worthless trees, which hindered satisfactory regeneration, and were occupying ground which might be supporting valuable new growth. The second question was an interesting one and it introduced a point on which practically no information was available. To-day he could not answer that question with certainty, but there were many experiments he would like to carry out in order to investigate that and many other interesting problems. It gave an indication of what a lot officers could do to help by making observations in the bush. However, although some seed in the ground may escape a fire, it seems scarcely likely that many seedlings would be secured from that source. It was most probable that regeneration resulted from seed falling or blown on to the burnt areas after fire. It must not be thought that no regeneration at all would result were the areas treated not burnt. Germination of the seed would take place in any case, but the "killing back" of the scrub on such burnt areas, resulting in reduced root competition in the early stages of the life of the jarrah seedlings, must help a greater number of those seedlings to survive the cotyledonary stage. There are no doubt many other factors, such as, for instance, insect damage, which firing influences, and reduction in root competition is merely one of them. While all these causes and effects, and factors which influence reproduction favourably and adversely, are being investigated, and the problem of the very best method of treatment to apply in all its details is being solved, regeneration operations along the simple lines already laid down by the department must be continued. For, after all, evidence is to be found anywhere in the jarrah bush to-day that such methods will give satisfactory results. It is most important that this fact be not lost sight of while we delve into the why and wherefore.

Mr. H. CLIFFORD said when he went down to collect seeds of Red Flowering Gum in its natural home near the Bow River in 1920 the only small area he could get seeds from was just about 10 acres. Where the fire had been he could get none. Both there and in Albany he noticed a great number of partly formed seed vessels had fallen off and he would like to know why.

Mr. GARDNER said with regard to the falling of flower buds, it must be remembered that in the redgum there were several flowers on the one stem. It was only natural to suppose that you would not get thirty large seed vessels where there were thirty flowers. The result was that when the flowers started to fertilise it was a case of the survival of the fittest, the smaller ones falling off. The same thing applied to jarrah flowers—there might be only six jarrah fruits where there were about 30 to 40 flowers. There were cases where the rain had got in and destroyed the seeds, but in any case the method of redgum appeared to be that the vessels fell off on to the ground and the seeds were scattered. The same thing applied to a certain extent to the jarrah. The fruits blew off and the seed was scattered about.

Mr. McVICAR: You mean after the vessel had fallen. It does not open on the tree?

Mr. GARDNER replied only in a very few cases where the seed vessel was small and thin.

Mr. McVICAR: The natural consequence is that there is not a wide scattering of the seed?

Mr. GARDNER replied no, there was not.

Mr. McVICAR said his reason for asking Mr. Clifford were the buds cut off or did they wither off was because in the tuart plantation the insect laid its egg in the bud, then it nipped the bud off quite clean.

Mr. H. CLIFFORD said the only thing he could see was that the borer was found in the bottom of the seed vessel and the whole thing withered. It was not nipped off.

Conference adjourned until 10.30 *a.m. on Wednesday,* 18*th July,* 1923.

SECOND DAY—Wednesday, 18th July, 1923.

Morning Session.

(Paper by G. E. Brockway.)

FIRE CONTROL ORGANISATION AND FIRE-FIGHTING OPERATIONS IN THE MUNDARING DISTRICT.

Introductory.—The first measure necessary for the successful practice of forestry is protection from forest fires. The cost of successful regeneration, whether natural or artificial, is such that on no account should it be undertaken until adequate provision has been made to protect it from fire.

In certain localities in this State great progress in fire protection has been made during the last two or three years. Although the areas protected at present represent only a small proportion of the total jarrah bush, nevertheless results obtained are of great importance in that they have dispelled a large amount of the uncertainty which was felt at the inauguration of the scheme. We consider that now we will be able to embark on larger schemes of fire protection with the knowledge and belief that bush fires in the jarrah country *can* be controlled, provided they are fought systematically. Were we not firmly convinced on this point, we would not have commenced either natural regeneration of jarrah or artificial regeneration of pines in the Darling Ranges.

My object in this paper is to deal with fire control organisation and fire-fighting operations in the Mundaring District.

Fire protection must be brought about in two ways, viz.:—

(a) Prevention of fires, *i.e.,* the elimination of the causes;

(b) Suppression of fires.

We will deal first with the subject of prevention of fires. We have as their chief causes the following:

—Locomotives, travellers, kangaroo and brumby hunters, bee-robbers, settlers, graziers, bush workers, school children, and occasional incendiaries of other types.

The first and perhaps the most important step in prevention is the *education of the public*. Up to date this has taken such forms as:—

(a) Illustrated lectures delivered in centres of population in and around the forest.
(b) The posting up of fire warnings offering rewards for information leading to the conviction of persons setting fires.
(c) The delivery to residents in the district of notices stating the laws in relation to the setting of fire and the penalty of their violation.
(d) Personal talks by Forest Officers with persons living in the district.

Judging from conversations I have had with various settlers, I am quite convinced that these people are quickly realising the importance of forestry. Certainly the majority of them refrain from setting fires as was the custom in previous years.

In our work of educating the public we meet numerous obstacles in the form of old beliefs, which must be overcome before all-round support can be hoped for. Thus, I have heard such opinions expressed as "It is simply the fate of the jarrah bush to be burnt periodically; there always have been fires and it is useless to try and prevent them because there always will be fires." Such fatalism as this is, to say the least of it, decidedly strange, nevertheless it exists among a very large section of the community.

A second method of prevention is to resort to legal action. This course, we consider, should be taken only as a last resort, and in particularly serious cases. It has considerable disadvantages, *e.g.*, the Bush Fires Act, as it now stands, is antiquated and decidedly unpractical, and, were we to enforce its clauses in full, we would be very soon regarded as enemies by every settler in the district.

A solution of many of the difficulties we experience when dealing with settlers in the district would be obtained were some system of burning under permit (granted by the Forester in Charge) introduced. A third factor which would be of particular value in some cases would be the introduction into the conditions of firewood permits—on fire-protected areas—of a clause whereby any portion of the permit area burnt should automatically cease to form part of the permit. I am firmly convinced that four firewood contractors out of five would do all in their power to prevent fires; nevertheless, such a clause as mentioned above is necessary to check the other one of the five.

A further point which might be mentioned in connection with prevention is the use of spark arresters on locomotives, particularly those using wood fuel in the forest. We do not expect that they will stop every fire from starting, nevertheless they should prevent the greater proportion of them. The sooner the use of these is enforced, the better will it be for the forest.

As a final point I would like to mention the use of fire-breaks. The burning or clearing of narrow breaks along public thoroughfares so that fires will not be started by carelessly thrown-down matches, cigar butts, etc., is advisable. Secondly, a system of properly located fire-breaks, subdividing the area, is of great help. These breaks need not be of great width, old tracks which have been cleaned up usually being sufficient.

Suppression of fires.—Two things are essential if a fire is to be fought successfully. The first is to locate it exactly as soon as it starts, while the second is to arrive on the scene in as short a time as possible in sufficient force to suppress it.

In order to ensure rapid and accurate location of outbreaks in the Mundaring District the first move was to obtain a reliable map of the area. A plane table survey was therefore made, and the area was marked out into 500-acre compartments. The two highest points in the district were then chosen, and were accurately marked on this map. On these two hills, which are some fourteen miles apart, look-outs, which were connected by telephone, were constructed just prior to the 1921-22 season. The particulars of these towers are somewhat as follows:—

There is a 10ft. x 10ft. floor 30 feet from the ground. The towers are roofed in and each fitted with the following:

(1) An obsolete Y theodolite for use in determining the bearings of a fire.
(2) A table carrying the plan of the district.
(3) A heliograph and stand.
(4) A telephone.
(5) Book of code numbers, signals, etc.
(6) Log book.

During the summer months a look-out man is always on duty from 8.30 a.m. till 5 p.m. and, if the weather conditions warrant it, later. The men take it in turns to go to the look-outs, each one staying for seven days. At the end of that time the next man arrives with a saddle back and a pack horse which carries the week's provisions. When they have changed over, the man who has completed his week on duty returns to the head-quarters.

Look-out man's routine.—Both look-out men must be on duty by 8.30 a.m. They then ring one another and also the head-quarters, and clocks or watches are synchronised. From 8.30 a.m. till 5 p.m. the look-outs must communicate with one another half-hourly. If no fires are located the signal "all clear" is given. In the case of a fire breaking-out, the following is roughly the procedure. Both look-outs take the bearing of the fire by means of the theodolites. This done, they advise one another what their bearings are, and both work out the position of the fire and check their results. The next move is to advise head-quarters of the existence of the fire. If there is a patrol in the vicinity of the fire, head-quarters is also advised to that effect. The patrol, as soon as he communicates with either look-out, is notified of the existence of the fire and is instructed to deal with it. Practically all communications with patrols are carried out per helio. All official messages sent or received by the look-outs are entered in the log book.

It is probable that in the near future this routine will be considerably altered, as it is hoped to instal a system of wireless. There will be a sending set on either one or both of the towers, while receiving sets will be carried by patrol men, working gangs, etc. These wireless sets should soon replace the heliographs which are now in use, and which can only be used to communicate with the look-outs from special high points in the forest.

Before leaving the subject of look-outs, I must remark on their efficiency. On a still day a fire a few

square yards in extent can be seen even at a distance of five or more miles, that is, provided it is not behind a high hill or in a deep gorge. On the other hand, on a dull smoky day, a fire in a gully may not be seen until it has attained perhaps two acres. Similarly, on a very windy day a fire in a deep gully or behind a high hill may perhaps have burnt a couple of acres before enough smoke has been formed to be seen.

Patrols.—During hot spells men are sent out to patrol certain beats where it is considered the fire hazard is very great. Each patrol is supplied with the following equipment:—

(1) Horse, saddle, bridle, and accessories.
(2) Heliograph and stand.
(3) Compartment map of the district.
(4) Loose-leaf notebook containing forms for various purposes, *e.g.*, reporting on daily work, fires, etc. Other forms in the same book give various code signals and numbers.
(5) Food for himself and horse.
(6) Water bottle.
(7) An axe.

On going out on duty the patrol is instructed to follow a certain beat, and communicate with the lookout from various helio stations.

Besides merely riding from one helio station to another, the patrol has other duties to perform, such as delivering fire notices and keeping a close lookout for fires on or near his beat.

Should a fire break out in the region he is patrolling, he must immediately proceed to it and fight it. If it is too serious for the patrol to suppress single-handed, and it shows signs of assuming large proportions before night time, it is his duty to engage casual labour or communicate with the lookout man, who will arrange for assistance.

All casuals engaged must be given a special form showing time worked and the amount due to them for their assistance. On presentation of these orders at district office, cash orders for amounts due are given in exchange.

It may be noticed that in the last few pages I have drawn attention to the fact that the workmen engaged are able to use the heliograph and understand Morse code. This, of course, in the majority of cases, has been learned since they have been in the employ of the Department. An ex-army signaller was engaged to instruct the gang in signalling just before the commencement of the 1921-22 season. By the end of the season practically the whole of the staff were able to use the helio quite well. One of the chief factors leading to such good results in this direction is the excellent practice men on the lookout are able to obtain sending messages to one another.

In order that no man can be unfairly treated by having more than his share of one particular kind of work, duty rosters are made out periodically and are pinned up in some prominent position in the camp.

It will, of course, be realised that men must be on duty during the week-ends, sometimes at night, and on public holidays. This, of course, is unavoidable. Such overtime is not paid for, but leave in lieu thereof is granted when the man is not on lookout or patrol duty.

Fire-fighting.—No two bush fires can be fought in exactly the same manner. Innumerable factors must be taken into account, *e.g.*, topography of the country, proximity or otherwise of roads or tracks, nature of the scrub, direction and intensity of the wind, distance from the base, size of the fire when it is first tackled, etc.

The usual procedure at a fire is somewhat as follows: On arrival a reconnaissance is made to determine the size of the fire and on what sides it is safe to leave it longest. Having decided on a plan of campaign the patrol commences fighting it. Rarely can the head fire be fought at the outset. It is usually advisable to start operations either on the tail fire and on the wings. As a rule these do not take long to suppress, and the fire-fighter feels safe should there be a change of wind. Having suppressed the least fierce portions of the fire, the fire-fighter can attack the head by gradually pinching it in. Unless a fire is particularly fierce, it can be largely suppressed by direct beating with bushes. For this purpose healthy redgums are preferable to jarrahs, which are too delicate, and wandoo, which are too heavy.

Each fire-fighter seems to have a slightly different method of beating. The method which I have found the most satisfactory is to beat each patch of fire at least twice. The first stroke should be fairly hard and straight down, while the second should be a glancing stroke, which has the effect of sweeping burning sticks, etc., on to the burnt-over ground. If there are two or more men on the fire, one should follow behind the other and throw in any burning sticks, etc., which are left. It is advisable for the fire-fighters to take it in turns, one beating and one following. If there is only one man at the fire, we consider it time well spent if, after suppressing four or five chains of fire, he goes back over it to see that it is quite safe. Sometimes, owing to the choppy nature of the wind, it is difficult to say exactly which is the head fire, which the tail fire, etc., for what is now one may in a few seconds' time be the other. With two men these fires can be dealt with fairly easily, as one can start on each side and take advantage of the change of wind to gather beaters for his next attack.

In cases where the head fire is threatening a dangerous area, such as a blackboy flat, where it would be likely to gain a considerable impetus, counter-firing must be resorted to. An old track or a break of some description is necessary for this. If there is not a break already, one must be made for the occasion. Unless the scrub is particularly high, a break one foot in width is quite good enough to commence the counter fire from. The clearing is best done with a heavy rake and an axe. In starting the counter fire one should not light more than about ten yards at a time, and when this is safe do a further stretch, and so on. For successful counter-firing, at least two men are necessary to ensure any degree of safety.

On only one occasion did we at all regard the fire as having the upper hand. On this occasion some kangaroo-hunters lit a series of about twelve fires along a front of some six miles. These fires were lit at the bottom of a big gully, just before noon on a particularly hot Sunday in March. Although the fire burnt something over five thousand acres, considering the conditions, no one can regard the results achieved by the fire-fighters as anything but satisfactory. The method which was employed and which enabled a small gang of men to cope with such a large burn was to fight the fire at night and rest or

patrol the edge where the fire had been suppressed in the daytime.

Practically all the large fires that have been experienced have occurred in poor wandoo or mixed country. Fires in pure jarrah do not run so quickly as those in the types of country above mentioned. Consequently, even if a fire in the jarrah bush has proved too severe to cope with in the daytime, it usually has not assumed very large proportions by the end of the first day, when suppression is comparatively simple.

An idea of the results achieved by fire protection may be gleaned from the following figures:—During 1921-22 season the area burnt was 1.43 per cent. of the total fire-protected area. During 1922-23 season the percentage had increased to nearly seven. This, however, is not so unsatisfactory as it at first appears, when we consider that five of the seven per cent. was burnt in the one burn mentioned above, and carried practically no jarrah bush.

During the two seasons a total of 165 fires occurred. Following are the causes:—

	1921-22.	1922-23.	Total.
Government locos. ..	22	6	28
Mill locos.	26	..	26
Bush workers	15	8	23
Campers	..	1	1
Stock owners	..	1	1
Travellers	12	26	38
Settlers burning off ..	8	3	11
Hunters, bee-robbers, etc.	6	20	26
Cause unknown ..	2	9	11

The costs of the various items have been somewhat as follows:—

Capital costs—	£
Lookout stations	550
Telephone line	550
Instruments	10
Firebreaks	950
Lectures	99
Survey of area	945
	£3,104=6d. per acre

On the per acre basis the maintenance costs have been as follows, per season:—

Manning of lookouts ..	·5 pence
Patrolling	·4 pence
Fires	·4 pence
Upkeep of breaks ..	·3 pence
Lectures, etc.	·15 pence
Total	1·75 pence per acre

Although our organisation and our methods and appliances for suppressing fires can be improved and modified to suit changing conditions brought about by continued fire protection, nevertheless we can hope to do very little without generous public support. The public will, however, help only when it realises that its forests are valuable assets which can and must be protected from fire if they are to retain for all time their value. Before the public can be expected to render help of a practical kind it must be educated, and to do this is the duty of every officer of this Department. Unfortunately, all officers do not seem to realise this.

As time goes on a burning forest will be regarded in much the same light as a burning crop or a burning house. Not till then, although we may train the finest gang of fire-fighters in Australia, can we expect anything near the one hundred per cent. success which we hope for from our schemes of fire protection.

Mr. McVICAR said we have all listened with great interest to Forester Brockway's paper on the fire fighting problem, or the prevention of fires, which should be our aim, rather than the suppression of them. We hope that Mr. Smith, with his wide experience in this subject, will open the discussion.

Mr. SMITH said you have heard what Mr. Brockway has said. He has expressed himself very clearly, but he has said a lot of things that may be discussed, and he will be well criticised by everybody.

One of the first things in fire fighting is to see the fire quickly, and to get to it. There are efficient men in the tower to take bearings of the fire and get in touch with headquarters and with parties of men engaged in work in the bush. The next thing after the fire is spotted and the bearings taken (you have your plan and map) is to get to it. Rapidity of transport is very essential. Our men should know the country thoroughly. A man might be told to go to a fire in a certain part. There may be a road leading to the fire ten miles round, but he should be able to get to it in a much shorter way by taking bush tracks, across country. We have got to the fire; we cannot do much until we get there. The first thing to do is to see that there is an assistant or a Forester there, to look round the fire and see how to deal with it; see the best way to get at the fire. Look around and see the country, and see if there is anything that will assist in fighting the fire, such as old roads, tracks, country that has been burnt probably the previous year, or anything at all that might be used, such as light scrub on one side of the road as against heavy scrub on the other. Another thing to study is the strength of the wind and the direction in which it is blowing, and the method of beating. We have to put it out. Mr. Brockway says that redgums are best. Some say they are no good, some say they are. We prefer them, for they stand more beating than the jarrah. Jarrah leaves seem to wither up.

Regarding the method of beating, Mr. Brockway says a downward stroke and then a side stroke. That is the best method of beating a fire. When you have a fire I believe in taking it on one of the flanks. A head fire is pretty hard, especially in the middle of the day. I can assure you that to attack a head fire is difficult. It is stated in some of these Yankee forestry books that you must attack a head fire; well, they must be hardy chaps, hardier than I am. The idea is to take it on the side. You can check it and gradually work the fire out to a point. It is no use going straight in front of it; try to work it into an old road.

After you have beaten a fire out, the next important thing is to make sure that you have got it out. I have seen a fire put out and it has broken out again. These fires must be patrolled. You can put a fire out and hours afterwards you may go over the area and find a log smouldering somewhere. I wish to impress upon you that when you have put a fire out, do not leave it unpatrolled for at least two days. It is easier with a small fire, but with a big fire they must be patrolled for at least two days after it has been suppressed.

Counter fires should only be resorted to as a very last resource. In only one case so far have we had to resort to it to any great extent. The year before last we had a fire in the ring-barked country in a mass

of blackboy. Most of the foresters know the ring-barked country in the Mundaring district, and the blackboys and scrub and suckers.

I can assure you that it is very difficult. Hunters went out there and got lost, and they used the system of blackboy firing to try to find where their cobbers were. That fire was so confoundedly hot that we could not get near it. We had to backfire. We came to the conclusion that we could not deal with it in any other way. We had several men there and the procedure of the backfire was that one man went along with a strong rake. He was followed by a man firing on the track cleared, or partly cleared; then he was again followed by a man beating the flames in towards the country burning.

You all know the jarrah country. There are so many roads and tracks that it is nearly always possible to get an old road or track or something to back fire from, if it becomes absolutely necessary to counter fire.

A very useful thing are these old roads and tracks, inasmuch as they increase the rapidity of access to any part of the bush. I would suggest that several of these roads in any area to be protected, be opened up. I may say that the scrub grows on them slowly. The York road in my district has not been used for years and years, and it is in perfectly good order. There are very few suckers on it and little scrub. They make excellent breaks.

Another very essential thing for the men to know is where the nearest supply of water is, and the nearest food supply. In connection with the fire at Mundaring, which gave so much joy to foresters, especially those foresters who were engaged in putting it out, we made a depot at Watson's place, just on the edge of the fire, and carted supplies of chaff and food there, and we got water from his well and fruit out of his garden.

Referring to the fire that occurred up there, I would like to stress one point about it. It started on Sunday night and Watson, Valentine, and Brockway and myself worked on it. When we had got it out I left instructions, before leaving, that Watson was to patrol that fire, and I might say that this Watson is one of the most efficient and conscientious men that I know. He is a thoroughly good worker. He went to the fire the next day and patrolled it, and about 12 o'clock said that the fire was absolutely out. At 2 o'clock the same day the fire had broken out again. I got a message from the heliograph station that the fire was still burning. You cannot be too careful in patrolling the site of a fire until it is absolutely certain that it is quite out.

An old dead limb on the top of a tree will often catch on fire. I was watching a fire once which had burnt about four acres when I got to it, and was going up the hill nicely. I put it out, and while watching the result of my splendid work coals started to drop down. I looked up and found a big jarrah tree was burning at the top. I had to set to work and burn a big strip around this jarrah. That goes to show that it is not always the fire that you sweep in that is burnt out. It may be the top that is burning and any man is apt to miss it. I think it is a source from which many fires do break out again. Another thing I would like to speak about is fire-fighting in the day time, and fire-fighting at night. You go to a fire in the day time, and do not think it can be put out except by back fire, etc. At night it is a totally different matter altogether—two or three men ought to be able to put out miles of it. You have only to beat it. Getting back to the fire in 1917, there was a splendid crop of saplings, two or three crops of blackboys, and goodness knows how many crops of scrub, and Mr. Brockway and I went to it about eight o'clock. We got busy about 9 o'clock, and beat it quite easily, in intense scrub, where I am sure that all the men in the district could not have got within 50 or 60 yards of it in the day time. Unfortunately, last year all the fires started on a Sunday, so I did not get many holidays. It appears that the fires are started by those "white blackfellows" who do nothing but hunt kangaroos and run a few brumbies. These men are a source of annoyance to the public and the forest workers. They burn the country to get the kangaroos to come in on it. The kangaroos come for the first green feed. When this conference is concluded, if we can find some way of inserting some clause in the Bush Fires Act, or in some Act, that will deal with these people effectively, we will have gone a great way towards fire control and fire protection. It is not the working men in the district we have got to deal with, but these "white black fellows."

Mr. A. CLIFFORD said Mr. Smith had said "a straight-down blow and a side blow afterwards." His experience was one blow one way. With a straight-down blow you spread your fire. You probably picked up twigs on your stick and threw them behind you. With reference to fires breaking out again, he had had considerable experience that way, and he noticed that most of the fires that broke out again were in old rotten blackboys. They often burned for two days. Mr. Port could bear him out in this. One of their sample plots burnt that way. The blackboys rolled off the side of a hill. With dry trees, he did not care where it was, if there was a strong wind blowing, the fire would get on the top of a tree and set alight to trees in the middle of ploughed fields, with no scrub underneath or anything. He thought the trees along the firebreaks should be chopped down.

Mr. KESSELL said a strip of green timber for two or three chains on either side was usually left.

Mr. CLIFFORD said a heavy wind would carry fire from one tree to another.

Mr. KESSELL asked Mr. Clifford what he considered was the necessary width of the strip of green timber.

Mr. A. CLIFFORD replied, about five chains altogether.

Mr. SMITH said he didn't believe in fire breaks at all. You would find dry topped trees anywhere in the forest.

Mr. KESSELL said in silviculture work you left a certain strip of green timber along the Department's boundary.

Mr. SMITH said Mr. Clifford was speaking about the downward stroke, but supposing the scrub was high and the fire was burning along the bottom? It was a very hard thing to get down to the source of the fire. He could assure him you would pick up scrub even if you hit a downward blow. Coming back to the source of outbreaks, he had seen roots burnt in the ground. They might go on for four or five feet and come up again. There were any amount of sources of catching after a fire had been beaten out.

Mr. PORT said they had always found a blow straight down often scattered the fire away from it. If you brought the blow in you had got a better chance of putting the fire out, because if you brought

the blow straight down you naturally made a wind and scattered the fire. He thought something ought to be done in regard to licenses for kangaroo shooting. Down in his district they had one or two big mills, and if you liked to go down there on a Sunday you might see eight or 10 kangaroo shooters out in the bush, and they had all got licenses to get meat. He thought something should be done so that these men were not granted licenses for getting meat. It was only another way of getting skins, and that should be stopped.

Mr. TURNER said he thought the previous speakers had been referring principally to kangaroo shooters and brumby hunters as the cause of lighting fires. In his experience, 90 per cent. of the fires started in his district were set by people granted grazing and pastoral leases over certain areas. The Government received revenue for these leases and, naturally, if the country was not burnt it was not much good for feeding their stock; otherwise the stock would not eat it. He claimed this, that whilst the Department granted grazing and pastoral leases over certain areas, the settlers would set fire to the country and have it burnt for feed.

Mr. KESSELL said, although some of these grazing leases existed at the present time under the Land Act, no more grazing leases were being granted without reference to the Forests Department, and the Lands Department were standing by the Forests Department now and not granting leases on prime forest country.

Mr. TURNER said even if leases were not granted, owners were allowed to run their stock there. He thought grazing should be stopped.

Mr. KESSELL said that was part of the organisation of more complete fire control. It was no good doing one thing with a view to fire prevention and causing a big annoyance in the district unless we took measures to organise the suppression of fires if they did occur. At Collie and Mundaring we were taking active steps to stop grazing.

Mr. McVICAR, referring to what Mr. Turner said about the graziers lighting the fires, said that happened every summer. He was travelling on the back road, between Nannup and Augusta one time, about 13 miles out, when he met one of the farmers in the Blackwood district, coming back from the "coast," as they called it. Every year they shifted the cattle from the coast to the hill country. He had not left that man 10 chains when he struck a small fire. As he progressed along that road, he got bigger and bigger fires. The man had lit the whole of the country for over 40 miles. He asked him how many dozen matches he had used. Naturally he said he did not light the fires.

Mr. KESSELL said that, of course, the top disposal operations would serve to a large extent to burn the best of the forest under conditions when the fire would do very little harm. It was a matter of using controlled fires to prevent big fires until we could extend fire protection organisation over the whole country.

Mr. SHARP said there was one point there, the issue of kangaroo permits, that Mr. Port mentioned. He did not know what was happening in other districts, but in Collie district all applications for permits and licenses went through the Forests Department.

Mr. PORT said in his district they went through the Police Department, and he thought it would be a good idea if they went through the Forests Department. The police did not know what was going on in the bush. They visited a certain centre, but the foresters were out in the bush nearly all the time, and they knew who were the people that should have the permits and who were not.

Mr. SHARP thought it would protect the areas if they all went through the Forests Department. The department took charge in Collie of the Game Act. Anyone could have a license before, but now only two people had them, and they were worthy people. He thought it a very necessary precaution that these things should go through the Forests Department.

Mr. DONOVAN said, speaking of fire beating, the best plan he had found for beating out a fire was a pronged stick, and not beat at all but just scrape along with it.

Mr. KESSELL said you had to take into account the difference in soil conditions in the two districts. Whereas Mr. Donovan had a good deal of sandy soil in his district, they were working on pure ironstone country at Mundaring, where scratching would not affect the scrub.

Mr. BROCKWAY said that system would be quite good, probably, in the virgin bush where there was leaf litter, but in the country they were protecting there was scrub several feet high, where it would not act at all.

Mr. MACKAY asked the Chairman as to the distance it was proposed to have these fire lookouts apart.

Mr. KESSELL replied, the distance would be about 15 miles. That probably was the optimum distance. It depended largely on the contour of the country and value of the forest and the density of the forest, but he thought 15 miles apart was quite an efficient distance for lookouts.

Mr. TRAINOR said he would just like to pass a few remarks on the subject of fire protection. In the first place he had to heartily endorse the remarks of Forest Officer Brockway and Forester Smith. There was one little remark of Mr. Smith's with regard to patrolling fires. He took it Mr. Smith did not mean to patrol after a fire for the whole day.

Mr. SMITH: No, say at dinner time.

Mr. TRAINOR said he was heartily in accord with the proposal to enlist the co-operation of local settlers, who would act as fire fighters when called upon. He thought it a fine thing to go round a district early in the season and talk to orchardists and all settlers, and obtain the names and addresses of all who would be willing to give assistance when fires were burning. It had been his experience when on the work of fire control at Mundaring that the use of the sideways sweeping stroke at the commencement was not possible in thick scrub. When a litter of leaves and small twigs covered the floor the sweeping stroke was naturally used. It was, however, only in exceptional cases where this practice was possible in the Mundaring district. More frequently the growth of shrubs was so thick that several downward strokes had to be made in almost the same place before the flames were beaten down. Then the sideways stroke was employed to sweep the burning ends of twigs and other litter on to the burnt area. In all cases after a fire had been dealt with at Mundaring an inspection would show a more or less clearly swept strip running round the end of the burnt country. With regard to the issue of licenses to kangaroo

shooters, he believed careful consideration would be necessary. There were some men who might want a license and, if refused, they would become our enemies, and we wanted to avoid that if possible. In the work he was now carrying out, he was endeavouring to become friends with everybody in or near the forests, and he would certainly recommend the issue of licenses to kangaroo shooters if he thought they could be trusted. Before concluding, he wished to emphasise the fact that the remarks of Forest Officer Brockway and Forester Smith were heartily endorsed by him.

Mr. BROCKWAY said, in regard to the question raised by Mr. Trainor *re* the granting of licenses, he did not think, if we did take the kangaroo shooters' licenses away, they could treat us very much worse than they did last year when they had the licenses.

Mr. SMITH said the thing still remained that we had no control over the man, whether he had a license or not. He could go out into the bush and, unless we saw him with the kangaroo or saw him shooting, we had no control over him. Those "white blackfellows" were the men who were causing us all the trouble.

Mr. MACKAY said that he had experienced the two largest bush fires that ever occurred in Gippsland. In beating out bush fires, he did not think it mattered whether you used the downward stroke, the upward stroke, the sweeping stroke, or the back swing. If we got bush fires here such as occurred there in years gone by, none of those strokes would put the fire out, either in the day time or at night time.

Mr. MACKAY referred to Mr. Smith's statement that he cleared five chains around a tree in order to prevent any further fire breaking out from a limb that was alight in the crown. As he undertood no other fire broke out he asked if there was any wind blowing.

Mr. SMITH replied: The usual prevailing winds.

Mr. MACKAY said five chains would not stop a fire extending from a burning limb with a very light wind blowing. He had seen fire travel half a mile from burning trees, and he thought they would light a fire much farther away in jarrah country.

Mr. BROCKWAY said during the past two or three seasons they had had a couple of hundred fires there, but on only one occasion did he hear of a spark blowing any considerable distance, and on that occasion it blew down to a blackboy flat. Usually it was quite impossible for a spark to blow that distance, because it struck leaves, etc., before it got that far. It was only in very open country that the fire was likely to spread that way.

Mr. KESSELL said if you watched sparks spreading while fire was burning, you would notice there was a big upward draught, but once the fire was out, the wind was either parallel to the surface or sweeping down, and there was very little danger, and the possibility of the spark carrying was very much less than when the main bush fire was burning. We must also have the lookout in order that we might see these new outbreaks immediately. Fires all started from a spark, and the quicker we got to them the smaller the outbreak we had to cope with. The difficulty in the past had been—and it was just the same in Gippsland—that nobody had paid attention to the fires until they had assumed serious proportions. It had been nobody's business to go. They had been let go until they had become big fires. We sought to fight bush fires while still small.

Mr. SMITH said he did not know much about the Gippsland country, but he had been in the Otway forest, which was similar country. He did not think any comparison could be placed on the conditions of the two forests. A fire that would start in Gippsland and assume enormous proportions would have no chance of starting here under the protection system. As Mr. Kessell had pointed out, it was nobody's business to go to it there, but here it was some man's business to go to the fire, and consequently it did not establish such an enormous face on it. He did not think we had got any trouble to fear from fires such as Mr. Mackay had experienced in the Gippsland country. Another thing, the bark of those trees was more inflammable and would carry farther than the barks of our timber.

Mr. McCOY said he not only saw sparks carrying five chains, but at Dwellingup mill he had seen bark carried 20 chains while the fire was burning—in jarrah country.

Mr. KESSELL thought the difficulties were just as great at Mundaring, because we had to cope with drier conditions. Nights were much moister and cooler the farther south we went, and the fire would die down at night much more than it would at Mundaring. We were no longer guessing, we had tried and succeeded.

Mr. WESTON asked Mr. McCoy, was not that fire at Dwellingup subsequent to the falling operations in that district, when the crowns still lumbered the ground?

Mr. McCOY replied that it was.

Mr. WESTON said we were going to do away with that risk in all districts.

Mr. MACKAY said he would like some little information. That was about looking round for tracks and so forth, to be conversant with the country in which a fire was likely to occur and in which foresters would have to fight it. He understood Mr. Smith to say that there would be tracks here and there which would practically act as fire breaks. Did those tracks occur in virgin forest or only in cut-out bush?

Mr. SMITH said, unfortunately, in the jarrah bush it was very hard to find virgin bush, and he did not think we would have much fire protection in it. Even in what was called virgin bush you would find tracks. You had to go a considerable distance to any part of our forest where you could not find tracks where people had been after poles or piles or something. There was always something to help you even in virgin bush.

Mr. WESTON spoke of the difficulty Foresters had with the "white blackfellow." He urged the importance of not ignoring the human element when dealing with these men. They read on a notice board that £100 fine or 12 months' imprisonment was the penalty for a forest offence, smiled, and dropped a match. The speaker said that from his experience much would be done in enlisting their sympathy by treating them as intelligent members of the community.

Mr. SMITH said it all came to the education of the community in each district before the inauguration of the scheme.

Mr. WESTON said he knew of one case where a man was an absolute enemy of the Department, and he had been known to light a lot of fires, but we had never been able to prove it against him. He came in contact with him when he went to the district, and he let him think that he (Mr. Weston) thought he had brains, and the man listened to him. Now he was

one of our helpers, and there had not been a fire there since.

Mr. TURNER said he did not altogether agree with Mr. Weston on one point when he stated that perhaps it would not be wise to get legislation to control bush fires. When a man caused a fire on private property he could be had up for trespass. It ought to be possible to get legislation to this effect where we got men lighting fires in the vicinity of Crown lands.

Mr. McVICAR said we must get our State forest areas defined, and then we could do it. We must get the dedication of State Forests first.

Mr. WESTON said in reply to Mr. Turner that in one State Forest a man did not trespass in order to light a fire, but he nevertheless lit two fires. He was riding along a road close to the State Forest, and he dropped a lighted match overboard. The evidence was plain enough for a bushman, but not for a law court.

Mr. KESSELL said the vast strides that have taken place in the attitude of the public towards this question, during the last two years, must be taken into account, and if we could secure the same progress during the next three or four years, we would be well on towards attaining the objects that had been mentioned in the recent part of the discussion.

Mr. SHARP said the main cause of the fires was from private property, and he thought we should control the fires on private property. We should issue some form of permit to those people who wanted to burn off. As it was now, there was a period from, he thought, the first of November to the first of March. He did not think there should be any specified time at all. There should be a permit issued stating at what time the holder might burn, and we could know exactly when fires were being lighted.

Mr. KESSELL said there were two amendments to the Bush Fires Act now before the Premier. He had promised to reconsider them. In these amendments provision would be made for certain areas to be declared "Fire Protected Districts" by the Department. No burning-off operations would be allowed in fire protected districts, except under permit. Secondly, that in such districts, in the event of a fire occurring on private property, the Department should have the right to send men in to control that fire, and the cost involved in fighting the fire should be recoverable in a court of law from the owner of the private property, if necessary. These two amendments would cover Mr. Sharp's suggestions.

Mr. MACKAY said he understood, that now private property owners had to notify the District Forest Officer before they burnt off.

Mr. KESSELL said that was so. We could not refuse permission to them.

Mr. MACKAY said it enabled us to take precautions against the fire spreading.

Mr. KESSELL said the trouble was at the present time that under the Bush Fires Act we had one closed season which commenced from, say, the end of December to the middle of March. The day after that season ended, the people owning private property grazing propositions wanted to burn off with a view to obtaining the best possible burn, while the weather was favourable, with the result that for perhaps a fortnight our lookouts were unable to see what was happening in our own country because of the smoke drifting in from the private property fires. If these fires were lit under permit we could arrange to have the burning off done systematically at different times.

Mr. BROCKWAY said the trouble was that up to the beginning of December all men could burn. We could not give any man permission to set his private property going after that, but after March we could not stop him. He thought what we really wanted was a system of permit, whereby we could give a man permission to burn at any time during the summer, and then we could get the fires well spread over the season, instead of getting them all starting at the same time. There would be less danger of fire spreading in February than there was in March. They all started as soon as the season was open.

Mr. WESTON said another awkward clause for the settler really was the fact that, according to the Forests Act, a settler gave us notice if he was going to burn on his own property and notified us, as he should do, according to the Act, and when the fire escaped we could prosecute him successfully for letting it get away. If he did not notify us, but had a fire accidentally on purpose, we had got no hold on him. When the farmer realised the position in regard to this section of the Act you might expect quite a lot of surreptitious burning, unless we could combat this by stopping a fire which he had originated without notifying us, and making him pay for the cost of putting it out.

Mr. McVICAR said in this connection, during the propaganda around the Mundaring district, he made it a point in the lectures to mention that the forester in charge of the district would issue cards to farmers around that district, and the farmer, if he was going to burn his country, had just to put the date when he was going to burn on the card and post it to the forester. The forester then would send one or more men to help that farmer with his burning off, and to see that the fire did not get into the State forest. He made a point of that. While we were asking the farmer to help us with fires in the forest, we were also willing to help the farmer.

Mr. PORT asked had anything been done in regard to mill locos using spark arresters? He thought they caused a good deal of the fires in the bush, especially on Crown lands where mill locos were running through.

Mr. SHARP said the Cheney spark arrester had been very satisfactory.

Mr. KESSELL said that the same principle applied to spark arresters very largely as applied to control of grazing country. We did not want to insist on the use of spark arresters in the country until we got some organised fire control system. It was no use causing annoyance to sawmillers unless we followed up the work, and the sawmillers had always co-operated with us in testing out of spark arresters. We had one imported from America, but it was a failure. The Cheney spark arrester had given very good results up to the present, and there was legislation at the present time that could be applied, if necessary, to force the use of spark arresters in fire protected areas.

Mr. RULE asked was the present system of fire breaks satisfactory? He understood the fire breaks under present conditions were not too effective. He believed there was some hope at one time that whim tracks would be made. A whim driver followed the line of least resistance, and fire breaks did not

necessarily follow the line of least resistance, so you could not expect the whim driver to follow the fire break. There were two little points he would like to mention. The two difficulties were, of course, that the population was very sparse and there was a certain absence of forest conscience. The most effective fire protection he saw was in Germany, in the pine forests. There the forester was backed up by a population whose forest conscience was stronger than the moral conscience. They had a very good system along the railway line. They had a fire break immediately along the railway, and 100 yards further another parallel fire break. These two breaks were connected at intervals by breaks running at right angles, so that the fire from the railway would be confined to a small compartment.

Mr. McVICAR said that was carried out in our own railway system.

Mr. RULE said there was one other point. Mr. Smith had remarked about the patrolling next day. He thought it would be found that there was a vital time next day when the sun got very hot.

Mr. KESSELL said in reply to Mr. Rule's first question, he needed to point out that at Collie we were faced with a particular problem. The only place where fire breaks were tried on any extensive scale was at Collie, and there the conditions approximated very nearly to the conditions under which a pine forest was worked, and consequently justified more intensive and expensive methods. The system of fire breaks at Collie was tried simultaneously with the lookout system at Mundaring. The lookout system was found more satisfactory and more economical, so that the cutting of fire breaks at Collie was discontinued.

Mr. RULE said he just brought up that point, because Mr. Smith mentioned he found fire breaks did not work satisfactorily, and that he did not believe in a fire break.

Mr. KESSELL said in an extensive area it was necessary to have certain fire lines from which burning back could be carried out. We used the existing cleared tracks in the country. The first work to be done in any country where it was proposed to organise fire control was to have a complete topographical survey made, and prepare plans which showed all these tracks.

Mr. MACKAY endorsed Mr. Smith's remarks as to the trouble following the Yankee grubbing of trees on breaks.

Mr. STOATE said, although they had only been discussing ways and means, he would like to mention, before the subject closes, that it was of vital importance that the belief must be strong in all officers that fire protection was possible. No matter from what cause, or under what conditions, or what country in the world, fire protection was possible. There was absolutely no doubt about it. It was only a matter of the cost involved and the number of men we could put on the job. He would like to make sure that all foresters were prepared to go out and convince the world that we could have fire protection.

Mr. KESSELL said there was one rather interesting sideline, that was the use of wireless in fire protection. It was a matter in connection with which inquiries had been made recently, and a few days ago he received a letter from the Amalgamated Wireless, in Melbourne, setting out the classes of apparatus and the cost. It certainly appeared to bring wireless telephony (not telegraphy) within reach. The objection to telegraphy was that you were confined to the use of the Morse code, necessitating considerable preliminary training. It would be much more satisfactory if we could have telephone messages sent out. We had only had one quote up to the present, but the price given for a self-contained sending and receiving set for use on a lookout station was £300, and the cost of a receiving set for use in the bush was £40. In the latter case, the men simply had to listen in at given intervals when messages would be broadcasted. With the development of wireless, the co-operation of other persons in the bush, settlers and people living on the mills, was much more easily secured. For instance, if we could supply a settler with a cheap receiving set which he could use not only to hear messages from the receiving station, but also to hear concerts at Perth, he might be more interested in fire fighting operations. It might appear rather fanciful, but he could assure them it was very near the realms of probability. In discussing all these schemes, we did not want to look forward to the day when we should have a huge staff throughout the country seeking to control fires. This work was not going to be done by employees of the Department, but bush hands and sawmill employees would be available. It would be a simple matter for us to have a representative at a bush camp and arrange for him to listen in at intervals during the day, and if certain or all men employed in the bush would recognise their obligations and form part of an emergency fire fighting force. We never expect to have the funds to maintain a fire fighting organisation run by the Departmental employees only. The success of the scheme was going to depend very largely on co-operation from general settlers and bush workers.

Mr. MACKAY said sparks from the bush mill engines were frequently blamed for the starting of fires. Personally, he blamed the bush worker more than the sparks. He thought, until we provided these men with thermos flasks and prohibited the lighting of fires in the bush to boil their billies, we would always have fires.

Mr. KESSELL said with top disposal operations we were going to do away with a lot of that. At present a man had the incentive to set the bush alight to help in his falling and hauling operations. We would do the burning before the faller entered new bush.

Conference adjourned until 2.15 p.m.

1923.

WESTERN AUSTRALIA.

REPORT of PROCEEDINGS

OF

CONFERENCE of SENIOR OFFICERS

OF

FORESTS DEPARTMENT.

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