10

BULLETIN No. 10.
(THIRD EDITION.)

Western Australia.

FORESTS DEPARTMENT.

SOME NOTES

ABOUT THE

FOREST RESOURCES OF THE STATE

WITH

ILLUSTRATIONS AND MAP OF MAIN FOREST REGION.

PERTH:
BY AUTHORITY: FRED. WM. SIMPSON, GOVERNMENT PRINTER.
1927.

BULLETIN No. 10.
(THIRD EDITION).

Western Australia.

FORESTS DEPARTMENT.

SOME NOTES

ABOUT THE

FOREST RESOURCES OF THE STATE

WITH

ILLUSTRATIONS AND MAP OF MAIN FOREST REGION.

S. L. KESSELL, Conservator of Forests.

Issued under the authority of the Minister for Forests:
THE HON. PHILIP COLLIER, M.L.A.

PERTH:
BY AUTHORITY: FRED. WM. SIMPSON, GOVERNMENT PRINTER.
1927.

u 4370/27

Western Australia:
ITS FORESTS AND TIMBERS.

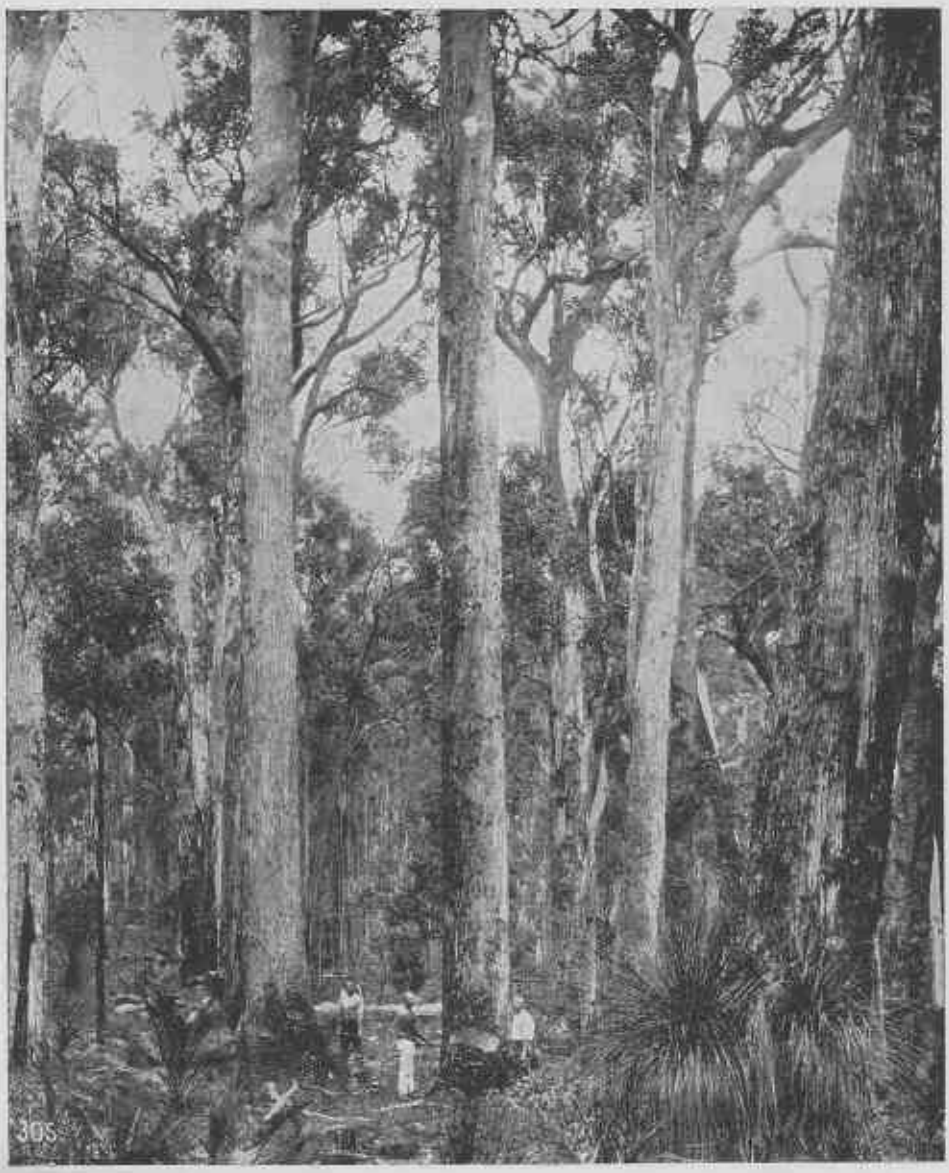
HISTORICAL.

THERE is romance in the forest story of every State in the Commonwealth, and in none is the story more attractive, more picturesque, and more inspiring than in Western Australia. It is a plain statement of fact to say that the foundation, in 1829, by the British Colonial authorities, of a settlement at the entrance to the Swan River was largely due to reports received in England as to the existence of immense forests of valuable hardwoods in the South-Western corner of what was then generally known as New Holland. The Government of New South Wales, in December, 1826, formed a small settlement at King George III. Sound, not so much by way of developing or exploiting the great unknown region as of furnishing a gentle hint to outsiders that the Union Jack covered the territory. The settlement was known as "Frederick Town," so named in honour of H.R.H. the Duke of York, and this settlement has since become the prosperous town of Albany. In 1827 Captain Stirling, in the "Success," visited and partially explored the Swan River and its tributary the Canning. He also explored the country in the vicinity of the Vasse, behind which lie the forests which contain giant jarrah and karri trees. The reports furnished to Governor Darling at Sydney by Captain Stirling, did much to influence the Colonial Office in its decision to establish a settlement on the Swan River. The first settlers found abundant timber for house building ready to hand, and at Perth (the capital), for 20 years at least after the foundation of the Colony, every building, including Government House, was built of jarrah or other native timbers.

EXPORT TRADE.

The extent of the forests and the high quality of the timber they contain early suggested to the hardy pioneer colonists that an export trade should be established. In these early days India and the Cape, for geographical reasons, bulked more largely in the commercial undertakings of the new Colony than did the Mother Country, and consequently the earliest shipments of jarrah were made to the countries named. There is no official record of the first shipments, although in a local newspaper established in 1832 references are made to exports of "mahogany," the name given by the early settlers to jarrah. The first official record of export was 1836, when a shipment of 200 loads, valued at £2,500,

Typical Karri Forest.
(The horse in the middle distance gives an idea of size of trees.)



Jarrah Forest.

(Note "Blackboy" in right foreground, with Zamia palms on left.)

was sent overseas. There is a hiatus of seven or eight years when, in 1844, a note occurs of a parcel valued at £163 having been dispatched. From 1846, however, the official record is complete, and the following figures illustrate the growth of the export trade:—

		£
1850	value	1,048
1860	,,	4,932
1870	,,	17,551
1880	,,	69,742
1890	,,	63,080
1900	,,	458,461
1910	,,	972,608
1913	,,	1,089,481
1916	,,	441,991
1926	,,	1,533,030
1927	,,	1,659,876

Since 1836 the total amount of timber exported from the State until 1927 was 273,694,970 cubic feet of a value of £25,499,236. The timbers represented by this huge total are almost entirely jarrah and karri.

The early colonists found a rich asset close at hand in the sandalwood, for which Western Australia is noted. The export of this wood to the East has been large, and the returns derived from it have played a very important part in the fortunes of the agricultural districts now known as the "Wheat Belt." The first official notice of the export of the wood is in 1845, when four tons, valued at £40, was sent away. There has been a steady rise in the amount of export, the total up to the end of June, 1927, being 393,175 tons, of a value of £4,381,579. Over recent years prices and supplies have fluctuated, and the Government have now taken over the control of exports, limiting the amount, and so stabilising prices.

Another forest product of Western Australia, the export of which has reached notably large dimensions, is that of mallet bark, a substance which contains a large percentage of tannin, the active principle in all tanning agents. The export trade dates from 1903, when mallet bark to the value of £859 was sent away; in two years the export had reached the phenomenal figure of £154,087, and the total export value up to the end of June, 1927, has been £1,110,108. But exploitation has been on such a reckless scale that stocks are almost completely exhausted, and exports are practically at a standstill; however, the Forests Department is now undertaking regeneration work in connection with this valuable product.

The important part which its forests have played in the development of Western Australia, when the figures relating to forest products are collected and set out in gross, become strikingly apparent.

	£
The total value of timber, sandalwood, and mallet bark exports amounts to	30,990,923
Total value of timber products used locally	24,155,500
Mining timber estimated at	29,500,000
Total	84,646,423

The forests of the State have, therefore, already yielded products to the enormous amount of over £84,000,000, and to this must still be added the value of gums, resins and fibres, and industrial and domestic firewood, regarding which statistics are not available.

The timber in the great forests is dealt with by milling plants with a capacity unequalled by those of any other State in the Commonwealth. The work of milling is partly in the hands of the Government and partly in those of private companies and firms. In the karri forests a log of 15 to 25 tons is by no means uncommon, and with trees 80 to 120 feet to the first branch, three logs of ordinary length can be obtained. In one mill in the karri forests a roof rests on girder spans each of which is a single beam of karri 80 feet long. The State Mills at Pemberton, in the karri country, have a capacity of 120 loads or 72,000 super. feet per day. At this mill also is an extensive powellising plant, and here a large proportion of karri sleepers used in the Trans-Australian Railway were treated. Here, too, there is an extensive fruit case factory, cases of native timbers now taking the place of those of imported wood in use in pre-war times.

THE PRIME FLORA OF WESTERN AUSTRALIA.

It is not within the scope of this brief notice to describe the flora of the Western State. Western Australia has often been called the "paradise of botanists," and its gorgeous shrubs and flowers have been introduced into many other parts of the world and have made its flora famous. Of these probably the Leschenaultias, Kangaroo Paws, Kennedyas, Verticordias, Hoveas, Patersonias, Grevilleas, and Bunjongs, or Bush Roses (Pimeleas), are perhaps the best known, but the Red Flowering Gum (Eucalyptus ficifolia), Christmas Tree (Nuytsia floribunda), Sturt's Desert Pea (Clianthus Dampieri), Geraldton Wax Plant (Chamaelaucium uncinatum), Flannel Flower (Actinotus leucocephalus), and White Spider Orchid (Caladenia Patersoni), and Pitcher Plant (Cephalotus follicularis) must also be mentioned. Boronia megastigma is especially popular owing to its wonderful scent, which is now being extracted by local firms.

Two peculiar members of the lily family of special interest are the Grass Tree of W.A. (Kingia australis), and the West Australian Blackboy (Xanthorrhoea Preissii). The Grass Tree is the basis of a considerable industry in the manufacture of excellent brooms, made from the outer sheathing of the core of the trunk; while the outside sheathing of the trunk is used in freezing works, cooling chambers and ice safes, as an insulator of the first order; the plant has several other possibilities. The Blackboy, which is similar in appearance, belongs to the same genus as the "Grasstree" of the Eastern States. It is doubtful whether all the products obtainable from Blackboy have been discovered, but among them are the following:—The leaf bases, which, as in the Grass Tree, are packed together to form a hard outer sheathing to the steam, are full of resin; this, when heated, coagulates into a hard substance known as "blackboy gum," and from this substance varnish and picric acid (50 per cent. by weight) are obtainable. Besides these, the plant also yields glucose, treacle, scents, alcohol, and certain tar products (including two dyes); also drying oils, turpentine substitutes, acetic acid, and several other compounds. Eight cwt. of coke residue of very high calorific value and 5,000 cubic feet of gas to the ton remains over after segregating these products. It appears to be not generally known that there are several species of Blackboy indigenous in Western Australia, but, apart from Xanthorrhoea Preissii, X, reflexa (which has a wider range, and is particularly characteristic of Wandoo country) is the only other species that has been used commercially. The young spiky leaves near their base are edible, and extremely nourishing, a feature of value to anyone becoming "bushed," more especially as these plants are very common in most districts.

To those interested in the Blackboy from a technical standpoint, it will be of interest to know that Professor E. Rennie and Messrs. W. T. Cooke and H. H. Firlayson, acting as a Special Committee of the Commonwealth Institute of Science and Industry, made an investigation of the resin from species of Xanthorr-

hoea not previously examined, and the following summary of the results obtained was made available in 1920:—

(1) The Xanthorrhoea resins from Kangaroo Island and W. Australia, in common with other species examined by various chemists, contain p-coumaric acid, either in the free state or in the form of an ester, and p-hydroxybenzaldehyde.

(2) By steam distillation from a strongly alkaline solution, the following substances not hitherto found in Xanthorrhoea resin, have been obtained:—

A.—Red Resin from Kangaroo Island (Sp. ?).—(a) A small quantity of fragrant liquid of vanillin-like odour; (b) paenol (2-hydroxy-4-methoxyacetophenone); (c) traces of material of higher boiling point.

B.—Yellow Resin from X Tateana (Kangaroo Island).—(a) A small quantity of fragrant liquid of vanillin-like odour; (b) paeonol in much larger quantity than in the red resin; (c) hydroxypaeonol in quantity about two-thirds of that of the paeonol; (b) a small quantity of material of higher boiling point.

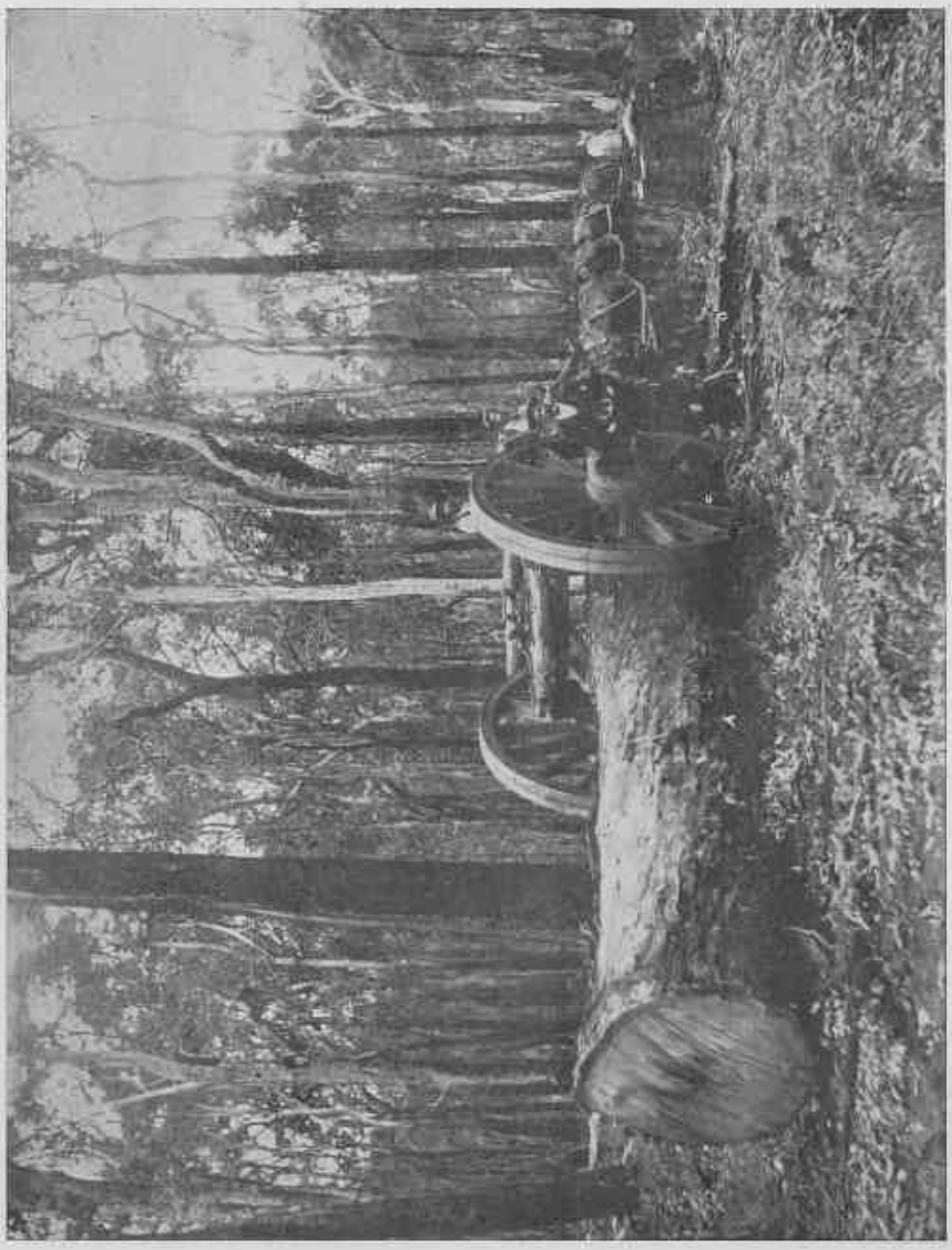
C.—Red Resin from X. Preissii (W. Australia).—(a) A small quantity of fragrant liquid not identified; (b) l-citronellol; (c) paeonol; (d) hydroxypaeonol; (e) a compound, possibly methoxydiphenyl ether; (f) a small quantity of so far uncrystallised material of very high boiling point.

Another conspicuous and interesting plant in the forests is the Zamia Palm (Macrozamia Fraseri). This plant is a member of the Cycad family, and is a survivor of that primitive group of seed-plants that flourished during the Coal Age. In most districts the trunk does not exceed two feet in height, but in the Karri country it grows up to 15 feet. The plant is poisonous to cattle, and the rickety effects are incurable; but, in spite of this fact, the early settlers extracted a substance from the pith, which they used as a substitute for arrowroot. The pith when boiled can be used as food for poultry, pigs, and other farmyard animals. The nuts when baked have a pleasant flavour and are eaten by the aborigines.

The State's wealth in trees is no less great, and the following list includes many of the commonest as well as the most useful species:—

Eucalyptus marginata	Jarrah
„ diversicolor	Karri
„ gomphocephala	Tuart
„ cornuta	Yate
„ calophylla	Marri
„ foecunda, v. loxophleba	York Gum
„ patens	Blackbutt
„ longicornis	Red Morrell
„ salmonophloia	Salmon gum
„ salubris	Gimlet
„ redunca, var. elata	Wandoo
Banksia verticillata	River Banksia
„ Menziesii	——
„ attenuata	Narrow-leaved Banksia
„ illicifolia	Holly-leaved Banksia
„ grandis	Bull Banksia
Santalum spicatum	Sandalwood
Casuarina Fraseriana	Sheaoak
Acacia acuminata	Raspberry Jam

Jarrah Tree just felled, and being sawn up.



Log Hauling in a Jarrah Forest.

Jarrah is the most extensively used timber. It is strong, hard and durable, has a beautiful grain and will take a high polish. Jarrah is essentially a furniture and cabinet timber, and lends itself admirably to carving, panelling and all forms of interior decoration. In the early years of the Colony, when the value of a timber was judged by its suitability for fence posts, railway sleepers and such uses, the wonderful durability of Jarrah led to its being extensively used for these purposes and for building construction, for which the timber is unexcelled. Ever since that period, Jarrah has been the principal timber used in Western Australia for all building purposes, fencing posts, pit props for the Collie coal mines, bridges, piles and railway sleepers (of which a large number are exported annually—chiefly to South Africa and India); many of the houses in New Zealand are built of Jarrah. Of late years, however, the suitability of the wood for furniture and higher grade purposes is being realised more and more, and its use for this class of work is increasing daily. An indication of the growing favour of Jarrah for such purposes may be found in the development during recent years of the trade with the Eastern States, which is chiefly in flooring boards. Eastern Australia has now ousted South Africa from her place as principal buyer of West Australian timbers.

Karri, which is even stronger than Jarrah and may be obtained in extraordinary lengths, makes an excellent superstructural timber, and its main use locally is in this section of building construction. It is also used for wheelwright work, flooring, beams and structural work generally, and makes extremely satisfactory telegraph arms, for which purpose it has been largely employed in England. The greater part of the timber is exported, and, unfortunately, as with Jarrah, it is sent abroad in the form of railway sleepers, an inferior use for a high-grade timber. In the case of karri, which is not durable in the ground or under water, preservative treatment is necessary. Recent research has resulted in the patenting of a new process known as Fluarising, which is now used instead of the Powellising treatment. Fluarising is a considerable improvement on other methods of treatment and is a specific against not only white ants but all forms of dry rot.

Tuart and Wandoo on Crown lands are reserved for departmental purposes, principally for the Government railways. The cost of maintenance on trucks has been reduced from £3 7s. 6d. to 10s. per annum by the use of these timbers in the under-carriages instead of steel. Tuart is one of the toughest and densest timbers in the world, while Wandoo (which is similar in these respects) is remarkable for the absence of chemical action, when used in conjunction with steel. The top planks of the trucks in the Government railways are always of Wandoo, which stands the wear of loading and unloading better than steel bands on soft-wood planks.

Tuart is also used extensively for wheelwright work, especially for the naves of the 10ft. wheels of the whims operating in the karri and jarrah forests (see photo., p. 10). Yate is also used for wheelwright work, and is preferred where the strongest shafts or frames of carts are required; it is one of the strongest timbers in the world; in one test for tensile strength the breaking load was 17½ tons per square inch—only 3½ tons less than that of wrought iron of ordinary quality; that it is not used more generally is due to the fact that it is found in open savannah forests at a distance from centres of population.

Sheaoak and River Banksia, as well as Jarrah, make very beautiful furniture. Banksia is commonly used by the Western Australian Government Tramways for seats and interior fittings of their cars, and in this guise attracts much attention and admiration.

York Gum, Salmon Gum, Gimlet and Morrell are timbers found in the agricultural and goldfields areas. Except for mining purposes, they have not been extensively used, but Red Morrell and Gimlet have played an important part in building, fencing, etc., in the agricultural districts.

Raspberry Jam (Acacia acuminata) is a small tree occurring throughout the agricultural districts; although small, it is very ornamental, and is commonly left in pastoral districts as a shade tree; it is a tough timber, but is preferred to any other for fencing purposes owing to its remarkable durability—fences of Jam are still standing that were put up 70 years ago. Wire passing through Jam posts has no chemical action upon the wood, so that the holes remain clean, rendering it an easy matter to re-wire or tighten up a fence. This wood gets its name from its remarkably strong and tenacious smell, resembling squashed raspberries. The heartwood is a very dark brown colour, and the sapwood yellow. Thus the timber shows a pretty design in ornamental boxes, etc., which take a fine polish.

Eucalyptus astringens has not been included in the above list, but this tree—known vernacularly as the Brown Mallet—is the species responsible for tanning bark exports already mentioned, and is therefore worthy of special recognition.

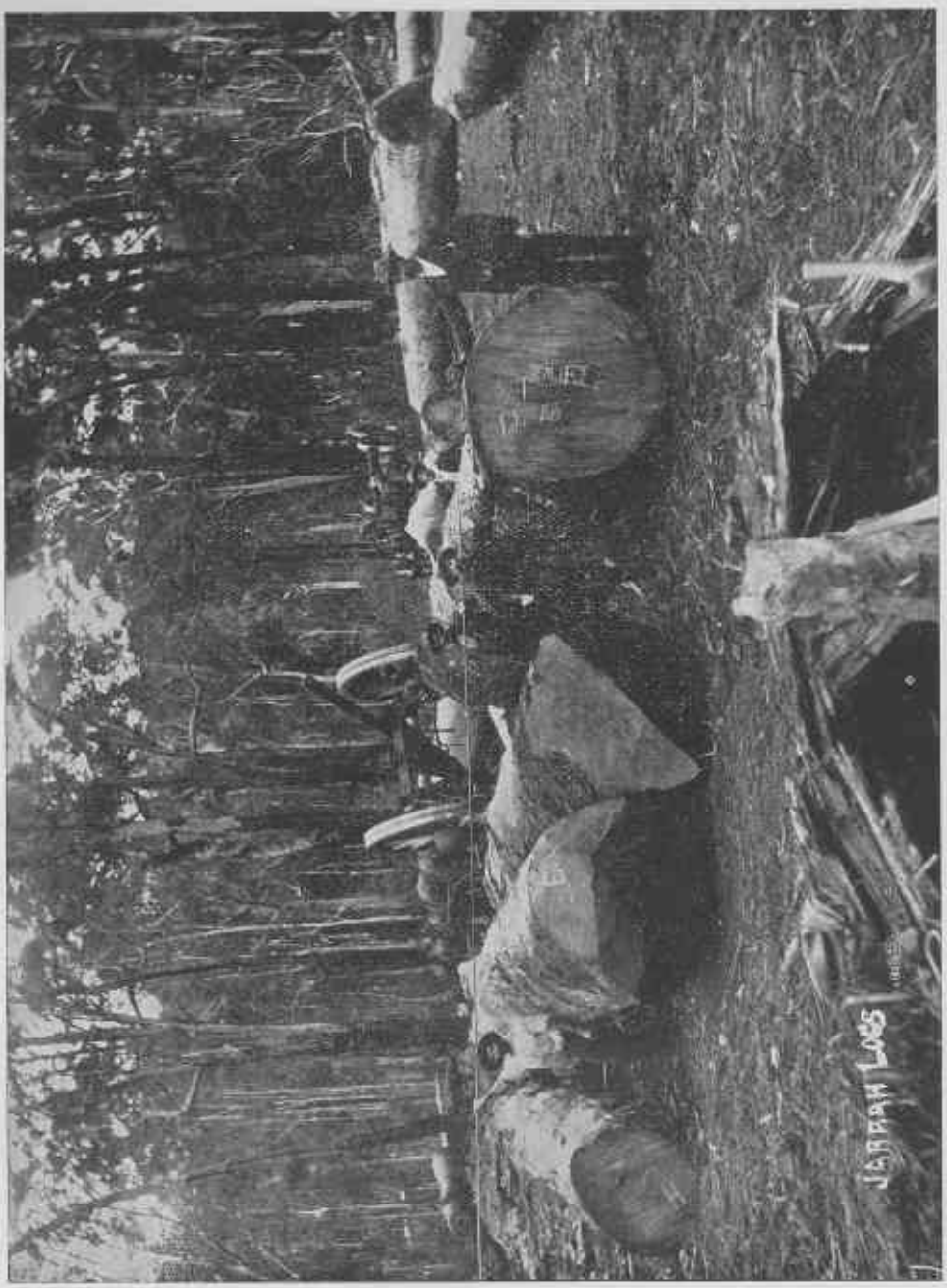
FOREST AREA.

Early estimates of the area of forest in Western Australia have resulted in a serious misconception arising as to the extent of our forest wealth. The State's forested areas were in the past frequently quoted as 20 million acres, but such a report is absolutely misleading. The prime forest region of Western Australia is less than 3 million acres and is situated in the extreme South-Western corner. It will be understood that timber for farming requirements and forest produce of considerable value, such as sandalwood, tanning barks, etc., are found over the greater part of the State, but, when considering the timber supplies of the future, the figure which should be borne in mind is approximately 2½ million acres. This is made up of—

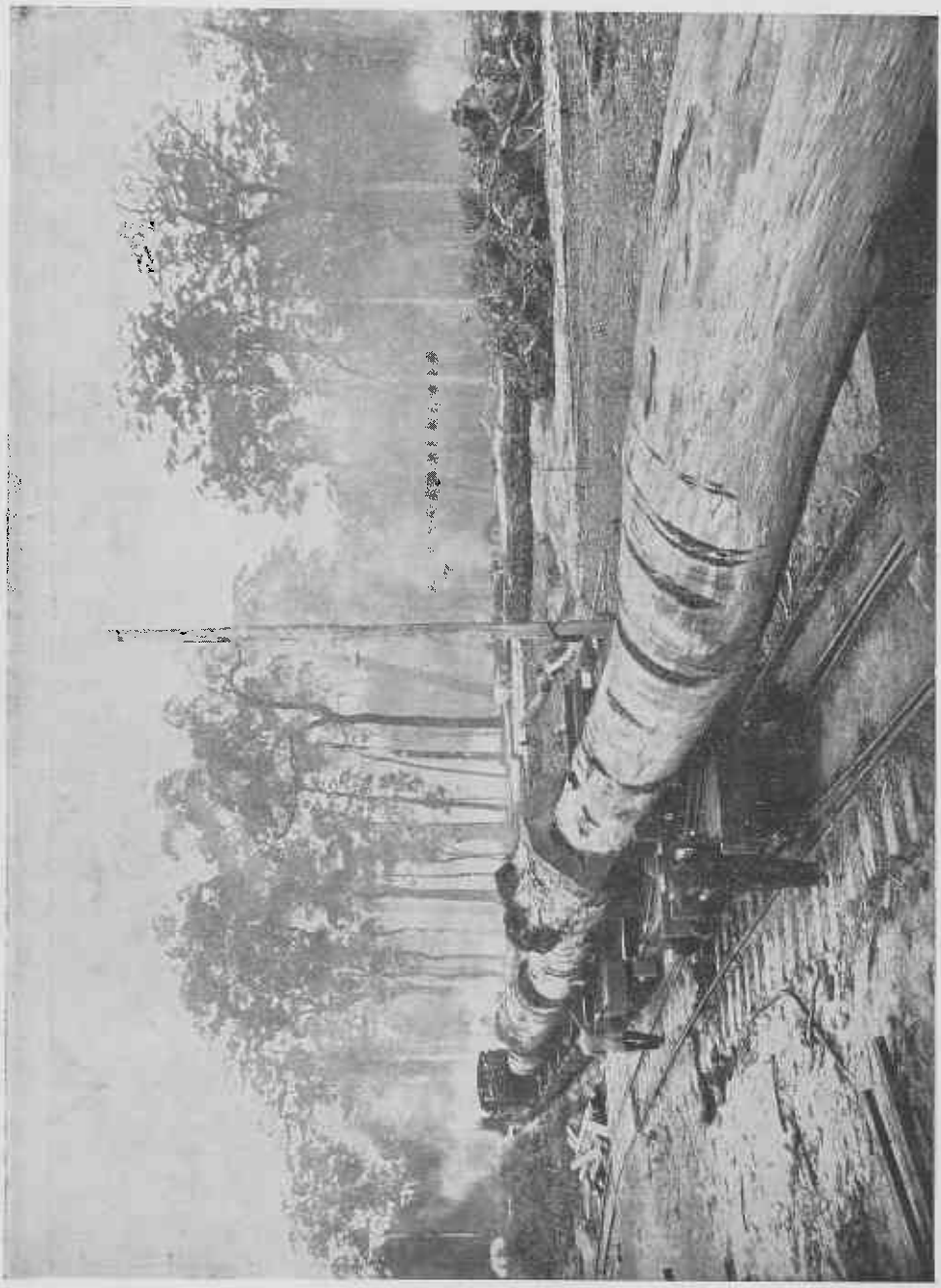
	acres.
Jarrah	2,330,000
Karri	*75,000
Tuart	7,000
Tingle Tingle	8,600
	2,420,600
Areas reserved for regeneration of Mallet	42,890
Areas selected for regeneration of Sandalwood (demarcation and reservation proceeding)	205,176

In Europe it is considered that 25 per cent. of the area of a country should be devoted to the production of timber in order to render the country self-supporting as far as timber supplies are concerned. In many European countries the percentage is much larger. For instance, in Sweden 53 per cent., in Austria 38 per cent., in Finland 33 per cent., in Russia 36 per cent., and in Germany 27 per cent. of the total area is forest country. The difficult problem which confronts the forester in Western Australia is very evident when it is realised that only .003 of the total area of the State is prime forest region and available for dedication as State forests. It is hoped that the growth of conifers on areas at present regarded as waste may help to make good the timber shortage which may be expected as the population of the country increases.

* The area of 75,000 acres consists of pure Karri forest which merges into a mixed forest of Karri and Marri, carrying a large volume of valuable Karri timber, so that the area of merchantable Karri forest may be regarded as 120,000 acres.



Logs at a Bush Landing.



A Log Train.
(Known as a "Rake.")

TIMBERS OF THE NORTH AND INTERIOR.

What has already been said applies only to the South-West area of the State. In the North-West there are many valuable timbers, but none of them is found existing in a state which deserves the name of forest. Some of these woods are of commercial importance; for example, coolibah and native ebony, and some of the varieties of the many mangroves of the Northern rivers hold large percentages of tannin. In the Cambridge Gulf district, Cyprus Pine (*Callitris intratropica*) exists in some quantity, particularly between the Gulf and the Northern Territory border. It does not occur in sufficient quantities, however, to warrant exploitation at the present time. As the country develops, and this timber becomes more accessible, it will, no doubt, prove valuable for local use in building construction, fencing, railway sleepers, and so on. It is particularly useful for such purposes, being immune to attack by white ants. The whole of the forests of Western Australia are rich in gums, resins, and tanning agents, and these await further investigation.

PHYSICAL PROPERTIES OF WEST AUSTRALIAN TIMBERS.

Nowhere in the Commonwealth are stronger timbers found than in Western Australia. A glance at the following table of transverse strengths of certain Western Australian and foreign timbers brings this clearly into view. It is this exceptional strength and their durability which has procured for the timbers of the State the ready acceptance accorded to them abroad.

Transverse Strength of Beams of Western Australian Timbers.

(For specimens of approximately 20 sq. ins. sectional area.)

Name of Timber.	At 12 per cent. moisture.		
	Weight in lbs. per cubic foot.	Modulus of Rupture in lbs. per square inch.	Modulus of Elasticity in lbs. per square inch.
Jarrah	55	15,000	2,080,000
Karri	58	17,300	2,680,000
Tuart	68	17,900	2,560,000
Wandoo	71	16,100	2,190,000
Blackbutt	54	14,200	2,000,000
Marri	56	16,600	2,590,000
Yate	71	21,500	2,800,000
York Gum	67	14,500	1,800,000
Salmon Gum	66	20,100	2,500,000
Morrell	64	16,900	2,400,000
Sheoak	52	12,000	1,360,000
Banksia	35	10,300	1,150,000
Raspberry Jam	62	15,300	2,360,000
Native Pear	46	7,700	850,000
Red Tingle Tingle	48	13,000	1,800,000
Yellow Tingle Tingle	63	18,000	2,600,000
Coolibah *	82	17,400	2,100,000
Karri-Sheoak	44	9,000	940,000
FOREIGN TIMBERS.			
Oak (English)	52	11,800	...
Oak (American)	48	11,500	1,800,000
Teak	49	13,500	2,390,000
Oregon †	32	7,900	1,680,000

* At 16 % moisture. † Small clean specimens.

THE WORK OF THE FORESTS DEPARTMENT.

For 90 years, that is, from the foundation of the Colony in 1829 until 1918, the vast forest wealth of Western Australia was to all intents and purposes at the disposal of all and any who cared to avail themselves of it. The restrictions on cutting were few and ineffective, with the result that there was much wanton and reckless exploitation. Until 1918 the forests were administered under certain clauses attached to the Land Act, but in December of that year Parliament, recognising the national importance of the great forest resources of the State, passed an Act "to provide for the better management and protection of forests."

With the passing of this Act, a new era was opened in the history of Western Australian forests, as, under it, the Executive is able to take measures of conservation and regeneration which in due time will result in a sustained yield of timber. Under the new Act a Forests Department was created, which has the control and management of all matters of forest policy, all State forests and timber reserves, and the forest products of other Crown lands.

The Act provides for the planting or thinning of forests and the making of plantations and nurseries, and the distribution of trees therefrom; also for the granting of permits, licenses and leases, and for the enforcement of the conditions of timber concessions, leases, permits, licenses and other forms of conversion granted under the Act or any former Act. The head of the Executive is the Conservator of Forests, who, under the Act, is declared to be a corporate body with all powers thereto attaching. Power is given to the Governor to dedicate Crown lands as State forests and to create timber reserves, and power is also given to the Executive to make such regulations as shall in its opinion be necessary for the protection of the State timber areas and for the good government of the resources placed under its care.

The forest "Working Plans," on which the continuity of forest policy, and, incidentally, the whole future of the forests, depends, are laid down by the Conservator, and, having been approved, cannot be altered except on the recommendation of the Conservator.

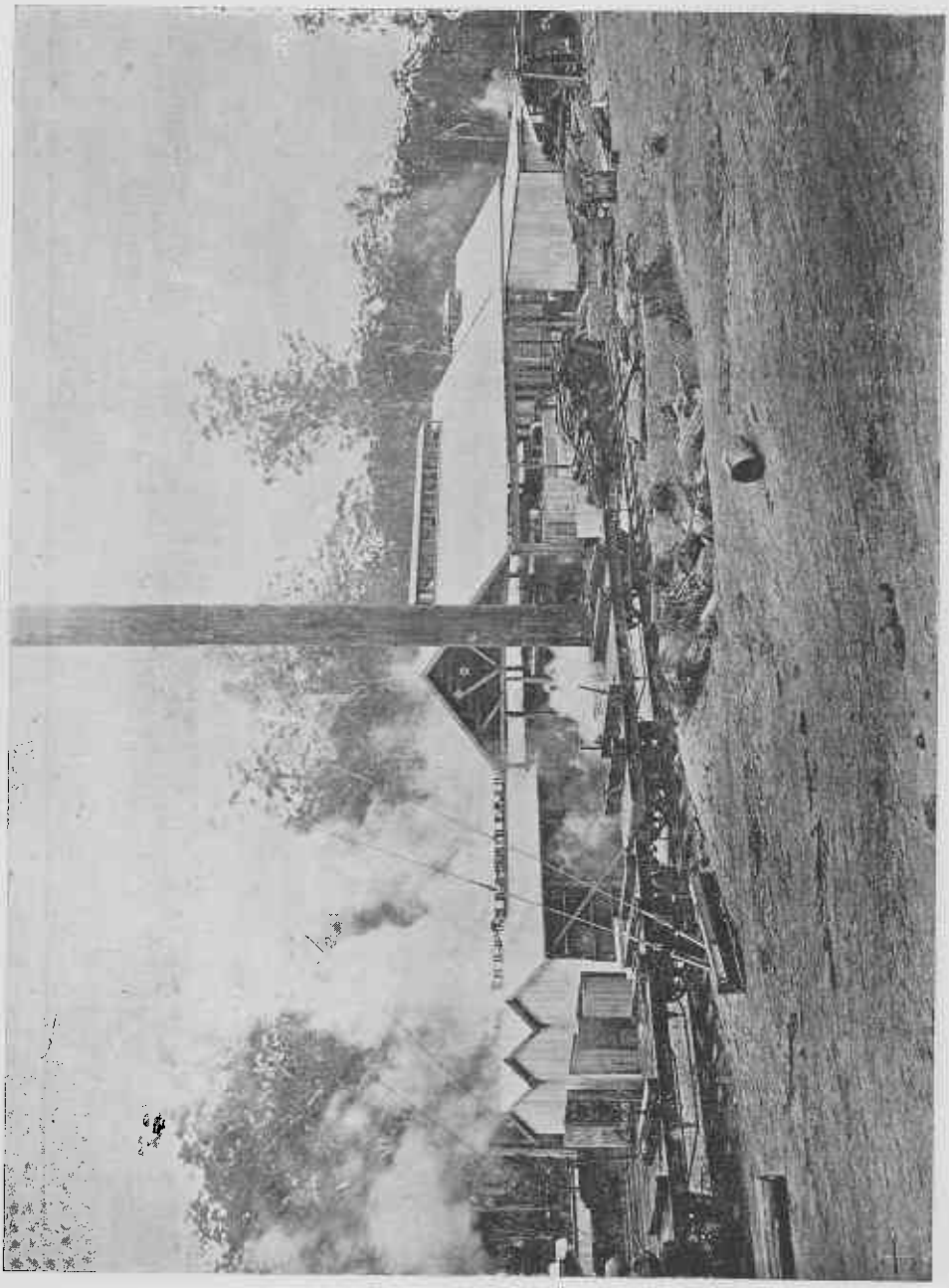
In order that the financial question shall not embarrass the operations of the Department, the Act states that "three-fifths of the net revenue shall be placed to the credit of a special account, and shall form a fund for the improvement and reforestation of State forests and the development of forestry."

In the nine years which have elapsed since the passing of the Act, the work of the Department has definitely emerged from the experimental stage, and development along many lines is rapidly taking place. A comprehensive survey and stocktaking of all prime forest country has been made. The following brief summary will give some idea of the work which is going on at present:—

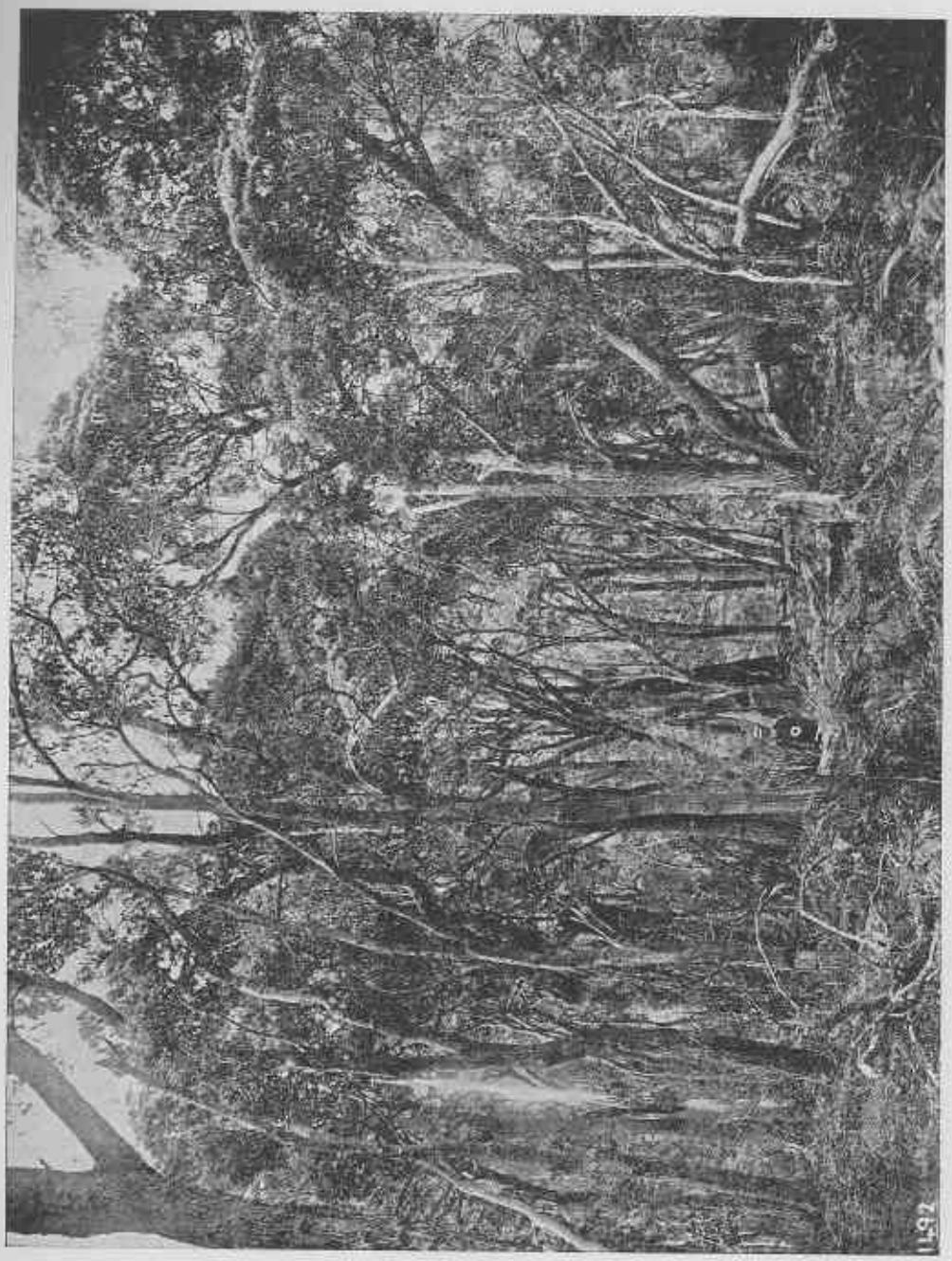
The areas of forest country to be silviculturally treated are divided into Working Circles and each Working Circle forms the subject of a Working Plan, which is drawn up to cover activities over a given period, say five or ten years. Before the Working Plans are drawn up a good deal of preliminary work has to be done to obtain information necessary for the preparation of maps showing topography, timber tramlines, roads and tracks in use by timber getters and so on. Twenty-eight Working Plans are at present in operation, covering some 660,200 acres, and further Working Plans are being prepared as rapidly as limited staff permits.

Efficient fire control is a necessary basis of all forest work and considerable advance has been made during recent years in both fire prevention and suppression. As more intensive forest work is being carried out in timbered country, the sympathy of local people has been enlisted, and the fire menace has decreased in proportion.

No. 1 State Mill at Manjimup.



Powellising Plant at No. 2 State Sawmill, Pemberton.



River Banksia (Banksia verticillata).

Fire control falls naturally into two main sections. The first is based on preventive measures which it is possible to take before the beginning of the fire season. Among such preventive measures is controlled burning of dangerous hazards and the safe disposal of lop and top resulting from falling operations. The first essential in fire suppression is early detection, and look-out towers have proved their value for this purpose. Where the amount of reforestation work being carried out is sufficient to justify the overhead expenditure, towers have been established and an organisation built up for rapid communication between the look-out man and workmen engaged on cultural operations in the forest. During the past five years no serious fire losses on any country treated for regeneration or planted with pines have been experienced, and it is anticipated that, as the "bush" is converted into tended forest managed by resident overseers, the fire problem will largely disappear.

Steps have been taken to restrict the output of timber from Crown lands and provide for more economic utilisation, with the object of extending the life of the timber industry. More intensive control of exploitation has been introduced, providing for the full utilisation of the mature and overmature virgin forest as a first step towards natural regeneration. Up to date an area of 14,620 acres has been silviculturally treated under the group selection system for the natural regeneration of Jarrah, 3,600 acres of Jarrah in the vicinity of the Collie coal mines have been treated under the clear felling system, and a satisfactory crop of seedling and coppice regrowth secured. Silvicultural work having for its object the regeneration of Karri and Tuart is being carried out in prime forest areas.

Indigenous forests, apart from a few cabinet woods, contain no softwoods, with the result that considerable quantities of oregon and baltic deal are imported. Steps are now being taken to grow supplies of softwoods on waste lands, and, despite climatic disabilities and poor soil conditions, plantations are being successfully established, which, it is hoped, will in time render the State independent of outside sources.

An increasingly important activity of the Department is the regeneration, in their original habitat, of two valuable species, the former reckless exploitation of which has so diminished supplies that there is danger of their complete extinction. These species are the Sandalwood (Santalum spicatum) and Mallet (Eucalyptus astringens), the former being valued for its timber and the latter for its bark, which contains a high percentage of tannin. Sandalwood is a parasite and does not regenerate easily, but experiments carried out by the Department have established the best conditions for replanting this species, and have proved that its regeneration even on an annual rainfall of 8 to 12 inches is by no means impracticable. Areas of young mallet regrowth are being reserved and protected, and plantations are being established in localities where it is thought the species will thrive. In addition to this the regulation forbidding the cutting of immature mallet trees is being rigidly enforced.

ARBORICULTURE.

In America and Canada, where the importance of State forests is keenly appreciated, what is known as the farmer's "wood-lot" receives every attention. Farmers are encouraged to plant suitable trees on their holdings, and the various Forest Departments assist farmers in this direction in every possible way.

The Parliament of Western Australia has wisely introduced in the Forests Act clauses designed at once to assist the farmer, and by so doing to extend the State's production of timber on alienated land. It is provided that—"On the disposal of land under the conditional purchase provisions of the Land Act, 1898,

it shall be a condition that the purchaser shall use an area of not less than two per centum of the acreage of the holding acquired by him for the growth of timber or other forest produce," and in a subsequent subsection it is declared that "the planting of trees on not less than five acres of any such land shall be deemed an improvement within the meaning of the Act."

In order to encourage the planting of trees by farmers and settlers, the Forests Department has a large nursery at Hamel, where hundreds of thousands of trees are raised for distribution at cost price. In some of the farming districts of the State, the original holders of the land, with an eye only to the present and the immediate future, practically denuded their holdings of all timber, thus depriving themselves and their successors of the countless advantages following the presence of timber on the farm. The value of the farmer's wood-lot is not yet sufficiently recognised in Australia, although in some of the older settled districts the errors of earlier times are being repaired by vigorous planting of trees. There are few farms that do not possess more or less land unsuited for the raising of wheat and other crops, but adapted for the growing of such timbers as may suit the soil and the rainfall of the particular district. If private individuals wish to embark on any scheme of planting, the Forests Department is always prepared to give advice on species and methods of planting, and, in cases where the magnitude of the undertaking warrants it, the services of a trained officer will be available to give advice on the spot.

The nursery at Hamel grows trees suitable for nearly every part of the State, and seedlings of these may be had by farmers and others in quantities to suit them, and at prices which cover only the cost of raising them. A catalogue may be obtained free of charge, on application to the Forests Department, Perth, and in it will be found a large assortment of both useful and ornamental trees. Trees are not supplied to applicants living within the Metropolitan area between Midland Junction, Gosnells, and Fremantle. This catalogue is issued in the autumn, and the distributing season closes at the end of August in each year.

The Forests Department has from time to time issued bulletins and pamphlets dealing with the timbers and forest products of the State, and a list of these, with prices, is given in appendix hereto.

APPENDIX.

BULLETINS.

Bulletin No.	Title.	Date of Publication.	Price.	Postage.	
				British Empire.	Other.
1	Kiln Drying of Jarrah (C. E. Lane-Poole)	1919	1/-	...	...
2	Notes on the Forests and Forest Products and Industries of Western Australia	1921	~~10/-~~ 5/-	5d.	9d.
3	Notes on the Tannin Resources of Western Australia ...	1923	Free	...	...
7	Western Australian Timber Tests, 1906 (and Supplement), Physical Characteristics of the Hardwoods of Western Australia, and Principal Timbers of Eastern Australia (G. A. Julius)	~~1915~~ 1929	~~5/-~~ 1/-	...	...
9	Short Descriptive Notes of the Principal Timbers of Western Australia	1925	Free	...	...
10	Some Notes about the Forest Resources of Western Australia, with Illustrations and Map of Main Forest Region	1927	Free	...	...
11	Blackboy	1925	Free	...	...
12	Sandalwood	1924	Free	...	...
16	Table of Contents, in cubic feet, of Logs	1920	3/-	...	...
21	Jarrah	1925	Free	...	...
22	Karri	1925	Free	...	...
23	Tuart and Wandoo	1925	Free	...	...
25	Grass Tree	1925	Free	...	...
27	A Glossary of Technical Terms used in Forestry Practice (S. L. Kessell)	1921	9d.	...	...
28	Seasoning of Western Australian Hardwoods (S. A. Clarke) ...	1925	Free	...	...
30	The Hardwoods of Western Australia	1923	Free	...	...
31	Descriptive Catalogue with Price List—Hamel Forest Nursery	Issued annually	Free	...	...
32	Botanical Notes, Kimberley Division of Western Australia (C. A. Gardner)	1923	2/6	3d.	6d.
33	Damage caused by Creeping Fires in the Forest (S. L. Kessell)	1924	Free	...	...
34	Key to the Eucalypts of Western Australia, with Descriptive and Botanical Notes, etc. (S. L. Kessell and C. A. Gardner)	1924	5/-	3d.	6d.
35	Key to the Eucalypts of Western Australia—Extracts from Bulletin No. 34 (S. L. Kessell and C. A. Gardner)	1924	1/-	...	...
36	The Foresters' Manual, Part I.	1926	5/-	4d.	7d.
37	Working Plan No. 1, Mundaring Working Circle	1926	1/-	...	...
38	Air Seasoning Study (S. A. Clarke)	1926	1/-	...	...
39	The Foresters' Manual, Parts II. to V.	1927	5/-	5d.	9d.
40	Seasoning of Western Australian Hardwood (S. A. Clarke)	1927	2/6	...	...

NOTE.—Bulletins Nos. 4, 5, 6, 8, 13, 14, 15, 17, 18, 19, 20, 24, 26 and 29 are now out of print.

By Authority: FRED. WM. SIMPSON, Government Printer, Perth

Addition to Appendix

Bulletin No.

41 "Description of 50 new species and 6 varieties of Western and Northern Australian Acacias, and Notes on 4 other species".

By the late J.H. Maiden and W.F. Blakely

Price 1s.6d, plus postage -
British Empire 2d.
Other 3d

42 "Forests and Forest Resources of Western Australia. A Statement prepared for the British Empire Forestry Conference, Australia and New Zealand, 1928".

Price 3s., plus postage -
British Empire 2d
Other 4d

Vegetation Map of Western Australia (included in Bulletin No. 42).
Price 2s.

43 "The Development of Forest Practice and Management in Western Australia".

By S.L.Kessell Free.

44 "A Taxonomic Study of the Genus Santalum, with special reference to the Sandalwoods of Australia".

By C. A. Gardner Free.

45 "The Air Seasoning of Jarrah Flooring" (1929)
By S.L. Kessell Price 1s.

46 "The Hardwoods of Western Australia" (1929)
Free.

Addition to Appendix.

Bulletin No.

47. "Forestry and Forest Resources of Western Australia. Progress Statement prepared for Fourth British Empire Forestry Conference (South Africa) 1935."

Price 1/-, plus postage -
British Empire 1d.
Other 2d.

48. "Timber Supply, Consumption, and Marketing in Western Australia. Statement prepared for the Fourth British Empire Forestry Conference (South Africa) 1935".

Price 1/-, plus postage -
British Empire 1d.
Other 2d.

49. "Standard Specifications for Jarrah and Karri, together with Notes on Allowable Working Stresses."

Issued by Forests Department, W.A.
Free.

- "Silviculture in Extra Tropical Regions".

By S. L. Kessell.
Free.

MAP

OF

PART OF THE SOUTH-WEST DIVISION

OF

WESTERN AUSTRALIA,

SHOWING FOREST ZONES.

Red hatching indicates approximately the position of prime merchantable forest.

SCALE: 15 MILES TO AN INCH.

TUART ZONE.

Tuart	(*Eucalyptus gomphocephala*).
Coastal White Gum	(*Eucalyptus decipiens*).
Peppermint	(*Agonis flexuosa*).

JARRAH ZONE.

Jarrah	(*Eucalyptus marginata*).
Marri	(*Eucalyptus calophylla*).
Blackbutt	(*Eucalyptus patens*).
Flooded Gum	(*Eucalyptus rudis*).
Wandoo	(*Eucalyptus redunca, var. elata*).
Powder-bark Wandoo	(*Eucalyptus accedens*).
River Banksia	(*Banksia verticillata*).
Sheoak	(*Casuarina Fraseriana*).

WANDOO ZONE.

Wandoo	(*Eucalyptus redunca, var. elata*).
Powder-bark Wandoo	(*Eucalyptus accedens*).
Jarrah	(*Eucalyptus marginata*).
Marri	(*Eucalyptus calophylla*).
Salmon Gum	(*Eucalyptus salmonophloia*).
Red Morrel	(*Eucalyptus longicornis*).
York Gum	(*Eucalyptus foecunda, var. loxophleba*).
Jam	(*Acacia acuminata*).
Sheoak	(*Casuarina Huegeliana*).
Sandalwood	(*Santalum spicatum*).

KARRI ZONE.

Karri	(*Eucalyptus diversicolor*).
Red Tingle	(*Eucalyptus Jacksoni*).
Yellow Tingle	(*Eucalyptus Guilfoylei*).
Marri	(*Eucalyptus calophylla*).
Bullich	(*Eucalyptus megacarpa*).
Karri Sheoak...	(*Casuarina decussata*).
Cedar	(*Agonis juniperina*).
River Banksia	(*Banksia verticillata*).

SALMON GUM ZONE.

Salmon Gum	(*Eucalyptus salmonophloia*).
Red Morrel	(*Eucalyptus longicornis*).
Yorrell	(*Eucalyptus gracilis*).
Gimlet	(*Eucalyptus salubris*).
York Gum	(*Eucalyptus foecunda, var. loxophleba*).
Wandoo	(*Eucalyptus redunca, var. elata*).
Jam	(*Acacia acuminata*).
Brown Mallet	(*Eucalyptus astringens*).
Blue Mallet	(*Eucalyptus Gardneri*).
Merrit	(*Eucalyptus Flocktoniae*).
Sandalwood	(*Santalum spicatum*).

COASTAL PLAIN.

Holly-leaved Banksia	(*Banksia ilicifolia*).
Narrow-leaved Banksia	(*Banksia attenuata*).
Firewood Banksia	(*Banksia Menziesii*).

SAND PLAIN ZONE.

Various small shrubs of several families. All of low stature.