COMMONWEALTH OF AUSTRALIA.

COUNCIL FOR SCIENTIFIC & INDUSTRIAL RESEARCH.

DIVISION OF FOREST PRODUCTS.

MONTHLY NEWS LETTER No.136.

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BUILDING MATERIALS RESEARCH, C.S.I.R.

Mr. Ian Langlands appointed Officer-in-Charge.

With a view to conducting investigations into the development, manufacture, properties and uses of building materials the Council for Scientific & Industrial Research recently appointed Mr. Ian Langlands, M.Mech.E., B.E.E., A.M.I.E.Aust. as Officer-in-Charge, Building Materials Research.

His first duties will be to make a survey of building industry problems to ascertain those which are most urgent and those whose solutions can be sought with existing facilities.

For the present no Building Materials Research Laboratory will be established but experimental work will be carried out in C.S.I.R. laboratories, especially those of the Divisions of Forest Products, Industrial Chemistry, Aeronautics and Soils and the National Standards Laboratory.

It is proposed to set up, as soon as possible, an information and intelligence service, the functions of which will be to survey and classify for easy reference the great volume of existing knowledge (both overseas and local) regarding building materials and their uses, to keep abreast with new knowledge as it becomes available, to digest the information and issue it in a form suitable for use by the building industry, and to deal with enquiries.

The work of Council for Scientific and Industrial Research will be complementary to that of the Commonwealth Experimental Building Station of the Department of Post-War Reconstruction which will deal with the design and construction of buildings and their fittings. The work of these organisations is closely related and intimate cooperation and liaison will be maintained between them.

Mr. Langlands was formerly Officer-in-Charge Timber Mechanics Section of the Division of Forest Products, C.S.I.R. He had a distinguished career at the University of Melbourne completing his course in Electrical Engineering in 1927 following which he was for two years assistant lecturer in Engineering Design and in that period he completed his course in Mechanical Engineering.

In 1929 he was appointed to a senior research studentship of the C.S.I.R. to enable him to investigate overseas the methods of research in determining the mechanical properties of timber and the adaptation of timber for use in structures. He spent some time at the Forest Products Research Laboratory at Princes Risborough, England, the Canadian Forest Products Laboratories at Ottawa and Vancouver, and at the U.S. Forest Products Laboratory at Madison. In 1931 on his return to Australia he was appointed Officer-in-Charge of the Timber Mechanics Section of the C.S.I.R., Division of Forest Products. Under his supervision the excellent equipment and large staff of the Timber Mechanics Section have been built up.

Mr. Langlands made valuable contributions to our knowledge of the mechanical properties of Australian timbers. From 1939 with the outbreak of war he supervised the systematic mechanical testing of Australian timbers and plywoods potentially suitable for aircraft construction. These tests provided a basis for the preparation of specifications for aircraft quality timber and design data.

His research on the design of timber columns and investigations on the efficiency of various types of joints and fastenings, especially timber connectors, have been of great value. These works made possible improved designs for the large timber structures which have been used so extensively in Australia during the war for hangars, factories, workshops, and stores.

In 1939 the C.S.I.R. Handbook of Structural Timber Design compiled by Mr. Langlands with the assistance of Mr. A.J. Thomas was published. This was followed in 1941 by a second revised edition, and a supplement "Large Timber Structures" was issued in 1942.

He was a prominent member of several war time committees which discussed technical problems associated with the use of timber and gave valuable assistance in the preparation of specifications to regulate the quality of Australian timbers for various Service uses. Mr. Langlands is actively interested in the Institution of Engineers (Aust.) and is a part-time lecturer at the University of Melbourne giving lectures on timber to students in Civil Engineering.

For the present Mr. Langlands will be located at the Division of Forest Products, C.S.I.R., 69 Yarra Bank Road, South Melbourne. When he moves to other accommodation his association with the Division will not be severed as timber will always be a major material in buildings and it is anticipated that the facilities of the Division will also be used for carrying out researches on other building materials.

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PERSONAL.

Mr. S.A. Clarke, Chief, Division of Forest Products C.S.I.R., attended the Timber Development Association Congress held in Sydney early in December.

Mr. S.F. Rust, Officer-in-Charge, Veneer & Gluing Section C.S.I.R. spent some time in Sydney in December on problems associated with the use of adhesives in service equipment.

Mr. J.T. Currie, Liaison officer of the Division of Forest Products, C.S.I.R. resident in Sydney recently visited Melbourne to discuss with other officers at the Division some problems encountered in Sydney.

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PLYWOOD WHEELS APPROVED FOR INDUSTRIAL TRUCKS.

After three months' use of plywood wheels on industrial hand trucks, a Victorian fruit cannery submitted the following report approving the use of plywood truck wheels as a substitute for the rubber-tyred steel wheels.

"WOODEN HAND TRUCK WHEELS. This confirms the writer's telephone advice regarding the testing at our factory of the experimental plywood wheels which you were good enough to make up some months ago.

"These wheels have been in constant use since fitting, carrying light to heavy loads the maximum being about 3½ cwt. (1¾ cwt. each wheel).

"The starred wheel is the most satisfactory as without the end grain being distributed as much as possible over the wearing surface it is inclined to wear more rapidly with the grain and so produce a series of flats.

"The starred wheel also chips less at the edges along the outside layers of plywood. The chipping, whilst possibly a little unsightly and not tolerated under ordinary circumstances, has not affected the use or stability of the truck.

"As regards wear our engineer reports that over the three months about ⅛" has been lost in this direction On further investigation any camber would not help materially as this would be quickly lost by wear.

"As mentioned we have ordered a considerable quantity to fit to our present trucks including several sets for some 30 cwt. lift trucks. We are proposing to make the diameter of the wheel about ⅛" over size to allow for wear which would give a longer life to the wheel, and giving the outer edges a ½" radius with the idea that this may minimize chipping along the edges.

"This order had already been placed before our tests were completed and if we were ordering again we would increase the width of the wheel by about ¼" to give a slightly greater wheel surface.

"We think that perhaps weshould say that the wooden wheel wears a little faster than rubber as the truck in operation now would be almost due for replacement as a result of the reduction in diameter throwing the hand truck when at rest slightly out of balance. The increase in diameter would extend the life of the wheel by at least 50 to 75%.

"Summing up, we would certainly not exchange rubber for wood but in our case we definitely prefer wood to steel wheels as a protection against damage to the factory floor which is all concrete and which before the adoption of rubber suffered severely from the use of steel wheels.

"We appreciate indeed the advice and assistance you afforded in the original experiments and would be happy to reciprocate with any further information or particulars you may desire.

"It may be of interest to you to have the return of the first set of wheels which we discard, and the writer proposes so doing unless you specifically advise to the contrary".

For continuation see bottom of page 4

NEW TYPES OF VENEER SPLICERS.

The advent of the hot press for the bonding of plywood was accompanied by the development of a new type of veneer splicer or "tapeless taping machine". This was an essential item of equipment as it was impossible to utilise paper tape in conjunction with the new hot press technique using artificial resin adhesives.

In the early machines it was necessary to pre-spread the edges to be joined with a high grade animal glue or gelatin before the sheets passed against a roller which applied a formalin to the glued surfaces. The sheets then passed between stationary bars which applied heat and pressure to the join. These machines were remarkably effective and have turned out an enormous volume of work in Australia. They had several draw-backs however, the principal one being the fouling of the heater bars with glue.

It is claimed that newly developed splicers have eliminated the faults found in the earlier types. Some of the features of the new machines are:

a. Veneers 1/100 to 3/16" in thickness can be edge glued at speeds ranging from 20-85 ft./min.

b. The veneers are clamped between three lower and three upper plates travelling at the same speed as the veneer, the outer plates constantly moving towards the centre plates. Thus constant pressure is exerted along the veneer joint without the slightest interruption during the run of the veneers through the machine.

c. Electric strip heaters heat the centre chain sections.

d. An artificial resin glue is applied to the surfaces to be joined as the veneers are fed into the machine.

Any surplus resin squeezed out from the joint is automatically removed from the chain by wiping pads moistened with a special chemical. The cleaning action is continuous.

e. The in-feed table section containing the feed rolls, glue disc and glue pot is kept cool. This effectively prevents heat transfer into the glue disc and tank thereby eliminating any possibility of preliminary polymerisation or setting of the resin.

f. The glue spread is controlled by doctor blades on each side of the disc.

These advantages ensure that there will be a demand for this class of machine in the future particularly in view of the developments that are likely to occur in the use of artificial resin adhesives.

S.F.R.

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PLYWOOD WHEELS APPROVED FOR INDUSTRIAL TRUCKS (Contd.)

The wheels used were built up at the Division of Forest Products, C.S.I.R. from 1/8" myrtle beech veneers some being laid up with the grain of alternate veneers at right angles as in orthodox plywood construction, but in the remainder the veneers were starred at 45°.

After five months' service the first wheels were removed from the trucks as unserviceable, but the starred wheels were still in use a month later.

STRONGER BOXES WITH SPECIAL NAILS.

The superiority of cement-coated nails over plain nails has often been claimed but not substantiated in the past. However, in 1944 in a series of tests carried out by the C.S.I.R., Division of Forest Products in which both types of nail were subjected to impact and static loads, the processed cement-coated nails showed on an average a 50% higher efficiency than the plain nails. Tests on half the nails were made immediately before driving and the remainder were pulled 3 months later. Actually there was no significant difference between the nails under impact loads but under static loading conditions the processed nails had almost twice the holding power of the plain nails.

This apparent reversal of previous experience was due not to an increase in the holding power of the cement-coated nail but to a marked decrease in the efficiency of plain nails. This has been attributed to the improved methods of wire drawing which result in the surface of plain nails being smootherthan when previous tests were carried out. In order to utilise their superiority, processed cement coated nails one gauge lighter than plain nails may be used if it be essential that cost should not be increased. It should be noted however, that the maximum size and number of plain nails that can be used in standard nailing machines for case, crate and box construction is probably insufficient to develop full strength of the timber shooks to provide a properly balanced design.

In the light of these tests it is recommended that the processed cement-coated nails be used in the same sizes as plain nails so making a stronger container with little increase in cost.

H.N.K.

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HOLES IN GREEN TIMBER - HOW THEY SHRINK ON DRYING!

A simple experiment to determine the shrinkage during drying of holes in green timber/was recently carried out at the Division of Forest Products, C.S.I.R. Several 1 in., 2 in. and 3 in. diameter holes were drilled in green boards of white birch and silver quandong. The diameters of the holes were measured accurately by means of an internal micrometer gauge. Progressive measurements both across the grain and parallel with the grain were made as drying proceeded. Simultaneously measurements were made on similar pieces of green timber to determine the shrinkage when no holes were present.

As has generally been believed, it was found that across the grain the reduction in diameter of the holes was closely in accordance with the normal shrinkage for the species used and that shrinkage parallel to the grain was almost negligible.

It is interesting to observe that in several cases a slight increase in diameter along the grain occurred during drying to fibre saturation point but subsequently slight shrinkage developed.

Many people using green timber are apt to overlook the fact that holes originally circular will shrink in width and become oval as the timber dries, and the consequent disability of fitting through the holes some time after fabrication, bolts or other fastenings is often annoying.

G.W.W.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

BROWN PINE AND BLACK PINE.

Brown pine and black pine are the standard trade common names for the timbers derived from two closely related species; Podocarpus elata R.Br. and Podocarpus amara Bl. These two species are the only two representatives of the genus Podocarpus which attain timber size in Australia. They are closely related to the genera Dacrydium and Phyllocladus which are represented in Tasmania by Huon pine and celery-top pine respectively.

Both species are often referred to as black pine and brown pine as she pine, Port Macquarie pine and as native deal.

Distribution: Brown pine is found in the coastal brushes and jungles from Illawarra in New South Wales to Cairns in North Queensland. Black pine, the more northern species, is found in Cairns-Atherton district and occurs also in New Guinea and the Dutch East Indies. They are both sub-dominant species found in mixture with other scrub timbers and also hoop pine and kauri in areas with continuous rainfall with a monthly minimum of 1½".

Habit: Both brown and black pine are small trees with a total height of 80-100ft. and a stem diameter of approximately 24". Brown pine has a brownish-grey bark of sub-fibrous texture and black pine has a darker bark and bears crimson fruit about 1" long which is said to be edible.

Timber: The truewood of these two timbers is macroscopically almost indistinguishable, though brown pine is slightly the heavier of the two. Both can be described as golden-brown timbers of even texture and compact and close grain. The truewood of black pine averages 30 lb./cu.ft. at 12% moisture content with a range of 26.5 to 32.5 lb./cu.ft. According to Swain in "The Timbers and Forest Products of Queensland" the air dry density of brown pine averages 37 lb./cu.ft. The air-drying of these timbers presents no difficulties. The shrinkage of black pine is small; in drying from the green condition to 12% moisture content the average shrinkage is 3.7% in a tangential direction (backsawn) and 1.7% in a radial direction (quartersawn). This timber may be kiln-dried readily with freedom from the usual drying defects, but is susceptible to a brown staining during drying due to the leaching out of a soluble manganese substance present in the timber. Both timbers are clean cutting and take a smooth finish with hand and machine tools.

Uses: Brown pine and black pine can be applied to purposes for which hoop or bunya pine are used, i.e. fruit and butter boxes, interior fittings, cheap cabinet construction etc., but on account of their better turning and cleaner cutting properties they are well suited to turnery and carving. They are then used in such articles as bobbins, kitchen utensils, butter churns, rolling pins, bread-boards and platters. They have been used in the manufacture of musical instruments as for piano keys and violin bellies.

Availability: Neither timber is in great supply and they are frequently mixed with parcels of hoop or bunya pine or kauri, and sold as such. Logs are usually sawn into boards which are cut as wide as possible but seldom exceed 12 in. in width.

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FLAX PROCESSING RESEARCH AT THE DIVISION OF FOREST PRODUCTS, C.S.I.R.

That there is a section of the Division of Forest Products actively engaged in research work on linen flax processing may not be generally known. However, investigations on flax have been in progress since 1937 when local spinners became interested in growing and processing flax and made a grant to C.S.I.R. to initiate research in modern methods of flax retting. Contact with the trade made Melbourne the most convenient venue for the investigations and accommodation then being available, the work was attached to the Division of Forest Products.

In 1939 the acreage of flax planted in Australia had grown to 2,000 and was expanding but after the outbreak of war, at the request of the British Government, the rate of expansion was speeded up enormously and from 1941 the annual acreage planted has been from 60 to 70,000. The fibre produced is worth well over £1,000,000 per annum.

It seems certain that the flax industry will be a prominent post-war industry in Australia although possibly with some reduction of acreage at first.

A rapidly developing new industry naturally requires technical guidance and assistance and this has been supplied by the Division. Research in almost every phase of processing has been initiated and an original staff of one officer and a junior has had to be expanded to five officers and four juniors. Problems are being investigated in connection with water and dew retting and a new process by which retting is carried out chemically has been developed to the pilot plant stage. This process accomplishes in 8 hours what water retting requires 4 days and dew retting 6 to 12 weeks to complete. Tests on scutching have been commenced but due to lack of accommodation for suitable machinery have temporarily been discontinued. Fibre evaluation methods, both physical and chemical, have received attention and have gone far to remove the personal element of the individual grader with which all flax grading has hitherto been associated. More attention is being paid to spinning quality and experimental equipment for this purpose is required.

<< Content

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Naturally, owing to the pressure of expansion only the most urgent problems have so far received attention and if the industry is to be an efficient one, continuation of investigations is necessary. At present only about 50% of the fibre in the straw is recovered in the form of long fibre. The balance is lost or recovered only as tow which is much less valuable. If the percentage of fibre obtained from the straw can be increased by only 1% (and this is a very modest figure) then the saving to the industry, on present prices, would be over £100,000 per annum.

The work has outgrown the stage where it can be accommodated in the laboratories of the Division of Forest Products where it does not really belong and the establishment of a separate laboratory with all necessary facilities is hoped for in the near future.

W.L.G.

PERSONAL.

Mr. S.A. Clarke, Chief, Division of Forest Products, C.S.I.R., visited Queensland during February to contact timber and plywood interests there on technical problems and the Queensland Forest Service on matters associated with developments in timber utilization and research.

Mr. C. Sorensen of the staff of the Division of Wood Technology, N.S.W. Forestry Commission spent some time at the Division of Forest Products, C.S.I.R. when he visited Melbourne recently to attend a conference on plywood for defence purposes.

Mr. G.W. Wright, Officer in Charge, Seasoning Section, Division of Forest Products, C.S.I.R. went to Adelaide and Mt. Burr in February to review kiln drying practice in South Australia.

Dr. H.E. Dadswell, Officer-in-Charge, Wood Structure Section, Division of Forest Products, C.S.I.R. and Mr. E. Smith, Photographer visited Brisbane in connection with publications on timber species in New Guinea and the Philippines.

Mr. N. Tamblyn and Mr. A. Rosel of the Preservation Section of the Division of Forest Products, C.S.I.R. recently made one of the periodic inspections of Pinus radiata test sleepers and poles in South Australia. The inspection of test sleepers was made in conjunction with the S.A. Railway Department and the test poles in conjunction with the P.M.G. Department.

COCONUT PALM LOGS.

Valuable Material from Pacific War Zone Under Test.

The coconut palm (Cocos nucifera) is the most important member of a small genus belonging to the Palm family.

Cultivated primarily for its fruit, coconut plantations have, until the war against Japan scarcely excited even a passing interest for other purposes. Little account was taken of the logs about 10-12 inches diameter which could be obtained from trees which in the older plantations and along the tropical beaches sometimes attain heights up to 100 ft. but more often about 50-60 ft. However, the existence of large plantations in tropical Pacific war zones has resulted in coconut logs being used extensively for all classes of construction, most important of which are buildings for the accommodation of troops, the protection of stores, corduroy on roads, bridges, jetties, dugouts and fox-holes and for numerous other purposes. This extensive use prompted a desire for information concerning the mechanical properties of coconut logs used either as a unit or converted in the form of split or sawn material. In common with other palms, coconut logs have no growth rings in the usual sense as the tree grows upwards from the top, and there is no subsequent increase in diameter except the swelling at the butt caused by the pressure of a big tree on the basal portion.

When crosscut a coconut log is observed to be made up of three zones - an outer layer about ¼ in. thick of dark brown fibrous tissue resembling bark, surrounding a hard ring about 2 in. wide comprising chiefly bundles of horny vascular strands set closely together in soft tissue. This layer merges into the central pithy core consisting of scattered bundles of vascular strands interspersed with soft tissue.

Some time ago ten logs 25 ft. long and about 10-12 in. diameter cut from coconut palms growing in New Guinea were received by the Division of Forest Products, C.S.I.R. for mechanical test and the results have proved to be of considerable interest. Initially, each log as received was tested "in toto" in bending and an average bending strength of 6,900 lb./sq.in. with a range of from 4,600 lb./sq.in. to 10,800 lb./sq.in. and an average stiffness of 1.56 x 10^6 lb./sq.in. were obtained. After this test both ends of each log were sawn into small clear specimens, half of which were set aside for drying, the rest being tested immediately in a green condition. It was so arranged that specimens were obtained from the pith outward so that variation with distance from the pith could be studied. The results obtained from these tests were extraordinary.

The moisture content of the specimens varied between 50% and 74% of the oven dry weight of the material. Basic density calculations on individual specimens ranged from 6 lb. to 62 lb./cu.ft., this large variation being explained by the very marked variation in texture from the pith to the outside. Whereas near the surface wood was hard, strong and dense, towards the centre it is soft and friable and the woody tissue between the fibres was in a process of decomposition in the logs as received. This was more noticeable if the specimen had been confined in a storage bin for some days after which time the smell of ammonia was very marked, and deterioration was more rapid.

A variation in crushing strength from 220 lb./sq.in. to 12,500 lb./sq.in. and Izod values from 0.6 ft. lb. to 147 ft. lb. were recorded. The maximum hardness was 65 times the lowest value. A full analysis is now being made of the results of the green tests and as soon as the remainder of the specimens reach equilibrium the tests on the air dried material will be carried out.

From first impressions it would appear that too much work would be involved in obtaining the relatively small amount of good quality wood from coconut logs but the tests made should indicate the basis for the selection of logs which will be most effective for structural purposes, and in general will provide information on the strength properties of a material of which very little is known at present.

H.N.K.

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PRESERVATION OF KARRI SLEEPERS.

Long Term Observations in Western Australia.

Karri (Eucalyptus diversicolor F.v.M.) is a Western Australian timber similar to jarrah in the appearance and weight but is relatively non-durable in situations where decay or termite hazard exists.

In common with other Eucalypt timbers, the truewood of karri is very refractory to pressure treatment with preservatives but may be penetrated slowly by diffusion of water soluble chemicals into green timber. This latter method of treatment was the basis of the Powellising process which was used extensively in Western Australia for the treatment of karri rail sleepers in the period 1906-26. In this treatment the green timber was boiled in open vats in a solution of molasses (6 - 8%) and arsenious oxide (1-2%) in water.

In Western Australia the Powellising treatment gave reasonable protection against termite attack but was unsuccessful in preventing decay and hundreds of thousands of treated karri sleepers were severely rotted after 6-8 years service. When the failure of Powellising became recognised a process was developed under the aegis of the West Australian Forests Department in which sodium fluoride and sodium dinitrophenate were substituted for the molasses.

The term "fluarising" was coined to describe the treatment as its preservative value was due mainly to the fluorine and arsenic.

The fluarising plant was located at the State Saw Mill, Pemberton, in the karri forest area and consisted of six vats fitted with steam coils together with accessory tanks and boilers. Each vat was 90 ft. long, 10 ft. wide and 7 ft. 6 in. deep with end doors to permit entry of the loaded trucks on which were stacked the green sleepers or other timbers which were separated by strips to allow free access of the solution during treatment. After boiling for 10 hours sleepers were then allowed to cool in the solution for a further 36 hours. Complete penetration of the preservative was not obtained and it is probable that effective treatment was limited to a depth of ¼-½ inch on the faces and edges with somewhat deeper end penetration.

The fluarising process became a commercial treatment in 1926 without field test of its preservative value. However, in 1929, the then newly formed Division of Forest Products, C.S.I.R. approached the West Australian Government Railways and Forest Departments and cooperative service tests were planned. In these tests which were commenced in the latter part of 1929, approximately 3,000 fluarised karri sleepers together with a number of untreated karri and jarrah controls were installed in 22 test lengths in 4 representative localities in the W.A.G.R. system. These sleepers which were numbered with numeral nails were inspected annually by the W.A.G.R. and at intervals by officers of the Division of Forest Products. An inspection record was kept showing the progressive deterioration of each individual sleeper until its date of renewal.

The final inspection was made in 1944 and a complete report of the test will be published shortly in the C.S.I.R. Journal.

The results are of considerable interest. The average life of all fluarised karri sleepers in the test is estimated at 13 years ranging from 10 to 18 years in the 22 test lengths. The measure of protection afforded by the treatment is indicated by the fact that the untreated control karri sleepers gave an average service life of 6½ years.

These untreated sleepers were attacked rapidly by decay with some associated termite attack. The treated sleepers failed principally from the same cause though in some sections where decay hazard was low, mechanical failure due to end splitting, "brooming" of the surface and finally failure to hold the dog spike assumed increasing importance in the later years of the test.

The treatment was promising but not entirely successful and while naturally durable timbers giving a superior service life are still available, fluarised karri sleepers cannot be recommended for general use in Western Australia. The weakness of the treatment lay in the susceptibility of the treated karri sleepers to splitting which exposed the inner untreated wood to attack by decay or termites.

The results of this test are of particular interest at present as the problem of utilising the less durable eucalypt timbers for rail sleepers is becoming increasingly important in the majority of Australian States due to depletion of forests carrying first class durable timbers and to the anticipated heavy demand for rail sleepers in the early post war years. To accommodate this demand it will be necessary to extend further the range of species accepted for rail sleepers and thus include second class hardwoods susceptible to decay, termite attack and mechanical breakdown.

The Division of Forest Products, C.S.I.R., has been requested to give urgent consideration to this problem and officers are at present engaged in surveying the position preparatory to developing a major project.

N.T.

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THE PROPERTIES OF AUSTRALIAN TIMBERS.

GREY HANDLEWOOD.

Grey handlewood is the standard trade common name for the timber known botanically as Aphananthe philippinensis Planch. This timber is also known locally as native elm (in N.S.W.) or axe handle wood.

Distribution. Grey handlewood is found fairly commonly in the northern portion of New South Wales from the Manning River north and in the Brisbane River, Rockhampton and Innisfail districts of Queensland. This species also occurs in and was recorded first, from the Philippines. It is only a sub-dominant or intermediate species in the jungle associations in the zone of continuous rainfall. Grey handlewood is mainly a tree of the stream bottoms, but is also found on dry jungle sites in the Bunya mountains.

Habit. Grey handlewood is only a small to medium sized tree having a total height of 50 - 60 feet and a stem diameter of under 20 in. Root buttresses are strongly developed in older trees. The bark is greyish-brown shedding in thin, roughly rectangular shaped flakes.

Timber. The truewood of this tree is a dull creamy white, grey or sometimes pale brown colour; straight grained, of a fine and uniform texture, extremely tough and elastic. A definite figure is shown on backsawn faces by the broad and conspicuous bands of soft tissue. The truewood of grey handlewood averages 45 lb./cu.ft. at 12% moisture content with a range of 40-51 lb./cu.ft. In drying from the green condition to 12% moisture content this timber shrinks 6.0% in a tangential direction (backsawn) and 3.5% in a radial direction (quartersawn). This Division has had no experience in the seasoning of this timber but according to Swains' Timbers and Forest Products of Queensland it has a strong disposition to warp, and requires careful handling. The truewood of this species is not durable in contact with the ground and the sapwood is commonly attacked by Lyctus and is also prone to blue staining.

Uses. The main use of this species, as its name implies, is in handles of various kinds, such as for axe, adze and pick and also for carpenters' tools such as saws, hammers, planes, chisels etc. It also makes excellent mallet heads for carpenters, tinsmiths, and plumbers. It may prove also a satisfactory timber in the sporting goods field, in baseball clubs, golf club heads etc.

Availability. This is a comparatively scarce timber and on account of its small size, yields only narrow boards and billets.

H.D.I.

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HOUSES AND BUSHFIRES.

Construction Details Important in Determining Hazard.

A report under the title "A Survey of Houses Affected in the Beaumaris Fire, January 14, 1944" by G.J. Barrow in the February 1945 issue of the Journal of the Council for Scientific & Industrial Research provides some valuable observations on the disastrous bushfire in the Beaumaris district, an outer suburban area about 12 miles from Melbourne.

Unfortunately "bushfires" in forest, scrub and grassland are a feature of summer in many parts of Australia, and although Victoria was practically unaffected, the summer of 1944-45 brought to the Blue Mountains area near Sydney, and to the Encounter Bay District in South Australia, fires which resulted in the destruction of numbers of homes as at Beaumaris.

Following the Beaumaris fire the C.S.I.R., Division of Forest Products carried out a survey to determine the influence of various building materials and constructional details in relation to fire resistance of houses in the path of the fire. The houses affected in this area comprised 58 totally destroyed, 8 damaged, and outhouses and fences of 64 other houses were damaged.

Conditions on the 14th January, 1944 were ideal for a bush fire. The entire locality was covered with dense scrub, high bracken and dry grass. Weather conditions prior to the fire had been very drying, and the day of the fire had a steady wind from the North and North-West with temperatures in excess of 100°F. and the relative humidity fell to 6 per cent which corresponds to an equilibrium moisture content of 2% in wood. The fire was divided into two main runs with many small branches, the first run preceding the second by some 20 minutes.

The following conclusions are drawn from the Survey.

The outstanding fact revealed by the survey was that the fire resistance of all types of houses was governed more by the design and constructional details than by the materials used in their construction.

Statistical analysis of the results of the fire have shown that there was no significant difference in fire resistance between houses constructed with walls of (a) brick or concrete; (b) weatherboard; (c) asbestos fibro cement and similar materials.

Outstanding sources of danger were large ventilators at the apex of gables; badly fitting tile roofs; large unscreened openings below the floor level and indeed, any opening which might allow ingress of sparks or burning material.

The storing of inflammable liquids and combustible materials in or against the houses was, in a number of cases, instrumental in creating uncontrollable fires.

Another contributing cause was faulty fittings which enabled birds, possums and rodents to fill the roofs with highly combustible material.

The type of surroundings played quite a large part in both the destruction and the saving of some houses. Several comparatively well built houses were destroyed owing to the proximity of trees and dense scrub which quite often had been encouraged to grow adjacent to the house and in some cases were right up to and under the eaves.

Several houses were saved by high trees near the house which caused a strong updraught of air, giving a hurdling effect to the fire and burning debris which swept up and completely cleared the house; this only occurred where the trees were preceded by grassland or very low scrub which terminated short of the trees.

From a close observation of the area it is safe to say that there is no chance of predicting the behaviour of a fire of this type. The fire appeared to be caught in draughts caused by and associated with itself, and at times burnt back considerable distances against the wind.

Land contour in conjunction with the wind was responsible for unexpected vortices which caused the fire to be drawn back up several hills destroying or damaging houses which appeared to have been passed.

The final conclusion drawn from the fire survey was that more intensive thought should be given to fire danger from without in the construction of houses, particularly in a fire hazard area.

G. B.

PULP AND PAPER RESEARCH CONFERENCE.

The sixth Annual Pulp and Paper Research Conference will be held at Burnie, Tasmania commencing April 10th, 1945 and is expected to continue for three or four days. Delegates to the Conference will be representatives of the Division of Forest Products, C.S.I.R. and research personnel of the three pulp and paper companies, viz. Messrs. Australian Newsprint Mills Ltd., Messrs. Australian Paper Manufacturers Ltd. and Messrs. Associated Pulp & Paper Mills Ltd.

Apart from general business and one or two other items, the discussions at Burnie will be devoted to subjects which fall under the following broad titles:

(i) the structure of the wood pulp fibre
(ii) the chemistry of wood - (a) lignin; (b) carbohydrates
(iii) methods of wood and pulp analysis
(iv) methods of pulp evaluation.

These titles embrace the fundamental investigations which are conducted by the C.S.I.R. Division of Forest Products under subsidy from and for the benefit of the Australian Pulp and Paper Industry. The main purpose of the Conference is to afford the Division of Forest Products an opportunity to present its research results so that these may be discussed to best advantage of all across the Conference table. It is also the purpose of the Conference to permit the general planning of future work to be carried out by the Division on behalf of the industry.

A few comments might help to indicate the importance of these fundamental studies to the pulp and paper industry.

The wood pulp fibre is the building unit of a sheet of paper but before it is capable of imparting the desired properties to the sheet, it must undergo various forms of mechanical processing. The latter serves to modify the structure of the fibre so that it will felt with, and bond with, adjacent fibres. The changes in structure so involved are small in comparison with the changes in paper making properties which accompany them. In fact these structural changes may only be observed by means of a high powered microscope and it is often necessary to employ even greater resolving means such as the electron microscope.

The chemistry of wood is vitally integrated with the pulping process especially where special pulps for the manufacture of gun cotton and cellulose products are concerned. For these purposes the wood pulp fibre needs to be carefully purified so that it consists largely of pure cellulose. The more that is known about the chemistry of the fibre, the easier it is to control these purifying processes. Lignin is present in our hardwoods to the extent of 20% of their weight. At the present time it is wasted or burnt as fuel in the chemical recovery processes of pulping. Lignin has been shown to possess several useful properties. For instance it is reputed to have thermoplastic properties. The object of researches on lignin is to elucidate its chemical constitution and reactions so that the best use might be made of it.

The development and control of the pulping process and of other processes using wood as a raw material depend on having satisfactory and, preferably, standardized methods of wood and pulp analysis. A considerable amount of research has already been done on these methods, and, as the result of this, the industry and the Division of Forest Products have already adopted the majority of the methods for use as standard throughout Australia.

The manufacture, buying, selling and processing of pulps are governed by their paper-making properties. Consequently it is essential that the latter may be assessed by means of reliable and reproducible methods. The Division of Forest Products has given a considerable amount of attention to laboratory methods of pulp processing, paper making and paper testing. As the result of this work, there is a standard procedure for use throughout Australia. The Technical Section of the Papermakers' Association of Great Britain and Ireland has been continuously advised of the results of this work which, in reality, has amounted to the perfection of a tentative procedure laid down by that authority.

W.E.C.

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SALT WATER IMMERSION TESTS ON UREA FORMALDEHYDE ADHESIVES.

Urea formaldehyde glues have been used on a fairly large scale in the construction of small marine craft during the past few years. From time to time various difficulties with these glues have arisen and one question under discussion recently has been whether prolonged immersion in sea water would have a harmful effect on the strength of urea-bonded joints, especially as reports from America have suggested that breakdown in urea-bonded Douglas fir (oregon) and some other woods is brought about by immersion in sea water.

The Division of Forest Products, C.S.I.R. recently completed some tests on hoop pine and karri plywoods and solid Douglas fir bonded with well-known urea formaldehyde resin glues. The plywoods were made up with hot and cold setting glues. The specimens were divided at random into five groups and were tested at intervals of 7, 14, 28, 56 and 112 days from the original gluing of each type of specimen. Each of the five groups was subjected to different conditions as follows:

(a) maintained at normal atmospheric temperature and humidity
(b) soaked continuously in fresh water
(c) as for (b) but conditioned for 7 days at normal atmospheric temperature and humidity before testing
(d) soaked continuously in salt water
(e) as for (d) but conditioned for 7 days at normal atmospheric temperature and humidity before testing.

The data collected were graphed and analysed statistically but in no case was it found that soaking in salt water caused a greater strength decrease than soaking in fresh water. However, plywood made with hot-pressed glues tended to give higher average wet strengths than if cold-pressed, but whilst cold pressed glues retained their original strength, those hot pressed tended to decrease in strength in time although this reduction was quite small.

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PERSONAL.

Mr. S.A. Clarke, Chief, Division of Forest Products, C.S.I.R., Dr. H.E. Dadswell, Officer-in-Charge, Wood Structure Section, Dr. W.E. Cohen, Officer-in-Charge, Chemistry Section and Mr. A.J. Watson, Chemistry Section are the representatives of the Division of Forest Products, C.S.I.R. at the Pulp & Paper Conference in Burnie, Tasmania. Mr. Clarke and Dr. Cohen are remaining in Tasmania for several days after the conclusion of the conference.

M.N.L. No. 138.

THE PROPERTIES OF AUSTRALIAN TIMBERS.

BROWN TULIP OAK. No. 138.

Brown tulip oak is the standard trade common name for the timber known botanically as Argyrodendron trifoliatum (F.v.M.) Edlin. syn. Tarrietia argyrodendron Benth. This species has two close relatives - red tulip oak Argyrodendron peralata (Domin) Edlin. (see M.N.L. 83) and blush tulip oak Argyrodendron actinophylla (Moore) Edlin. Brown tulip oak is also referred to as crowsfoot elm, booyong and stavewood.

Distribution. This species is a common second storey timber of the brush forets from the Manning River in New South Wales to the Endeavour River in Queensland. The tree attains its best development in moist gully bottoms where it is often associated with various species of Eugenia. On poorer sites it is usually a fairly small tree.

Habit. Brown tulip oak is a medium to large sized tree, 80'-120' in height, and with a diameter above the buttressed roots of up to 2 feet. The stem produces well developed plant buttresses at the base but has a clear cylindrical bole above of 40-60 feet merchantable length. The bark is grey-brown and longitudinally fissured with a reddish blaze.

Timber. The truewood of this species is dark brown with a reddish tinge, but is not such a definite red-brown as red tulip oak. The sapwood is white to very pale brown and between sap and truewood there is a transition or intermediate zone of a somewhat lighter brown than the truewood. The grain is straight to somewhat interlocked and the wood has a uniform, coarse to medium texture, some figure is noticeable on backsawn faces due to fine bands of parenchyma, and a slight rippled effect can be seen due to storeying of the fine rays. The larger rays are very prominent on a split radial face due to their size. The truewood of brown tulip oak averages approx. 55 lb./cu.ft. at 12% moisture content. In drying from the green condition to 12% moisture content this timber shrinks 6.5% in a tangential direction (backsawn) and 3% in a radial direction (quartersawn). In kiln seasoning this timber from the green condition a fairly mild schedule is necessary; the species is prone to collapse and a reconditioning treatment is recommended. This species is a fairly hard to work and although sawing and planing fairly readily, is hard on hand and machine tools; it is also suitable for bending at larger radii. Brown tulip oak is not durable in the weather and the sapwood is very susceptible to Lyctus attack.

Uses. Brown tulip oak has been used mainly for cases and for flooring, joinery and moulding, panelling, particularly in railway carriage construction, and to a limited extent for cabinet making as this timber is rather heavy for this purpose although taking an excellent finish. More recently brown tulip oak has been veneered successfully and used to a large extent for boxes and cases and in the manufacture of pallets to facilitate transport of defence stores. It has also been used in this form for resin-bonded waterproof plywood for marine craft construction.

Availability. Although not available in large sizes the species is plentiful in the northern New South Wales district in the form of logs for peeling and as sawn stock.

PERSONAL.

Mr. Alan Gordon, Acting Officer-in-Charge, Utilization Section, Division of Forest Products, C.S.I.R. will be visiting Queensland in May for four or five weeks to commence investigations into sawmilling problems in that State.

CORRECTION.

In the article on Coconut palm logs in M.N.L. 137, page 4 3rd line should read "between 50% and 740%" and line 15 should read "14.7 ft. lb."