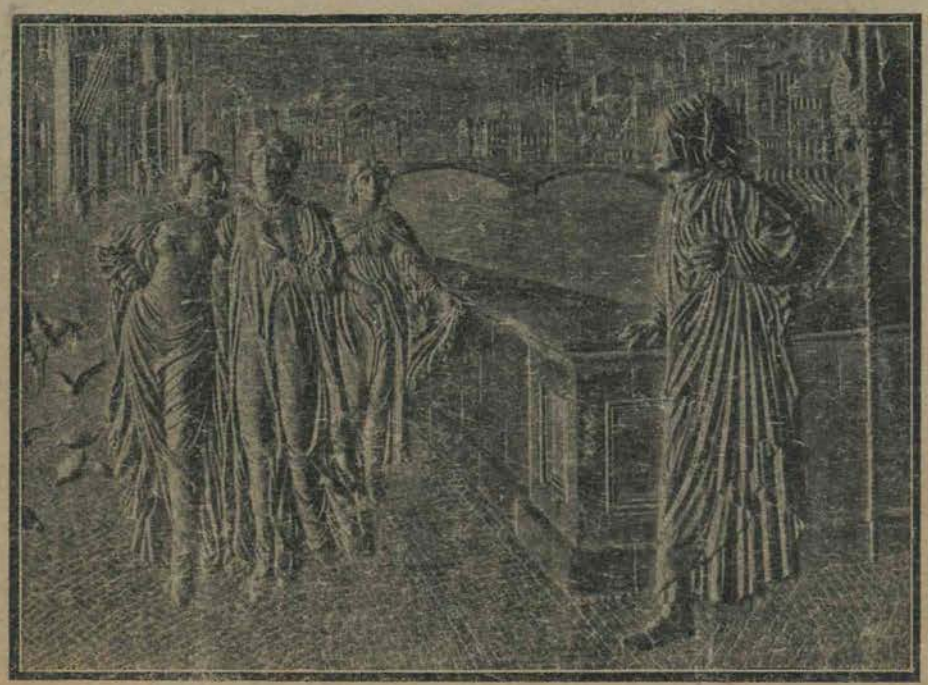
QUARTERLY

JARRAH

THE OFFICIAL JOURNAL of the AUSTRALIAN FOREST LEAGUE

PERTH WESTERN AUSTRALIA

Edited by J. S. Ogilvie, Hon. Secretary of the League



Carving in Jarrah: "Meeting of Dante and Beatrice."
Shown at the Exhibition of Western Australian Forest Products in Sydney.
The Artist is Mr. William Howitt, of Perth.

River Banksia, near the Warren River.

ISSUED QUARTERLY

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Jarrah

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Correspondence and contributions on forestry matters are invited from members of the League and others interested in forestry and cognate subjects. "Jarrah" has no politics. It knows only forests and forestry, but it will gladly welcome the assistance of patriotic politicians in its propaganda. Questions on matters relating to forestry are invited and will be answered, and suggestions for increasing the usefulness of "Jarrah" will be carefully considered. No responsibility is accepted for opinions expressed or conclusions arrived at by contributors or correspondents.

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Forestry and Land Settlement.

THE Governor's speech at the opening of the session of Parliament now in progress and the policy address of the Premier, Mr. James Mitchell, make it quite evident that friends of the forests must be active and watchful. Land settlement, aided by a comprehensive scheme for the construction of new railways, is the main plank in the Government's platform, and there is not wanting evidence that an effort may be made to place soldiers and other settlers on land now covered by merchantable timbers and forming part of the national forest heritage. We admit quite freely that this State is in urgent need of further settlement on its unoccupied areas, and that its future in a very large measure depends upon the success with which increased primary production is promoted. But we are not prepared to agree with the view that such development should be made at the expense of the State's forests, and, in particular, we dissent from the proposition that settlement should be promoted on areas forming part of her forests. Some months ago, before Mr. Mitchell accepted office as Premier, he, through the public press, announced his strong adherence to a policy of railway construction, particularly in regard to South-Western areas. The matter was widely discussed in the press at the time, and it was then pointed out by critics of Mr. Mitchell's proposal that close settlement in the heavily timbered areas of the South-West was attended by disabilities which remove it from the region of practical propositions. There is, first of all, an inordinately heavy expense of clearing, and, again, there stands out prominently the economic fact that to clear at

great expense land which already carries a valuable crop in order to replace that crop by one of less value is not in the best interests of the State.

The forests of Western Australia have been a source of wealth since the very foundation of the colony. They have been recklessly exploited from the start, and they stand in urgent need of conservation in every direction, and regeneration where areas have been denuded or cut over. A further inroad into them under the pretext of land settlement could only be justified if it were proved that all other available agricultural land in the country was fully occupied. There are none, we fancy, in Western Australia, who will assert that such to-day is the case. It would be quite easy to name a number of agricultural or spur railways in this State running through and into good agricultural land which are not paying propositions, for the simple reason that the expected settlement in the neighbourhood has not taken place. Why, then, build new and expensive railways into new districts until the areas opened up by existing railways are filled by settlers? While good agricultural land close to railways is to be had, it would seem that incurring further expenditure for railways is as unnecessary as it is uneconomic. That this view will be taken by Parliament when concrete proposals are put before it is earnestly to be hoped. Any attempt to reduce the forest areas of this State, particularly those covered with jarrah and karri, the timbers upon which an immense and paying export trade rests, would not be in the national interests. Before the Government goes so far as to put details of its proposals before the public, it might be well if those at the head of affairs were to make themselves acquainted with what is being done in the Eastern States. Soldier settlement and land settlement in every one of the States in the East is being pushed on rapidly, but in none is such settlement being effected at the expense of the forests.

The Recent Forestry Exhibition in Sydney.

THE truism that the work of national reconstruction will be most rapid and complete in those nations which use their own resources to the greatest extent possible has of recent days become trite through frequent repetition. A glance round the nations lately engaged in a colossal death struggle reveals unmistakably the fact that the truth of the proposition is assented to with admirable unanimity, but in many instances assent seems to mark the limit of the national effort. The translation of that assent into a living fact vibrating with creative power has not been so generally effected. France, of all the nations lately at war, seems to be the only one that has taken active steps to exploit to the very utmost her own great natural resources—not only to exploit those already existing but by hard work to create others. America, which possibly felt the strain of war less than any of the belligerents, has taken up the work of reconstruction with an enthusiasm worthy of all praise. In the British Empire efforts are spasmodic, and there does not seem to be any general realisation of the basic and intimate connection between speedy reconstruction and steady exploitation of natural wealth. In every State of the Commonwealth pressing domestic problems appear to be claiming the greater share of public attention and to be engaging the energies of the leaders as well as the people to the detriment of reconstructional effort.

To Western Australia belongs the credit of having done something that may rightly be regarded as a move in the direction of helping herself out of her own difficulties by the use of her great heritage of natural wealth. And Western Australia's effort has been pioneered by the Department which controls the great national forests. Our timbers, needless to say, are known locally, although even in their own country full knowledge of their capabilities is restricted to certain quarters only. In the Eastern States the knowledge of Western Australian forest products and what they

can do is remarkably scanty, and the little that is known about them is often sadly overlaid with an almost impervious coating of prejudice. With the object of making better known the value of Western Australian woods, some months ago the then Minister for Forests, Mr. R. T. Robinson, K.C., decided to take the first step in reconstruction work by giving the people of New South Wales an opportunity of seeing our forest products and what could be done with them. The Minister's object was quite single-minded, and his only aim was to do something to keep within the Commonwealth the vast sums of money it annually sends abroad for foreign timbers.

Acting under the Minister's instructions, the Conservator of Forests, Mr. C. E. Lane-Poole, who shares to the full his Minister's views on the question, prepared a representative collection of exhibits, and these were forwarded to Sydney. The collection was made up of many samples contributed by the Forests Department, notably a panelled room containing furniture of artistic design, the whole being of jarrah. The Sawmills Department contributed specimens of karri as applied in building construction and finishing, also karri stave wood made up into casks. The Railway Department sent a notable collection, the chief items of which were the undercarriage and part of the body of a waggon, and a bogie, all of native timbers, and some tramway seats and panelling of beautifully figured banksia. Messrs. Millars' Timber and Trading Co. lent a collection of furniture and panelling whose beauty of design lifted jarrah into the region of timbers fitted for the most artistic cabinet work. The people of Sydney came and saw and admired and wondered. To many who pride themselves upon their knowledge of the capabilities of Australian timbers the panelled room and the furniture came as something of a revelation. There is reason to believe that from a commercial point of view the objects with which the exhibition was undertaken have been amply achieved. We congratulate the Minister upon the happy idea of holding such an exhibition. It was reconstruction work of the best kind; for not only did the effort make better known to the people of New South Wales the high qualities of the timbers of this State, and so tend to create a demand, but it has done something towards achieving the first practical principle of reconstruction—that is, the dependence as far as possible upon ourselves for our own requirements.

Honouring the Fallen.

A Memorial Avenue.

Ceremony at King's Park.

THE ceremony of opening the avenue of oak trees planted in the May Drive, King's Park, in honour of soldier victims of the war was performed recently, and was thus fittingly coincident with the fifth anniversary of the declaration of war. The weather, however, was atrociously unfitting. The proceedings had scarcely commenced when a very heavy downfall of rain occurred. There was no protection for the large congregation of participators, and spectators; the bareheaded choir of children from the Thomas-street school suffered the full force of the storm without possibility of cover, and the Governor (Sir William Ellison-Macartney), who was in the middle of his ceremonial speech when the rain started, had to finish his utterances under an umbrella hastily thrust aloft by the Minister of Mines and Industries (Mr. Scaddan), who happened to be his Excellency's immediate neighbour. This, fortunately, was the only shower by which the function was marred, and the whole of the scheduled programme was carried out. The honour trees —each one a memorial to some fallen soldier and numbering 404 in all—had previously been planted, under the direction of the King's Park Board, and it remained merely for the stakes to be tied to the oaks, though some of the name plates have yet to be erected. The tying process was accomplished, partly by relatives interested in the trees and partly by boy scouts, who represented those relatives who were unable to be present. In view of the bad weather

the attendance was surprisingly large. Guests of honour and the owners of the trees were accommodated on an improvised platform, adorned at each end with flags at half-mast. After the Governor had declared the avenue "well and truly opened," the flags were raised and the Salvation Army band played the recessional hymn and "Land of Hope and Glory," accompanying the choir composed of the Thomas-street boys and girls, the while the boy scouts flourished emblematic flags of no mean size.

The president of the King's Park Board (Mr. Lovekin), who presided over the gathering, said that, although they had only been able to plant 404 trees, the secretary had received applications for hundreds more, and they must supply them in the future as a duty they owed to the men who had served the Empire so well. They must also perpetuate the ceremony, and he would suggest that the children should take part in all future ceremonies, since it was really for the new generation that the soldiers had fought.

His Excellency, in declaring the avenue opened, said he had received a message through the Secretary of State from the Queen, who had presented the oak acorns to the park authorities in the first place. In this the Secretary of State said:—"Her Majesty had been interested to learn, from letters received from Mr. Lovekin, that the May Drive, King's Park, Perth, will be planted on August 4 with trees raised from seeds sent from Windsor Castle, and that the planting will be carried out by relatives and friends of soldiers. The Queen will be glad if you, on this occasion, will convey a message expressing her hope that these oak trees will grow and flourish for many years, and will stand as a reminder to the generations to come of the devotion and loyalty of those brave sons of the Empire who gave their lives in the cause of justice, freedom, and right." He said that this message expressed, in becoming and fitting words, the spirit in which the avenue of honour was conceived, and the purpose which it was intended to commemorate. The ceremony was a fitting conclusion to those manifestations of joy and thankfulness and relief which had taken place in the State on the termination of the struggle for freedom which had raged for 4½ years. It was an expression of the deep and solemn sense of the debt which they owed to those who gave their lives for the country, who now slept the sleep of the brave, seeking rest; for the Empire, without their devotion, would have fallen, and very probably their own country would no longer have been theirs. And it might happen, perchance, that the grandchildren and the great-grandchildren of the present generation would come to this beautiful park, on a pilgrimage to this avenue of honour, imbued with a great pride, to claim kinship with some one or other of the honoured soldiers, and to draw inspiration from the silent monument of the people's tribute, and be moved to a duty equal to those of their forefathers, who had laid down their lives, in her Majesty's words, for freedom, justice, and right.

The Minister for Education (Mr. Colebatch), in proposing a vote of thanks to the Governor for his inspiring address, said they must express their abiding gratitude to those men whose wisdom and foresight had preserved this beautiful park to the people for ever. Those foremost in preserving it were the late Lord Forrest and the late Sir Winthrop Hackett; and it was pleasing to know that, though these men had passed away, there were others, filled with equal enthusiasm, ready to carry on the work. He also desired to express the public appreciation of the action of the chairman of the board (Mr. Lovekin) in making this occasion possible by magnificent personal generosity. This avenue served a greater purpose in keeping green, in the public memory, the deeds of some of the men who formed the splendid Australian Army, which, by its valour, endurance, and resource, had raised Australia into the dignity of a great nation. It would also remind them of the heavy task they would have to perform if they were to prove worthy of these men's immortal sacrifices. The King, in his message, had said they must build up a new world on the ruins of the old, and give a generous recognition to the wants of the people. If they did this they would help to perfect the civilisa-

tion for which these men had shed their blood and the women their tears.

The Minister for Mines and Industries (Mr. Scaddan) seconded the vote of thanks, and in doing so said they felt grateful to his Excellency for attending in spite of the elements. He was pleased that so effective a means had been devised to express the feelings they had towards those who had died on the battlefields to preserve the liberty which they now enjoyed. There were people who had travelled from Albany and Denmark to be present at that gathering, and to plant a tree. He hoped that the people in the metropolitan area would undertake to look after the trees on behalf of those who lived so far away.

The vote of thanks was carried by acclamation, and the function ended with the playing of the National Anthem. Apologies for absence were received from Mr. P. Collier, M.L.A., Mr. W. T. Loton, a member of the board, and Mr. and Mrs. A. Langler.

How Trees Make Pictures.

(By W. C. Thomas.)

"There is no tree like to another tree:
Each has the features that its brother has,
Yet has some beauty that is all its own."
—Malloch.

WHEN you exclaim, "Oh, what a beautiful picture!" have you stopped to analyse its component parts? Perhaps you have, and have set values on the mountains, the river, the lake, the imposing buildings, ancient or modern, and the trees. But have you imagined the view without the trees? Take up the first picture handy, one of an average landscape, with wooded hills, a lake, nicely broken up with tree-decorated islands, and upon one somewhere near the middle distance a ruined castle or keep, with its inevitable mantle of ivy, a golden strand whereon are cattle showing you what "dolce far niente" means. Now ask, which of these parts making up the pretty picture can best be spared and still leave something worth while appreciating? I think you will at length agree that, whilst each part but one could be sacrificed, there is one that could not be—the trees; to remove them would destroy the charm of the landscape. Trees are to a picture what the stave is to music —the framework upon which it hangs.

You get away sometimes into the bush, and it is the trees you mostly go to see and listen to, for they have an entrancing language of their own, and each an individuality transcending even the voices of the streams and brooks that lave their feet. If you are there at dawn you will truly appreciate—

"the sound of the waking forest,"

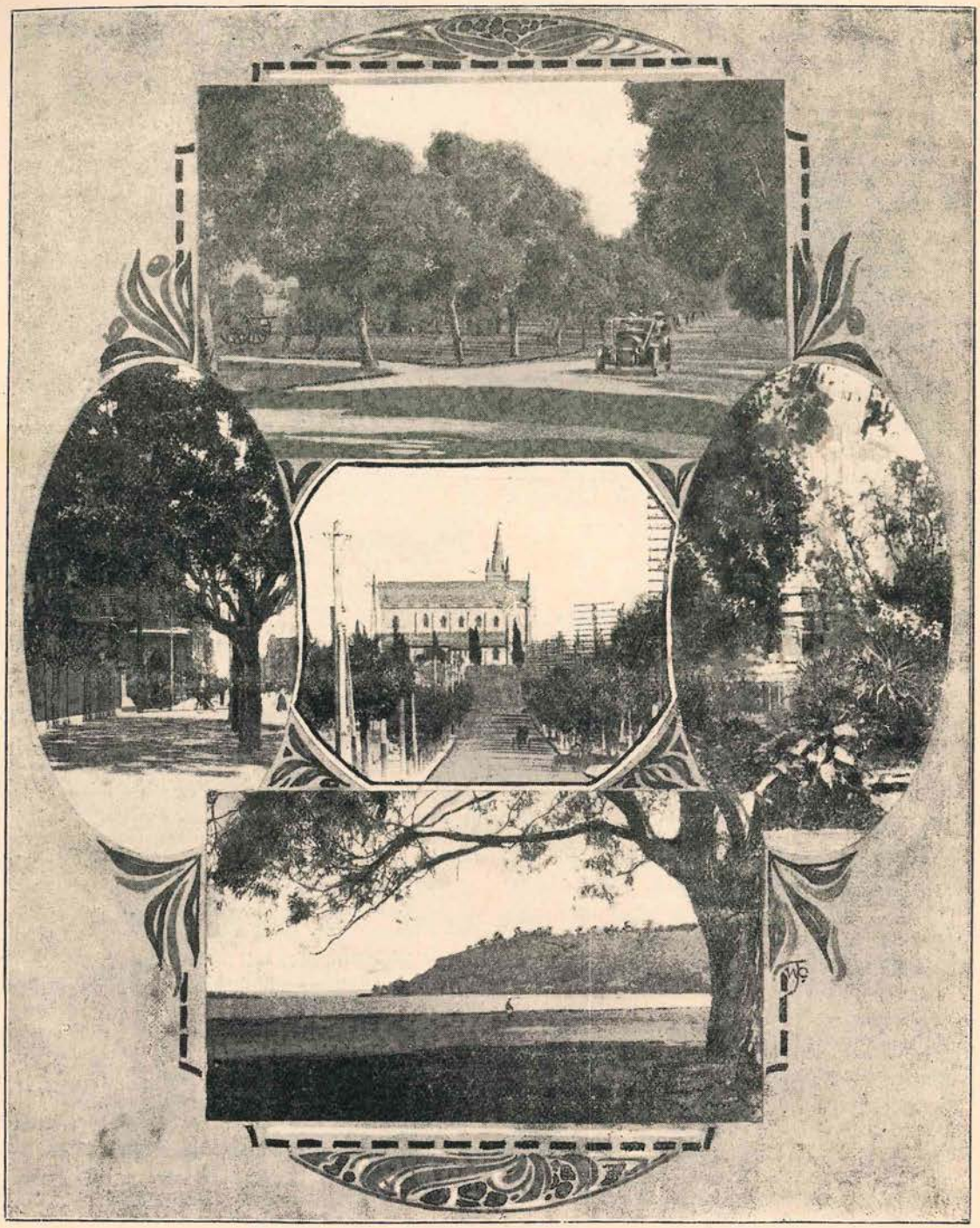
because then you hear the trees and the dawn breezes in happy conversation. You come after a stiff climb up a broken road to a spot that overlooks a valley. You let your feelings of pleasure find expression in whispered praise of what lies before you—

"The woods lie solemn in the noonday glow,—

the woods, the trees, the serried ranks of bushland denizens with their crowns of green, trooping down the hill-sides to the river that glints up towards you like countless heliographs.

You go to the goldfields, and you miss something as you look out from the train across wide wastes of mulga land—something that you perhaps never consciously missed before—trees. Their absence makes you note it with disappointment. There is no "melody of leaves astir," only a wretched little scrubby growth, brown and sere and sad, and the brazen sky seems to hold out no hope of things ever being any more cheerful and appealing. You would not care to spend a vacation in mulga land, but how happy you would be along the shaded banks of the Swan, the Helena, the Blackwood, and the Murray! Why?—because these shaded banks are the gifts of healthy, luxuriously-foliaged trees, and it is there you would gladly pitch your camp, and by holidaying there pay your silent tribute to the trees.

Think how dreary, monotonous, and unattractive many of the streets and highways of our cities and suburbs would be without their trees, and how close to beau-



"How Trees Make Pictures."

tiful pictures many of them are since the cult for such ornamentation became popular! The illustrations will serve to give point to my theme. These are taken at random from a miscellaneous collection, but they are typical. The first view is of the drive in King's Park, showing the flowering gums—that string of gems on the brow of the most beautiful park in Australia; the left-hand oval depicts the grateful shade of the lilacs in the Terrace; the right-hand oval gives a glimpse of the Law Courts through a wealth of trees; the lower view shows Mt. Eliza framed by an old gum on Mount's Bay-road—remove the tree, and the picture would at once lose its charm; the centre view is of the Cathedral of the Immaculate Conception viewed along Lord-street, where there is a fine avenue of trees.

It is a fine movement, this ornamentation of our public streets. The councillor who raises a protesting voice against money spent in this manner is fortunately rare. The thing to lament is the narrowness of some of our streets, which precludes adornment with trees, and nothing is more deplorable than the absence of trees from Perth's principal thoroughfares, particularly Hay-street. Given another half-chain width and well-grown trees along its whole length, what an imposing, appealing picture would it not make viewed from the hill by Havelock-street!

You people from Adelaide and Melbourne are never tired of singing the praises of their Park Lands and tree-girt roads, and their glorious botanic gardens. It is trees, again, that lie at the base of your gratitude. Other of you talk with pride of the pleasant arbors and cool corners of your own gardens, and all the charms that sway you are attributable to trees you have planted and carefully trained and nurtured until they grew shapely and threw umbrageous shade.

The city beautiful must of necessity be akin to a garden, and there can be no garden without trees, no picture of natural contour that will make a lasting and abiding impression upon the people destined to dwell therein, so when the spirit of the times has folded us all in its mantle, and we move as one to a common end—the beautification of life—we shall see the dull-faced building brightened with dancing foliage—

> "Where every passing breeze may play,
> And catch the leafy minstrelsy,"

and the air of Spring will be softened and sweetened with radiant fragrant blossom; where the dour and repellent slum now makes its appeal for removal we shall see green plots with borders of fine trees throwing grateful shadows upon neat cottages, fit homes for men and women, and fit nurseries for their children.

Timber More Valuable Than Gold

"Since it is certain and demonstrable that all arts and artisans whatsoever must fail and cease if there were no timber and wood in a nation (for he that shall take his pen and begin to set down what art, mystery, or trade, belonging any way to human life, could be maintain'd and exercis'd without wood, will quickly find that I speak no paradox), I say when this shall be well-consider'd, it will appear that we had better be without gold than without timber."—*Extract form Evelyn's "Sylva,"* 1664.

Mr. D. E. Hutchins and "Jarrah."

In a letter received recently by "Jarrah" from Mr. D. E. Hutchins there occurs the following paragraph:—"May I add my congratulations on the excellence of 'Jarrah?' I hope it will have a long and prosperous career! So far, it seems easily the best of the Australian forestry periodicals." Needless to say, "Jarrah" is much cheered and gratified by these appreciative words. There is no one in the forestry world with a higher reputation that Mr. D. E. Hutchins, and his "Discussion of Australian Forestry," published a couple of years ago, ushered in the New Year in the history of forestry in Australia.

Electric Trolley Cables.

A New and Special Use for Jarrah.

THAT Western Australia in due time will follow the lead already given by America, Great Britain, and certain of the Eastern States in the transformation of the railway motive power from steam to electricity can scarcely be denied. The advantages of the latter form of power are too obvious to call for recapitulation. If British experiences can be taken as a guide, this State has in its principal commercial timber a substance of unique value in electrical railway work. Jarrah has been used almost exclusively on English electric railways in connection with trolley-cables, but it has remained for recent experiments to demonstrate the fact that no other material except jarrah seems to be entirely satisfactory. Some time ago it was determined to fit up a section of the Lancashire and Yorkshire railway with all-metal cars and all-metal appliances of every description. Had the idea been carried to successful accomplishment, jarrah would, of course, have found no place in that all-metal section, but it would seem that the engineer in charge has not been able to carry his all-metal intention out with that completeness which he had hoped for.

Mr. George Hughes, M.Inst.C.E., in a report upon the matter, writes as follows: "Trolley-cable: Naturally the designer was extremely anxious that it should be an 'all-metal' car in every sense of the term, therefore the question of housing the trolley-cable gave rise to considerable investigation, and every endeavour was made to find a substitute for jarrah timber, which had been used for some years quite successfully on the Liverpool - Southport 600-volt section of the Lancashire and Yorkshire railway. Exhaustive tests had been made in 1909 upon prepared samples of kauri-wood, jarrah, oak (untreated, as well as treated with alum and copper sulphate), iron pipes, fireproof cables, concrete, Canadian redwood, uralite-asbestion, and wych elm, with a view of approximating to working conditions and breaking down the material experimented upon with current up to 1000 amperes at 600 volts, the object being to ascertain, the arc once started, which design and which material resisted and damped the arc in the most successful way, and with the least damage to the surrounding structure. It was found that jarrah fulfilled all the conditions most successfully; nevertheless, when the all-metal car was being designed, further considerable investigations were undertaken to find a substitute for jarrah, but without success; therefore jarrah was used. It is an additional insulation, it will not burn with a flame, and it smothers an arc when formed."

Writing on the same subject, Mr. Francis E. Gobey, O.B.E., Assoc. M.Inst. C.E., adds his testimony to what Mr. Hughes has said. Mr. Gobey reports that—"Some experiments which had for their object to find the most suitable material for cable troughing for electric railway cars, with an arc of 1000 amperes from a 600-volt third rail, resulted in jarrah being proved practically non-inflammable, and it has been very successfully adopted for cable troughing." It would seem from the result of these English experiments that the future holds big and unique opportunities for jarrah in electrical railway engineering.

The Profits of Pine Planting

Thirty years ago the authorities at the Tokai Government Plantation, Cape Colony, planted 125 acres with pines. It is now announced that the standing timber on that area was sold for £60,000, or at the rate of £480 per acre. Excluding the cost of formation and interest charges thereon, this result works out at £16 per acre per annum. Taking interest charges into consideration, and assuming that the rate of interest paid was not more than 5 per cent., the return per acre would be something like £14 per annum. Is there any other crop which year in year out yields the farmer a return such as this?

Forestry and Repatriation.

(By Kingsley Fairbridge, Diploma of Forestry, Oxford University.)

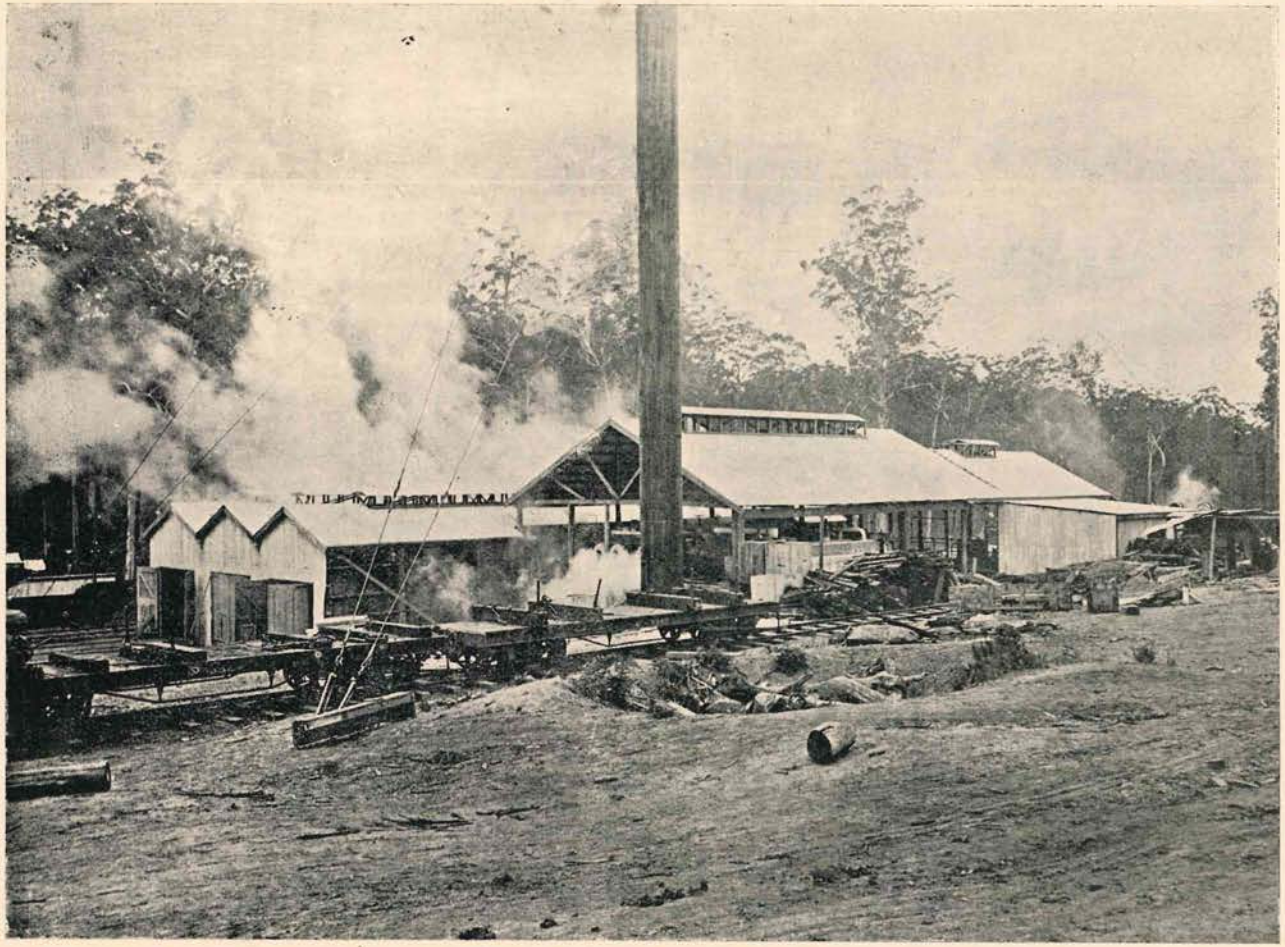
AS our soldiers return in increasing numbers it is inevitable that someone will propose "forestry" as a suitable employment. The suggestion will probably be adopted by the authorities, and rightly so, for by multiplying the avenues of employment open to our men the latter will more readily regain the goal of stable economic citizenship. But—and this "but" is a big one—great care must be exercised upon the manner of employing returned soldiers, or the work will be profitless.

From the termination of the Boer war to about 1908 there occurred a period of considerable unemployment in Great Britain, and a Royal Commission was appointed to enquire into causes and suggest remedies. By an unhappy coincidence some of the Commissioners held theories upon the subject of forestry, and formulated a detailed scheme for the utilisation of unemployed labour upon afforestation. Upon even cursory examination this scheme presented to professional foresters such disastrous financial weaknesses that it took no more than a breath of criticism to tumble the whole card-castle to the dust. The most unfortunate feature of the whole affair was that the work of a previous Commission of Afforestation became sympathetically engulfed in the vortex of derision that drowned the proposals of the Unemployment Commission, and the very fair chance which had previously existed of establishing systematic State forestry in Great Britain was lost.

The moral of this is that excellent, well-meaning people must not be allowed to formulate proposals for employing numbers of men upon a specialised occupation with the full necessities of which they are not acquainted. In other words, that if returned soldiers are to be offered employment in State forests the offer must come from the State forest officers, who know what they and the forests want, and not from ingenious politicians or an enthusiastic public.

From time to time European countries during periods of shortage of employment have tried to make forestry a form of "relief work," but generally with very dubious results; and I cannot see any reason why such a course would be any more successful in Western Australia. Temporary labour under permanent overseers is, however, largely used, and is drawn almost entirely (and most successfully) from the numbers of small farmers living in the neighbourhood of the forest areas. During the slack season on the farms, the European winter, numbers of small farmers find profitable and healthy employment in the State forests, where they engage under the supervision of the permanent under-officers in the operations of cleaning, thinning, felling, stacking, and even planting-up—though the latter is more often undertaken by the wives and daughters rather later in the season. These small farmers, being landholders themselves and neighbours of the forest, are careful and trustworthy, and very different from casual labour imported from the towns. I see no reason why returned soldiers, settled in the neighborhood of State forests and engaged upon developing their own holdings, should not find profitable occupation and a welcome addition to their incomes during stated seasons of the year by accepting temporary employment under the Forestry Department at constructing fire-belts, destroying over-mature trees, thinning, and regulating the new growth generally.

Already many small farmers in our State augment their incomes by doing outside work for Roads Boards, timber mills, or their neighbours; and an extension of this expedient to State forests, when once the work was properly supervised and understood, would be mutually beneficial. A scheme might even be put together whereby the fringe of the forests, and the pockets of richer land within them, might be set aside for agricultural settlement by soldiers, with the understanding that sylvicultural work would be offered them at certain seasons of the year. One cannot close one's eyes, however, to the probability that the whole success of this co-operation would depend upon the goodwill of the new settlers and their willingness to



The Powellising Plant at No. 2 State Sawmill at Pemberton.

preserve the forests; without the will to help, the contiguity of the forest's new neighbours might prove to be parasitic rather than symbiotic.

Whatever active course is adopted with regard to forestry and repatriation it should, I think, be the supreme aim of all those who are most sincere in their desire to assist our returned soldiers to give the officers of the Forestry Department a free hand in determining how many men the forests can absorb, and how best they can absorb them. Otherwise their efforts will be doomed to disappointment, friction, and financial failure. With soundly constructed working plans intelligently followed, and with a thorough and adaptable system of inspection by competent officers, permanent employment may be found for some of our returned soldiers; and, as I have previously suggested, permanent seasonal employment may be found for many more. And with the goodwill of the employees the Forestry Department may find in the present occasion the basis ultimately of a fully staffed service.

The Seasoning of Timber.

(Continued.)

(A/Professor Alfred Tomlinson, M.Sc., Assoc. M.Inst.C.E., M.C.I.)

Types of Kilns.

PRESENT practice in kiln-drying, in the various parts of the world, varies enormously. Even with the same species of timber and for the same purpose all kinds of conditions are met with. Temperatures vary anywhere from 70 deg. to over 220 deg. F.; and 1-inch timber requiring from 2 to 30 months' yard seasoning, is kiln dried in from two days to six weeks. Usually hardwoods are dried at a much lower temperature than softwoods.

In America hardwoods are now kiln dried, and recently, for war purposes, the whole of the timber used in the construction of aeroplanes was kiln dried.

The dry kiln, however, has been one of the most troublesome factors arising from the development of the timber industry. For, unfortunately, until recently proper methods of seasoning have received little scientific attention. Forms of kilns and mode of operation have, in the past, commonly been merely copied by one woodworking firm after the example of some other older establishment. Thus, to put it mildly, present practices have many shortcomings, and methods of drying "difficult to season timbers," such as hardwoods, have often been on wrong lines.

Humidity, or dampness, is of great importance, for the rate of drying and prevention of case-hardening and checking are largely dependent thereon. As before stated, particularly with hardwoods, it is essential that the surface of the wood should dry less rapidly, otherwise case-hardening and then disaster will result.

Circulation is necessary, of course, for drying to take place at all. Probably this factor has been the cause of most of the kiln-drying failures. The evaporation of moisture from the wood requires heat, and this must be supplied by the circulating air. Moreover, the moisture-laden air must be constantly removed, and fresh, drier air substituted. The wood must dry evenly on the surfaces, otherwise the shrinkage is uneven and warping and splitting will be the result. It is thus necessary for the movement to be uniform, and, moreover, the circulating air must without much baffling resistance come in contact with every portion of the timber to be dried. For if the air stagnates when in contact with the timber the temperature will drop and the humidity rise to a condition of saturation, so that drying cannot take place, and the timber will tend to mould and rot. The proportioning of the kiln and method of piling the timber to be dried are evidently of extreme importance.

The *temperature* depends upon the species and condition of the timber. Obviously it is advantageous to have as high a tem-

perature as possible, both for economy of operation and speed of drying, but the physical properties of the timber will govern this. Many species, including jarrah, cannot be dried satisfactorily at high temperatures on account of their peculiar behaviour.

Kilns for drying timber may be divided into two classes, viz., (i.) *Progressive* and (ii.) *Compartment.*

For convenience in handling the timber to be dried is usually in trucks on rails. In a progressive kiln the conditions at one end differ from those at the other, and the timber is dried progressively by being moved throughout the whole kiln. The air circulation is longitudinal, so that the conditions during drying vary, more or less uniformly, from one end of the kiln to the other.

In compartment kilns the conditions are changed during the drying process, and the timber remains stationary and is all dried at one time. The air circulation is transverse, so that the conditions, at any time, during drying are uniform throughout the whole kiln.

The methods of operation generally used may be placed under the headings:—

(a) Non-condensing.
(b) Superheated steam.
(c) Condensing.

In (a), the humidity or dampness is controlled by the use of escaping steam and evaporated moisture. The circulation may be either natural or forced, and the moist air is allowed to escape from the kiln. Softwoods and "comparatively easy to season" woods, such as pine, ash, and cedar, are usually dried by this natural ventilation method, the kiln being of the progressive, (i) class. These kilns, however, are only very roughly under control and may be regarded as not being positive enough for hardwoods, especially if they are "difficult to season."

In (b), superheated steam is passed over the timber either by natural or forced draft in compartment, (ii) class. Obviously the method may be used only where the species to be dried are not injured by high temperatures, and where quick drying is essential. Many of the softwoods such as pine and ash are successfully dried by this process, but the hardwoods, especially the hard dense, such as oak and walnut, are materially injured.

In (c) the humidity is controlled by re-circulating the air, which has taken up moisture from the timber, across water pipes or through water sprays. The temperature of the pipes or sprays governs the amount of water that condenses from the air, and thus regulates the humidity of the air when re-heated before being passed over the timber again. The circulation of air may be either natural or forced. These kilns of the compartment, (i) class, are under proper control, and for this reason it is believed that all kinds of wood, soft and hard, including the Eucalypts, may be successfully dried by this condensing method.

It appears, then, that the kiln for drying " the difficult to dry" Eucalypt hardwoods should be the condensing compartment type. Experimental kilns of this type, using the Tieman water spray principle, were designed and erected at Millars' Nash-street Yard and at the Department of Engineering, University, Crawley, the kiln at the latter being of commercial full size cross section. The results of investigations on local hardwood have fully justified the original belief, namely, that the condensing compartment method was the solution to the seasoning difficulty.

The kiln at Crawley, as stated before, is of the condensing compartment type with natural and partly forced circulation. The main feature is the humidity control by means of water sprays introduced by H. D. Tieman, of the U.S. Forestry Service.

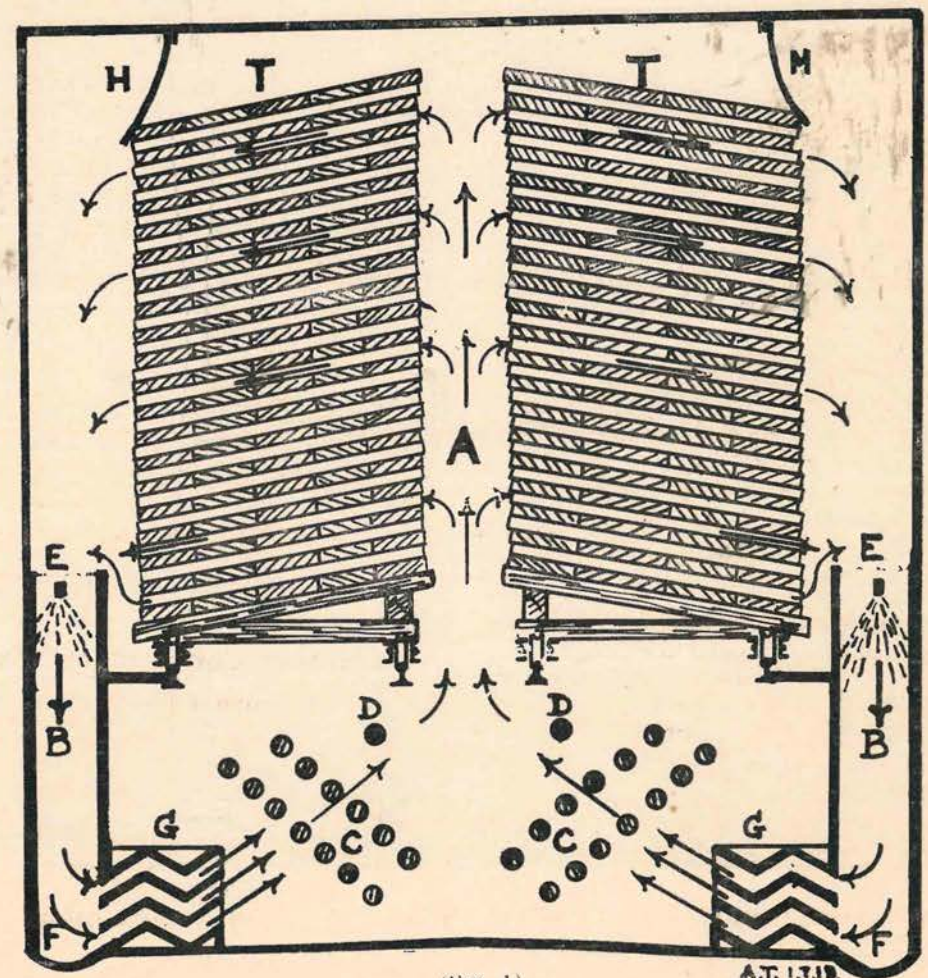
Condensing Compartment Kiln.

(Tieman Principle.)

Briefly, the kiln (see figure 1) consists of a drying chamber A, containing two lines of trucks T carrying the timber to be dried, with a partition on either side, running the whole length of kiln, making two narrow side chambers B, open top and bottom. The steam heating pipes C and pipes D for admitting live steam are placed underneath the material to be dried. At the

top of the side chambers B are water sprays E, at the bottom are gutters F and eliminators or sets of baffle plates G to separate the fine mist from the air. Curtains H are hung from the roof to the edges of the piles as shown to prevent the air from passing over the piles and thus short-circuiting them.

The circulation of the air is shown by the arrows. Thus the heated air rises in the flue between the two piles of timber. As it comes in contact with the piles, parts of it are cooled and forced to pass outwardly through the piles to the spray chambers. The movement through the pile is naturally diagonally downwards, and the inclined piling of the timber ensures that this course is not unduly resisted, otherwise poor circulation is apt to result. In the spray chamber the velocity of the descending column of air is greatly augmented by the sprays. It then passes out through the baffle plates, is heated by the radiators, and commences on its upward course again. Besides inducing an increased circulation, the spray may be said to regulate the humidity. In the side chambers the sprayed air in descending absorbs as much water as it can hold in the form of water vapour. It also becomes misty, for it mixes with small particles of free water. In the zig-zag baffles these particles of water are eliminated, and merely saturated air emerges into the main chamber. This air, which cannot take up or absorb any more moisture, at the particular baffle

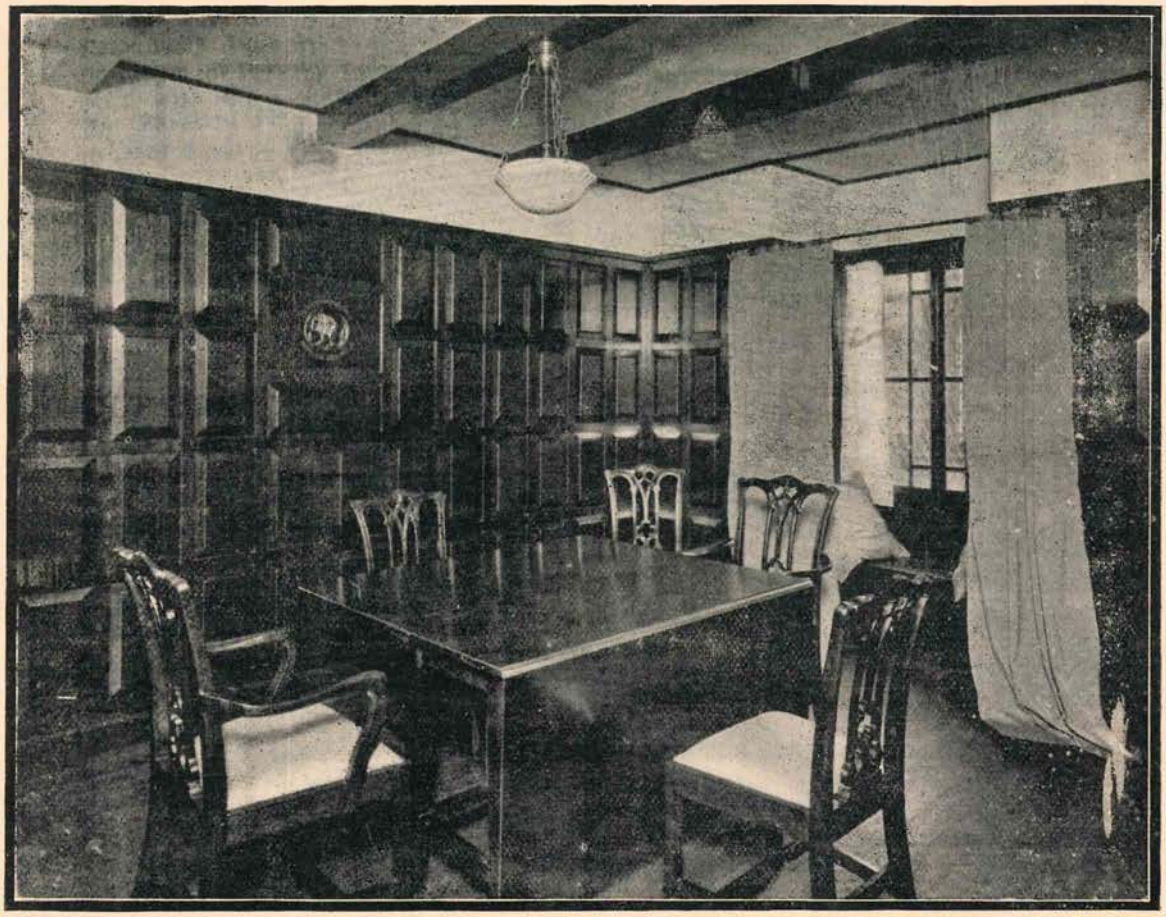


(Fig. 1)

temperature and pressure, is said to have a relative humidity of 100 pct. As is well known, if this temperature is lowered the air will give up some of its water vapour and deposit it in the form of dew, the humidity still remaining 100 pct. If, however, the temperature is raised the relative humidity will decrease, will be less than 100 pct. For the air will not then contain the maximum amount it can hold, since the total amount of water in a given volume of air remains constant, and raising the temperature increases this volume. Evidently the cycle of operations is as follows:—

At the bottom of main chamber the air, at baffle temperature and 100 pct. humidity, in passing over the heaters increases in temperature and decreases in per cent. humidity. When moving through the timber pile it is gradually cooled through absorbing moisture, and thus continually decreases in temperature and increases in per cent. humidity until, after passing through the spray chambers, it emerges from the baffles into the bottom of the main chamber again with the same baffle temperature and 100 pct. humidity as before.

(To be Continued.)



Panelled Room of Jarrah, with Jarrah Furniture, shown at the Western Australian Exhibition of Forest Products in Sydney.

An Industrial Anomaly.

Importation of Wattle Bark.

"JARRAH" has on several occasions drawn attention to the unfortunate position in which the Australian wattle bark industry stands, and has pointed out how and why South Africa has secured a practical monopoly of the wattle as a tanning agent. The following article from the Melbourne "Age" fully supports all that has appeared in "Jarrah":—

For reasons that are quite obvious, Australia should be a very large supplier of the world's requirements in leather. Nature in fitting Australia for a great pastoral country has been singularly generous in also providing her with a rapidly maturing tree, whose bark contains in abundance the tannic acid used in making hides merchantable. Instead of using these unique advantages to supply our own leather market and build up a great surplus for export, we have not only shipped hides overseas, but sent away also the wattle bark, and imported the resultant leather commodities. To complete the comedy, or the farce, much of the comparatively small quantity of leather produced here has been tanned with the bark of Australian wattle trees propagated in South Africa. The accompanying table gives the monetary value of these importations for the past six years. The statistical term, it will be noted, was changed four years ago from the calendar to the financial year.

WATTLE BARK IMPORTATIONS.

Year.	To Victoria.	To Australia.
1912	£24,475	£50,920
1913	10,977	27,243
1914-15	18,371	24,924
1915-16	25,996	47,176
1916-17	28,547	45,575
1917-18	15,392	19,615

In December, 1914, a duty of 1/6 per ton was imposed on wattle bark, but importations, instead of decreasing, mounted up until the last financial year when shipping was very scarce. The propagation of the wattle is taken much more seriously in the country from which we have been drawing these shipments than it is taken here. The Department of Agriculture of the Union of South Africa has published this year a bulletin on the work at the field station for the study of wattle insects at New Hanover, Natal. The report states that the cultivation of the black wattle for the sake of its bark in South Africa is of comparatively recent origin, and goes on to say:—'While the first cultivation and shipment of bark were due to tentative individual effort, we now find several companies planting extensive areas. . . . The train now steams through miles upon miles of wattle plantations, and as far as the eye can reach the slopes of the hills are covered with the dark green foliage of this evergreen wattle."

The golden and the black wattle are the principal varieties of acacia from which bark is stripped for the tanneries in Australia. The main producing districts have been the area between Heywood and the South Australian border, Seymour, Avenel, Buchan, and the country near the Lakes Entrance, in Gippsland. A good rainfall is necessary. The golden wattle is found near the sea from the mouth of the Glenelg River to Queenscliff. It is somewhat richer in tannage than the black wattle, and thrives on the poor coastal sand or sandy loam when it is sheltered. The black wattle flourishes further inland in ironstone pebble formation, granite drift, or the poorest sandy soils, with a clay subsoil, to retain the moisture.

Shortage of bark. Mr. H. R. Mackay, Victorian Conservator of Forests, attributes largely to the fact that open undulating lands in the Seymour, Heathcote, Casterton, and central Gippsland districts, which formerly supplied large quantities of bark, have been converted into sheep holdings, and no care has been taken to fence off subdivisions to protect the young trees.

The cost of growing wattles in Natal is stated to be 8/ to 30/ per acre. In Victoria, owing to the need of wire fencing in most districts, the cost would nearer £2 to £2/5/ per acre, including enclosures and cultivation. While stripping in Natal costs 6/ to 8/ per ton, the cost in Victoria and

South Australia ranges from £2 to £2 15/ per ton; but even allowing for the high costs of production and marketing, in South-eastern Australia there are large areas of land which might be utilised for the growth of tan wattle, especially where family labour is available. Victorian bark in bundles now realises approximately £10 5/ per ton in Melbourne.

The Victorian Forests Department has upwards of 21,000 acres of black wattle of natural growth in the Grampians State Forest. At You Yangs 1900 acres have been planted with golden wattle. At Mount Beechworth and Mount Cole smaller plantations have been established, some 250 acres in all being under wattle. At Kentbruck, in the Western District, over 1500 acres were planted with golden wattle some years ago. This plantation was damaged by fire in 1912, but has since partially recovered from the devastation. Latterly, 400 acres have been sown at Lake Lonsdale. Additional areas have been sown at the rate of 500 to 600 acres annually, but it is intended to greatly increase the acreage after the new Forests Act comes into operation next month.

Exportation of Victorian bark reached its maximum many years ago, the greatest quantity shipped in one year being 9724 tons. The destination was Great Britain, but exports have since dwindled to about 1500 tons, and the buyers are mostly in other Australian States. In 1915 the Inter-State Commission suggested that a bonus of £1 per ton might be paid in order to foster the cultivation of wattles, and Mr. Mackay is of opinion that such a bonus, if paid for at least three years, would be effective. Tanners urge that no time should be lost in cultivating wattles on Crown and other lands suitable for the purpose, and consider that the industry should take an important place in the repatriation of soldiers.

The steeplejack is one fellow whose business isn't falling off.

Prof. Compton told the Wholesale Sash and Door Association that the test of any theory is: Does it work? That is also a pretty good test of a man.

Forestry in Great Britain.

THE final report recently issued of the Forestry Sub-Committee of the Reconstruction Committee of the Ministry of Reconstruction is one of the most important official documents that has seen the light during the war period. The disastrous effect of permitting the denudation of the forests of the country came into particularly striking light early in the war, and it was recognised that effective measures should be taken to reforest such areas as were suitable for the growing of timbers. The following is a summary of the main conclusions of the Committee, which included such eminent foresters as Lieut.-Colonel F. D. W. Drummond, Lord Lovat, Professor Sir W. Schlich, and Sir John Stirling Maxwell:—

1. The total area under woodland in the United Kingdom before the war was estimated at 3,000,000 acres, the average yield from which is believed to have been 45,000,000 cubic feet, or about one-third of what it should have been under correct sylvicultural management. The figures indicate the unsatisfactory condition under which the British and Irish woods are at present managed, and prove the urgency of remedial measures.

2. During the five years preceding the war the average annual imports of timber similar in character to that produced in the British Isles were equivalent to 550,000,000 cubic feet of standing timber. The whole production was, therefore, less than 8 per cent. of the consumption.

3. The area of land utilised for rough grazing, but capable of producing first-class coniferous timber of the same character as that imported, is not less than 3,000,000, and probably more than 5,000,000 acres. 2,000,000 acres would be devoted to timber production without decreasing the whole production of meat.

4. Dependence on imported timber has proved a serious handicap in the conduct of the war. The United Kingdom cannot run the risk of future war

without safeguarding its supplies of timber, as every other power that counts has already done.

5. In order to render the United Kingdom independent of imported timber for three years in an emergency, it is necessary, while making due allowance for an improved yield from existing woods, to afforest 1,770,000 acres; taking 80 years as the average of rotation, we advise that two-fifths of the whole should be planted in the first forty years.

6. It is not proposed to plant arable land, but a limited area of arable land should be acquired with the forest sites wherever possible in order to provide small holdings for forest workers.

7. Forestry demands long views but the first fruits are not so long delayed as many imagine. The policy of State Afforestation which we recommend will begin to produce pit wood from the quick-growing species of the better kinds of mountain land from the fifteenth year onwards. By the fortieth year the plantation in the first ten years alone will contain sufficient timber to to keep our pits supplied in an emergency for two years, on the scale of present consumption.

8. The first essential is a Forest Authority, equipped with funds and powers to conserve, purchase, lease, and plant land, and generally to administer the areas acquired with compulsory powers to be exercised when needed.

9. We recommend that the Authority should be authorised to make limited grants for every acre replanted on annual afforestation during the first ten years after the war by public bodies or private individuals.

10. We estimate the cost of the first ten years at £3,425,000. It may be necessary to invest altogether £15,000,000 in this enterprise during the next forty years.

11. The above proposals are formed in the interests of national safety, which requires that more timber should be grown in the British Isles.

There remains a further question: The United Kingdom derives more than half its imported timber from virgin forests in foreign countries, which are steadily being depleted. Canada contains the only large reserves within the Empire. Unless arrangements can be made with the Dominion Government for the effective conservation of these reserves, it is inevitable that provision should be made within the British Isles on a far larger scale than is here proposed.

A Disastrous "Line" Storm in Forest Country.

IN June of last year in Wilga, in the Wellington district, in the South-West portion of Western Australia, a storm of the kind known as a "line" storm by meteorologists was experienced. Mr. Surveyor Terry, who made a plan of the track of the storm, writes as follows:—

> "This blow appears (from information gathered) to have started somewhere near Lowden, and I found evidences between there and Noggerup and to the south-east of the latter place. These were scattered limbs of trees and occasional trees blown down.
>
> "The course was somewhat erratic, but generally from the north-west, and the forces apparently concentrated into full strength at Little Camelup Swamp (Wellington Location 1960), leaving a lane of fallen timber and scattered limbs along the course shown."

The following graphic account of the visitation has courteously been furnished to "Jarrah" by Mrs. Shepherdson, the wife of the manager of the Adelaide Timber Company's sawmill at Wilga:—

> "The district of Wilga was the scene on June 1st last of a tornado, which, travelling in a southerly direction, most fortunately only skirted the Adelaide Timber Co.'s mill.
>
> "The noise of its approach was terrifying to some who, away from the noise of the machinery, could plainly hear the roaring of the wind.
>
> "Those in the mill had their attention drawn to what appeared to be myriads of small birds in wild flight. This

No. 1 State Sawmill at Manjimup.—Note the big Redgums in the foreground.

proved to be leaves and pieces of bark; then, as portion of the roofing flew and pieces of light timber and small branches of trees from close by joined in an aerial frolic, it became apparent that something was astir.

"The men made for cover, and one rushing out was knocked down and stunned and had to be carried in out of the storm. Fences went over, tree-tops flew in all directions, a shed which sheltered a sulky by some means fell, walls first, roof on top of the walls, and sulky upside down on top of all.

"But this was evidently the work of an outrider of the storm, for out in the forest the trail of wreckage is appalling, and had it rushed in its fury right in line of the mill village the consequences would have been most disastrous. As it was, although it tore past about 300 yards out, and covering a space of from three to five hundred yards wide, uprooting hundreds of large trees, beheading and completely stripping the bark from others, in places twisting the tops from the trunks, and leaving these hanging by a rope of twisted bark and wood, yet no loss of life to man or beast occurred. And the railway gang, also the mill-haulers and teams, were out. In both cases most fortunately they had the happy position of spectators, and viewed the rush of the storm fiend from a safe distance.

"Horsemen went out immediately to ascertain how the folk in the bush had fared, finding all safe, but concerned for the safety of the folk in the home places.

"One striking feature of the storm is that, from both sides, all trees have fallen inwards, while inside the zone of wreckage they have fallen in all directions.

"In places the grass and low scrub is battered flat to the ground; then will come a group of tree 'stalks,' mere sticks of timber left without foliage, top, or even bark; and so on for miles.

"The track from the mill to Mr. Afflack's homestead was completely obstructed, from where it crosses the railway, up to the fence, a distance of about four hundred yards.

"The account of Mr. Afflack's small son (who ran home from the mill through the storm) that, 'One big tree fell in front of me, and while I was climbing over that another fell behind me and the boughs hit my feet,' can be fully credited when the scene is viewed. Scarcely any damage was done to the homesteads or to the mill, though in many cases the storm, in its twisty trail, went very close to some homes. In Mr. Afflack's the only damage done was the breakage of a small quantity of crockery. And one poor old kangaroo with a broken leg and a bullock with a dislocated hip appeared to have been the only actual sufferers.

"The tornado was of great interest locally, and its track is The Sight to be shown to all visitors.

"It may be that, in the years to come, Baron Munchausen's trees, which flew upwards for a distance of five miles, and then came down and sedately replanted themselves, will have cause to tremble for their laurels."

Avenues of Honour.

"Jarrah" notes with satisfaction that Adelaide has moved in the matter. At a meeting of the Soldiers and Sailors' Fathers' Association, held in the first week of February in Adelaide, it was announced that Mr. Sydney Kidman had given £500 towards a fund for planting the road from Adelaide to Glenelg for a distance of five miles with an honour avenue of trees in memory of South Australian soldiers. The scheme inaugurated by the Board managing the King's Park in Perth refers only to trees planted along a portion of the drives in that Park; so far as can be learned no active steps have yet been taken to plant honour avenues in any part of the metropolitan area. This is much to be regretted, for nothing can better preserve the memory of fallen heroes than avenues of great trees. Does Perth hold no citizen with a desire to spend an amount in such a worthy cause as is proposed by Mr. Sydney Kidman?

Some Interesting Timber Tests.

During the time that the Exhibition of Western Australian Forest Products was being held in Sydney, Professor Warren, of the Engineering School at the Sydney University, made a series of tests of Australian timbers, in the testing room of the Engineering School. The subjoined table gives particulars of these tests. The value of these experiments lies in the fact that they bring home to timber-users in Sydney the fact that jarrah is one of the strongest and toughest timbers on the continent. In many quarters in Sydney where one would have expected more exact knowledge, jarrah was believed to be a brittle wood and unreliable in building construction. The result of Professor Warren's investigations fully confirms results of tests made in Western Australia, and should go a long way to dispel erroneous ideas existing in New South Wales as to the high quality of our principal commercial timber:—

TRANSVERSE TEST OF TIMBER.

FOR FORESTRY COMMISSION. N.S.W.

Mark.	Description.	Length, feet.	Depth, in.	Breadth, in.	Weight, lbs. per cub. ft. as tested.	Breaking load in tons.	Modulus of Rupture, lbs./in.	Hor. Shear in lbs. per sq. in. (ultimate).	Modulus of Elasticity from Deflection. lbs. per sq. in.	Modulus of Elasticity from Extension. lbs. per sq. in.	Remarks.
1	Jarrah Beam (E. Marginata)	11.0	10.3	10.3	58.8	33.69	10360	533	2.016 x 10.6	1.206 x 10.6	Sound specimen, failed by tension at the centre.
	Rate of loading .00067in. per in. per minute at extreme fibre.										
2	Grey Ironbark (E. Paniculata)	11.1	10.05	10.1	71.9	37.0	12190	612	2.453 x 10.6	1.402 x 10.6	Seasoning crack along one side. Failed by shear along this crack.
	Rate of loading .00073in. per in. per minute at extreme fibre.										
3	Mountain Ash (E. Gigantea)	11.0	9.75	9.8	39.3	24.38	8790	429	1.523 x 10.6	.925 x 10.6	Seasoning cracks at end. Failed by tension at the centre.
	Rate of loading .00070in. per in. per minute at extreme fibre.										

W. H. WARREN, Professor of Enginnering.

The Use of Australian Timbers in Britain.

THE matter of making the Empire as self-dependent as possible seems to be attracting much public attention in the Old Country. Many organisations for the purpose of forwarding the movement are at work. At a recent meeting in conference of the Timber and Forestry Section (Lord Morris of St. John's in the chair) of the British Empire Producers' Organisation, the following resolution was unanimously carried:—

> That this conference is of opinion that it is in the national interest that the Empire should, so far as possible, be rendered self-supporting in essentials such as food and timber, and that arrangements should be made without delay for the supply of timber for building and other purposes to be obtained from sources of supply within the Empire.

Exporters of timber in Western Australia might find it to their advantage to get into touch with Mr. M. C. Douchesne, F.S.I., Secretary to the English Forestry Association, Farnham Common, Slough, Bucks., England.

Trees and Men.

(By P. L. O'Loghlen, M.L.A.)

LET me present the point of view of the man who works in the tall timber:—He agrees that conservation is a necessity. Waste of timber actually menaces the livelihood of foresters and mill hands. It is admittedly a danger to the water supply, and ultimately so serious a decline in the average rainfall as to practically reduce the fertility of the State. Apart from this—and surely that is a contingency sufficiently serious—the absence of a policy of ordered conservation generally means the absence of any regulation at all in respect to honest conditions. And regulation—of the sensible and level-headed types—is what the worker welcomes in the forests. He would have proper supervision of the areas to be cut over as well as of the wages to be paid and the living conditions for himself and his family. Up to date his complaint is that the forests have been more theatres of laborious toil than avenues of rational living. Family is not, at present, afforded a decent basis in the Westralian bush, and the worker affirms that it should be, and further contends that its cost should be a first charge on the wealth cut from the growing trees.

In this matter the protection of the social morale is, says the man who marches out at dawn to the forest's edge, as much a matter for the Forests' Department as is any other consideration it regards as important. If royalty must be paid to the State for every foot of timber cut, then the State could easily see that the man who does the cutting gets what the world has come to describe as a "square deal."

So far as Westralia is concerned, its timber areas are among its chief assets. Their exploitation has contributed vastly to the general progress. As a literal fact, the State is in a more stable condition in the South-West than in any other part of its vast territory, and this remains indisputable despite the very obvious bad effect the war-dislocation had on the timber industry. The reasons for this are not far to seek. Although the axe never thins out the growth, settlement develops in its wake. Small farms and orchards dot the hillside where once loomed the giant trees. Not far away is the little town with its colony of traders—all engaged in various ways in knitting a people to the soil.

It is the point of view of the worker that what has been done in this respect is only a tithe of what could have been done had he been paid decent wages and given a reasonable environment while employed in the mills and forests. From the conjugal point of view, the timber is conditioned in such a way as to seriously prejudice the married state. Apart from the lack of schools and other necessary social institutions, the essential problem of how to make a hut a home is ever present. The workers say this matter is a vital part of the whole problem of forest management.

Of course, it is argued that the industry cannot stand additional producing costs. If that is so, then the contention applies equally to every aspect of the State regulating interference no less than to that involved in the worker's demand. If all that is right to sell timber at a profit and if selling it profitably means sweating the workers and the State unprofitably, then it would be far better for the timber to remain on the hillsides and not be sold at all.

Such a gospel of despair is, however, rejected by every man who has ever worked with the axe or the saw. He knows that a developing country where iron is either costly or unprocurable must use timber. Australia is already amongst the greatest of the timber-consuming countries of the world. With proper organisation of the output and a sound treatment of denuded areas, so that recovery may be expected in another generation, the outlook would be reasonably satisfactory. My whole point is that the problem of the forests is one in which work and trees are inseparably related. To ensure proper treatment for both calls for an attitude of mind which is as concerned for the welfare of the workers and their families as it is for the continuity of the wooded growth. I believe strongly that is the point of view of the thousands whose industry, under some conditions or none, is indispensable to forest working.

Empire Forestry Co-operation.

IN no part of the British Empire is the relationship between natural forests and national economics more clearly understood and better appreciated than Canada. Those interested in Forestry questions under whose notice Canadian journals, and particularly Forestry journals, come observe with keen satisfaction that in all of the provinces steps are being taken to conserve the country's timbers, and in particular to obviate loss by fire. The war has taught every nation, and more particularly the British Empire, the value of forests to a country. There is much being done, not only at home, but in every one of the overseas dominions, with a view to putting forests in a sound and permanent position. The work is vast and involves many serious and intricate problems. In this matter, as in almost every other, nearly everyone has something to learn from his neighbours, and, in most cases, is able to teach his neighbours in some direction or another. In order that the best might be made of the Empire's forestry skill and experience it has been suggested in Canada that an Empire Forestry Association should be founded, whose main object should be to assist in co-ordinating forestry efforts throughout the Empire and collecting and distributing information in regard to it. In Ottawa a very representative council has been formed for the purposes, and in a letter to the Minister for Forests, the Hon. R. T. Robinson, K.C., Mr. Robson Black, Secretary of the Association, writes:—

"For some months past we have been in communication with foresters and woodland owners in the British Isles, looking towards closer co-operation between the various forestry associations within the British Empire. It has been suggested that in order to provide a channel of communication between these various societies, and to bring the members of one association into intelligent touch with those residing in other parts of the Empire, it might be advisable to form a British Empire Forestry Association.

"As you are aware, the cause of forestry is bound to occupy a much larger place in public policies than has been true of the past. This at least appears to be true of Canada. We would greatly value your advice, and that of any other men having the welfare of Australian forests at heart, so that we may place before our correspondents in England and Scotland the evidences of support from parts other than Canada. We confidently anticipate that the closer relations brought about by such an association would eventually lead to a better understanding in matters of trade in timber products."

It is understood that the Minister has expressed his approval of the association, and has promised to do what he can to forward its objects. It can scarcely be doubted that such an association, acting as a forestry clearing-house and information bureau, would be able to do good work in the interests of the Empire forests generally. Mr. Robson Black's address is 206-7 Booth Building, Ottawa, Canada.

Trees, Rain, and Rivers.

(By W. C. Grasby, F.L.S.)

(Concluded.)

IN "Jarrah," Volume 1, No. 3, November 1918, was printed the first portion of an article under the heading of Trees, Rain, and Rivers. The object of the writer was to show that there must be a sufficiently good and regular rainfall in order that forests may exist, either naturally or by planting, and that there is not sufficient evidence to show that the destruction of forests has had any appreciable effect upon the amount of rainfall of a country or section of a country, although such vandalism may have a very great effect upon what becomes of the rain after it does fall. Limitations of space rendered it necessary to cut the article in two in the middle of a quotation from Mr. Mellish, F.R.G.S., president of the Royal Meteorological Society. In order that the concluding part of the article may be understood, it is ne-

cessary to reproduce a paragraph of what appeared before. Mr. Mellish said:—

"It has often been maintained that forests increase the rainfall of a locality, and that reduced rainfall and desiccation of a district have resulted from the clearing of its woods, but very little direct evidence in favour of this is forthcoming. Records showing that the rain recorded at stations within a forest area differs from that at other stations a short distance outside the forest prove nothing, as the variation may be due to other topographical causes, while the retardation of the velocity of the wind in passing among the trees may influence the amount of rain caught by the gauge. Where a forest area has been cleared, no information is available as to what the normal rainfall was before the removal of the trees, and re-afforestation is such a slow process that we may have long to wait before rainfall returns are available for a forest area the rainfall of which was known before the trees were planted.

"In a discussion upon this subject at a meeting of the Society in 1885, Mr. Symons said that he had been unable to find any reliable statistical evidence in support of the general belief as to the influence of forests upon rainfall, and the lapse of twenty-five years does not seem to have altered this position. Mr. Symons went on to point out that the strongest case he knew of in support of the statement that the growth of forests increased the rainfall was that of the island of Ascension, where an increase of rainfall seemed to have followed the establishment of plantations for ornamental purposes.

"That forests are frequently associated with a larger rainfall than neighbouring districts which are devoid of timber is no doubt the case, but this is because the rain favours the growth of trees, while the larger rainfall in its turn is due to topographical conditions, such as higher altitude, which render the forest site unsuited for agricultural purposes, and so have saved the forest from destruction.

"This is well brought out in the case of California in a paper by Mr. W. F. Hubbard, published in the 'Monthly Weather Review,' in which he shows that the forests in this State are confined to the Pacific coast and the western slopes of two successive mountain ranges, just the districts with the heaviest rainfall, while they dwindle on the eastern slopes and fail entirely in the plains. He puts a rainfall of 15in. for the six months of growth, April to September, as the minimum required in this district for flourishing forests. He also points out that trees are more dependent upon conformity of rainfall than field crops, for if a severe drought comes but once in five years the trees may be killed, while in the case of a crop of grain only one year's growth is lost. On the other hand, trees with their deeper roots are much better able to resist the effects of any ordinary drought."

The above is only a sample of the opinions of meteorologists. But while trees follow rain—and trees cannot be grown where there is not a natural rainfall sufficient for the purpose—the influence of forests on the rain which falls is very considerable. Forests exercise a decided influence on what becomes of the rain after it does fall. We need not go to foreign authorities for evidence in this direction. Dr. Griffith Taylor, physiographer for the Weather Bureau, in some of his publications placed the salmon gum forests of Western Australia from a little eastward of Merredin in the desert area, and he says distinctly that Kalgoorlie and its neighbouring settlements were established in a desert, and yet the country was fairly well timbered. I contend that Dr. Taylor is absolutely wrong in calling that forest country a desert. It appears that he accepted the definition of an American authority who classed any country with an average rainfall of below 10 inches as desert. Even then I think he is wrong, but this is not a place to argue that point.

We know the facts to be that the country in question, in common with that of our Eastern Wheat Belt, has a limited rainfall which falls chiefly during the seven cooler months, and that prior to settlement surface water was very rare indeed. Even in the winter months it was unusual for any water to run off, and streams and springs were non-existent over wide areas. The existence of the salmon gum forests,

however, is proof positive on two points. First, that there must be a sufficient rainfall to support abundant vegetation; second, that the country cannot be subject to prolonged droughts. In other words, the forests prove that the rainfall must be fairly regular, and the records of 25 years show that such is the case. When we examine the salmon gum forest, we find that the trees are surface rooted, and the reason is clearly that the rainfall water does not saturate the subsoil to a great depth.

We next find that, if we inspect a salmon gum forest in winter after fairly good falls of rain, all the water appears to be taken up almost immediately, and the soil does not get wet. Of course, in periods of heavy rain the case is different. The point which I wish to make is a comparative one. When the soil of fields which have been cleared becomes too wet to plough, that in the virgin salmon gum forest is only slightly moist. The water has not run off in either case, but in the forest it has been absorbed by the vegetation. In fact, these trees seem to have, like mallee, acquired the power to take in water when they can get it, and hold it as a store to enable them to withstand the dry season. This is a striking example of the influence which a forest exercises on the rain after it has fallen.

In wet districts, where the growth of vegetation is always more abundant, the roots and the accumulation of vegetatable matter on the ground act like a sponge, and check the rapid run-off. They thus prevent the washing away of the soil. It is well known that in various portions of the world treeless areas are subject to torrential floods. Greece and Palestine are striking examples; but we need not go out of our own State, for since the clearing of the Wheat Belt, which has taken place within the last 20 years, it is common to see great washaways on the hillsides and in the gullies. Before the settlement and clearing of the land, distinct watercourses were very, very rare, but they are becoming more and more common, and much harm is being done to the most fertile soils. This could have been largely prevented by exercising judgment in clearing. These washaways are not produced because the rainfall has increased since the settlement; the result is entirely due to injudicious clearing.

Forests undoubtedly to some extent increase the humidity of the air, because of the water held by the means already stated, and because of the moisture evaporated from the trees themselves. Then, again, forests check winds, and in spite of the large quantities evaporated from the trees, the checking of the winds prevents to some extent the drying out of the soil moisture.

The effect of trees on the water which falls upon the soil is seen in another remarkable manner in this State. It is well known that when the goldfields were opened surface water was exceedingly rare, soaks were very uncommon. But when the forests have been ringbarked, soaks break out in many places, gullies become moist, springs occur where none were before. In the South-West, where permanent water was very uncommon before ringbarking, springs are to be found on nearly every hillside. The brooks which were formerly dry every summer are now perennial streams, and during the last few wet years the effect of clearing the timber is shown in numerous landslips. Between Balingup and Nannup, when the forests were green 20 or 25 years ago, there could occasionally be seen the remains of a small land-slip, but what is known as the equilibrium of the soil was fairly well established. Now that the timber has been killed, during the last few wet seasons the soil has become oversaturated, and there being no tree roots to hold it back, dozens of examples can be seen where masses of soil up to several acres in extent have slipped down the hillsides. Much more evidence could be given about the injurious effect of the injudicious clearing, but my limits of space have been reached, and I must cease for the present. My point is that, while I am convinced that it is not quite correct to argue that forests produce rain, that does not lessen the importance of preserving trees and planting trees, because of their influence on the rain when it has fallen.

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