When an order is received, it is not necessary to tally the stock piece by piece, but the requisite number of rows are taken off the stack to provide the quantity required. For example, if the stack is 20 ft. long and 2 ft. wide and 400 square feet or 4 squares are required, 10 rows would be removed.

For end matching to be a success, a number of precautions must be observed. The first is that the timber must be properly seasoned. Insufficient seasoning or badly warped material will give difficulty in laying because ends, tongues and grooves will not fit neatly and easily. Providing, however, the timber is properly seasoned, no fear on this score need be entertained. Secondly, careful attention must be paid to the end matching to give thoroughly square docking in the first place, and to give clean unsplintered cuts from the cutting of the tongue and the groove. This is not difficult with properly operated equipment, except that it has not been found desirable generally to end match material over 5" wide by this process. 3" and 4" stock is most favoured.

This method of end matching might well be extended to a number of. eastern States plants. Where there is an outlet for short length material, the miller can often raise the grade of his material by docking out faults at the mill. There are many mills where such a procedure is desirable, and where the total value of the mill output would thereby be increased. Also, there has been a tendency in recent years to supply hardwood flooring in mixed species, particularly where these species vary widely in colour. Many are attracted by the strong colour contrasts so obtained, Original effects of a similar nature could be obtained by the use of short length end matched stock in species with contrasting colours.

THE NEED FOR THE DEVELOP NT OF WOODWORKING TESTS.

In the sawing and finishing of timber the design and condition of the tools used play an important part and greatly influence the ease with which the operations can be carried out as well as the finish produced, Even amateur woodworkers realise that blunt cutting edges on saws, planes, or chisels make carpentry arduous and produce unsatisfactory results. It is not perhaps generally recognised that the sharpest tools can make easy work hard if certain principles of design are not observed.

In the case of carpenters' saws, for example, the teeth on the ripsaw are of different shape to those on the cross-cut saw. Justification for this difference is found immediately if one attempts to rip down a board with a cross cut saw and then does the same job with the correct saw. There is a great difference in the effort required when using the right and wrong saws. Similarly in a sawmill, something like havoc would result if the saws on the breastbench and docker were interchanged. The design of the teeth of the, saw is based on whether it is to cut along the grain or across it.

Saw sharpening specialists, after years of practical experience, have been able to improve the results obtained in various sawing operations. Some docking saws now used in wood working plants will produce an end surface almost as smooth as if it had been planed. Some ripsaws saws produce edges so true that pieces can be glued edge to edge without further treatment. But these improvements are not general throughout the sawmilling or woodworking industries. Saws that have proved most suitable with common timbers often give poor results with new species. The immediate conclusion has been that the new species is most difficult to saw, but often, after numerous experiments, modifications of design in the shape of the saw teeth so improve the cutting that the new timber cuts as easily as any other. In this field woodworking research can be of great service to the industry in demonstrating principles and correcting faults likely to occur simply by following precedents.

Modern wood-working research has aimed particularly at a study of planing technique. Both hand planes and planing machines are fairly standard and are designed to deal efficiently with common timbers. Some woods, however, do not take a satisfactory finish with standard settings and modifications are necessary to obtain the required finish economically. Experiments have shown that the cutting angle of the plane knives markedly influences the smoothness of the finish. Through research, it has been possible to produce high quality finishes on a number of timbers that formerly were regarded as difficult.

If machinery is improved, all subsequent steps in finishing are greatly facilitated and smooth surfaces are obtained more readily. In Australia, hundreds of timbers occur which are more or less unknown to overseas manufacturers of machinery and limitations are thereby imposed on the attainment of ideal

finishing. There is a definite need for information on wood-working properties so that the beauty and decorative value our timbers can be fully developed.

BREVITIES.

Yard Driers - A comparatively recent development in the seasoning of timber has been in the direction of accelerating air seasoning by the use of yard driers. These driers are at present being used by a number of timber mills on the West Coast of America and very favourable reports of their effectivenesss have been received. Briefly, the yard drier consists of a portable fan or fans, together with appropriate housing and these are placed between pairs of air-drying stacks. They are used to promote a rapid air movement across the timber and thus hasten the drying. Further acceleration is obtained in some cases by the addition of heating pipes. No commercial tests have been made in Australia with this type of equipment, but a small scale test has been made in the laboratories of the Division of Forest Products. This test indicted that in many cases the system would have much to recommend it.

2. Dr. W. E.,. Cohen, Senior Chemist of the Division of Forest Products, who is at present studying at the United States Forest .Products Laboratory, writes as follows in regard to an item in a news letter relating to wooden houses which raised a good deal of attention and considerable skepticism in some quarters:-
"Timber houses in the United States were at one time rated higher for fire insurance. Nowadays whether the house be of brick or timber the insurance rate is the same provided the roof is not of wooden shingles". In other words, the fire hazard. of houses is governed entirely by the type of roof. Shingle roofs are rated the highest, whereas slate, tile, asbestos or ashphalt are regarded as fire proof. There is a definite feeling prevalent in Australia that wooden houses are a very big fire risk. It is comforting to know that in the U.S.A., where the experience of wooden houses is so large, insurance companies have found that this is not so.
3. Mr. R.S.T. Kingston has recently joined the staff of the Division of Forest Products as Assistant Research Officer. Mr. Kingston, who is a graduate in engineering of the University of Tasmania, will be attached to the Section of Timber Mechanics, and will pay particular attention to problems connected with timber bending.
4. The new 600,000 lb, testing machine for the Division of Forest Products is expected to arrive in Melbourne during May. It will be erected in a specially designed,at the new Forest Products Building in Yarra Bank Road, South Melbourne. The purchase of this machine which will be capable of testing columns up to 24 feet long, beams, bridge girders, etc., up to 34 feet span, was made possible through the generosity of Mr. Russell Grimwade of Melbourne.

NEWSLETTER

Forest Products

1936##053

MONTHLY NEWS LETTER NO. 53 FIRST PUBLISHED IN 1 JUNE 1936

YARD HYGIENE

The benefits derived from the application of the principles underlying modern methods of sanitation and hygiene to our daily lives are well known even to the layman. Statistics are also eloquent in proving the freedom of the present day generation from the attacks of plagues and maladies which periodically ravaged the world in the times of our ancestors. These self-same principles might with advantage be applied to the sanitation of the modern timber yard.

Timber is liable to attack by numerous fungi and insects which require the presence of a definite set of conditions for their development. In many cases, these conditions are present in the littered and uncared for timber yard. Insects delight in the presence of heaps of bark, pieces of timber, and other refuse which afford shelter and opportunities for egg laying.

The aim of the timberman should be to remove all such debris and to reduce the possibilities of insect and fungi infestation by suitable yard hygiene. This may be accomplished by close adherence to the following points:-

(1) The yard should be established on fairly flat well-drained ground and should be kept free from weed growth.

(2) The main alleys, the rear alleys, and spaces between stacks should be wise enough to provide ample space for handling the timber and for the free movement of air.

(3) Stack foundations should preferably be of the pier type built so that the minimum distance of the first layer of timber is 18" from the ground; the essential point being that air should be able to circulate readily beneath the timber.

(4) The stack should slope from front to rear 1" for every foot of length.

(5) Some form of roof covering is advantageous in decreasing degrade from checking and warping.

(6) Sufficient strips should be used to separate the boards and to allow free access of air.

(7) Random length stock should not be included in the one stack.

(8) All debris, particularly bark and timber, should be collected and burnt.

Observation of these simple rules will largely prevent the attack of fungi and insects and in addition will tend to give the optimum conditions for the air seasoning of timber.

THE USE OF ALUMINIUM PRIMING PAINTS IN THE PAINTING OF WOOD

Considerable work has been carried out in the United States of America to discover satisfactory priming paints which will increase the life of paint coatings applied to oregon, southern yellow pine and western larch. These three species, which form the greater part of the timber used in general construction, are all alike in that, as a rule, early failure of paint coatings takes place on back sawn faces, particularly over the hard, horny bands of late wood. This research brought into prominence the value of aluminium paints as satisfactory primers. These, together with the graphite

primers, were of outstanding merit when compared with the conventional type of primers.

Some recent tests have shown that the average durability of white lead paint applied over an aluminium priming coat on oregon and southern yellow pine is increased by as much as ten months. No increase was noticed with redwood and white pine, two timbers characterised by very even texture. With a lead and zinc paint, however, the average durability was increased 3 to 4 months on redwood, 4 to 8 months on white pine, and 15 to 17 months on oregon and southern yellow pine.

One other point in favour of aluminium primers is that, in the event of neglecting to repaint for some time, coatings applied over aluminium primer suffer less damage and the surfaces are more easily repainted.

With the conventional type of priming paints using a vehicle comprising drying oils and thinners, there is frequently too great an absorption of the vehicle by the wood leaving an insufficient amount to properly bind the pigment. Any effective priming paint must prevent moisture from reaching the wood surface by forming an impervious, relatively thick continuous film. This condition is met more satisfactorily by the use of a varnish vehicle which due to its more viscous nature does not penetrate so deeply and leaves a heavier film on the surface.

The efficiency of aluminium paint is due firstly to its ability to retain its moisture proofing for long periods protecting the underlying surfaces and adding life to the top coats, and secondly to its uniform adherence to both early wood and late wood. The value of this paint has been recognised to such an extent in the United States that a considerable amount of timber is primed prior to leaving the mill.

As yet little is known regarding the value of such primers when used on hardwood, but there is every reason to suppose that they will be satisfactory and an advance on the methods at present employed.

HOW SOON SHOULD WOODEN FLOORS BE LAID OVER CONCRETE SUB-FLOORS?

The minimum time to allow between the paving of a concrete sub-floor and the laying of the wood floor itself is a problem which often confronts architects and contractors. After the wood floor is laid, evaporation of moisture from the concrete is greatly retarded and if the concrete has not dried sufficiently, the humidity builds up between it and the wooden floor. This state of affairs is liable to cause the wood to swell and cup and subsequently to leave permanent unsightly cracks. The degree of dryness of the concrete should therefore be considered carefully and even in rushed jobs an attempt should be made to allow the concrete to dry out.

In order to obtain some idea of the periods necessary for such drying out, tests are being made at the present time by officers of the Division of Forest Products during the course of the erection of the new Forest Products Laboratories, South Melbourne. In these tests, a thin sliver of wood is supported by two glass rods about $^{1}/_{8}$" above the surface of the concrete and entirely enclosed by a flat bell shaped shield which is fitted with rubber on the edge and is weighted down on the concrete to make an air tight cover. The set-up is left for about 24 hours, during which time it has been found that the sliver of wood comes to equilibrium with the conditions above the concrete, i.e. it increases to the same moisture content as would the under side of the wooden floor. The moisture content of this sliver is then determined by the oven drying method.

At the same time, the electrical resistance between two terminals set in the concrete is being determined with the object of establishing a relation between the condition of the concrete and its electrical resistance. This relation, however, will probably vary with different concrete mixes.

Tests so far completed indicate that at this time of the year the concrete should be left at least four weeks after the final wetting.

A NEW METHOD FOR THE UTILISATION OF WOOD WASTE

In a recent issue of the Journal of the Society of Chemistry and Industry (January, 1936) it has been reported that an American company has now produced a special type of

compressing machine which converts wood waste without the use of a binding material into a highly compressed fuel with about three times the density of wood. Many efforts have been made to utilise small wood waste, but these have seldom given financial results. One large concern in Europe failed after spending some £4,000,000 in five years on such processes. Hence, industrial concerns have been rather afraid to venture into this field. It is, therefore, of interest to read of the way in which this American company overcomes the problem.

The compressing machine which has been developed consists of a water cooled rotary disc in which 40 dies are arranged. A tapered spiral pressing screw regulates the feed and presses the raw material as it is delivered to the machine through its first and second stages of compression. A pressure-holding cylinder is also provided, the function of this part being to insure the uniform density of the fuel log. The piston rod of this pressure cylinder is forced against the die face. While the material for a new log is being forced into a die, it is, in turn, forcing a completed log out and the piston rod of the pressure cylinder is being held against the outer end of the completed log by hydraulic pressure which is controlled automatically so that uniform density is secured. When the completed log has been forced out of the die, the pressure cylinder is released, the log falls into a conveyor, the disc moves to the next position, and the piston rod of the pressure cylinder is again forced against the die face, and so continues the process of regulating the compression of the next log.

The machine weighs over 20,000 pounds and is completely automatic in operation, so that labour charges are reduced to a minimum.

The raw material passed to the machine must not contain more than 10% moisture and if this figure is exceeded in the material available, it must be dried in suitable apparatus. The material may consist of shavings, sawdust, chips, and small pieces, and is, first of all, ground to a uniform size in a hammer mill. The material is then forced by a screw at a pressure of 165,000 lbs into a die in the steel disc. As each die is filled, the disc automatically turns to the next opening which is then filled. During the pressing in of the raw material, a temperature of 450°F is attained, hence the need for cooling the rotary disc.

Each compressing machine produces 10 tons of logs per day. The logs weigh 8 lbs each, are 12" long and 4" in diameter, and pass from the machine at the rate of 120 per hour. Compressed wood logs contain practically no moisture, are clean to handle and economical in use.

BREVITIES

Mr G.W. Wright, B.E., has joined the staff of the Division of Forest Products as Assistant Seasoning Officer. Mr Wright, who is a graduate of the University of Western Australia, was, prior to his appointment to the above position, Assistant Utilisation Officer in the Western Australian Forests Department.

In a recent issue of "Barrel and Box and Packages", an interesting point has arisen in the United States in connection with the trademark applied to tin beer cans. The wooden beer keg manufacturers claim that the trademark "Keglined", as applied to such beer cans, is grossly deceptive in that it implies that such cans are protected inside by a wooden lining, and it conveys the impression that the beer is improved thereby. In the main, such a trademark indicates that the beer has the same flavour as draught beer. It has been found that the consumers of beer prefer it drawn from wooden kegs because of the flavour and taste, and the sales of draught beer comprise some 70% of the total sales.

It is interesting to learn that over 740 million battery separators were made in the USA in 1935. In this industry, some 35,000,000 ft of cedar were used. The Division of Forest Products has, from time to time, carried out experiments with several Australian timbers to determine their suitability for such purposes. Of those tried, hoop pine and Queensland kauri have given the most satisfactory results.

In the Timber Trades Journal, we read of another victory for wood. The Darlington Town Council (England) discussed the question of wood versus steel window frames and the discussion was notable for the testimony to wood paid by the practical man in the building trades. When the discussion reached the right level, namely, fitness for purpose, there was the assertion that wooden frames were superior to and had a longer life than metal frames. It was stated that metal frames were being removed from various buildings after only seven years' use.

Arsenic preserves concrete and wood
(From the News Edition of the Journal of Industrial & Engineering Chemistry)

Sweden has developed two new uses for arsenic, of which she has such a large surplus. The Sote-Fjord Canal which was opened last October is unique in that all the wood in its construction and especially the piling is provided with a protective coating of arsenic concrete. This material, which is patented, is produced by mixing cement, sand and arsenous oxide (proportions not given). The effect of impregnating building timbers with arsenic is discussed in a comprehensive report. Such timbers were stated to be resistant to the attack of the shipworm.

CSIRO
AUSTRALIA

NEWSLETTER
Forest Products
1936##054
MONTHLY NEWS LETTER NO. 54 FIRST PUBLISHED IN 1 JULY 1936

THE TESTING OF BOXES AND CRATES

The magnitude of the box and crate industry is not generally realised, but some idea of its importance may be gauged from the fact that 10-15 million boxes of commodities such as butter, eggs, and fruit (fresh, dried and canned) are exported from Australia annually. In addition, over 50 million containers are required per annum for the domestic trade.

The primary function of a container is to protect its contents from damage. However, because of faulty design, a large proportion of boxes in use either allow their contents to become damaged or are unnecessarily expensive and wasteful of material. In service, containers are often subjected to severe handling, particularly in the export trade where they may have to be handled 10 or 15 times before reaching their final destination. However, containers which deliver every unit in every package undamaged may not be the most economical in the long run. The ideal containers is the one in which over a long period of time the cost, plus the cost of the damage to the contents, is a minimum. It should be borne in mind, however, that the economic loss resulting from delay, loss of good will, and cost of making settlements is always greater than indicated by the claims lodged.

When a box is so constructed that all the parts resist the risk of handling and transportation equally then it is considered to be balanced in construction, i.e. there is no tendency for one part to fail before another. In unbalanced boxes that render satisfactory service there is a surplus of material in the stronger parts and a box equally serviceable or even more so can be obtained by reducing the strength of the stronger parts until they are in balance with the remainder. There will then be a reduction in weight and cost.

Balanced construction can best be determined by laboratory tests which often enable substantial savings to be made in the cost of the box without any reduction in its strength. Since the containers in service are subjected to various and constantly changing transportation hazards, it is impractical to secure complete data for design by observing them in service. Examination of failures by experienced observers will reveal the weaknesses and suggest the principles of design to apply in overcoming them, but it is impractical to make changes and to develop balanced construction through service tests alone. For this reason, laboratory tests which closely simulate the hazards of transportation and which can be carried out quickly and economically have been developed. Each test is designed to reproduce one or more of the stresses encountered in service. During these tests, the sequence of failures can be observed and the weaknesses from which they result determined.

The practical value of the tests in improving the design of containers has been repeatedly proved by the great reduction in loss and damage in service experienced when the designs developed from the laboratory tests have been put into practice.

There are three main types of laboratory tests - (i) the drum test, (ii) the drop test, and (iii) the compression. The revolving drum box testing machine combines in a single test practically all the stresses and shocks that containers encounter in service. The drum is a hexagonal-sided machine, 7 feet in diameter, and it rotates slowly on a horizontal axis. On the six

internal faces are arranged baffles and guides in such a way that the box or crate being tested slides or falls, landing on its ends, sides, top, bottom, edges and corners. In this method of testing, the box is loaded with its contents, or a substitute that produces the same effect. As the container moves on from one drop to the next, the observer notes and records each failure and the number of the drop at which it occurred (a counter being provided on the machinery for this purpose).

In the drop tests the box or crate is dropped from a definite height upon an iron plate or other solid surfaces. It is dropped repeatedly from increasing heights until failure is complete. In the compression test a steadily increasing pressure is applied to the box by means of a testing machine.

The Division of Forest Products is fully equipped for carrying out all the above-mentioned tests and inquiries are invited from manufacturers or users who are in any doubt as to whether they are getting the best results from their containers.

THE STAINING OF VENEERS

This is a problem which at some period or other has confronted practically every furniture or plywood manufacturer in Australia. The number of inquiries received by the Division indicates that many of these manufacturers do not know the cause nor do they know the precautions which may be taken to minimise or perhaps obviate this problem.

Staining is caused by a chemical action between the alkali (caustic) in the glue and certain materials such as tannins, etc. which are commonly present in many of our woods. This chemical action results in bluish-black discolouration on the surface of plywood. Such a discolouration is, of course, usually more noticeable when using a very thin face veneer which is easily penetrated by the alkali on the glue. The majority of the remedial measures are aimed at the prevention of the penetration of the alkali to the surface of the plywood. It must be clearly understood, however, that with some timbers and classes of veneer, e.g., butt and crotch veneers, it is practically impossible to completely prevent staining when using an alkaline glue such as casein, soya bean glue, and the majority of vegetable glues.

By paying close attention to the following points, it is frequently possible to reduce considerably the amount of staining obtained:-

1. The veneer should be as dry as possible - this may be 2-3% moisture content for some species, but more commonly 6-8% for kiln dried stock.

2. The amount of water used in the glue should be reduced to a minimum consistent with satisfactory spreading.

3. The amount of caustic soda present in the glue should be reduced to a minimum consistent with satisfactory solution of the casein and with satisfactory working life of the glue. (The caustic soda may be added as such or formed by the chemical action between sodium silicate, i.e. water glass and lime. In this case, the lime content should be reduced as far as possible, bearing in mind that a reduction in lime means a reduction in water resistance).

4. The use of pressures higher than necessary to obtain satisfactory adhesion should be avoided. Under ordinary conditions, with well prepared cores and cross bands, 70-80 lbs per sq. inch should be ample pressure. Lower pressures may be used with good results.

5. The glued-up stock should be kept under pressure for as short a time as possible. Three hours may be sufficient, but this is best determined by experiment.

6. The assemblies should be broken up and stripped out to remove as quickly as possible excess water added by the glue.

7. Absorbent cauls should be used between panels to absorb excess moisture.

8. A light dusting of powdered boracic acid between the panels may tend to prevent staining by neutralising the alkali.

If staining still occurs, the last resource is to wash the stained surfaces over with a solution of oxalic acid (1 oz. sodium sulphite to 12 ozs

of water) before treatment with the oxalic acid is, however, usually more effective.

LONGITUDINAL SHRINKAGE OF WOOD

The longitudinal shrinkage of wood is usually so small that it can be safely neglected. There are occasions, however, on which even the small amounts of longitudinal shrinkage with normal wood are important. The longitudinal shrinkage which occurs with some abnormal wood is often so appreciable as to cause trouble.

The chief occasions when longitudinal shrinkage is objectionable are when it causes (i) shortening of posts or studs and throws the adjoining members out of alignment, (ii) exceptionally wide openings of but joints, and (iii) bowing in pieces which may shrink unevenly.

The most marked longitudinal shrinkage occurs in compression wood, a type of wood formed in bands in the lower side of leaning trees and a type which is fairly common in non-pored timbers such as hoop pine, oregon, hemlock, spruce, etc. These bands of "compression" wood are darker in colour and denser than the corresponding bands of normal wood, and they may cause considerable trouble in the drying of non-pored timbers because of the bowing which is produced. This bowing is due to the greater longitudinal shrinkage of the "compression" wood.

Other types of wood in which longitudinal shrinkage may be excessive are:- (i) wood of very low density for the species, (ii) wood near the pith of a tree, and (iii) wood with pronounced sloping grain. In the last instance, the effect of transverse shrinkage comes into play.

Another point to be borne in mind is that, although the percent. shrinkage of a long piece of wood may not be any greater than that of a short piece, the actual amount of shortening is greater. Consequently, a method of preventing trouble is to use shorter lengths and so break up the longitudinal shrinkage.

The longitudinal shrinkage which occurs during the drying of Australian timbers is now being determined in the laboratories of the Division of Forest Products.

WOOD TAINT IN BUTTER

This subject has been referred to numerous times in this series of News Letters, because of some doubts, which are still expressed by interested parties, on the need for or the success of, the casein-formalin spray now compulsory for overseas butter boxes of hoop pine.

The Annual Report of the Forest Products Laboratories of Canada for the year 1935-36 contains the following paragraph referring to wood taint:-

> "This study was conducted in co-operation with the Department of Agriculture. During the year, laboratory tests with the casein-formalin treatment which was developed by Dr Wiley of the Council for Scientific and Industrial Research, East Melbourne, Australia, were continued and supplemented by commercial tests in a local box factory. As a result, the Dairy Branch of the Department of Agriculture decided that the treatment is suitable for Canadian conditions, and is recommending its use instead of paraffin in butter boxes."

Dr Hood and his co-workers in the Department of Agriculture in Ottawa have carried out a great deal of experimental work in many forms of spray, wrapping and special liners in an attempt to overcome taint. In the end they find that for cheapness and effectiveness the casein-formalin spray is the best and they propose it for general use in Canada.

CSIRO
AUSTRALIA

`

NEWSLETTER

1936##055

MONTHLY NEWS LETTER NO. 55 **FIRST PUBLISHED IN 1 AUGUST 1936**

CONSTRUCTION TRENDS

There are many engineers who are of the opinion that the uses of timber in construction are becoming less and less and that eventually it will be superseded entirely by reinforced concrete and steel. This is not a correct interpretation of the position. Mainly due to research and improved timber design, it is very probable that timber will always have its field of use in construction. Improvements are continually being made to the manufacturing and erection methods for steel and reinforced concrete structures, and so it may be reasonably expected that improvements in timber design must be made if it is to hold its position in the construction world. It is interesting to note in just what way these improvements may be effected.

Up to the present, forest timber of large size and select quality has been readily available. However, this may not always be the position and the smaller trees which will be obtained from natural and artificial regrowth forest areas may be too small to furnish one-piece structural parts of the dimensions required. Hence, economical ways and means will have to be found to cut and build large members from small material. The concept of this development which is becoming more important and necessary for the future visualises built-up posts and columns, glued laminated beams, glued laminated arches of varied forms and sizes and finally new types of frame buildings, towers and bridges utilising relatively small scantling sizes and made possible through the use of modern connectors and more efficiently nailed and bolted joints.

Observation of current trends in construction clearly shows that, in addition to the part that timber and scantling members will play in structures of the future, plywood must render great and increasing services. Factors favouring the use of plywood are its strength and nail-holding ability, the uniformity of its properties, the large lightweight units in which it can be used and the relatively small percentage of waste during manufacture. The advantages of using plywood have not been overlooked by the many designers who are attempting to evolve a practical system of construction for a pre-fabricated house. In addition to lending itself to a panel type of construction, plywood has been glued to the upper and lower faces of the floor and ceiling joists respectively to form what is virtually a box girder. The use of stressed plywood in this way enables the size of the joists to be reduced from 10" to 6" with a corresponding saving in cost. Another recent development which is associated with the use of timber connectors and timber trusses is the use of plywood gusset plates. Multi-ply boards up to 6" thick have been used for this purpose.

By further technical improvement and adaptation, the field for the uses of timber in construction offers prospects for being materially increased. The Division of Forest Products is keeping in touch with overseas developments in this regard and is taking every available opportunity to adapt them to Australian conditions.

SELECTION OF TIMBER FOR HANDLE AND SPORTING GOODS STOCK

In the selection of timber for purposes in which high shock resistance is a most important factor, there are two essential points to be considered, namely, (i) the elimination of all timber brittle in nature, and (ii) the avoidance of timber with sloping grain. Brittle timber will fail readily and easily under a sudden sharp impact and, therefore, is useless for such things as handles, tennis racquets, baseball bats and skis. Everyone is familiar with the carrotty appearance of the brittle failure of certain woods and such timber should always be avoided, but unfortunately it is not an easy matter to detect it on inspection.

There are various causes of and reasons for brittleness in timber, among which may be listed **decay, high temperature treatment** (as in a kiln), **low density, heart** in both advanced and incipient stages, **compression wood** in the non-pored timbers, compression failures, etc. Each of these has been discussed fully in Trade Circular No. 32, which will be issued very shortly by the Division of Forest Products. In this Trade Circular methods for detecting brittleness are also discussed. The most practical methods for those interested in the selection of material for handle and sporting stock are: (i) the splinter test, and (ii) the knife test. In the former, a small splinter is taken from the sample and broken between the fingers. The appearance of the failure is noted: if splintery, the particular sample of wood is suitable for use, but if it is brittle, the sample should be rejected. The knife test is based on a similar principle; only in this case, the point of the knife is used to lift the grain on a longitudinal face. If it lifts with difficulty and a long ribbon of wood can be pulled away then the timber is tough and suitable; but if it lifts quickly leaving a carrotty wood failure, then the sample is unsuitable.

Cross or sloping grain may be more easily avoided since it can be the more easily detected on inspection. Vessel lines in pored timbers or surface seasoning checks indicate the direction of the grain. Thus, in preparing the handle or the article to be manufactured, care can be taken to avoid sloping grain. A slope of 1 in 25 causes a reduction of about 9 per cent. in impact strength (shock resistance); a slope of 1 in 20, 15 per cent. of 1 in 10, 43 per cent.; of 1 in 5, 66 per cent. Thus, in these articles, it is very desirable that the grain should be absolutely straight and in no circumstance should the slope exceed 1 in 25. The influence of sloping grain on the uses of timber have been discussed in Trade Circular No. 13 issued by the Division of Forest Products and both this and Trade Circular No. 32 on the Causes and Detection of Brittleness in Wood can be obtained free of charge, on application to the Division.

FIRE RETARDANT TREATMENTS FOR WOOD

The earliest recorded attempts to "fireproof" timber date from the fourth century B.C., when Aeneas used vinegar for this purpose. Since this time a multitude of methods and chemicals purporting to make timber "fireproof" or "fire resistant" have been patented. The majority are of doubtful value.

It is only occasionally in Australia that the need arises for the use of so-called "fireproof" timber. As a result, very little attention has been given to this problem. In the Untied States of America, a by-law of the city of New York passed in 1899 requires that all timber used in buildings above 150' high must be "fireproof". This has stimulated the search for efficient "fireproofing" methods. Recent disasters at sea have also focussed attention on the necessity for using "fireproof" timber on passenger ships. It must be understood, however, that up till the present, no treatment has been evolved which will make timber absolutely "fireproof". At the best, treatments can only make timber "fire resistant" or "fire retardant".

Treatments which aim at making timber fire resistant can be classified under two heads, namely, Surface Coatings and Internal Treatments. Surface coatings depend on their insulating action or a tendency to reduce the action of the flame. Examples of such surface coatings which act as insulating agents are calcimine, cement, sodium silicate, and asbestos. Mixtures of sodium calcium silicates with various salts tend to reduce the action of the flame. On the other hand, timber which has been heavily impregnated with various inorganic salts and mixtures of salts may be made very nearly fireproof or extremely fire resistant. The impregnation of the timber is usually carried out in iron retorts under vacuum and pressure. Combustion of the wood is thus prevented by either:-

(a) The water of crystallisation given off by the chemicals forced into the wood, e.g. Borax.

(b) The formation of an external glazed coating over the surface of the wood by the decomposition of chemicals. This coating prevents the transmission of heat, in addition to preventing the access of oxygen to the outside zone of charcoal, e.g. borates and ammonium salts.

(c) The evolution of an inert or non-combustible gas on vapour from the wood to dilute or combine with the combustible gas, e.g. ammonium salts.

(d) The formation of a layer of incombustible clinker-like charcoal on the exposed surfaces of the wood which remains in place and forms an effective insulting barrier against impinging flame.

Any substances used in the "fireproofing" of wood must possess in addition to the essential qualification of affording protection against fire, the attributes of being cheap, permanent, and non-corrosive to metals. Failure to comply with these essentials has restricted the use of many chemicals which possess a satisfactory fire proofing action.

In general, the high concentration of chemicals necessary to give adequate protection and the expense connected with the impregnation and subsequent seasoning of the timber has tended to make the cost of "fire resistant" timber prohibitive except for special purposes. Such costs may vary from 30/-d. to 55/-d. per 100 super ft. of timber 1" in thickness. The demand for fire resistant timber in Australia is usually met by using native species which are naturally resistant to fire. Jarrah and Turpentine are the two best known timbers used in this way. In some instances, surface coatings may be applied to naturally non-resistant timber. As yet, however, the high cost of treatment, the lack of treating facilities and the difficulties associated with the impregnation of many of our native timbers have prevented the application of internal treatments.

SOLID WOOD, PLYWOOD AND LAMINATED STOCK

Solid wood has widely different properties in the various directions relative to the grain. These differences are gaining greater recognition in timber utilisation and, in recent years, greater use has been made of technical knowledge.

Since wood is made up essentially of hollow fibres, the longer dimension of which runs lengthwise in the tree, significant differences in strength and shrinkage are found in the direction parallel to and across the grain. The tensile strength, compression strength, bending strength and stiffness are more than twenty times greater parallel to the grain than perpendicular to the grain. The shrinkage and swelling with changing moisture conditions is much greater across than along the grain, in fact, the lengthwise changes of normal wood with change of moisture content are so small as to be negligible. Knowledge of these facts, as well as factors of economy, has led to the increased use of plywood and laminated stock.

Plywood is made with thin sheets of layers of wood placed together, the grain of alternate plies being at right angles. This tends to equalise the proportions of material with grain running in each direction. In 3-ply, the simplest form of construction, the grain of the outer plies runs in the same direction, that of the centre ply being at right angles. In this form one-third of the finished plywood has the grain running longitudinally and two-thirds with the grain transversely. In 5-ply the proportions are $^{3}/_{5}$th and $^{2}/_{5}$th, although by making the centre ply very thin, it is possible practically to equalise the distribution. With 7-ply and 9-ply greater balance and uniformity in the finished article can be obtained.

Compared with solid wood, plywood has a greater strength in bending across the grain, but less in the longitudinal direction. Three-ply with the outer plies running lengthwise has about 82% of the bending strength of an equivalent thickness of solid wood with the grain running lengthwise, but 3-ply with the outer plies crosswise is about double the strength of ordinary wood. As the proportions of the grain direction are equalised by 5-ply, 7-ply, or 9-ply construction, panels tend to equalise their strength in longitudinal and transverse directions, the strength of longitudinal sections being less than the equivalent thickness of solid wood, but that of

the transverse section enormously greater than solid wood across the grain.

Plywood also gives balance in properties with shrinkage, warping and splitting reduced to a minimum. This factor is, for some purposes, more important than strength. Plywood does not shrink or swell appreciably in length or width with changes in moisture content because the grain is distributed in both directions. With reduction in shrinkage and swelling there is also a reduction in forms of warping. The resistance of plywood to splitting permits it to be nailed near the edges without injury to the panel.

Laminated stock consists of a core, cross-banding and face veneer. The core is built up of narrow strips glued edge to edge and end to end, the smallness of the units tending to equalise the differences in shrinkage between back-sawn and quarter-sawn pieces. The cross-banding is a veneer placed with the grain running at right angles to that of the core, thus imparting greater transverse strength and restraining shrinkage in width. Face veneers are principally decorative, but also contribute to the stability of the panel by distributing planes of weakness. The strength and shrinkage characteristics of laminated stock are intermediate between those of solid panels and plywood.

BREVITIES

Trade Circular No. 31 of the Division of Forest Products dealing with Gluing Practice - Part 4, Artificial Resin Glues, has just been issued. Copies may be obtained from the Division.

This circular deals with a type of glue of recent development which has as yet made little advance in Australia. The advantages of the resin glues, however, are such that in certain fields they will undoubtedly be used in increasing quantities. Very little specific information is available regarding the details of resin glue manufacture, but it was considered desirable to present the information at present available.

Two officers of the Utilisation Section of the Division - Mr A.J. Thomas and Mr F.E. Hutchinson - have left for Sydney to initiate the grading studies of the NSW timbers in co-operation with officers of the Forestry Commission of New South Wales. Mr Thomas will specialise on the grading of poles, piles, sleepers, and structural products, particularly those intended for expert to New Zealand. Mr Hutchinson will work on the grading of hoop in the production and marketing centres.

CSIRO
AUSTRALIA

NEWSLETTER
Forest Products

1936##056

MONTHLY NEWS LETTER NO. 56 FIRST PUBLISHED IN 1 SEPTEMBER 1936

TIMBER DEVELOPMENT ASSOCIATION OF VICTORIA

As a result of considerable preliminary discussion by various bodies interested in the timber trade, a meeting was held at the rooms of the Timber Merchants' Association of Victoria on August 20th, at which a Victorian Timber Development Association was formed.

The Chief of the Forest Products Division, Mr I.H. Boas, was in the Chair, and the Chairman of the Victorian Forests Commission was also present.

There was a large attendance representative of the following bodies:-

Timber Merchants' Association of Melbourne and Suburbs
Hardwood Millers' Association of Victoria
Wooden Box and Case Manufacturers' Association
Timber Importers' Association
Plywood Association of Victoria
Hardwood Agents' Association.

The objects of the Association are to develop the timber trade by means of propaganda to overcome unjustified prejudice and ignorance of timber and its value as a material of construction, through lectures, press publicity, a journal, and other such means. In particular, it aims at opposing the campaign in favour of timber substitutes by means of a counter campaign in favour of wood. The timber interests at last are recognising that the growth of the use of timber substitutes is becoming a serious menace to their trade and that unless steps are taken to meet the situation that has arisen, they must look for a continual weakening in the position of timber.

In this news letter, from time to time, attention has been called to the fallacies behind the use of steel window frames and the opposition to the use of wooden houses. In Great Britain, a similar organisation has been at work for a few years, and already shows signs of effecting considerable improvements. It is hoped that this movement will become Australian-wide, and result in a similar betterment in the timber markets in Australia.

Such an Association should have been formed years ago, but it is not yet too late and with proper co-operation between the groups interested, there is no doubt but that good will result. Timber, though it has some faults, is still the most generally useful material of construction, and because of its great flexibility, ease of working, low conductivity for heat and adaptability to varied design, should not be displaced to the extent which has become common.

Mr Galbraith in his remarks spoke of the growth of the use of steel sleepers in South Africa because of the Government's interests in local steel mills, and emphasised the relative discomfort to passengers on the trains, which he personally experienced on a recent trip through that country.

It is expected that the Timber Development Association will be well supported and that one result will be the widespread dissemination of knowledge of timber and its uses.

TRENDS IN KILN DESIGN

Earlier kilns were largely of the natural draught type, and the first big step onward in design came with the use of fans to increase the air movement. This was an important development as it increased the rate at which the timber could be dried.

Originally the fans were outside the kilns and the next step forward was taken about twelve years ago when the fans were placed inside. The internal fan type rapidly demonstrated its superiority, and is now becoming almost universal in modern installations. Concurrently, there came the replacement of centrifugal fans by the disc type. Since these improvements, no major developments in kiln design have been made. There have been minor adjustments but the main improvements in kiln drying have been increased knowledge and experience in the operation of the kilns so that timbers at one time held to be impossible to kiln dry, are now readily so dried.

It does not appear likely that any major or revolutionary alteration in kiln design is likely unless it be in the direction of an entirely new principle. Comparatively little is known of the optimum ratio of height to width in a kiln stack, and effects of varying spaces between the stack and the kiln walls, and similar factors that may improve kiln performance. The Division of Forest Products is carrying out a series of studies on the movements of air in a specially designed kiln, with the object of elucidating some of these factors.

In a recent issue of the "Timberman", it was suggested that perhaps future development would be in the direction of heating the timber by passing an electric current through it. The idea behind this is that in timber, moisture moves from the wettest towards the driest areas, and also from the hottest towards the coldest portions. In an ordinary kiln these two tendencies oppose one another because the outside of the timber is the driest, whereas the inside is the coolest. If the heat is applied to the centre of the timber, both these tendencies operate in the same direction, and consequently the rate of drying would be greatly increased.

This idea is by no means new, for twenty years ago, a Melbourne manufacturer was using a similar method for drying large timber squares. Nothing is known of the effect of such a rapid drying on the quality of the timber, nor of the relative cost of the method. It is, however, very desirable that some thought should be given to revolutionary ideas in kiln drying, as it is unlikely that the modern kiln, satisfactory though it is, is the last word in timber seasoning.

BLUE STAIN

The sapwood of softwoods, such as *Pinus radiata* and hoop pine, is frequently married by a blue stain which appears as long, bluish grey streaks or blotches on the faces, and as wedge-shaped areas on the cross section. This sapstain is caused by several species of fungi, whose treads grow in the cells of the wood, feeding on the contents, such as starches and sugars, and giving rise to the blue stain by the reflection of the dark colour of the threads through the walls of the cells. Since the fungi do not break down the cell walls, the strength of the wood remains practically unimpaired. The discolouration, however, renders it unsuitable for purposes where the natural colour is required.

Fungi need air, moisture, food and warmth for their growth. If timber is dry or completely waterlogged, the growth of fungi in it will be prevented. But if the moisture content of the timber lies above 20%, it will be susceptible to attack by staining fungi. These fungi grow most rapidly at temperatures about 70°-85°F while above and below these values the rate of growth drops off until such temperatures are reached at which no growth occurs at all. The food for the sapstaining fungi is supplied by the wood. The most rapid development of these fungi can be expected when all the conditions necessary for growth are most favourable, and therefore the greatest trouble from sapstains is to be expected on moist wood during the warm rainy periods of the year, such as at the present time. To prevent staining, the timber must be dried as rapidly as possible. The best and safest method of doing this is kiln drying. If kilns are not available, the timber must be air dried. Provided proper precautions are taken, air drying can be carried out very satisfactorily except under very severe weather conditions. The timber yard must be kept clear of all kinds of debris which may serve as developing grounds for the staining fungi. Good foundations of healthy dry timber should raise the stack about 18 inches above the level of the ground. Spaces

must be left between the timber in the stack to allow ample air circulation between each board and covers should be provided to protect the stack from the rain. Only sound dry strips should be used between the boards, since stained strips will pass on the infection to healthy timber.

In spite of good seasoning practices, however, staining sometimes occurs when the weather conditions are very unfavourable. To prevent staining at such times, the timber must be chemically treated. The treatment consists in dipping the timber for about 20 seconds immediately after sawing in chemical solutions which prevent the growth of the fungi. A cold solution of borax (2%), hot solutions of sodium bicarbonate (about 8-12%) or sodium carbonate (6-8%), or a 50-50 mixture of the two latter solutions will reduce considerably, if not eliminate, the percentage of stain. Two proprietary mixtures which give efficient sapstain control have recently been put on the market: Lignasan, by E.I. du Pont de Nemours & Co. Inc., Delaware, USA, and Dowicide P, by Chemical Treatments Co., New Orleans, USA. For satisfactory results, these chemical treatments must always be supplemented by good seasoning practices such as have already been recommended.

TIMBER IN TURNERY

Timber plays an important part in the manufacture of furniture, wooden utensils, ornaments, bobbins, handles, sporting goods and vehicles. Different standards of turning are required in the respective uses, and unless the suitability of a timber for turning is considered in relation to the particular article being manufactured, its capabilities might be misjudged.

Ornamental turning is the most exacting in its requirements because the cutting tools produce both the pattern and the finish. As the article leaves the lathe, the edges need to be clearly defined and the faces lustrous in order to display the intricate patterns. For spools and bobbins, the timber should cut cleanly and easily, accuracy of dimension and rapid production being more important than lustrous finish. Articles of furniture and woodenware need to show sharpness in the detail, true edges and general smoothness. In the less exacting types of turning the article is merely shaped in the lathe and the finish is imparted by sanding, filling and polishing. The results in these cases are judged on the general smoothness of the turning and freedom from torn spots that would be difficult to sand out.

In general, homogeneity in texture is the primary requisite of a wood for turnery. Coarsely porous timbers, ring-porous timbers, and those non-pored timbers which show a difference in texture between the springwood and summerwood portions of their growth rings, are the least suited for turnery purposes as these types of structure make even cutting, smooth finish or fine detail most difficult to obtain. The ideal timber for turnery should have a close homogeneous texture with only minute pores, should cut with a silky feel without blunting tools unduly, and should have a decorative figure and high lustre.

FOAMING OF GLUES

Foaming in animal glues may be due to one of two causes. Firstly, for some unknown reason, batches of animal glue may be particularly subject to foaming even when care is taken in their mixing. The comparative liability to foam of different batches or types of animal glue may be determined by beating the glue solution with an egg beater or other type of agitator, making sure that similar conditions and types of apparatus are used in all tests. After beating for a specified time, the height to which the foam rises and its rate of subsidence is measured. Glues with a tendency to foam cause considerable trouble, especially when used in mechanical spreaders.

Secondly, foaming can be caused in animal, casein and other glues because of the method of handling. Excessive beating in the mixing, too frequent and vigorous stirring in the glue pot, too fast a roll speed in the mechanical glue spreaders and running of these idle all beat air into the glue mixture and tend to produce an emulsion of air and glue, popularly termed foam.

Foamy glue is particularly objectionable in both hand and machine gluing. The presence of the air prevents the glue being easily applied and thus tends to an uneven general spread with subsequent lack of satisfactory adhesion. Also the air bubbles actually present results in the glue being, as it were, "spotted"

on and the area of the surfaces in which the glue is actually in contact with both faces is considerably reduced. A weaker joint naturally results, and in the case of gluing of face veneers, air spots may subsequently show through a highly polished finish as minute blisters.

Foam in the glue pot or mechanical spreader can fortunately be readily controlled by the addition of chemicals, but the use of these alone is not advocated and all care should be taken that the glue is not agitated unduly or unnecessarily. Neatsfoot oil and Turkey Red Oil are commonly used to prevent foaming, about a teaspoonful of these being added to 1 gallon of the glue mix. These materials are the most satisfactory, but if neither is available, foaming in animal glue can be considerably retarded or prevented by adding a very small quantity of tallow, a piece about the size of a pea being sufficient for 1 gallon of glue.

NEW USES FOR PAPER

In the news edition of a recent number of "Industrial and Engineering Chemistry", there was a brief note on the sale at baseball games and race tracks, of paper raincoats made in Japan and sold for 25 cents (1/-d). The paper is impregnated with tung oil to make it rain-proof.

One can imagine how such coats would sell on our race courses or football fields when sudden showers are so liable to make the crowds of spectators rather uncomfortable. Whether they could be made and sold in Australia for anything like one shilling is doubtful; but it might be worth trying.

During the War, paper was used in Scandinavia and Germany for such purposes as floor coverings, sacks, and even clothing, and gave quite good service. Some of these paper articles can be seen in the museum of the Division of Forest Products. They were made by cutting the paper into narrow strips, which were then run through a waterproofing solution and twisted into threads, which were then woven into different types of fabric. Various coloured papers were used, and some very attractive patterns produced.

Under the circumstances, the paper products were certainly very useful; but they had no permanent value when compared with other materials. Still, for a sudden shower, a cheap paper overcoat is likely to have definite possibilities.

CELLOPHANE

Cellophane, the thin transparent material made from wood, and so widely used nowadays for wrapping numerous articles, has certainly added much to the attractiveness of many commercial products. Its latest development is as an electrical insulation for wires.

In electrical motors, for instance, the design has been improved by wrapping the wire in cellophane only one thousandth of an inch thick. This appears to give quite satisfactory insulation and enables the same number of turns of wire to occupy far less space.

The cellophane wrapping has been thoroughly tested and found to stand up to all requirements.

PAVING MATERIAL FROM WOOD WASTE

In the cooking of wood for paper-making, about 50% of the wood substance is dissolved and has to be run to waste. The getting rid of this waste is one of the serious problems of the papermaker, and naturally many attempts have been made to find some use for the huge volumes of waste liquor.

Numerous small uses have been developed, but none of sufficient promise to offer an important contribution to the solution of the problem. Alcohol has been made by neutralising and fermenting the sugars in liquor. A tanning extract has been made which finds a limited use in leather tanning.

The "Timberman" reports a recent development in making a road binder which is said to give excellent results and to be superior to many other road binders. Apparently the success of the process depends upon a cheap method of evaporating the liquor. The product hardens in a few hours and is unaffected by water.

NEWSLETTER

Forest Products

1936##057

MONTHLY NEWS LETTER NO. 57 FIRST PUBLISHED IN 1 OCTOBER 1936

INTERNATIONAL CONFERENCE ON TIMBER UTILISATION

About 100 delegates from 21 different countries attended the Second International Conference on Timber Utilisation held in London in March last, under the Chairmanship of the Earl of Dunmore. The Chairmanship in his opening remarks, laid stress on the importance of the timber industry in which it was estimated that 400 million pounds sterling was invested.

Several papers were read on Wood Utilisation in various countries and others dealing with research, educational problems, marketing and the quality of timbers as affecting utilisation. Among the most interesting papers were those on the utilisation of wood waste, the principal dealing with "Wood Gas", "Wood as a new raw material in modern chemistry", "New Problems in Chemical Utilisation of Wood in Sweden", and "Wood and Charcoal Gas".

These papers all indicated a similarity in the problems in various countries and there appears to be a widespread and firm conviction that timber will very shortly become one of the most important raw materials ranking next to iron and coal. Research has shown how wood may be converted into textiles, food stuffs and fuel for motor cars, among other uses of importance. There is no limit to such uses and successive conferences will undoubtedly record further advances in this direction.

The conference plans to continue the work of international co-operation, to arrange for international inquiries and international competitions. It further considered the establishment of an international pavilion at the World Exhibition to be held in Paris in 1937. Such conferences cannot fail to do good both to the timber industry, and what is perhaps more important, in helping to build up a co-operative spirit between countries.

WOOD PIPES

The use of wooden pipes for conveying water dates back many hundreds of years. The original water supply of both London and New York was first reticulated through wooden pipes, these having been made by boring holes through logs, the individual sections being fitted together with various ways, chiefly by simple insertion of a smaller section into a larger. Such crude wood pipes gave good service for several hundred years.

With the more modern development of the wood industry, wood pipes are now scientifically prepared, and their construction is based on definite engineering data, so that, for instance, the thickness of the walls and the external wrapping are designed to carry the loads necessary.

Two main types of wood pipe are in use. Firstly, there is the factory produced or machined banded pipe. This is constructed of specially selected, seasoned and, in some cases, preservative treated wood. The wood is machined partly circular, the edges of individual staves being jointed, something after the style of a tongue and grooved flooring board. The finished staves are assembled around special formers where they are machine bound with heavy galvanised iron wire. Subsequently, they may be coated with special mixtures of tar and pitch and hessian.

This method of manufacture is particularly suited for smaller diameter pipes. Above a diameter of about 4 feet, pipes are generally of the second type, i.e. continuous stave, although continuous stave pipes can also be made in small sizes. The individual staves are prepared as before, but the pipes are actually constructed in situ. The arrangement of the staves is such that the pipe is continuous. The staves are held in position by mild steel bands, these being fitted with a special clamping and tightening device. When the pipes are first filled with water, the wood swells, resulting in a water tight pipe. Many advantages are claimed for the wood pipe among which are the following:- greater carrying capacity which is not reduced because of rust, corrosion or internal growths, lightness and ease of handling, combined with adequate strength, can be easily tapped or joined, can be used above or below ground, is not affected by alkaline or saline waters, is not subject to contraction or expansion caused by temperature variations, is not subject to electrolysis, can be used on sharp curves without the aid or special coatings, and ease of handling in inaccessible districts.

The use of wooden pipes is rapidly developing overseas, and in Australia considerable use has already been made of them. In the early days, Douglas fir was used almost entirely, followed by the use of Western Australian karri, which was treated by either the powellising or the fluarising process. More recently, pipes have been made of New south Wales turpentine and investigations into the suitability of other Australian timbers are being made by the interested manufacturers.

Good life has been obtained from lines which were installed over 25 years ago and these are still in service.

There is no doubt that wood can be successfully used for the fabrication of pipes and by the use of durable timbers or of others effectively treated with preservatives, pipe lines can be constructed which will give a long and satisfactory life.

THE SELECTION OF A GLUE

Is enough thought given to the glue line and the role it plays in the manufacture of plywood or laminated products? Does the average manufacturer realise that it may be the weakest link in the manufacture of laminated stock? Does he realise that the standard of his final product is dependent largely upon the quality and characteristics of the glue used? These, and a host of similar pertinent queries are of vital importance if the full benefits are to be derived from the use of laminated construction.

Thus, this short note is simply a plea - a plea for a more intelligent conception of the vital importance of choosing the best glue to cope with the vagaries of the timber being used, and to satisfy the use requirements of the finished stock.

Every manufacturer should take "time-of" to ask himself a few simple questions. A sample set of such questions and answers would be similar to the following:-

Q. What are the essential requirements of any glue line.
A. The glue must be applied cold and must provide a strong, water resistant joint.

Q. What other glue line characteristics are of importance?
A. The glue should be easily spread, non-staining, quick setting, of low water content, and easy on saws and knives.

It is realised, of course, that the bogey of excessive cost is lurking at the back of the manufacturer's mind, as he formulates and answers these questions, but these days, this bogey is practically non-existent, as a satisfactory glue line can be obtained at a reasonable cost.

The next logical step is to select the glue which best fulfils the specification set up, firstly paying attention to the essential qualifications, and secondly, making the final decision after carefully studying the relative values of the desirable secondary attributes as opposed to the undesirable characteristics possessed by each type.

If an absolutely waterproof joint is required, the final choice must lie with one of the artificial resin type glues, the majority of which require a hot press for their successful application. If a strong water resistant joint is the prime necessity either a casein, soya bean, or blood albumin glue may be applied with

success. But, of course, other characteristics may restrict the use of these glues for the purpose under consideration. Blood albumin glue is primarily a hot press glue, a feature which has made it unsuitable for use under existing Australian conditions. In addition, its application when using thin face veneers may not be advisable owing to its dark colour showing through the veneer. Again, some forms of casein glue may not be suitable. Staining may be excessive, or the glue may be too hard on tools. Perhaps a cheap glue with low water resistance and a long working life is required An adhesive made from starch would fill the bill admirably. And so on - one could enumerate various sets of conditions which can only be met by utilising a certain type of adhesive.

To the ordinary man, the joining of two pieces of wood immediately conjures up visions of the old-time glue pot. We have progressed beyond that stage, however, and the glue industry has become specialised. Research has produced many new types of adhesives and improved considerably on existing types so that nowadays, a glue to give satisfactory adhesion and performance under practically any set of conditions may be obtained. The old conservative idea of tying up to one particular brand of glue, or of jealously guarding the composition of a certain glue reputed to possess mystic powers and viewing with suspicion any new glue appearing on the market is no longer sound practice. It simply denotes lack of initiative and desire to pass onto the consumer the results of modern research.

Modern developments and requirements demand that the glue problem be studied from the angle of what the job requires to get the best results. Then, set up the glue specification to attain this end and finally hunt up the glue to best fulfil the conditions laid down.

PRESERVATION OF POLES

Recently, an inspection was made of a number of experimental pole stubs which were treated by various preservative methods and installed near Benalla, Victoria. The treated poles have been in service for from 2½ to 3½ years and untreated poles were set at the same time. Already the untreated poles have been badly attacked by termites (white ants) or decay and the value of treatment is obvious. Some treatments are beginning to show signs of failure and a comparison of the different methods in test will no doubt be of considerable interest to all pole users.

At the inspection were present 17 visitors representing various Government Departments using poles and representatives of various wood preservatives or wood preservation processes.

Similar pole test sites have been installed in Victoria at Belgrave and Ballarat and in New South Wales at Wyong and Clarencetown. Pole engineers interested in the results of the tests to date or desirous of being present at the periodical inspections are cordially invited and asked to get in touch with the Senior Preservation Officer, Division of Forest Products, Melbourne.

LONG LIFE OF WOOD

Another unusual record of the long life of wood employed in the construction of ships was recently printed in the "Waterways Journal", published at St Louis, Missouri:

> "What is claimed to be the oldest vessel afloat was discovered recently in the Swedish auxiliary schooner "Lisa". She was built in 1799, which means she has reached the old age of 137 years. Originally built for the Danish navy, the veteran schooner was hauled out on dry dock recently and it was found that her bottom needed only a little caulking and painting to put her in shape for service. During the early part of her career she ran in the Greenland and Iceland trade and at times called at American shores, though her loading capacity is only 125 tons. Built of holm oak, she is as strong now as the day she was launched. A 25 horsepower auxiliary motor was installed in 1925."
>
> (Extract from "Timberman", July 1936)

BREVITIES

Shortly before the War, the famous theatre in Drury Lane, London, was destroyed by fire.

Next day all that remained were the two outer walls and a great wooden tie beam 24" x 30". The beam, sole remaining support of the walls, upon removal was found to be charred to not over 1" in depth below which depth it was as good as before.

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

CSIRO
AUSTRALIA

NEWSLETTER

Forest Products

1936##058

MONTHLY NEWS LETTER NO. 58 FIRST PUBLISHED IN 2 NOVEMBER 1936

SOME INTERESTING POINTS ABOUT TENNIS RACQUETS

One of the worries of sporting goods manufacturers is the necessity of conforming with the whims of fashion. Not only does this increase the cost of the goods, but in many cases, the public demands an article which the manufacturer knows perfectly well is less efficient than is desirable. A recent example that has come to the notice of the Division of Forest Products is the question of tennis racquets. At the present time, the public demand is for a very lightweight racquet. A few years ago it was considered effeminate for a man to use a racquet weighing less than 14 ozs., but now there is practically no demand for racquets heavier than 13½ ozs. At the same time, the purchaser expects the lighter racquet to give just as good service as the heavier one. It should be realised, however, that other things being equal, a lightweight racquet cannot be as strong as a heavy racquet. To reduce the weight, the manufacturer can do two things: (a) reduce the amount of wood in the racquet, or (b) use lighter wood. It is obvious that reducing the amount of wood in the frame must weaken it, and the design of racquets has reached such a stage of perfection that the manufacturer dare not reduce the cross section of the frame any further. Now, lightness and strength in wood do not go together. In general, the heavier the wood the stronger it is, and for such exacting purposes as sporting goods, it has always been considered the best practice to select the densest pieces. Now, however, the manufacturer is forced to use the lighter piece, which a few years ago would have been rejected as unsuitable or else used for the lower grade racquets. Thus, the quality of the racquet inevitably suffers. Reputable manufacturers naturally do not like doing this, but so long as the public demands lightweight racquets, they will be compelled to continue the practice which, of course, is against the interests of the purchaser.

The problem is not confined to tennis racquets; manufacturers of cricket and baseball bats, racing oars, hockey sticks, etc., are faced with the same problem - the difficulty of combining lightness and strength. If purchasers only realised that in buying a slightly heavier article they were getting one that would give much better service, everyone would be better off.

TENNIS RACQUETS - AN IMPROVED METHOD OF MANUFACTURE

Tennis racquet manufacture has advanced a further stage following upon the advent and development of artificial resin glues in the field of wood adhesives. This new method of manufacture enables the building up of the racquet in a manner conforming to the principles of plywood construction to give a frame that is much less likely to twist or warp. The artificial resin type adhesive also provides a highly water resistant glue joint.

In the usual method of manufacture, the frames are built up singly, employing animal glue to bond the various laminations. The new method departs from this practice, however. A number of racquet frames are sawn from a block which has been glued up and pressed around a form in a special press, utilising an artificial resin glue film as the adhesive.

The frames are produced in either 5-ply or 7-ply thicknesses, with 17 or 19 plies in the

handle. Sheets of veneer 63" long by 16" wide are used both in the 5-ply and 7-ply construction. In the 5-ply racquet, the three laminations running parallel around the frame are each $^{9}/_{64}$" thick, while the two intervening laminations at right angles are $^{1}/_{32}$" and $^{1}/_{24}$" respectively. The requisite number of plies are assembled and interleaved with sheets of the glue film. This film comprises a thin (0.005") paper sheet which has been impregnated with the artificial resin. The sheets are then roughly bent and placed in a specially designed hot press. Wedges, shoulder strengthening pieces, and centre handle laminations which have been glued up previously are placed in position. Steam heated dies operated by hydraulic rams close on the sheets, forcing them into the correct racquet shape under closely controlled conditions of temperature and pressure. The racquet section remains in the press about 20 minutes, during which period the laminations are united into a solid sheet through the thermosetting action of the glue under heat and pressure. After cooling, this section 16" long is ready to be sawn into the appropriate number of frames which are usually cut sufficiently thick to allow a full section of the handle to be moulded from the solid piece.

The racquet frame requires a short period to attain equilibrium with atmospheric conditions, after which it is ready for the further stages in its manufacture. The first machine thicknesses the frame and tapers the handle. The throat and shoulder is then cleaned up on a spindle moulder working to a jig. The next procedure is to fine down the frame by hand, after which the frames are drilled for the gut on a "Briggs" boring machine. The racquet is then ready for stringing and the application of the various bindings and colours which add so much to the appearance and subsequent sales value of the article.

In England, various woods are used in the racquet construction. The main frame is usually built up of ash or Canadian birch, with Sycamore, Hickory, Mahogany or plane trees being used largely for handles, wedges and overlays.

At the present time in Australia, the main factor retarding the adopting of this system of racquet manufacture is the necessity for the use of an expensive, especially designed hot press. The artificial resin type glue film is no obstacle, as it can be imported from Germany at a reasonable cost. The extensive demand for tennis and other racquets should warrant, however, the expenditure on the equipment necessary for the construction of racquets in this way, and it is probable that before long the system will be adopted in this country.

THE LIFTING TRUCK

Although a combined air and kiln seasoning process has long been recognised as the most efficient method of seasoning many Australian hardwoods, particularly eucalypts, the advantages of this method of seasoning were offset to some extent at first by the large amount of handling entailed.

This problem of double handling has been completely solved by the use of the lifting truck. With this the timber is handled in a complete stack from it is first stripped out until it is machined. The green timber is stripped out on bolsters placed on skids which are built over rails, the stack conforming to the cross sectional dimensions of a kiln charge. The lifting truck is then run under the stack which is raised off the skids, run onto a transfer truck and carried to the air seasoning yard. Here the stack is lowered onto similar skids and the truck then runs out from underneath. After air drying, the stack is similarly transferred in turn to the kiln, reconditioning chamber and machine shop.

In 1932, the first lifting truck was designed and placed in use by Mr P.V. Christensen, a well known identity among timbermen in Victoria. Since then, nearly 40 lifting trucks designed along the same lines have found their way into use in various seasoning plants in Australia.

A recent innovation in conjunction with the lifting truck has been made by Messrs. Elder, Smith & Co. Ltd. at their seasoning yards in South Melbourne. This consists of a set of moveable skids on which to lower the stack of timber and so fill the lifting truck. The value of having the skids moveable lies in the fact that the stack of timber can be left at any desired position either for machining or loading onto trucks without having an extensive system of fixed skids which may frequently be an obstruction to vehicles on the

plant. Another advantage is that such skids may be taken away to facilitate cleaning operations.

RECENT PUBLICATIONS OF THE DIVISION

Two Trade Circulars, Nos. 32 and 33, have recently been issued and are now available for distribution.

Trade Circular No. 32 deals with the causes and detection of brittleness in wood, and is of special interest to handle and sporting good manufacturers. Various methods for the detection of brittle wood are referred to, the most simple being the breaking splinter and the knife test. These and other methods of detection are discussed fully in this publication.

Trade Circular No. 33 deals with the deterioration of timber caused by fungi. This circular is Part 1 of the series on this subject, and has particular reference to the influence of decay. There is still a widespread idea that rotting is a property inherent in wood and a very general ignorance of the fact that it is preventable if proper precautions are taken. With the greater use of well seasoned timber and with better ventilation in buildings, there is no reason why rots should be a serious cause of damage. This circular deals with the simple precautions that can be taken to prevent such damage and also gives some information on the nature of rots and the external features by which they can be recognised.

Both these circulars can be obtained on application to the Division.

BREVITIES

Mr W. Young, Chemist of the Plywood and Veneer Board of Queensland, is spending two months in the laboratories of the Division, investigating various features of timber research.

Phenolic Resin Glues. An interesting development in the use of these glues is in the fabrication of barrel staves which are both waterproof and also proof against attack by most chemicals. The staves are built up from stave shaped plies, i.e. with both lateral and longitudinal curvature, and bonded into an integral stave with a phenolic resin.

An Improved Three-ply Wall Covering. An improved three-ply wall panel is being marketed in the USA at the present time. The standard 8' x 4' panels are grooved in a variety of patterns by a special machine. Simple mouldings are then fitted in the grooves flush with the surface utilising a water resistant glue. In addition, when joining two panels, a similar piece of moulding is glued or nailed flush with the surface over the rabetted edges. The panels are manufactured in a number of designs to produce very artistic effects. This new idea eliminates the necessity of using battens to cover the points and should thus find application in high grade work.

CSIRO
AUSTRALIA

NEWSLETTER
Forest Products
1936##059
MONTHLY NEWS LETTER NO. 59 FIRST PUBLISHED IN 1 DECEMBER 1936

MARKETING OF AUSTRALIAN TIMBERS IN ENGLAND

One of the senior officers of the Division of Forest Products has recently returned from a visit to America and England. While in the latter country, he made some inquiries regarding the marketing of Australian timbers, and the following notes will be of interest as indicating the viewpoint of the English trade.

The advocacy of the wider use of Empire timbers in the United Kingdom has met with a very promising response, but Australian timber men who wish to develop the market for Australian timbers in the British Isles must realise that users of timber there cannot afford to govern their purchases of timber by sentiment alone. While there is a steadily increasing desire to favour Empire timbers, the questions of quality, prices and continuity of supplies cannot be left out of consideration. Further, the Empire itself provides such a wide range of timbers that any one unit of the Empire must face the fact that, apart from foreign competition, it has to meet a strong and healthy competition from other Empire timbers. The market for Australian timbers, for example, cannot be developed by adopting the attitude that Australia can offer timbers so unique that their use is assured once they have been seen. On the contrary, the United Kingdom timber trade would at the most be only temporarily and slightly inconvenienced were even the established Australian timbers withdrawn at once. Their place would very soon be taken by equally good timbers from other parts of the Empire.

This is especially so in the case of hardwood flooring timbers, of which the number offering is astounding. Recent enquiries throughout the trade in England brought always the same reply - that any attempt to promote new flooring timbers would be unprofitable and unsettling, in that money would have to be spent in promoting an unknown timber when at best could but displace a more or less parallel Empire timber already in use. So far as Australian flooring timbers already on the United Kingdom market are concerned, the general opinion expressed was that there is scope for considerable development. There seems to be a growing desire to obtain Australian flooring kiln-dried on this side, although importers would like to see more evenly dried stock than is being provided at present. The serious set-back to Tasmanian hardwood flooring, caused a few years ago by the shipment of undried and collapsed stock, has been largely overcome by the policy of exporting kiln-dried and reconditioned stock, but there is no doubt that there is a need for better drying if this timber is to increase in popularity. Several large concerns expressed the wish that they could obtain Jarrah and Karri flooring kiln-dried and machined in Australia, and this might also be extended to other flooring timbers such as Tasmanian hardwood and tallowwood.

The desirability of being able to obtain stocks kiln-dried in Australia was also mentioned in reference to solid ornamental timbers such as sawn Queensland Walnut.

The general opinion of timber merchants and manufacturers was that the greatest opening for Australian timbers was in ornamental veneers. Some of these are already popular and there is always a place for new ones. An essential that was stressed in connection with the successful marketing of veneers was the

supply of matched veneer in adequate quantities. It was stated that it is difficult, at present, to get sufficient matched veneer of any Empire timber and that this is the only factor likely to prevent their common usage.

Such concerns as were handling Hoop pine plywoods were pleased with the improvement in quality of recent years, but said that the market was limited owing to the fact that the size of sheets being supplied (72" x 36") was not suitable for the English trade. Sheets 48" in width are in demand as they cut up more economically, but they are unprocurable in England.

The difficulty of getting regular shipments of Hoop pine plywood and of Australian timber in general was stressed as being a big disadvantage operating against its wide use.

VACUUM VENEERING PROCESS

The vacuum veneering process was developed in Europe. It is finding extensive use in the USA, mainly for the application of face veneer to rounded, curved, irregular, and sometimes ordinary straight surfaces without the use of a press and expensive male and female forms. It is an answer to the demand for wood veneered curved surfaces in modern day furniture. Hitherto, mass production of furniture featuring curved surfaces has been restricted owing to the high cost of equipment needed in the manufacturing processes. This revolutionary method is now available to veneer rounded surfaces with only slight modifications in standard procedure, in large or small quantities, and at a reasonable cost.

In brief, the process consists of utilising the pressure of the atmosphere to replace the pressure customarily applied by means of screw or hydraulic presses. The vacuum veneering equipment comprises a rubber bag or sack, or a series of rubber bags or sacks connected with a vacuum tank and pump. A tray to form a fixed level base is fitted into the sack. The work to be veneered is assembled on a slightly smaller tray sliding on the first tray. Care must be taken to place the veneers accurately on the core, one edge being tacked or taped at the point where the pressure of the sack will be first applied. Too much glue should not be used. The glue should be of a quick setting type, of the proper viscosity, and should be applied only to the exact surface of the core to be covered by the veneer. The use of a quick setting glue demands that the assembly time and elapsed time before the application of the vacuum should be reduced to minimum.

After the work has been assembled and placed in position in the rubber bag, the end of the bag is hermetically sealed with a special clamping device and the air exhausted. A vacuum of 20"-26" is aimed at. For every inch of vacuum ½ lb. pressure per square inch of surface is exerted on the bag and its contents. Care must be taken during the drawing of the vacuum to adjust the rubber where it resets on the different pieces and to see that the veneer is not displaced. When the vacuum is complete the upper wall of the bag or sack should conform to the contours of the various pieces of work on the tray.

To the ordinary craftsman accustomed to the application of fairly high pressures in veneer work, the use of pressures varying from 10-13 lbs. per square inch immediately suggests that satisfactory adhesion cannot be obtained over this range. Judging by reports from USA, however, this is a misapprehension, and by using the correct type of quick setting glue which also possesses good adhesive properties at such low pressures a good joint is produced.

A TAPELESS TAPING MACHINE FOR JOINING VENEER

This type of machine is replacing to a large extent the conventional taping machine for many purposes in Europe and USA. It is also being used in occasional factories in Australia, but its many advantages warrant its more extensive application under local conditions.

After the veneer to be edge glued has passed through the jointer the edges are coated with animal glue and allowed to dry; the sheets are then fed through the machine at speeds up to 25 feet per minute receiving a light coating of formalin along the edges to be joined. During the passage of the veneer through the machine, the glue is set by heat and pressure to give a joint as strong as the wood itself in tension across the grain.

This type of joint obviates the necessity for sanding or steaming to remove tapes, with the

attendant danger of loosening of the face plies when the latter method is applied. It is also useful when applied to cross banding.

A NEW PROCESS FOR SEASONING TIMBER

A new process described as "chemical seasoning" has been developed at the Forest Products Laboratory, Madison, USA, and applied successfully, on a laboratory scale, to the seasoning of large sized timbers of both hardwoods and softwoods. In this process the timber is first soaked in a saturated water solution of a chemical such as common salt and left long enough for the salt to penetrate the outer surface of the wood. The material is then removed from the solution and dried in the usual manner except that much more rapid drying can be obtained without fear of the timber checking.

On account of the reduced vapour pressure of the salt solution, the moisture from the inside of the timber moves to the surface without the surface drying out so that the tendency for checking to occur is thereby eliminated. The process entails no actual chemical reaction between the wood and the chemical used.

By this process, 12" x 6" Douglas fir planks have been kiln dried free from degrade in 26 days after 8 days soaking in a salt solution. Without such a treatment the kiln drying period would probably be about three months and even at this rate of drying serious degrade may occur.

It still waits to be shown that this seasoning process can be used successfully on a commercial scale except under very special conditions, but in the meantime, work is proceeding at the Madison laboratory developing special treatments for different species and determining the results with different chemicals. Besides improving the seasoning properties of the timber some chemicals at the same time offer fire and decay protection. On the other hand, many of the chemicals are corrosive to metal fastenings, dull the knives of woodworking machines, and tend to make the surface of the wood become moist during humid weather.

In the laboratories of the Division of Forest Products, a start has been made to determine the extent to which this process is of value in connection with the seasoning of Australian timbers. Already one field of application has been found, enabling the seasoning period necessary for blocks of hardwood required for highly specialised purposes to be reduced from several years to a few months.

BREVITIES

A meeting of the Timber Sectional Committee of the Standards Association of Australia was held recently in Sydney. At this meeting the Division of Forest Products was represented by Mr I.H. Boas, Chief of the Division, who presided, and Mr W.R. Ferguson. A number of grading rules together with comments from the various State Sub-committees were discussed. The following will be issued shortly for public critical review.

(a) Grading rules for hoop and bunya pine and kauri plywood.

(b) Grading rules for lining and weatherboard of eucalypt and brush timbers of New South Wales and Queensland.

(c) Grading rules for hoop and bunya pine lining.

(d) Grading rules for cypress pine flooring.

In addition, lists of standard common and botanical names for Australian timbers will be issued for comment.

Mr Boas reported that when in London recently he discussed with the Timber Advisory Committee of the Imperial Institute the grading rules and standard sizes for Empire hardwoods. Standard specifications for jarrah and karri have been prepared and issued by the Forests Department of Western Australia. These specifications have met with general approval and it was decided to endorse them as a Standards Association publication. With reference to the Terms and Definitions used in Timber Grading Rules, a good measure of agreement has been reached between the British and Australian drafts. This list has been revised and is ready to be issued by the Standards Association. Comments received on the radiata pine flooring, lining and weatherboard grading rules and the hardwood paving blocks grading rules were discussed

and these will be issued in the near future as Standards Association publications.

The laboratories of the Division of Forest Products have been recently transferred from their temporary quarters in East Melbourne to the new quarters in South Melbourne. Inquiries should now be addressed to the Chief, Division of Forest Products, Yarra Bank Road, South Melbourne, S.C.5, (Tel. M4706). Those wishing to visit various officers of the Division will find the new laboratories conveniently located on the south side of the Yarra River, very close to the Spencer Street bridge.

CSIRO
AUSTRALIA