SEVENTH ALL AUSTRALIA TIMBER CONGRESS

PERTH FOREST TOUR

OCTOBER 12 - 14, 1969

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DAY 3

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## DAY 1 SUNDAY 12th OCTOBER

MANJIMUP, The major sawmilling centre of W.A. Some 40 per cent of the States sawn output of timber comes from surrounding forests.

BRIDGETOWN, on the Blackwood River is noted as a major centre for apple growing.

BOYUP BROOK, on the upper reaches of the Blackwood River is one of the best known mixed farming centres.

Join Donnybrook—Boyup Brook road.

COLLIE—Buffet Lunch—The only coalmining town in W.A.
Leave South Western Highway.

HARVEY: Like Waroona relies on irrigated pastures. Important forestry centre.

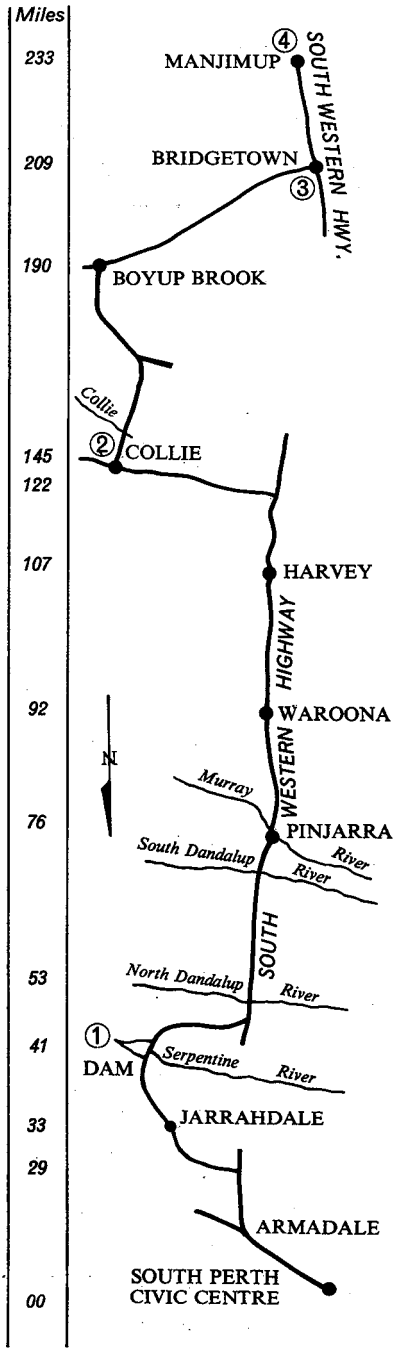
WAROONA: The commencement of irrigated pastures. Major agricultural pursuits are dairying and potato growing.

PINJARRA: Junction for important sawmilling and forestry centre of Dwellingup in the hills.

Rejoin South Western Highway.

SERPENTINE DAM—Morning Tea –The largest dam supplying domestic water to Perth.

JARRAHDALE: Sawmilling has been carried on here for 100 years.
Leave South Western Highway.



## DAY 2 MONDAY 13th OCTOBER

| | Miles |
|---|---|
| MANJIMUP | 97 |
| "Fonty's Pool", owned and developed by Mr. A. Fontanini. | 90 |
| Lefroy Brook sample plot—92 year old Karri regeneration. | 72 |
| Big Brook—39 year old Karri regeneration. | 64 |
| Warren National Park. | 51 |
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| Morning tea at Pemberton Swimming Pool. | 25 |
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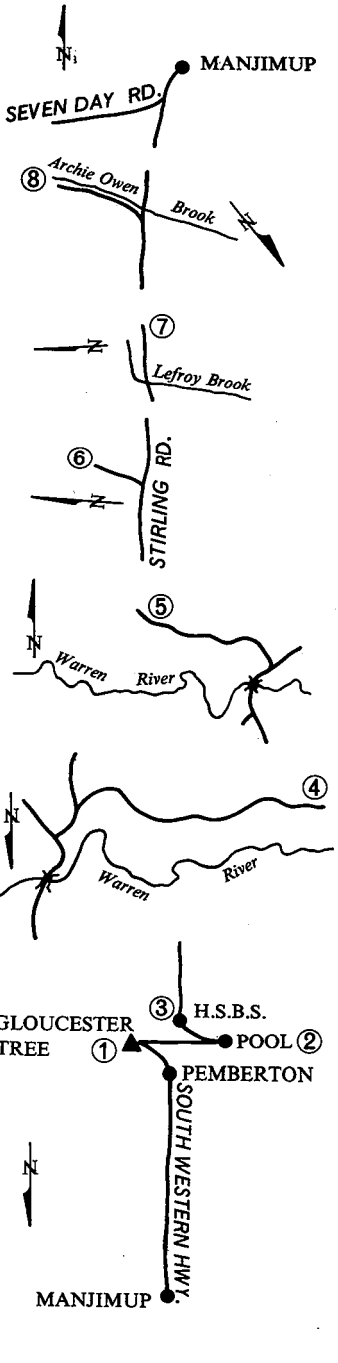
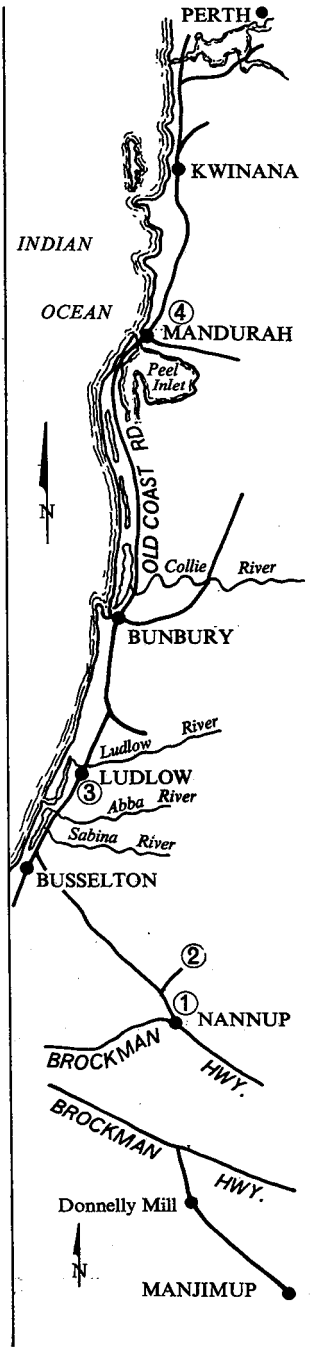
| PEMBERTON: Largely dependent on the timber industry, but also a well known tourist centre. | 20 |
| | 00 |



## DAY 3 TUESDAY 14th OCTOBER

| | Miles |
|---|---|
| PERTH | 229 |
| Kwinana Industrial Complex. | 206 |
| MANDURAH: A popular holiday resort. | 183 |
| BUNBURY: The major port for the South-West. | 118 |
| LUDLOW FOREST—Picnic Lunch. | 94 |
| Milward Plantation—scenic views of Radiata Pine Plantations, Blackwood River. | 43 |
| NANNUP—Morning Tea. | 39 |
| Donnelly Mill and settlement. | 19 |
| | 00 |



SUNDAY, 12th OCTOBER, 1969

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | 0900 hrs. : Depart from South Perth Civic Centre for Serpentine Dam - 41 miles. | 0900 | 00 |
| | For the first 18 miles the route passes through urban and industrial areas of the coastal plain reaching the foothills of the Darling Range at Armadale. From there the foothills are followed to the 29m. peg where the touring party leaves the South-West Highway and climbs into the hills passing through Jarrah-dale after four miles. | | |
| | Jarrahdale is of historic interest in that it was on this site that one of the first sawmills to ex-port jarrah commenced operations in 1872 nearly a century ago. Timber for export was transport-ed by the Company's own railway line (wooden rails with iron plates on the curves) to the port of Rockingham. The company (now Millars' | | 33 |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | Timber & Trading Co.) still operates in the district and recently erected a modern sawmill at Jarrahdale.<br><br>Also in fairly recent times, bauxite has been mined in the district and the ore is transported by rail to Kwinana for upgrading to alumina. From there it is shipped to overseas markets and Victoria (Port Henry) for further refining. From Jarrahdale the road heads south for 8 miles to the Serpentine Dam. | | |
| Stop 1 | Serpentine Dam - Morning tea at cafe.<br><br>This dam is the most recent and largest supplying water to the Perth Metropolitan Area. | 1010 | 41 |
| | Depart for Collie - 104m.<br><br>The road climbs out of the Serpentine Valley, passes the Karnet Rehabilitation Centre (for the rehabilitation of alcoholics and other "mild" trespassers of the law), then winds | 1030 | |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | downhill to again join the South-West Highway. Typical areas of jarrah "dieback" and trial plantings of other commercial tree species on these sites will be seen on either side of Karnet. | | 53 |
| | For the next 69 miles the route parallels the foothills of the Darling Range passing through Pinjarra (74m.), Waroona (90m.), Harvey (107m.) and Brunswick Junction before leaving the Highway and heading into the hills to Collie, 23 miles distant. | | |
| | Pinjarra is the road and rail junction for the major jarrah sawmilling and forestry centre of Dwellingup some 15 miles to the east. On the plain and along the foothills around Pinjarra the main agricultural pursuits are dairying and the raising of beef cattle and fat lambs. | | 74 |
| | Approaching Waroona irrigated pastures are seen for the first time with a consequent change in land use. Dairying becomes the major industry supp- | | 90 |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | orted by potato-growing in selected areas. | | |
| | Harvey, the major town of the irrigated areas, is an important forestry centre. Apart from extensive jarrah forests, the Harvey Divisional Forest Office controls plantations of Radiata Pine in the hills - approx. 2,800 acres - and Pinaster Pine on the coastal plain - approx. 3,800 acres. | | 107 |
| | Brunswick Junction, another centre for dairying and potato growing is also the rail junction for Collie and three miles further on the tour leaves the South-West Highway and heads into the hills. | | 119 |
| | Two places of interest on the way are the private plantation of Tynedale Ltd. which has established about 1,000 acres of Radiata Pine and Forests Department plantings also of Radiata Pine, on the catchment of the Wellington Dam. | | |
| Stop 2 | Collie - Buffet Luncheon. | 1300 | 145 |
| | Collie is the centre for | | |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | the only commercial coal-field in W.A. producing about 1,000,000 tons of coal per annum, much of which is used in the near-by $40 million Muja Power Station. About 9,000 people live in the town and surrounding districts and sawmilling (400,000 acres of State Forest and 13 mills), apple growing, sheep and wool, fat stock raising, mixed farming and forestry work make sub-stantial contributions to Collie's economy. | | |
| | Depart for Bridgetown via Boyup Brook - 64 miles. | 1400 | |
| | After rising out of the "Collie coal basin" the route continues in a gen-erally southerly direct-ion through State Forest to Mumballup (13m.). From here the town passes through mainly farming country to the east of the prime forest. A gen-erally reliable rainfall of 20"-30" p.a. makes this district well known for the raising of cattle and | | 158 |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | sheep and the growing of cereal crops both for coarse grain (oats and barley) and fodder. Until recently a flax factory operated in Boyup Brook treating locally grown crops. However this is closed and consideration is now being given to using it for locally produced linseed. | | 190 |
| | From Boyup Brook the road heads westerly to Bridgetown following the high ground to the north of the Blackwood River - both Boyup Brook and Bridgetown are on the Blackwood River. As is usual with increasing rainfall the land use pattern changes and apple growing and the raising of dairy and beef cattle increases. Although extensive jarrah forests once occurred through the Blackwood Valley and surrounding hills few are left as most of the soils on which they grew are fertile and arable. | | |
| Stop 3 | Bridgetown - observe scenic views. | 1545 | 209 |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | Bridgetown is noted for its apple orchards on rich agricultural soils. | | |
| | Depart for the overnight stop at Manjimup, a distance of 24 miles.<br><br>For the first 8 miles the road climbs out of the Blackwood Valley to Yornup and from then onwards the tour follows rather flat country of the divide between the Blackwood River and a number of other small rivers which rise nearby. The forest cover gradually improves approaching Manjimup. | 1600 | |
| Stop 4 | Manjimup - Overnight stop (2 nights)<br><br>Manjimup is the major sawmilling centre for the State, over 40 percent of the sawn output of W.A. coming from surrounding districts. Dairying for butterfat production (a heavily subsidised industry) is decreasing while the raising of sheep and beef cattle and the establishment of apple and | 1640 | 233 |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | stone fruit orchards is increasing. Pig raising remains static but it is expected that peas and other fruits for canning and freezing will increase. Some of the heaviest yielding crops of potatoes in the State are grown in the Manjimup shire, up to 27 tons per acre being recorded. | | |

EVENING FREE

| | MONDAY, 13th OCTOBER, 1969 | | |
|---|---|---|---|
| | NOTE : With more stops during the day and more commentators available, subsequent notes on the tour will be brief. | | |
| | 0850 hrs. : Depart for Pemberton (20m.) and "Gloucester Tree" two miles to the east of Pemberton. | 0850 | 00 |
| Stop 1. | Inspect "Gloucester Tree Lookout". | 0925 | 23 |
| | This fire lookout tree is named after the Duke of Gloucester who inspected it | | |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | in 1947 when it was being built. The cabin, built in the branches is 200 feet above ground level. | | |
| | Depart for Pemberton Swimming Pool or hall depending upon weather conditions. | 0955 | |
| Stop 2. | Morning tea. | 1000 | 25 |
| | Proceed to Pemberton sawmill (Hawker Siddeley Building Supplies) - one mill. | 1025 | |
| Stop 3. | Observe milling of karri and inspect the preservation plant. | 1030 | 26 |
| | After leaving Pemberton the route heads south over the Warren River then turns westerly along a logging road to Hawker Siddeley's logging operations - distrance 14 miles. Observe felling a large karri tree in virgin forest. | 1120<br>1150 | 40 |
| Stop 4. | Picnic lunch.<br>Observe further logging | 1230<br>1330 | |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | operations. | | |
| | Depart for the Warren National Park - 11 miles. | 1350 | |
| Stop 5. | Inspect virgin karri forest. | 1415 | 51 |
| | Proceed along the Old Vasse Road then travel generally northerly through Treen Brook karri forest. This forest resulted from regeneration burns following logging operations - without tree marking - some 29 to 39 years ago. Continue on to Big Brook. | 1425 | |
| Stop 6. | Inspect 39 year old karri re-generation in Big Brook Forest. | 1505 | 64 |
| | Depart for Lefroy Brook sample plot via Pemberton and North Pemberton Road - 14 miles. | 1515 | |
| Stop 7. | Inspect Lefroy Brook sample plot, a 92 year old stand of karri. | 1545 | 78 |
| | Proceed via Diamond Tree Siding to the South-West | 1600 | |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | Highway thence westerly along Seven Day Road to "Fonty's Pool" - 16 miles. | | |
| Stop 8. | The pool, popularly known as "Fonty's Pool" was built and the attractive surroundings developed by Mr. A. Fontanini. | 1635 | 94 |
| | Return via Seven Day Road and South-West Highway to Manjimup - 7 miles. | 1655<br>1710 | 101 |

EVENING ENTERTAINMENT

| | | | |
|---|---|---|---|
| | TUESDAY, 14th OCTOBER, 1969 | | |
| | 0850 hrs. : Depart for the Mt. Folly pine plantation near Nannup - 36 miles. | 0850 | 00 |
| | For the first 10 miles the route passes through farming country. Originally the farms were part of the "Group Settlement Scheme" and were cleared in the 1920's. | | |
| | At 19 miles the tour will pass through Bunning Bros. sawmill settlement of Wheatley on the upper reaches of the Donnelly | | |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | River. Note the small forestry settlement on the north side of the river.<br>Continue through State forest for most of the journey to Mt. Folly pine plantation. | | |
| Stop 1. | A brief stop will be made at a high point overlooking the plantation and the town of Nannup. | 1000 | 36 |
| | Continue through the plantation observing the rapid growth of Radiata Pine particularly on old pasture land. | 1010 | |
| Stop 2. | Morning tea at Nannup. | 1035 | 44 |
| | Depart for Ludlow tuart forest via Busselton - 46 miles.<br>After leaving Nannup the road heads generally north-westerly traversing some 25 miles of lower quality jarrah forest, passing Jarrahwood sawmill (Millars' T. & T. Co.) after 15 miles. | 1100 | |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | Busselton is a well-known holiday resort, the gently sloping beaches making the town particularly popular for families with young children. The major agricultural pursuits are dairying and potato growing with the timber industry playing an important part in its economy. | | 84 |
| Stop 3. | Picnic lunch in tuart forest. | 1215 | 90 |
| | Depart for Perth via Bunbury and Mandurah - 140 miles. | 1300 | 90 |
| | Near Capel will be seen open-cut sluicing of ilmenite sands (Western Titanium). This and other areas nearby produce some 500,000 tons of ilmenite a year. Other minerals produced from the sands are Zircon, Rutile, Leucoxene and Monazite. | | |
| | Bunbury, situated 115 miles south of Perth, is one of the State's earliest settlements being founded in 1837. | | 116 |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | The town is solidly based and is growing both in size and importance as a natural outlet for the timber industry of the South-West, as a centre of many new industries and the port for the rich hinterland producing wheat, potatoes, fruit and other agricultural products. It is also the nearest port for the Collie coalfields and for the export of ilmenite and titanium oxide. If a wood chip industry is established, considerable expansion of Bunbury's harbour facilities will follow.<br><br>With a population of 15,000, its mild climate, ocean beaches and sporting facilities make it a popular tourist resort. It is also reasonably close to such scenic features as the underground caves further south.<br><br>Until reaching the Metropolitan Area the route parallels the west coast and follows the Old Coach (Coast) Road. For the | | |

| Stop No. | Particulars | Progressive Time | Progressive Mileage |
|---|---|---|---|
| | first few miles the road runs alongside the Leschenault Inlet and passes Laporte Titanium (Aust.) Ltd., where ilmenite sands are treated. | | |
| Stop 4. | Mandurah - Stop for 10 minute rest break. | 1515 | 181 |
| | Proceed some 46 further miles to Perth passing the large industrial complex of Kwinana. | | |
| | Arrive in Perth. | 1645 | 227 |

T O U R  E N D S

## GENERAL NOTES ON THE FORESTS OF WESTERN AUSTRALIA

The following notes are intended to give an outline of the major aspects of forests and forestry in Western Australia.

### WESTERN AUSTRALIA

Land Area = 625 million acres.

Population = 920,000. Over 50% in the Perth Metropolitan Area.

### FOREST POLICY

Although the "Swan River Colony" was founded in 1829, it was not until the passing of the Forests Act and Regulations in 1918 that uncontrolled exploitation of the native hardwood forests was checked.

The Forests Act and Regulations (1918-1954) proides for :

(1) The dedication of the State Forests which can be alienated only by agreement of both Houses of Parliament.

(2) Nine-tenths of the nett forest revenue to be available for forest replacement and improvement.

(3) The formation of a Forests Department and the appointment of a Conservator of Forests who shall be a fully qualified forester. The Conservator has wide powers in applying policy.

(4) The preparation and enforcement of Forest Working Plans, which shall be revised at

periods not exceeding 10 years.

FOREST AREA

At 30th June, 1969, the forest area was as follows :

| | |
|---|---|
| State Forests | 4,456,326 acres |
| Timber Reserves | 1,865,876 acres |

State Forests

These cover less than one per cent of the total area of the State and are confined almost entirely to the south-west corner in the region having an annual rainfall of over 25 ins.

Distribution of the main forest types is as follows :

| | Thousand Acres |
|---|---|
| Jarrah | 3,196 |
| Jarrah and Wandoo (mixed) | 164 |
| Jarrah and Karri (mixed) | 656 |
| Karri | 171 |
| Karri and Tingle (mixed) | 14 |
| Tingle | 11 |
| Tuart | 6 |
| Mallet | 55 |
| Sandalwood | 2 |
| Pine Planting Area | 181 |

In addition to the above are two well-known commercial species, W.A. Blackbutt - (Euc. patens), and Marri (Euc. calophylla) - see subsequent notes.

Botanical Names (for previous)

| | |
|---|---|
| Jarrah | Euc. marginata |
| Wandoo | Euc. wandoo |
| Karri | Euc. diversicolor |
| Tingle (Red) | Euc. jacksonii |

Botanical Names continued

| | |
|---|---|
| Tingle (Yellow) | Euc. guilfoylei |
| Tuart | Euc. gomphocephala |
| Brown Mallet | Euc. astrigens |
| Blue Mallet | Euc. gardneri |
| White Mallet | Euc. falcata |
| Sandalwood | Santalum spicatum |

Timber Reserves

Most of these are located in the inland areas and provide mining timber and firewood for goldmining centres such as Kalgoorlie and Norseman. A wide variety of eucalypts are found in these inland areas.

THE MAJOR TIMBERS AND THEIR USES

Jarrah (Euc. marginata)

In W.A. this durable, attractive, red-brown timber is used for a great variety of purposes, including many for which softwoods are considered essential in other countries.

It is used in house building for stumps, joists, framing, siding, flooring, window frames, doors, mantelpieces, and panelling. In large buildings it makes excellent beams, columns and rafters.

It is famous as a railway sleeper timber and is used in the construction of bridges, wharves, piers and jetties. Small ships have been made of it and it is commonly used for telephone and transmission poles.

Karrie (Euc. diversicolor)

Similar in appearance to jarrah, this timber is

not durable in the ground, but its strength and stiffness combined with the extraordinary long, clean lengths which may be obtained, render it unsurpassable for superstructional work. It is favoured for mine guides in the goldmines of this State and in South Africa, and large quantities are used locally for coach, wagon and motor body building as well as for house framing, particularly roof trusses, fruit cases and, in the past, wine vats and casks, wooden pipes and flumes.

Treated with pentachlor phenol in oil under very high pressure it is prized for transmission and telephone cross-arms. Other uses include veneer for multi-ply waterproof sheets used in concrete formwork, and being good bending timber, has been used in the construction of laminated bowstring trusses. It is on Lloyd's list of shipbuilding timbers and has been pulped successfully on an experimental scale.

Recently, the difficulty of seasoning karri poles for preservative treatment without serious end splitting and surface checking seems to have been largely overcome by the use of the "boultonising" process involving boiling the green poles in creosote under vacuum to remove sap, and then applying pressure to force the creosote into the wood. The potential economic importance of this breakthrough will be appreciated when the extensive karri pole stands are seen in the southern region.

Wandoo (Euc. wandoo, Syn. redunca var. elata)

The light brown wood is heavy, hard, strong, tough and highly durable. It is recognised as one of Australia's best railway sleeper timbers and is particularly suitable for flooring subject to heavy wear. It is used in railway wagon construction, particularly in top planks in wagon

sidings where it is subject to heavy service conditions.

A remarkable feature of the wood is that it does not corrode steel even after 20 years or more contact with it. The wood contains a high percentage of tannin and one factory produces a commercial extract from the chipped wood.

W.A. Blackbutt (Euc. patens)

This tree is not listed in the forest types areas previously given. It occurs in small patches in the gullies and pockets of alluvial soil through the prime jarrah forest, and mixed with jarrah in some parts of the karri forest.

The timber is similar to jarrah in weight, strength and durability, but is pale yellow in colour. It is used for much the same purposes as jarrah, including railway sleepers, and its attractive colour makes it popular for flooring and panelling.

Marri (Euc. calophylla)

One of the most widely distributed species in the South-West of the State, marri reaches its best development south of the Blackwood River in the higher rainfall areas. Here, in association with jarrah and karri, trees well over 100 feet in height, with boles 40 feet to 50 feet in length and butt diameters of four feet or more, are common.

The timber is light brown in colour and easily worked, but the prevalence of gum veins and "loose rings" have, in the past, inhibited its use as a saw timber. Nevertheless, it is stronger than, though not as durable in the ground as jarrah, seasons much better than either jarrah or karri

and takes paint well. In pole sizes, the depth of sapwood, associated with the inherent strength of the timber makes it ideal for preservative treatment and for some years now all P.M.G. transmission poles have been of treated marri.

At the moment it is the "glamour tree" for the production of wood chips for export to Japan. In this respect it is notable that the wood shows little fibre breakdown, even in the heart of the tree thus enabling the species to be chipped as a whole tree operation, avoiding costly segregation of faulty material.

A fine shade tree, it flowers regularly giving a copious supply of nectar and is therefore popular with apiarists.

One large sawmill with an annual log intake of some 900,000 cubic feet now mills marri exclusively.

Tuart (Euc. gomphocephala)

The pale yellow timber with its interlocked grain is particularly strong, but only moderately durable in the ground. Only small quantities are available and at present its main use is in railway wagon construction. It makes an excellent floor and attractive panelling.

TIMBER PRODUCTION AND DISTRIBUTION

Over the last few years the annual production of sawn timber ranged from 200 to 210 million super feet. About 25 percent of the output is in the form of railway sleepers for both local use and particularly export. This State supplies over 90 percent of overseas exports of railway sleepers from Australia.

The production by species is approximately as follows :

| | |
|---|---|
| Jarrah | 70% |
| Karri | 20% |
| Other Hardwoods | 6% |
| Plantation Pine | 4% |

About 30 percent of total production is exported, a little more than half going to the Eastern States of Australia and the remainder overseas. South Australia, which takes large quantities of karri for home building, is by far the most important Australian market. South Africa, New Zealand and the United Kingdom are the largest overseas buyers.

Imports of veneer logs and sawn timber represent about nine percent of local consumption. Veneer logs and sawn light hardwoods from Malaysia form the bulk of the imports.

AFFORESTATION

Western Australia has no indigenous softwoods and it is estimated that our native hardwood State Forests, on present standards of utilization can provide, under sustained yield, little more than 40 million cubic feet of timber per annum.

With a population of 915,000 the present per capita consumption of sawlogs is about 40 cubic feet per annum and it is expected that the population will reach one million in about three years' time. Currently less than 20 percent of log timber comes from private property, and it is recognised that supplies from this source will be considerably reduced within the next few years. It is obvious therefore that to meet future requirements, plantations of exotics will be necessary.

This situation was appreciated many years ago and extensive trials of the establishment of over 30 exotics have been carried out. These trials have shown that two species of pine, P. radiata and P. pinaster, are best suited to our conditions. The latter, with the aid of fertilizers, has been successfully established on the poor coastal sands from north of Perth, south to Busselton. Radiata Pine, however, requires better class soils and these have largely been taken up for agriculture. Shortage of suitable soils for this species is a problem in this State.

Western Australia aims to establish 240,000 acres of pine plantation. To date some 59,000 acres have been planted of which about 40 percent is Radiata Pine.

## PINE UTILIZATION

For the year ended 30th June, 1969, the total roundwood production from Forests Department plantations, mainly in the form of thinnings, was 2.8 million cubic feet U.B. The production was fairly equally divided between Radiata Pine and Pinaster Pine.

The type of production was approximately as follows :

| | |
|---|---|
| Sawlogs | 61 percent |
| Particle Board Logs | 31 percent |
| Peeler Logs | 4 percent |
| Fence Posts | 3 percent |
| Other | 1 percent |

## FIRE PROTECTION

One of the most important functions of the Department is the protection of State Forests from fire.

The climate in the south-west corner of the State consists of cool, wet winters and hot, dry summers. In general, about 80 percent of the rainfall occurs in the six months, May to October inclusive.

Hazard Reduction

Rotational controlled burning is practised with the object of covering the whole of the forest area in five years.

For the jarrah forest, fire danger ratings and a controlled burning guide have been prepared and tested in practice. They have proved valuable aids to the planning and execution of rotational controlled burning. Investigations along similar lines are being carried out in the karri forest region.

Detection

Fire-spotting is done from a network of 36 lookout towers spaced at intervals of 10-15 miles or more rarely, 20 miles throughout the forest. Actually, several of the "towers" are karri trees with their branches lopped and cabins built in the upper branches. The cabins may be from 170-200 feet above ground level. Gloucester Tree is an example. The highest constructed wooden tower is 140 feet.

Fires are usually pin-pointed by cross-bearings from two or more towers.

Communications (telephone)

Very High Frequency (V.H.F.) radio now forms the main supplementary means of communication, but is supported by H.F. radio for the transmission of weather reports, etc. At present the V.H.F. system consists of 18 repeater stations, 18 fixed stations and 143 "mobile" sets. These give a radio coverage

of the whole of the State Forest except for a relatively small area in the extreme south-east.

## FOREST MANAGEMENT

The general management of State Forests is governed by working plans and estimates covering a Scheme of Expenditure are placed before Parliament each year.

The practice of management is carried on within a framework of 15 Divisions under the management of Divisional Officers responsible to Superintendents.

### Forest Engineering

The need to provide adequate access to the forests for the purpose of protection and management has resulted over the years in a network of some 16,000 miles of roads, tracks and firelines being constructed and maintained. The Department provides and maintains the plant and equipment necessary to carry out this work. Other equipment includes stationary engines, power pumpers, power saws and agricultural implements.

### Buildings

Wherever possible, the Department provides housing for its employees, the total number of houses at present approaches 500. The old system of having a divisional headquarters with small out-lying forest settlements for each region is no longer applicable. Changing times and social attitudes make it necessary to move people in out lying settlements to centres of larger population. Better road systems and faster transport make it possible to cover larger forest areas from central locations.

Apart from offices and research buildings the

Department also has five small pine mills and two small hardwood mills.

Mapping and Inventory

The Department prepares all its own topographical and vegetation maps using photogrammetric procedures which have been greatly improved by the recent acquisition of a Wild B8 stereo plotter for base plant preparation. The mapping programme covers about 1.8 million acres per year.

Systems of continuous inventory have been introduced into the hardwood forest using air-photo stratification. Since 1954 all State Forests have been covered by detailed inventory and re-inventory is now proceeding at a rate of about 0.5 million acres per year. Continuous inventory using height-age relationships for site classification is now being introduced into the plantations, where the former system of inventory based upon subjective site classification and yield tables has been abandoned because of basic mensurational problems and variability of site and stand conditions.

REFORESTATION AND SILVICULTURE

Careful control is exercised on all sawmilling permits within State Forest to see that under the silvicultural system in operation, the correct trees are removed in such a way as to protect the remaining growing stock and encourage regeneration. This control is achieved by the actual branding by a forestry officer of every tree which is to be felled. After felling, a top disposal and burning operation assists to protect the immature growth and provide both a seed bed and fire protection for the young crop.

In the northern cut-over jarrah forests, surplus

stems in the form of useless trees and veterans of marginal quality, as well as competing stems in sapling and pole stands are still occupying valuable growing space. To bring these forests to a condition of maximum production, a stand improvement programme is proceeding which involves normal logging, salvage cutting, thinning and the removal of useless trees.

## FOREST RESEARCH

Very briefly the current research programme involves investigations into the following (not in order of importance) :

### 1. NATIVE HARDWOOD FORESTS

#### A. Jarrah

(i) Thinning regimes in sapling and pole stands in prime forest.

(ii) Inducement of dynamic growth in natural regeneration.

(iii) Achieving satisfactory stocking where regeneration is inadequate.

(iv) Rehabilitate deteriorated sites where jarrah has died out.

(v) Stem analysis to measure the response to treatments.

#### B. Karri

(i) Ensuring adequate stocking of karri or other introduced hardwood species.

(ii) Thinning regimes in sapling and pole stands of second growth karri.

C. General

The life cycle and possible control measures for forest insect pests such as jarrah leaf miner.

2. SOFTWOOD PLANTATIONS

A. P. pinaster

(i) Tree improvement.

(ii) Site potential of available planting land.

(iii) Thinning regimes.

(iv) Periodicity of growth in relation to environment.

(v) Cause of a shoot disorder.

(vi) Other planting sites further south.

B. P. radiata

(i) Methods of ground preparation for best establishment results.

(ii) Control of scrub after planting.

(iii) Thinning regimes.

(iv) Testing the South Australian regional volume table for P. radiata under W.A. conditions.

3. FIRE RESEARCH

A. Native Hardwood Forests

(i) Fire danger rating and controlled burning guide for the southern jarrah and karri forest region.

(ii) Fire damage in jarrah.

B. Softwood Plantations (P. pinaster and P. radiata)

(i) Safe limits for controlled burning under pine canopy.

(ii) Prediction of fire behaviour in uncontrolled fires in plantations.

4. MANAGEMENT RESEARCH

(i) Pine mensuration.
(ii) Pine growth.
(iii) Sampling for Inventory (Hardwood-Pine).
(iv) Yield calculations.
(v) Economics of forest operations.
(vi) Development of A.D.P. systems.

5. UTILIZATION RESEARCH

A. Forests Department

(i) Comparison of strengths of round and split mine props in the Collie coal mines.

(ii) The life of commercially preservative treated karri and marri railway sleepers.

B. Forests Dept. in conjunction with Division of Forest Products

(i) Marine borer tests of treated pine and hardwood at Kwinana and Port Hedland.

(ii) The life of treated and untreated timbers in cooling towers.

(iii) The life of preservative treated marri, karri and jarrah railway sleepers.

## "LOGGING" - W.A. HARDWOODS

Log extraction in the prime forest areas of W.A. come under five natural headings.

1. ACCESS — Roads for motor trucks have replaced the railway and steam locomotive. Much steeper grades can be negotiated, the areas of working can be readily changed, roads are easily constructed and stands of low density can be logged economically.

2. FELLING — The petrol driven one-man chain saw has become the accepted tool replacing the axe and cross-cut saw. Traditionally felling is done on piece work.

3. SNIGGING — Skidding or dragging the logs from the stump to loading point is generally done by crawler tractors with or without arches, and by large rubber tyred logger-stackers. Smaller rubber tyred tractors are used in jarrah areas with easy grades, less than 1 in 8.

4. LOADING — Loading of logs onto motor trucks is carried out by bulldozer or log stacker, whilst mobile winches are used in some locations.

5. HAULING — Hauling logs from the bush to the sawmill is by motor truck on private roads where practicable. Motor trucks hauling logs on public roads are under the disadvantage that they cannot be loaded to

makers' capacity and remain within the legal load limits.

Economic Considerations

So that the overall costs of these five operations are kept at a reasonable level, it is necessary for the capacities of the individual machines and men to be used to the fullest extent. In principle, distances between roads must be short enough to avoid excessively long snigging by tractors to loading points, yet far enough apart to avoid excessively high road costs, terrain and availability of good road building material being the governing factors in determining how close trucks are brought to the stump. The number of tractors, trucks and fallers must be sufficient to keep the sawmill regularly supplied with logs, yet remain flexible enough to meet varying forest conditions.

The logging operator of today needs to know exactly which piece of equipment is the most economical for the particular job and also how to use it to the best advantage.

One-Man Chain Saw

The one-man chain saw has been developed to a reasonable degree of dependability to make it the universal and most economical tool for felling. These saws have increased the felling rate per man considerably. This in turn, has kept felling costs steady during a period of rising labour rates, and also increased individual earnings by fallers, who are traditionally paid on a piece-work basis. The introduction of one-man chain saws has also had the effect of lowering stump heights, and increasing the utilisation of marginal quality logs from the forest.

Chain saw felling still requires a high degree of skill as did the earlier axe and cross-cut method.

Road Making

The location of roads in new areas can initially be carried out from information taken from aerial photograph maps prepared by the Lands Department. These maps indicate topography as well as the distribution of forest types and the density of the forest. However, much confirmatory "cruising" on foot is usually necessary.

Reconnaissance of the proposed roads can then be made by bulldozer on a compass bearing. Clearing and forming of the road is done by bulldozer, followed by drainage and gravelling. Road maintenance is carried out by frequent grading.

The location of main haulage roads is subject to approval by the Forests Department. After the area has been logged, these roads come under the control of the Forests Department and are used for forest management purposes. They will, of course, be available for future cutting cycles.

The volume per acre of available sawmill logs is not sufficient to justify, nor are logging conditions so difficult in W.A. as to call for, logging by balloon or aerial cable. In any case the introduction of such logging methods in W.A. would possibly be resisted by the Forests Department because of the serious damage to young growing trees which usually results from such operation.

New and improved methods of log extraction are constantly being examined and over the years there has been a vast change in the operation with a tremendous reduction in the number of bush workers required to produce a given quantity of log timber.

The forest areas from which the logs are extracted are held under a sawmill permit issued by the Forests Department, which is renewed every five years. Details of areas to be operated over during the ensuing twelve months and proposed roading are submitted to the Department for approval in June of each year.

When approval has been granted, bush foremen mark out blocks of some 5-10 acres for each faller. Forests Department's Officers treemarkers then marks with their individual brand, the trees which it is considered should be cut.

Forests Department tree marking policy has undergone a marked change over the last few years with a swing from a purely selective logging operation to one of clear felling, apart from selected seed trees, which are removed as soon as restocking has been effected, in the karri forests.

In the jarrah forest sylvicultural practices vary to suit particular conditions, the over-riding objective, common to all foresters, being to put the forest into the most productive condition possible. The standard practice for tree marking in the jarrah forest is to remove all but selected seed trees and young growing stock. However, in the widely dispersed areas, of small acreage usually on poorly drained sites, in which the root destroying fungus Phytophthora Cinnamomi is attaching and killing the jarrah forest, a clean cut is being carried out.

The aim of forest management has been to regulate cutting at a rate equivalent to the increment and this balance, has, broadly, been achieved, but the picture is now somewhat confused because of the incidence of Phytophthora Cinnamomi.

## MODERN METHODS OF MILL OPERATION

Rapidly rising wage costs and an increasingly difficult labour position have combined to force a close and constant examination of conversion methods, with the result that there has been an enormous investment in new sawmill equipment during the last twenty years.

In the mill, log carriages electro-pneumatically controlled and capable of sawing accurately to dimension, combined with faster log handling equipment, have meant a considerable advance in the breaking down operation. Sized flitches produced by these high capacity precision machines reduce the amount of sawing required in succeeding operations to produce finished timber. Power-feed benches, electro-hydraulically controlled, capable of fast accurate sawing, powered dockers, transfers and rollers and improved mill lay-out have all been factors in a reduction of manual handling and a drive for greater efficiency.

In the yard, the introduction of the mobile crane, fork lift and green chain or sorting table, has eliminated much of the physical effort, previously associated with timber handling. More-over the advent of these mechanical aids has led to better packaging and presentation, ease of storage, better protection of stock lines, and, of course, much faster and more economical handling all round.

### Green Chain

All but the larger sections of timber are fed directly from the mill outfeed rollers on the green chains or sorting table and conveyed at a handy working height on live chains or ropes. As each piece of timber moves slowly down the table

it is subjected to a grading check (it is graded in the first instance at the mill docker) and on passing this test, is pulled off the table by an attendant when it has reached a point opposite where sections of that particular size and length are being bundled, or if it is a stock section for seasoning it will move further along and be strip stacked directly from the table.

Sections of timber which are being supplied in the green state are stacked directly from the table to form a bundle and when the bundle has reached a predetermined size, it is wired and is then ready to be picked up by mobile crane or fork lift and conveyed to the holding yard, or loaded for despatch.

Similarly, the stripped stack of joinery sections or boards, when it has reached a predetermined height, will be lifted away from the table and conveyed to the holding yard.

Some of the advantages attached to this method of handling are :

(1) A steady flow of timber away from the mill.

(2) Manual handling is considerably reduced and the work force is under cover.

(3) A large variety of sizes can be handled and bundled quickly.

(4) Timber cut for seasoning can be strip stacked quickly and placed under cover.

Mobile Timber Handling Equipment

The mobile crane in particular, is an essential piece of equipment in the timber yard today. Its

versatility makes it the most valuable and most intensively used unit in the timber yard.

The development of special flat top rail wagons for transportation of timber has resulted in increasing use of fork lift trucks, which are ideal for this type of loading. These units are used, also, for moving completed stacks of stripped stock from the green chain to the air drying yard.

# HISTORY OF THE SAWMILLING INDUSTRY OF WESTERN AUSTRALIA

by Mr. R. D. Ireland,
Deputy General Manager,
Millars' Timber & Trading Co. Ltd.

Any paper dealing with the history and development of an industry in Western Australia, must necessarily dwell on the natural resource being exploited, in this case the native forest, and the market changes over the years.

The aim of this paper is to give a glimpse of a large virile industry, and the course of its development during the 135 years of its existence, as marked by the major changes which have influenced its growth.

Going back to the establishment of the Colony on the Swan River in 1829 we find that the first sawmill equipment to be brought into the country arrived in October of that year in the ship "Lotus". Records show that the first sawmill actually to operate was established at Guildford and the first jarrah to be milled was known as Swan River Mahogany.

## First Sawmill

It is interesting to note that the first recorded mill site was at Mt. Eliza, though there is no indication today as to whether the mill was actually erected on that site. As early as 1833, the British Navy became interested in jarrah for ship building, and some of the first recorded exports were made to the British Admiralty, an order for 200 loads having been lodged in that year. It is also interesting to recall that pit-sawing was common in the early days of the colony, and water

power was certainly used for the operation of sawmills very early in the establishment of the Colony.

During the forty years between 1830 and 1870 interest in our hardwoods waxed and waned and jarrah was the only species produced in quantity. Many ventures failed, probably more than succeeded, and though limited export markets were developed it was not until fairly late in the century that any stability could be noted in the timber industry. In the 1860's export markets were beginning to become soundly established and there are records of telegraph poles being exported to South Australia, sleepers to India, and other important markets were the other Eastern States, the United Kingdom, New Zealand, Mauritius, South Africa, Ceylon and China. The export markets of our timbers today are mainly those countries I have mentioned, with the exception of China. It is also recorded that, as today, high transport costs militated against export development.

The 1870's saw important developments in the industry and it is recorded that early in 1871, the first locomotive was imported into the State, being brought by a sawmiller named Simpson whose mill was near Wonnerup. Later in 1871 sawmilling started at Jarrahdale and a line was built to Rockingham; we find that the second locomotive to be imported was put on this line, which was wooden railed. It was not until 1879 that the first Government railway line in the Colony was constructed, this being between Geraldton and Northampton. However, from this time on, increasing railway development promoted the use of timber for sleepers and also facilitated the transport of timber.

## First Karri Mill

Until the 1870's all attention had been focused on jarrah, but in 1872 M. C. Davies, one of the pioneers in the timber industry, commenced development of the sawmilling industry in karri, when in 1878, he established the first karri mill at Karridale, obtaining a licence for a very large area for a long period. The milling centre at Karridale, which was practically isolated from other main centres in the State at that time, became a hive of activity, and at the peak of production about 700 men were employed, the company being virtually self-sufficient, even to the point of printing its own bank notes. Today, visitors to Karridale can see few signs in this remote little backwater, which is surrounded by a grove of young karri trees with perhaps no more than ten or a dozen dwellings in the area, that it was once such an active and busy centre. To facilitate the export of the production of Karridale, large jetties were built at Flinders Bay and Hamelin. These jetties, which were completed about 1880, were mainly constructed from marri and karri, and the last shipment from Hamelin was made during 1907. In spite of the long period which has elapsed since the jetties went out of use and the tremendous storms which have raged on the south-west coast, the main framework of the jetty at Hamelin still stands, some 80 years after it was constructed. Flinders Bay, which reverted to a little fishing village, is back in the news, this time as a potential outward loading point for the substantial Scott River iron ore deposits.

## Moondyne Joe

An interesting story of those times concerns Moondyne Joe, who was possibly the only bona fide bush-ranger in W.A., certainly the most famous one.

Moondyne Joe was living in honourable retirement from bushranging activities and working for M. C. Davies. Competition in those days was just as keen as it is today, and the W.A. Jarrah Company at Busselton was anxious to discredit the name of M. C. Davies & Co. They planned to do it in this way. A dray was to go out, together with some fallers, into the M. C. Davies concession, where it was proposed to fall some very defective trees, and out of these, billets of very defective timber would be produced which would be hauled back to Busselton and placed on show as being typical of the timber marketed by M. C. Davies. Unbeknown to his employers, Moondyne Joe, who had heard of the plan on the grapevine, followed the nefarious employees of the W.A. Jarrah Co. out into the bush where they hid their dray. When they had gone through the bush, had fallen some of the trees and cut billets out of them, leaving them stacked, Moondyne Joe followed them up, hauled the billets off into the bush, covered his tracks, and when the unfortunate employees came back to pick up the billets they could find no trace of them. Realising that their plot had misfired, they rushed back to their dray and galloped off at a great rate. Unfortunately for them Moondyne Joe had also given the dray some attention, cutting through the spokes of the wooden wheels to within about half an inch, so that they had not gone very far before the dray collapsed completely and the poor unfortunates fled on foot. Fortunately, competition, though every bit as keen as in those days, finds expression in a rather different form today.

## Expansion of Exports

The 1880's brought a period of consolidation in the industry and an extension of railway development, including the establishment of Government

railways within the State. The 1890's brought a wave of prosperity to the industry, and a vast expansion in the export trade. This period also saw the beginnings of industrial organisation among employees. It was not until after the turn of the century that serious industrial strife occurred, and records show that a most serious dispute, involving a stoppage of 14 weeks, occurred in 1907. This dispute arose from an award reduction in wages of 6d. per day. The agreement was finally settled by restoration of the reduction, and though feelings ran high among the participants, the strike was conducted in a spirit of fair play typical of the isolated milling communities of those days. It is recorded that clerical staffs were pressed into service to operate sawmills, much to the amusement of the mill workers, and it was reported that Teesdale Smith, one of the leading personalities of the timber industry, took charge of a locomotive running between Albany and Beverley.

Role of the Railways

The railways played a very big part in the development of the timber industry, and it is said that trains, which were usually mixed passenger and goods, could be stopped anywhere en route, even between Perth and Fremantle, for the discharge of timber and other goods. To ensure satisfactory service, the Commissioner of Railways of the day regularly travelled on the train.

Whilst the milling interests of the nineteenth century endeavoured to exploit the forest wealth of the State, apparently without much heed for the future timber needs of the nation - their own production and marketing problems, also the lack of any Government appreciation of the limits of the forest areas and the rapid development of

agriculture in areas which would far better have been retained in perpetuity for forestry and water conservation - made their actions at least understandable.

However, a new era was fast approaching. In 1896 the first Conservator of Forests, Mr. J. Ednie Brown was appointed. Though not a trained forester, he made some of the earliest estimates of the availability of timber, and endeavoured, unsuccessfully, to introduce a protection policy. Considering his estimate of commercial forest areas was of the order of twenty million acres, the total budget of his Department of £2,210, seems hardly adequate by today's standards, when the Forests Department expenditure is in excess of £1 million per annum to administer possibly a quarter of the area which was so greatly overestimated by Ednie Brown. Nevertheless, his efforts were constructive, and in time, they bore fruit.

Forests Act Inaugurated

It was not until 1916 that a trained forester, Mr. C. E. Lane Poole, was appointed as Conservator of Forests, and in 1918 a milestone occurred in the industry with the placing on the Statute Books of the Forests Act. The result of this Act, which provided for the setting up of a separate Department under the direction of a Minister for Forests, and also for the permanent dedication of large areas of State Forest, was to secure as far as possible the future timber needs of the State, and continuity of operation for the sawmillers. This Act, still in substantially the same form today has been developed, and the administration of which by the Forests Department we can well be proud, but in the vitally important spheres of soil and water conservation, it has also played a major part. The Timber Industry Regulation Act,

which is as important in relation to labour conditions and safety as the Forests Act is to conservation of the forests, was enacted in 1926. This Act is also administered by the Forests Department, and is in advance of similar legislation elsewhere.

During the period following the 1914-18 war, which was one of depression for the industry, great changes in bush and sawmill practice were gradually taking place, and in this 40 year period the following major changes have been noted. In the bush, the horse and bullock gave way to the steam hauler and subsequently the caterpillar tractor. A very recent development is the rubber tyred logger in place of tracked vehicles in jarrah forest. The axe and hand cross-cut saw were replaced by the power circular and chain saw. Motor trucks took the place of bush trams, and in the mills, diesel and electric power are now gradually replacing steam. In yards mobile cranes and fork lift trucks have replaced a great deal of unskilled manual labour. The first seasoning kiln was installed in 1919, and since that time kiln seasoning of boards for flooring and mouldings has become almost universal throughout the industry.

Railway sleepers have always been an important category of production in recent years having accounted for about 25% of total sawn output of hardwoods. The greater part of our sleeper production comes from small mills, many of them operating in private property, specially set up to produce sleepers. Jarrah and wandoo are the main species cut for sleepers, and they have a well-earned reputation for durability. The small, sleeper-producing mills have taken the place of the sleeper hewers, and have made it possible to recover millable timber from large areas of marginal country unsuitable for large general purpose mill operations.

## Local Market Increases

Over all the years the story has been one of uneven progress, due to fluctuating markets and the pressure of economic difficulties. Possibly the most striking feature in recent years has been the increasing importance to the industry of the market within the State. Forty or more years ago 70% of the State's timber production was exported and 30% used in W.A. This position has now been completely reversed, though the overseas and interstate export business is still very important to the industry and the State.

The map on the cover of this brochure, illustrates the location of W.A.'s main forest areas. It also shows the importance of Bunbury and Busselton as ship-loading centres for exports. Since the Forests Act came into operation in 1918, action has been taken progressively by the Forest Department to protect and manage the State's hardwood forests. Since 1920, the area of dedicated State forest has been increased from 3,823 acres to 4,459,038 acres in 1964. By efficient management and careful long-term planning, the Forests Department aims to provide a long working life for the main established mills, thus providing continuity of employment for the 9,000 people estimated to be dependent on forest pursuits for a livelihood in W.A.

## Growing Pine Plantations

It can also be seen from the map that extensive pine plantations are being developed by the W.A. Forests Department. The increasing market for softwoods, and the urgent need for Australia to reduce its dependence on imported timbers, demonstrate the importance of pine planting to the State's economy. Up until June, 1967, about

49,000 acres of land had been placed under pine, mainly quick-growing radiata in richer soil areas and slower growing pinaster in poorer soil regions. Some private plantations have been established, but the main effort to increase the forest estate derives from the Government, through the Forests Department. The Australian Forestry Council, under the chairmanship of the Minister for National Development, aims to co-ordinate forestry planning at the national level, and it is a sign of the importance now placed on the Forest Industries that the Federal Government is now providing substantial financial assistance towards the pine planting programmes of the various States. It is also hoped that the example of many other countries will be followed in providing incentives for the establishment and further development of private plantation.

Conditions are constantly changing in the industry and in the markets it serves. Competition from imported timbers is severe in markets in which we seek to sell our timber, and we endeavour to counter this by increased efficiency. Competition from substitutes, however, is increasing dramatically, and timber is being superseded by other materials in many of its traditional uses. The competition is being countered to a degree by timber promotional effort, particularly by branches of the T.D.A., but there is no doubt that aluminium, steel, concrete and other materials will continue to encroach on the market for timber.

Challenges of the Future

These factors make it imperative for the sawmiller to produce, as efficiently and economically as possible, timber in sections, lengths and quality, for which a market exists or can be developed. The co-operation of the Forest Department is essential in making available to sawmillers the best cut

possible, consistent, of course, with providing for reasonable future requirements. If we do not meet the challenge of the substitutes today, from the firm base of a strong, healthy industry, there will be a negligible market for our hardwoods in their present form in 30 or 40 years' time.

In conclusion, having mentioned some of the problems sawmillers face today, we must re-state the asset position, resulting from 135 years of sawmilling activity in Western Australia.

In basic resources, we have a forest which is being administrated to provide a sustained yield of timber to meet present and future requirements. We have at our disposal the services of one of the most efficient research organisations of its kind in the world, the Division of Forest Products of C.S.I.R.O. We have the benefit of a wide range of mechanical aids for bush and mill working, also alternative sources of power. We have a strong, progressive Association,* which, acting in co-operation with the Forests Department, actively promotes safety, productivity, orderly marketing and the promotion of timber in all its uses. These are the fruits of the 135 years history of the sawmilling industry in W.A. to date.

* The Associated Sawmillers and Timber Merchants of W.A.

## NEW MILL AT PEMBERTON

Today, sawmillers, like people in all other industries, are confronted with two major problems which admit in broad terms, of a somewhat common partial solution.

These problems are on the one hand maintenance of a place in a constantly changing and highly competitive world, and on the other attraction and retention of an experienced labour force in a period of over-full employment. The partial solution is increased efficiency by means of improved layout, greater mechanisation, better handling methods and the offering of an improved final product. By these means it is sought to attract a better class of labour, pay higher wage rates, increase productivity per man and reduce production costs.

It was in the light of these problems and with these principles in view that the question of building a mill to replace the one which was burnt at Pemberton some years ago was approached.

### Great Range of Sizes

It was clear from the start that one basic consideration had to be borne in mind, this being the necessity to handle a substantial log volume in logs of a great range of sizes and lengths in a timber of a high basic density often carrying a large degree of fault. This called for speed in handling, ruggedness in construction, accuracy in sawing and facilities for rapid disposal of waste. After extensive investigations in the Eastern States of Australia, and the Pacific Coast and the Mississippi Valley of U.S.A., it was decided that, taking into account the type of timber to be handled, the sawing pattern it was proposed to

follow and the other problems involved, the type of equipment most suitable for the job was that commonly used on the Pacific Coast with some variation to meet local conditions.

Accordingly, it was resolved, and this decision was reached only after long and careful study and inquiry, to build the plant round band saws and a stub edger, with high speed Pacific type steam operated log handling equipment, this being considered the most suitable type of plant for handling a large log volume at high speed, cutting to a restricted specification with a minimum of kerf loss.

Logs are received at a conventional landing and fed to the mill by a heavy duty log haul. They are kicked from the log haul to the log deck which incorporates log stop and loader, Symondson type log turner, nigger and lift skids all of which are steam operated.

The log carriage, which is operated by steam gunshot feed, is a four head 84" riderless unit, with caliper type dogging, flitch turning dogs and air flippers, manufactured by T. Eilbeck and Son Pty. Ltd. of Perth to a specification prepared by the Company. To cope with the loadings it is required to handle, this carriage has been designed for great strength and is considered to be the heaviest and most rugged unit to be put to work in the West Australian industry.

The headrig is a 10' Salem band mill with electric strain. It takes a 16" x 11g. x 62' long bandsaw.

Following the bandmill, which incorporates an off bearer-roll, is a fully mechanised roll case feeding flitch storage, transfer to edger and transfer to a band resaw.

Principal Producing Unit

The edger, which is the principal producing unit in the mill, is a Summer 60" x 8" with 8 shifters. It has a fully mechanised infeed table plus an outfeed table remotely controlled to discharge right and left as required. The divided output passes two air operated dockers, with finished product taken away on powered roll cases for discharge to a green chain. Following each docker is a radial arm (power feed) circular saw recovery bench with round-about, both served by a docking saw.

The band resaw, which incorporates an electrically controlled line bar in the feed table, is a Prescott 84" of late design. It is followed by an outfeed table, discharging to a docker or to a return system as desired.

The docker is a conventional air operated type, finished timbers being discharged via a roll case to the green chain. Provision has been made for back feeding from the edger to the band resaw and from the resaw docker to a power feed recovery bench.

The mill floor is 16' above ground level, with log deck cylinders and waste and sawdust conveyors under the floor.

Sawn timber passes over a 240' long and 18' wide green chain and is handled in the yard by fork lift and crane.

Power is supplied from the company's power station adjoining the mill. Because the small kerf of the band mills provides an inadequate supply of sawdust fuel for the boilers, two hogs have been installed to convert waste to fuel.

Whilst it cannot be claimed that any of the equipment is new to the West Australian industry, this is the first occasion on which all such equipment has been brought together in one plant.

## HARDWOOD PRESSURE TREATMENT PLANT AT PEMBERTON

### Pressure Treatment

The treatment of timber with a preservative under conditions of heat and pressure is not a new idea and has been practised in overseas countries for many years. However, such treatment has been confined essentially to coniferous timbers where the need to impart a measure of durability to the timber was recognised many years ago.

The development of techniques to treat the light-density timbers did not present great difficulties as a relatively low pressure of 200-300 lbs. per square inch was sufficient to assure absorption and the equipment necessary to contain these pressures was, in consequence, of comparatively light construction.

### High Pressure Treatment in Western Australia

Treatment in Western Australia began when it was realised that the durability of karri should be increased for use in situations of exposure to weathering and termite attack for although world renowned for its inherent strength properties, the timber did not possess an equal durability. Early attempts involved boiling the timber in open vats in a solution containing arsenic and molasses and later sodium fluoride. Retention was virtually nil, the process was ineffective and later abandoned.

Over a long period of experimental investigation, the Division of Forest Products, C.S.I.R.O., developed a satisfactory method of treatment of eucalypts by high pressure impregnation in a closed cylinder of massive construction and thus

the first commercial high pressure plant of its type in the world was constructed at Pemberton.

Now, with the ability to impregnate the naturally strong karri with a satisfactory preservative, a field of use hitherto unknown has been opened up for this specie of timber.

## Present Application of High Pressure Treatment

High pressure treatment at Pemberton began with the preservation of large numbers of cross-arms for the Postmaster General's Department. The purpose of the treatment was to provide a cross-arm which, when placed in service, would have a life equal to that of a treated pole on which it was placed so that once put into use, neither pole nor cross-arm would fail before the other.

Further developments have been treatment of large trial parcels of sleepers for use by the West Australian Government Railways and of karri fence droppers.

## The Process

The Pemberton process involves the use of a 3% solution of pentachlorphenol in furncase oil. Such heavy preservative oil has been found to give maximum resistance toweathering of the cross-arms when placed in service.

The plant consists essentially of a cylinder 30 feet long by 4 feet 3 inches diameter connected to a heat exchanger and a series of vacuum and other pumps and storage tanks.

The door of the cylinder is held closed under pressure by two yokes and sealed by a chevron seal under pressure in excess of that within the

cylinder.

Furnace oil is brought by road tanker from Kwinana and held in a steam heated storage tank. From there it is pumped to a 500 gallon mixing tank where the dry pentachlorphenol is dissolved by re-circulating hot oil. The solution is then pumped into an insulated working tank. This tank can be heated by steam coils or by circulation through the heat exchanger if necessary. A separate measuring tank, fed from the working tank, supplies the plunger pump which raises the cylinder to full working pressure. Steam for heating and for "steam-stripping" the treated arm is supplied from the sawmill boiler house.

Rigid Specifications

The cross-arms of 3 in. by 3 in. cross section are sawn to rigid specifications regarding size, straightness, cross-grain and other defects. They are initially air dried and later treated in drying kilns and finally machined. After drying and before treatment they are passed through a semi-automatic drilling machine where specified spacing of the spindle holes is carried out. The cross-arms are then loaded onto bogies for treatment.

Treatment consists of 1 hour impregnation at a pressure of 900 lbs. per square inch and a temperature of about 170°F. followed by a short vacuum and "steam stripping" to remove surplus oil and give as clean an arm as possible. A short final vacuum removes vapour from the cylinder before the door is opened.

Surplus oil and condensate from "steam stripping" are run into a settling tank and the oil returned to the working tank. After removal from the

cylinder the arms are cooled and inspected for defects that have taken place during treatment. Finally the arms are bundled and despatched.

The plant is capable of treating two charges of a total of over 660 9-ft. arms on a single shift operation.