1900.

VICTORIA.

ELEVENTH PROGRESS REPORT

OF THE

ROYAL COMMISSION ON STATE FORESTS AND TIMBER RESERVES.

FIRE-PROTECTION IN COUNTRY DISTRICTS:

BEING A REPORT ON THE MEASURES NECESSARY TO PREVENT THE CARELESS USE OF FIRE, OR THE SPREAD OF BUSH OR GRASS FIRES ON PUBLIC AND PRIVATE LANDS.

PRESENTED TO BOTH HOUSES OF PARLIAMENT BY HIS EXCELLENCY'S COMMAND.

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FIRE-PROTECTION IN COUNTRY DISTRICTS.

PROGRESS REPORT.

To His Excellency the Lieutenant-Governor of Victoria.

MAY IT PLEASE YOUR EXCELLENCY :

We, the members of the Royal Commission appointed to investigate the general question of forestry and forest control and management in Victoria, have the honour to present the following Progress Report :—

FIRE-PROTECTION IN COUNTRY DISTRICTS.

Introduction.

The main provisions of the law at present in force in Victoria for the prevention of the careless use of fire, for many years applied to the whole of the colony, and still apply to the greater part of it, special provision having been made in 1896 for the north-western territory known as the mallee and mallee border. They consist of two sections of the Police Offences Statute of 1865, which were embodied in the Consolidated Act of 1890 (54 Vict., 1126), as amended by section 6, of Act No. 1241.

Section 22, of Act 1126, forbids the igniting, using, or carrying when ignited, of any inflammable material whereby the property of any other persons is injured, destroyed, or endangered, or the leaving of a fire kindled in the open air, without the same being properly extinguished, under a maximum penalty of £100, or six months' imprisonment with or without hard labour. Power is given to any occupier of land to burn straw, stubble, grass, or herbage, or to kindle any wood or inflammable material on such land, after he has cleared of inflammable substance a space around the matter to be burnt not less than 15 feet in breadth, and also after he has given to adjoining occupiers notice in writing at least 24 hours before the burning is to take place. Occupiers are also given power to burn off any grass or herbage on land held by them, between two and nine o'clock p.m., after giving the like notice in writing to adjoining occupiers, and after having drawn plough-furrows to a width of 3 feet on either side of the tract to be burnt.

Section 23 provides that persons camping and halting on any land, and lighting or using a fire there, shall have the owner's name and place of abode legibly painted on their vehicles under a penalty not exceeding £20. A proviso is added that nothing in sections 22 or 23 shall take away or interfere with the common law right of any person to sue for and recover compensation for any damage caused by the reckless or negligent use of fire.

In section 8 of the *Vermin Destruction Act* 1890 (54 Vict. 1153) power is given to owners and occupiers of land during the months of May to September, inclusive, to burn without giving notice to any authority or person, straw, stubble, grass, herbage, wood, or other inflammable material, after clearing around the matter to be burnt a space of not less than 15 feet in breadth.

In the Mallee Lands Act of 1896 (59 Vict. 1428) a number of the most useful provisions of the South Australian Bush Fires Act of 1885 (sections 3 to 8 and 10 to 14) were incorporated and made to apply to the mallee country and mallee border. The latter measure is dealt with under the heading of South Australia.

Such is a brief synopsis of the present meagre and inadequate legislation for this important subject; the original provisions having been adopted over 30 years ago when settlement generally was sparse, agriculture confined to very limited areas, and immense tracts, now subdivided into small holdings, occupied as pastoral areas for the grazing of sheep and cattle. In saying that our legislation is inadequate for the purpose, it must not be assumed that better protective measures are in force in other colonies of the group (with the single exception of South Australia). The backwardness of the Australian colonies in fire protection legislation is in marked contrast with the stringent laws adopted during recent years in the United States and Canada. In default of more complete provision, it is to be regretted that when in 1896 a considerable portion of the South Australian Bush Fires Act was made use of in connexion with new mallee legislation, it was not revised and adapted to the requirements of the whole of Victoria instead of being confined merely to the north-western province.

I.—Legislation in other Colonies and India.

New South Wales.

The Careless Use of Fire Prevention Act of 1866 (29 Vict. No. 21) is a short measure of eight sections. The lighting, using, or carrying when ignited, of any inflammable material within 20 yards of any growing crops or stacks of corn, pulse, or hay, or within 3 yards of any stubble-field or grass land, whereby the property of any other person is injured or destroyed, is forbidden under a penalty not exceeding £50 for each offence, or imprisonment with or without hard labour for a period not exceeding three months. The leaving of fires which have been lighted or used in the open air before they are thoroughly extinguished is forbidden under a penalty not exceeding £10, or imprisonment not exceeding one month. Occupiers of land are authorized to burn straw, stubble, and grass, wood, or other inflammable material on their land after clearing of inflammable material a strip of land not less than 15 feet wide around the area intended to be burnt, and giving 24 hours' notice to neighbouring occupiers.

They are further permitted to burn off any grass lands between seven o'clock in the morning and nine o'clock in the evening on giving like notice. Where any occupier makes a fire-break 15 feet wide along his boundary fence, and owing to the neglect of the neighbouring occupier to make or clear a similar break the dividing fence is damaged by a fire, the latter is required at his own cost to repair or re-erect the damaged fence within one month, and in default of his doing so, the necessary repairs may be made, and the cost charged to him, and recovered by the first-mentioned occupier. Persons found offending against the provisions of the Act may be arrested by any person without warrant, and delivered into the custody of the police, and all offences may be adjudicated upon, and penalties recovered in a summary way before one or more justices. Proceedings under the Act cannot be quashed for want of form, or removed by *certiorari* or otherwise into the Supreme Court, but appeals are permitted to Courts of General Sessions. Any person who may be convicted of obstructing another in carrying out the provisions of the Act, is guilty of a misdemeanour, and may be fined, or imprisoned, with or without hard labour, for any term not exceeding six months. Finally, it is provided that proceedings under the Act are not to interfere with any right to sue for compensation for damages caused by the reckless or negligent use of fire.

Queensland.

The Queensland Act of 1865 to prevent the careless use of fire (29 Vict., No. 9) is in its main features identical with that of New South Wales, and being of earlier date, the latter appears to have been adapted from it to meet the requirements of the mother colony. The principal provision of a special character is in section 1, where the offence of wilfully or negligently setting fire to growing crops, grass, or stacks of corn, pulse, or hay, is punishable by a fine of from £2 to £50, or imprisonment, with or without hard labour, for a period not exceeding three months. By section 6, the application of the Act is limited to districts in which the inhabitants to the number of 50 petition for the same.

South Australia.

This colony has adopted the most complete and practical legislation now in force in Australia for the protection of country lands from the ravages of fire.

The following are the principal provisions of the measure—*The Bush Fires Act* 1885:—

No fires may be lighted—

(*a*) For the burning of stubble, hay, grass, or herbage, from the 1st of November to the 30th of April, between twelve noon and six o'clock p.m., but corporations or district councils may, under certain conditions, alter and vary the hours so fixed.

(*b*) For the burning of scrub during November, December, and January, under a penalty of £10 to £50.

During February, March, and April, scrub may be burnt by owners or occupiers of land between sunrise and sunset, if a space of half a chain is ploughed or cleared round the tract to be burnt. A breach of these conditions, or burning scrub without having at least four men to watch and control the fire, is punishable with a fine from £5 to £30.

Persons about to burn stubble, grass, scrub, &c., on their land, are required to give one day's notice to owners or occupiers of land (or buildings) adjoining, who may reside thereon, or within 5 miles thereof. Holders of pastoral licences in the like case must give one day's notice to the nearest constable; in all cases, at least four adult persons must be on the spot to keep the fire under control, and a space of not less than 8 feet must previously have been ploughed or cleared round the field where the burning is to take place. Any breach of these provisions, or burning between the prohibited times, renders the offender liable to a penalty of £3 to £20.

No fires for the burning of stubble, hay, grass, herbage, or scrub, may be lighted on a Sunday under a penalty of £20 to £50.

From the 1st of September to the 30th of April the use of any ignitable wadding in firearms is prohibited, under a penalty of £5, and power is given to the owner or occupier of any land, or his servant, to examine firearms carried by any person on such land during these months, in order to learn the nature of the wadding used. Any person refusing to allow such examination, or to give his proper name, is liable to a penalty of £2 to £5.

Persons wishing to light or use a fire in the open air are required to first clear of inflammable matter a space having a radius of 10 feet from the same: for neglecting to do this or to properly extinguish the fire before leaving the place, the penalty is £2 to £20.

Smoking in the open air (unless within a town or with a pipe properly covered) during November to April, within 20 yards of any stack, rick, stable, field of hay, corn, straw, or stubble, or other inflammable vegetable production, is forbidden, under a penalty of 10s. to £2.*

The placing of inflammable or combustible material, such as matches, for the purpose of causing a fire, &c., through such being ignited by focussing the sun's rays through glass, or by any other means, with intent to damage person or property, is felony, and punishable by imprisonment up to fourteen years, with hard labour.

The blasting of trees during November to April by means of any explosive, without at least four persons being present to prevent any fire arising, is forbidden, under a penalty of £1 to £20.

Finally, it is provided that nothing in the Act is to take away or affect any right of action, or other remedy which any person may have for loss or damage caused by fire, or for any trespass committed.

* *Vide* Appendix.

British India.

The Upper Burma Forest Regulation of 1887, as amended in 1890, is the latest and most complete of East Indian forest laws. The following are the chief provisions in regard to fire :—

Any person who sets fire to a reserved forest, or in contravention of any rules in force, kindles any fire or leaves any fire burning, in such manner as to endanger such forest, or

(*b*) kindles, keeps, or carries any fire, except at such seasons and in such manner as a forest officer specially empowered in that behalf may from time to time notify, or

(*c*) . . injures by fire . . . . any tree shall be punished with imprisonment for a term which may extend to six months, or with fine which may extend to R.500 (£33 6s.) or with both in addition to such compensation for damages done to the forest as the convicting court may direct to be paid.

Whenever fire is caused wilfully or by gross negligence in a reserved forest, by any person having rights in such forest, or permission to cultivate therein, the local government may notwithstanding that a penalty has been inflicted in respect of such fire, direct that in the forest or in any specific part of it, the exercise of all or any rights of pasture or to forest produce shall be extinguished or suspended, and the permission to cultivate withdrawn.

Every person who exercises any right in a forest, who is permitted to remove any forest produce therefrom, or to pasture cattle or cultivate therein, and

Every person employed by such person in such forest, and every person in any village contiguous to such forest who is employed by or receives emolument from the Government for services to be performed, is bound to furnish, without unnecessary delay, to the nearest forest or police officer any information he may possess respecting the occurrence of a fire in or near such forest . . . and to assist any forest or police officer demanding his aid—

(*a*) in extinguishing any fire in such forest,

(*b*) in preventing any fire which may occur in the vicinity of such forest from spreading to it.

Colony of the Cape of Good Hope.

Under the Forest Act of 1888 the following provision is made :—

The Government may issue a proclamation preserving any Crown or *private* forest or plantation for the maintenance of water supply to springs, rivers, dams, and tanks; for the protection of roads, bridges, railways, &c., and for the preservation of the public health; and for the purposes of such proclamation may make regulations for . . . the firing and clearing of the vegetation thereon. Any contravention of such regulation is liable to a penalty not exceeding £10 for each offence.

Any person who, in an undemarcated forest—

(*c*) lights or kindles, or assists to light or kindle, or aids or abets another in lighting or kindling any fire whether within, or within 20 yards of such forest, in consequence of which any tree or part thereof, or any timber or forest produce is burnt or injured, or is in danger of being burnt or injured ; or

(*d*) leaves without taking due precautions against its spreading or causing injury, a fire lighted by him, or in the lighting of which he has assisted, aided, or abetted, shall be liable to imprisonment with or without hard labour for a term not exceeding twelve months, or to a fine not exceeding £20, with the alternative of such imprisonment for a period not exceeding six months unless such fine be sooner paid, or to both such fine and the first-mentioned imprisonment.

In the case of demarcated forests the maximum penalties for the offences set forth in (*c*) and (*d*) are imprisonment for three years with or without hard labour, or a fine of £100, with an alternative of imprisonment with or without hard labour up to twelve months, unless the fine be sooner paid, or both fine and the first-mentioned imprisonment, together with such compensation for damage done to the forest as the Court may fix.

In commonages on Crown lands, in undemarcated forest, or on other Crown lands, forest officers are authorized to make firepaths and burn dangerous grass within a reasonable distance for the preservation of any adjacent Crown or private forest.

Any person negligently lighting or throwing down any match or other lighted or inflammable material within the boundaries of a demarcated forest, or any person setting fire in the open air to trees, wood, bush, or grass, within a quarter of a mile of any demarcated forest without giving notice to the field-cornet of the ward, or to a forest officer, so as to allow him to be present at the firing, is liable to a fine not exceeding £10, or to imprisonment with or without hard labour for a period not exceeding 30 days, and in the event of such fires, whether caused wilfully or negligently, causing any Crown forests to be damaged or injured, the offender may be ordered by the court to pay the value of the damage done.

Any person lighting, or aiding or abetting in lighting without proper authority, a fire in any private forest (which term includes all privately owned land on which trees and wood form the chief produce of the soil), is liable to a fine not exceeding £10, or to imprisonment with or without hard labour up to one month.

Regulations.

When it is intended to burn a fire belt near a forest contiguous to private property, the forest officer, or private proprietor, as the case may require, is required to give at least five days' notice in writing of such intention, and the party served with such notice may claim a reasonable extension of time to enable him to cut or clear firepaths or spaces to more effectually control the course of the fire. Should the day chosen be unfavorable for the work, another day may be appointed by mutual consent. The cost of the work is to be borne in equal shares by both parties, but the operations are to be entirely under the control of the forest officer. If the private proprietor fails to attend with the requisite assistance, the firing is to be carried out by the forest officer, but the failure of the proprietor to attend does not free him from responsibility should the fire spread and cause damage, while any claim to compensation for damage done to his property, if due precaution is not observed, is barred.

II.—Legislation in North America.

UNITED STATES.

As a general rule, what is called forest fire legislation in the United States applies not only to large tracts of National forest but to any tracts of timber-bearing or woodland country in settled or partly settled districts, and frequently to all unorganized territory, *i.e.*, without the bounds of municipalities. In Maine, the select men of towns are made fire wardens, their duties being to post copies of the law in conspicuous places, and to superintend the extinction of fires. Persons summoned by them must give assistance under a penalty of £2. No town is allowed to expend, for fire extinction more than 2 per cent. of its valuation for taxation. Any one neglecting to put out a camp fire is liable to a fine up to £20 or to one month's imprisonment, or to both. The use of combustible wads in firearms is forbidden. Municipal officers and county commissioners are required to make strict inquiry into the causes of fires, and to prosecute offenders. Railroad companies must burn or cut and remove all grass, &c., along their right-of-way once a year; use spark-arresters on their engines; report fires near lines at first telegraph station; and must not deposit live coals, fire, or ashes on their lines. Employés must put out all fires used by them along the tracks under a penalty of £100 or imprisonment up to 60 days. Violations of the Act by railroad companies are punishable by a fine of £20 for each offence. In New York a forest fire law was passed in 1885. This was the first state of the Union to establish the principle of creating officers responsible for the execution of the law, and to organize a force of fire wardens throughout the State. In 1895 a more comprehensive measure dealing with fisheries, game, and forests, was passed, but the provisions for the enforcement of the regulations relative to fires remain the same, the chief forester being primarily charged with this duty, and the fish, game, and forest wardens being required to act as fire wardens of State lands, and the supervisors of towns, as regards other lands. The general features of the Act are the same as those in the Maine law. The punishment for wilfully or negligently setting fire to waste or forest lands, public or private, is a fine of £10 to £100, with liability to pay full damages to the parties injured. In most of the states the penalties for breaches

of the fire-protection laws are severe, ranging from £1, for minor offences, to £1,000 for graver ones, with corresponding terms of imprisonment. Perhaps the most comprehensive state law on this subject now in force is that of Minnesota, a summary of which, and also of the Pennsylvania law, is given hereunder :—

Minnesota.

The State auditor is made forest commissioner of the State, and is supreme in all matters relating to the preservation of the forests, and the prevention and suppression of forest and prairie fires. His deputy is the chief fire warden, who enforces the provisions of the Act throughout the State. The supervisors of towns, mayors of cities, and presidents of village councils, are fire wardens of their respective towns, cities, and villages, and other persons may be appointed wardens where necessary by the chief warden. The latter officer is required to organize the preventive force to the best advantage, to divide the territory into fire districts, to take measures to prevent or suppress fires, to investigate and report on fires, to arrest, without warrant, offenders against the Act, to collect returns and statistics from the force of wardens, and generally to supervise their duties. The wardens in their several districts enforce the Act, and have power to arrest offenders against its provisions without warrant. They receive, for actual services rendered, pay at the rate of 8s. a day, two-thirds of which is paid by the county and one-third by the State. Any employé engaged in the like service receives 6s. a day. All claimants for pay are required to present full accounts for same, and to declare on oath that such are just and correct. No warden may be paid in any year for more than fifteen days' service, nor any person employed by the wardens in preventive work, for more than five days in any year. Wilfully, negligently, or carelessly setting on fire, or causing to be set on fire any woods, prairies, or other combustible material, whereby property is injured or endangered, or suffering any fire to damage the property of another, is punishable by fine up to £20, or imprisonment up to three months. Maliciously setting, or causing to be set on fire, woods, prairies, or other combustible material, whereby property is destroyed and life sacrificed, is punishable by fine up to £100, or imprisonment up to ten years, or by both. Kindling fire on or dangerously near to forest or prairie land, and leaving it unquenched, carrying a lit torch or other exposed light near such land, or using combustible wads, is forbidden under a penalty up to £20, or imprisonment up to three months. Defacing or destroying warning placards under the Act is punishable by fines up to £20 for each offence, or imprisonment up to three months. Railroad companies are required to use efficient spark arresters on all engines, and to keep their right-of-way cleared to a width of 50 feet on each side of the track-centre. The deposit of fire, live coals, or hot ashes by employés in the vicinity of woodland, or land liable to be overrun by fires is forbidden, and the occurrence of fires along the lines must be reported at the nearest telegraph station. Where a fire occurs along any railroad line the company concerned must take effective measures to extinguish it. Wilful violation of the Act by such companies is punishable by a fine up to £20 for each offence, while employés violating the special provisions in regard to railroads may be fined from £1 to £10. Owners of threshing or other portable machines must have efficient arresters on their engines when in use, and no person in charge of such engines may deposit live coals or hot ashes in any place without putting them out or covering them with earth before leaving them. Any violation of this provision is punishable by a fine of £1 to £10. Finally, it is provided that nothing in the Act affects any right of action for damages, and that all fines are to be paid into the Treasury of the county where the offence is committed, and to be used by the county board in defraying the expenses of enforcing the Act in such county.

Pennsylvania.

Pennsylvania, from early colonial times, has had laws for the protection of its forests and woodlands from fire. The most recent legislation is contained in two Acts passed by the State Legislature in 1897. Under the first of these all constables are *ex-officio* fire wardens, and have power to call upon any person within their respective townships to give aid in extinguishing fires ; the wardens receive as compensation for their services 7½d. an hour, and the persons so assisting 6d. an hour, the expense of the protective service being borne in equal shares by the state and the county (municipality). Any person refusing, without reasonable cause, to give the warden

assistance when called upon, is liable to a fine up to £2, or to imprisonment for 30 days, or to both. Wardens are required to report, on oath, to the courts of Quarter Sessions all violations of the law, and it is the special duty of the Judges of such courts to see that these reports are faithfully made. Wilful or negligent omission on the part of the wardens to make such reports, or failure of duty in the matter of fire extinction, is punishable by fine up to £10, or by imprisonment up to three months, or by both fine and imprisonment. The foregoing fire extinction provisions apply to all lands bearing timber or brush of 50 acres and upwards, and also to areas of less than 50 acres, whose proximity to other timber-bearing land of or above that extent might endanger the latter.

By the second Act the commissioners of the several counties are required to seek out and bring to punishment offenders who wilfully or otherwise cause the burning of timber-lands, and to take measures to have such fires extinguished where it can be done. Failure to comply with this provision is punishable by fine up to £20, or by imprisonment up to two years, or by both. The expense of carrying out the Act is to be borne in half shares by the State and the county.

CANADA.

Province of Quebec.

The burning of standing trees, shrubs, piles of wood, branches, or brushwood within, or within a mile of, any forest at any time of the year is forbidden, but persons may do so for the purpose of clearing land (except between the 1st of July and the 1st of September); and for cooking, warmth, or industrial purposes, but from the 15th of May to the 15th of October they must:—select a spot where there is the least inflammable matter, and clear the place where the fire is to be lighted within a radius of 25 feet if for industrial purposes (making of charcoal, tar, &c.), or within a radius of 4 feet if required for cooking, &c., and before leaving the place totally extinguish the fire. All locomotives on any line running through Crown forests must be fitted with the most improved and efficient spark-arresters, and appliances to prevent the escape of fire from the ash-pans, and engine-drivers are required to see that all such fittings are properly used and applied. Any railway company violating this provision is liable to a penalty of £20 for each offence. Companies are also bound to clear their roadways on both sides of the lines of all combustible matter. The Lieut.-Governor in Council is authorized to proclaim fire districts in any part of the province, and also to revoke the same. Fires must not be lit in any such district in or near woods, between the 1st of April and 1st of November, but *bonâ fide* settlers may do so for the purpose of clearing land at any time, except between certain specified dates in the summer season. All railway companies and licensed timber-getters in a fire district are bound to give the superintendent of fires the services of any number of their employés that he may require, and their salaries and expenses when on fire-protection duty are borne in equal shares by the railway companies, timber lessees, and Lands Department. Neglect or refusal to comply with any requirement of the Act renders the offender liable to a fine up to £40, or to imprisonment up to three months. Any person throwing down or dropping a lighted match, pipe-ash, cigar, or other burning substance, is bound to completely extinguish it, under a penalty up to £10, or imprisonment up to three months.

Province of Ontario.

The provisions of the law in the neighbouring province of Ontario are somewhat similar. An efficient fire-ranging system was established there in 1886, the total cost of the service in 1895 being over £5,000, of which about £2,800 was refunded to the Government by timber licensees. Under the system in force a number of rangers are placed, during the summer season, on occupied or unoccupied Crown lands, where, owing to settlement, railway construction, or lumbering, outbreaks of fire are feared. The number of these rangers is commonly left to the owners of the limits (cutting areas), and they are also allowed to select the men employed, the Lands Department reserving the right to remove any man regarded as unfit. They are required to put up posters of the Fire Act in suitable places, and distribute copies of it among settlers. They may engage assistance should fires break out, and should these assume large proportions they must at once notify the timber licensees and the Department. The Crown

and the licensees bear the expense of suppressing fires and the pay of the rangers (8s. a day) in equal shares. At the end of the season, the rangers are required to send in their diaries and sworn accounts with reports of the fires and the losses caused thereby. This preventive service is said to be well organized and to have saved enormous tracts of country from the ravages of destructive fires. The chief causes of these fires are the clearing of land by settlers, and the carelessness of camping and hunting parties.

III.—Alleged Causes of Fires in Victoria.

Sparks from Railway Locomotives.

The belief that grass and bush fires are sometimes caused by sparks escaping from the railway locomotives is very common in some districts, and we have therefore devoted special attention to this part of our inquiry. At the outset we may say that no direct evidence has been offered to us in any part of the colony by eye-witnesses or other persons that fires have been so caused. Statements have been made on hearsay that grass fires have been seen to break out near a line immediately after the passing of a train, the presumption being that they were due to sparks or cinders from the locomotives. Letters to the same effect have appeared from time to time in the public press. Of course, such statements are difficult either to prove or disprove. In hot weather, with a strong wind blowing, a live cinder or large spark if it reached the open air might be carried to a considerable distance from the line, and if it fell alight in dry vegetation would almost certainly cause a fire. In the absence of direct evidence, however, the main point for us to determine must be whether the Railway Department takes reasonable precautions to guard against the escape of such sparks or cinders.

Being desirous of ascertaining the pattern of spark-arresters in use in the neighbouring colonies, we submitted a number of questions on the subject to the respective Railway Commissioners, and from the answers received from them make the following extracts :—

New South Wales.

The arrester in use here is considered the best for practical purposes on the lines of this colony. It does, of course, to some small extent interfere with the draught of the engine, but not to a prohibitory degree, and it is efficient in preventing the escape of dangerous sparks. Owing, however, to the steep grades on the New South Wales lines, such high pressure has to be employed that the draught must necessarily carry a certain amount of spark. The following additional precautions against risk by fire are taken:—

(*a*) Burning off the grass within the railway fences when sufficiently dry.
(*b*) Chipping a track, and ploughing a fire-break, where preferable, outside the railway fences when the property-owners adjacent thereto have no objection.
(*c*) Chipping a track inside the railway fences when practicable.

Under the Railway Act, the Commission are required to work the railways by means of locomotives (in steam), and as the best known spark-arresters are used, and every reasonable precaution taken against risks of fire, claims made for damage to property by sparks from passing locomotives are generally declined.

Queensland.

The pattern of spark-arresters in use on the Queensland railways is that known as the perforated plate type, the holes being $\frac{3}{8}$ of an inch in diameter, and the plate being placed horizontally across the smoke-box, on a level with the top of the blast pipe, as shown on the inclosed print. One spark-arrester is considered sufficient for proper prevention of sparks. The Chief Mechanical Engineer is of opinion that it makes little difference whether the spark-arrester is made of perforated plate, as in the case of the Queensland railways, wire netting or parallel wire, as is the case in New South Wales and Victoria, so long as the holes, spaces, or meshes are not of larger size than $\frac{3}{8}$ of an inch, and—

(*a*) provided that the area of the holes, spaces, or meshes is not restricted to such an extent as to interfere with the draught;
(*b*) or larger than already mentioned, in view of the necessity of breaking up sparks of large size or retaining them in the smoke-box.

South Australia.

Two forms of spark-arresters are in use on the South Australian Government Railways—the Flat Grid and Moriarity's Conical Arrester. Drawings of both, and a piece of the wire-netting used in the former, are enclosed One arrester, the Flat Grid, is fitted to every engine, and remains in all the year. From the 15th of October till the 1st of April of the following year, the Conical Spark Arrester is fitted to each engine, in addition to the Flat Grid. The Locomotive Engineer considers these arresters the best he has seen or tried for practical purposes, having regard to—

(*a*) Non-interference with proper draught of engine. The fixing of the arrester does undoubtedly slightly interfere with the steaming of the engine, but not sufficient to justify making any alteration in the blast-pipe orifice.
(*b*) The arresting of sparks. They are a great protection in preventing the escape of dangerous sparks.

Complaints are occasionally received from land-owners of fires caused by sparks from engines. There is no statutory provision in the South Australian Railway Acts limiting the amount of damages in case of fire, nor is there any provision for arbitration in case of claims for damage by fire.

The arrester in use in the locomotives of this colony is of the flat-grid pattern, and when, for greater safety, a second one is put in each engine at the beginning of the hot season, they are fixed in the smoke-box, at a distance of 5 to $6\frac{1}{2}$ inches apart, so that the bars or wires of each grid are at right angles to each other. The length of the long space in the transverse bars varies from $3\frac{1}{2}$ to 6 inches, and the width of the opening or mesh is $\frac{1}{8}$ of an inch when the grid is clean and free from obstruction.

As all arresters interfere more or less with the free draught of the engines, and the smaller the mesh the greater the obstruction in this respect, it is obviously of great importance that the arresters in use should be so fixed that they cannot be tampered with or opened to secure a free draught when a train is behind time or a steep grade has to be surmounted. In the Victorian locomotives this requirement is fairly met, first by the stout and durable character of the grid-bars, and secondly by the arresters being so securely bolted down in the smoke-box that they cannot be removed while the fires are alight and the engine under steam.

As regards the regular examination of these spark-breakers, it is the duty of the fireman to clean them every day, and of the engine-driver to examine them and at once report any defect he may discover in them. The foreman of each engine-shed is also held responsible for their regular examination. Lastly, a boiler inspector, who at regular periods visits the locomotive depôts throughout the colony, is in the course of his work required to make an independent examination of all arresters, and to report to the Chief Mechanical Engineer any defects in them or any irregularity in connexion with their use.

In considering the width of mesh in the Victorian arrester ($\frac{1}{8}$ inch bare) and the smaller mesh used on some lines in the north-western states of the American Union and Canada, it must be borne in mind that the fine mesh has to be employed where soft wood or wood with a small proportion of coal is burnt in the engines, owing to the high cost of the latter kind of fuel. It is significant that while in earlier American State and provincial legislation there was often a provision requiring bonnets or screens of wire netting, with a mesh in some cases as fine as $\frac{3}{16}$ of an inch, to be used on all locomotives, in recent legislation, such as that now in force in Minnesota and Pennsylvania, the definition of a specific width of mesh is abandoned, the statutory requirement in this respect being merely that all railway companies operating in the state or province shall use *efficient* spark-arresters in their engines.

We consider that we are not called upon to pronounce whether the double arrester in use during the summer season in the railway locomotives of this colony is absolutely the best and most efficient for the purpose for which it is designed. Such an opinion could only be given with authority by a committee of mechanical engineers, thoroughly versed in the construction as well as practical working of locomotives, and after careful examination and tests of the various patterns in use on the principal American railway systems. But, after duly weighing the evidence at our disposal, the written statements of the Chief Mechanical Engineers intrusted with the control of the Locomotive Departments of the New South Wales, Queensland, and South Australian railways, and comparing the drawings showing the pattern of arrester and size of mesh in use in Victoria and the colonies named, we have come to the conclusion that by the employment of the pattern of double arresters now in use here, reasonable precautions are taken to prevent the escape of dangerous sparks from the engines. Further, the standing instructions under which the engine-driver and fireman are made responsible for the examination and cleaning of the arresters after each day's run, and the additional examination required to be made by the locomotive foreman of each shed, and by the boiler inspector, appear to provide fairly effective checks to secure the keeping of the arresters in proper condition. As, however, the best precautionary rules cannot be depended on unless they are strictly adhered to and faithfully carried out, the provision of effective spark-arresters on all locomotives in use, and the maintenance of them in a proper state of efficiency and repair should, we consider, be made a statutory obligation on the Railway Commissioner.*

On the question of the efficiency of spark-arresters or breakers on American systems, so recently as the end of last year, we may cite the following from the December number of *Locomotive Engineering*, an excellent railway technical journal published in New York :—

> Unfortunately, there is a natural conflict between devices designed to promote free draught and those intended to prevent spark-throwing; and the conflict between the free passage of fuel gases from the fire-box to the atmosphere, and the obstructions put in to prevent these gases from carrying cinders along, has led to the multitude of inventions that have been applied to the front end of locomotives. *No practical arrangement has yet been produced which would entirely prevent spark-throwing.* We have seen a few devices that prevented spark-throwing, but they also prevented the engines from steaming freely enough to pull a train. . . . There are very few locomotives in Europe equipped with spark-arresters. The arrester and devices to regulate the draught originated and were developed in connexion with American locomotives. The first arrester was a cap of netting connected to a widened top of an otherwise open stack. The next step was putting in a cone or deflector beneath the netting. . . . There have been hundreds of spark-arresting smoke stacks patented, but the cone and netting, that both came on the suggestion of necessity and were not patented, were the most meritorious features of all of them. . . .

* *Vide* Appendix.

On the question of the possibility of live cinders escaping from the ash-pans, the Chief Mechanical Engineer of the Railway Department, in his sworn evidence before us, while admitting that such cinders might escape, claimed that they must fall and remain on the permanent way. He further stated that netting and other arrangements across the doors of the pans had been tried, but had to be discarded owing to their interference with the draught of the locomotives, and that the enginemen had strict orders to run with the ash-pan doors shut as close as possible. While fully accepting the statement that precautions are taken in this matter, we are of opinion that the provision and maintenance of effective appliances to prevent the escape of cinders from the pans should be made compulsory by law.

Lastly, we have to consider the question of railway fire-breaks. At present the Department spends about £45,000 a year in weeding, chipping, mowing and burning off; from £12,000 to £15,000 of this sum is spent with the object of preventing fires from spreading, the remainder being for the weeding of the permanent way. The custom at present is to chip off a space a yard wide along the railway fences wherever the surface is suitable for this work, and to burn, as soon as it becomes fairly dry, the grass along the right-of-way on either side of each line. Wherever the grass land lying outside the railway fences belongs to the Crown, a further strip 30 feet wide is burnt off, and, in some instances, where the adjacent land belongs to private persons, an arrangement is made with them to burn similar strips. As a whole, the printed instructions to the line inspectors and permanent-way men on this subject are practical and carefully drawn up, and, provided that the rules are faithfully adhered to, no fault can be found with the existing practice of the Department in this respect. We are of opinion, however, that in the matter of fire-breaks also the very necessary precaution of making and maintaining them should not be left to the discretion of the Commissioner and his staff, but be made compulsory.

Use of Phosphorized Bait in destroying Rabbits.

Among the various methods adopted by settlers to keep in check the rabbit pest is the preparation of poisoned bait by mixing phosphorus with wheat or pollard.

During last summer statements appeared in the public press that several destructive bush or grass fires were directly traceable to the careless preparation and use of this bait in hot weather, and similar statements were made to us, in writing, when we entered on this investigation. As a first step we procured several samples of both pollard and wheat, as prepared for bait by farmers in the drier districts of the colony, and submitted them for examination and test to the Government Analyst. Unfortunately, we were unable to procure at the time freshly made bait, and the phosphorized matter tested by the analyst was considerably weakened by exposure to changes of weather and moisture for several weeks. He reported that the samples sent disclosed no phosphorus in a free or dangerous condition, *i.e.*, in lumps. As to the instructions respecting phosphorus in the pamphlet on vermin destruction issued by the Crown Lands Department, which doubtless is of great assistance to settlers in preparing the various kinds of bait for vermin, he stated—"If the directions are carefully and *skilfully* carried out, I believe a safe preparation will result, although I do not consider it so good and safe as the bi-sulphide of carbon mode of preparation."

We also sent to the Government Analyst a sample of chemically prepared grain. His report on this, dated 19th February last, is as follows :—

> I have examined and severely tested the sample of phosphorized wheat, and found that in the hot sun alone it merely fumes, giving off phosphorous acid. I mixed some with dry grass, and placed it in the hot sun of to-day, and no combustion took place. I then placed it over boiling water in the sun—no combustion took place. This grain is so prepared that the phosphorus is in a very fine state of division, and, moreover, the grains are coated. There is no danger in using this preparation. If phosphorus is in coarse pieces in pollard, &c., it is dangerous.

So far as we can learn, the bi-sulphide of carbon method of preparation, which, to insure safety from ignition under the heat of the sun, necessitates the use of several constituents, and requires great care in making, is confined to several firms of manufacturing chemists. In preparing it the phosphorus is chemically dissolved in bi-sulphide of carbon, and mixed into a gelatinous paste; in which, it is claimed, every grain of wheat is thoroughly and evenly enveloped. This chemically-manufactured bait, although generally recognised in the country districts as safer than the home-made mixture, is somewhat dearer than it, and it is only natural, therefore, that settlers, when compelled by law to extirpate vermin, avail themselves of the cheapest methods of doing so.

The instructions issued by the Crown Lands Department for making phosphorized bait set forth that, in order that the grain may be quickly and evenly coated with the poison, the phosphorus, after being thoroughly dissolved in boiling water, should be poured on the grain in a revolving machine. In actual practice the ordinary method adopted by farmers is to melt the phosphorus in boiling water, and then pour the liquid into another vessel containing the grain or pollard, or, in some cases, one bucket or can is used for melting and mixing. Unless very great care is exercised there must always be danger of the presence of free or lumpy phosphorus on some portion of the bait when prepared in this way, and it may be regarded as established that particles of this highly inflammable matter, carelessly mixed with grain or pollard, have ignited under the sun's heat and caused fires in thickly grassed country.

From the evidence and statements furnished to us on this subject, we select the following passages:—

The Chief Commissioner of Police states (Evidence, Q. 25) :—

A case came under my notice some time ago, when it was almost beyond doubt that some phosphorized wheat had caught fire. I think it would be as well to ascertain whether that is so, because it may have caused a lot of fires. We had the case at court, and it was held that this was not inflammable matter, and the case broke down.

The Conservator of Forests states (Evidence, Q. 115):—

The operation of the Vermin Act has been most disastrous with regard to the use of phosphorus in poisoned grain; to my mind that has been the cause of thousands of fires in the bush.

A forester in the North-eastern district states:—

At Warrenbayne last week [early in March], Mr. H —— laid some phosphorized mixture one afternoon, and it ignited and fired his paddock.—At Swanpool, Mr. D —— told me in January last he saw a fire start about two chains from where he stood. He succeeded in stopping it, and the only cause he could see at the spot where it started was a dried rabbit (one of those poisoned by phosphorus), which had, as he conjectured, ignited from the phosphorus, it being a very hot day. Some time ago Mr. S —— laid phosphorized bran on his farm at Boho, and the mixture ignited as he laid it, and a big fire occurred. I was present, and many of my neighbours. Phosphorus properly mixed will not fire grass, but so many mix it wrongly that fires frequently occur from it.

A forester in the north-western district states :—

I can furnish reliable evidence of a fire caused by improperly mixed pollard and phosphorus. It occurred on land at Burke's Flat. Messrs. T —— and C ——, farmers in the neighbourhood, informed me that they were prepared to swear that the fire was caused by improperly mixed pollard and phosphorus. Both of them helped to put the fire out, and T —— assured me that when breaking the lumps of pollard under the sun they broke into flames. No fire has arisen in this district from phosphorized bait when it has been mixed by the Government vermin inspector.

The forester in charge of Wombat reserves states:—

I was present with Forester Stewart when a fire broke out between the Ballan-road and the Werribee, on the 16th of January last, and I counted ten fires which started on this date. The conservator, in his evidence before the Forest Commission, is quite right as to phosphorized wheat being a menace; for I feel sure some of these fires were caused by wheat, as they all broke out at about two o'clock, when the sun was at its strongest, and along a direct line adjoining selections on the edge of the forest where rabbiters were at work complying with the Act. I have known, for a fact, that one of the largest fires which occurred in the Mount Cole district was caused by a person mixing his own wheat and making it too strong.

Within the last few weeks a country municipality—the Council of Bet Bet Shire, in the Maryborough district—has taken up the question of the danger of using phosphorus in destroying vermin, owing to its inflammable properties. The councillor who brought the matter forward, and who, it is stated, has had great experience in the destruction of rabbits in a badly infested district, expressed the opinion that many bush fires of mysterious origin were wrongly attributed to travellers, and were really due to the use of phosphorized bait. Other members of the council supported him in this view, and it was decided to send letters to all other shire councils in the colony, asking for their opinion on the safety or danger of this form of vermin poison, and on the question of its further use or disuse.

To sum up the result of our inquiries, we are satisfied that there is strong presumptive, as well as direct evidence, that the present crude method of preparing phosphorized bait adopted by many settlers is dangerous, has been the cause of fires in the hot season in the past, and if allowed to continue will cause such fires in the future. We therefore recommend that a provision be inserted in the Fire Protection Bill dealt with in this Report to forbid the use, during the summer season, for the destruction of vermin, of any preparation in which phosphorus is an ingredient, unless it is certified by the Government Analyst, or by an analyst appointed under the provisions of the *Health Act* 1890, to be without free or lumpy phosphorus, and safe for use on grass or other lands during that season.

Clearing Land by means of Fire.

The clearing of land by settlers, especially in localities where there is a heavy growth of brushwood and scrub, has been the cause of many disastrous fires in such districts as Gippsland and Cape Otway. The common practice in scrub country is to fell the undergrowth close to the ground, leaving it where it falls until it is thoroughly dry, and when a hot windy day comes the dead litter is set on fire in a number of places. This is what is known as a "good burn," and obviously the drier and hotter the weather the more likely the work is to be complete. Unfortunately, the effect of these "burns" is frequently not confined to the selection where the scrub is kindled, and many a district has suffered heavily from the fires which the occupier intended to keep within a small paddock in the course of being cleared. There is also the likelihood of such a fire extending to forest reserves or Crown lands in rough and broken country, where it may burn unchecked for days, and, when a change of wind comes, be swept back to destroy strips of country previously untouched. This actually occurred in southern and western Gippsland in 1898, where, after an interval of about three weeks, the fires smouldering on Crown lands broke out anew in the ravaged settlements, and caused further destruction of property.

We have had before us several detective and police reports on the subject of some of the worst Gippsland fires in the year mentioned. Great difficulty appears to have been met with in getting any definite information or evidence from settlers as to the origin of fires which were alleged to have been due to the grossest carelessness, if not to an even worse cause. It was clear that scrub and grass had been set on fire in several cases without any notice being given to neighbouring occupiers of land, and without any precautions to prevent the fires spreading, but no reputable person was prepared to give evidence, or, indeed, to assist the police in any way in the execution of their duty. The burning of scrub was necessary, with or without precautions. Their neighbour was in fault to-day, but they might be in the same position to-morrow ; this, apparently, was the attitude which they took up in dealing with the baffled police. Despite the enormous destruction caused by the careless use of fire in the district, no evidence to secure any conviction could be obtained, and, therefore, no prosecution was attempted.

While on this subject, we may point out that no restrictions in regard to the burning of scrub or the careless use of fire generally can be effective unless they apply to both public and private land. There are forest and other State reserves in every part of the colony, and, in a number of cases, such as occurred in 1898 in the Otway district, destructive fires, caused by selectors burning timber and scrub on their holdings, have spread to and raged for many days over extensive areas of valuable timber, destroying immense numbers of thin-barked mature trees, as well as the younger growth of saplings and seedlings.

We recognise that in humid districts, where undergrowth and scrub is common, settlers must be allowed some latitude in clearing their land by means of fire, but it is only right, in the public interest, that they should be subject to some restrictions, and not have a free hand, as at present, to burn when and where they choose. A scrub fire, once it gets beyond control, is much fiercer than an ordinary fire on open park-like land, and in windy weather the lighted bark and live cinders are carried long distances to unburnt land, thus setting fire to the country in every direction. Selectors, moreover, usually choose the hottest part of the day to start their clearing fires—in other words, that part of the day when a fire is most likely to get beyond control. While the present license in this matter is allowed to continue, it is not at all probable that there will be any diminution of the accounts of ruin and disaster which now regularly appear in the pages of the daily press whenever midsummer sets in. We are of opinion that the clearing of land by means of fire during the summer months should be under strict control, and our recommendations to secure this end appear under the heading of "New Legislation."

Camp Fires.

Carelessness in lighting these is a frequent cause of bush and grass fires. Drovers, hawkers, swagmen, and other travellers, on making a halt, frequently light their fire at a tree, large log, or stump. Even should they wish to put it out, they are apt to find that when kindled in this way it has advanced too far in the wood to be easily extinguished. A fire in a hollow tree or stump may burn for days, and if

the wind rises, sparks, live cinders, or pieces of lighted bark are almost certain to be carried to any dry litter or grass in the immediate vicinity. The reckless way in which camp fires are kindled and left burning by some travellers in summer, not only on the public roads, but on private land, and in Crown reserves, is a grave source of danger to land-owners, as well as to the property of the State. Our recommendations for the restriction of the lighting and use of such fires will also be found under the heading of "New Legislation."

IV.—Destructive Fires in Victoria.

Of fires which were more than local, or confined to a particular district, the one which, above all others, lives in the memory of the older settlers is the immense conflagration which in February, 1851, swept over the greater part of this colony.

The conditions of settlement were indeed very different then from what they are at present. The population was very sparse, while the open Crown lands were occupied in large areas by pastoral tenants, and agriculture was chiefly confined to limited tracts in the Portland Bay and Geelong districts. Many districts were understocked with sheep and cattle, and, as the favorable winter and spring of 1850 had produced a luxuriant growth of grass, settlers expected that when the pasturage became dry, and hot northerly winds prevailed, there would be serious outbreaks of fire. These fears were gradually realized, but, although some fires, causing damage to fences and homesteads, occurred in January of the new year (1851), it was not until early in the following month that devastation spread over many districts. On the 6th of February of that year, a day known in the history of the colony as Black Thursday, the whole territory may be said to have been on fire, from the north-eastern border to Mount Gambier, and from the coast line to the River Murray. Villages, station homesteads, farm houses, outbuildings, and fences were swept away, sheep and cattle destroyed by thousands, settlers burnt to death in a vain flight for safety, many leagues of the rich grazing country on the western plains stripped of every trace of vegetation, and whole districts in other parts of the colony turned into a blackened desert.*

Although nearly every dry season was marked by local fires, the next great conflagration, known as the Otway and Heytesbury Forest fire, took place on the 4th and 5th of January, 1886. It swept over a large part of the counties of Villiers, Heytesbury, and Polwarth, extending from Panmure, near Warrnambool, on the west, to the neighbourhood of Bass' Strait, on the east, destroying an immense amount of property, including the homesteads and fencing of a number of settlers in the forest district.

The next year noteworthy for its destructive fires was the summer of 1898, and particularly the months of January and February, when extensive tracts of country in central and west Gippsland, more especially in the Thorpdale, Neerim, Poowong, Warragul, Drouin, and Strzlecki Range districts were devastated. In this part of the colony several small townships were obliterated, and large numbers of sheep and cattle burnt alive.* Next to Gippsland the destruction appears to have been greatest in the Otway Forest, where the fires raged for nearly a fortnight, destroying, not only the homesteads and fencing of many selectors, but also extensive tracts of valuable timber, such as mountain ash, blackwood, beech, and satin box.

The humid spring of last year resulted in a fine growth of grass in many districts of the colony, and when the summer heat fairly set in about the middle of December the dried-up pasture lands were in a highly inflammable condition. The outbreak of serious fires began about that period in the North-eastern District, near Beechworth, and continued until the end of February last. Although there were many hot and sultry days, the heat, with its usual accompaniment of dry northerly winds, was not of long continuance, the wind changing frequently to the south, and intervals of fairly cool weather coming between. Had the season been as dry and hot as that of 1897–8, with the thermometer registering at Melbourne over 100° F. in the shade for several days together and northerly winds prevailing, and enormous areas of indigenous grasses as dry as tinder, there is reason to believe that the colony would have had another Black Thursday. Even with a favorable summer and intervals of ordinary hot weather, the destruction of property and live stock this year was very great, while in Gippsland three persons lost their lives by fires. The bare recital, in the form of

* *Vide* Appendix.

a summary, of the losses caused by the most serious fires in the rural districts, as reported in the Melbourne daily journals, will show the extent of the devastation during the months of December, January, and February last :—

BUSH AND GRASS FIRES, SUMMER OF 1899-1900.

December, 1899.

Beechworth—Yackandandah district : Bush and grass fires, estimated damage, £50,000. Live stock, homesteads, fencing, and grass destroyed.

Broadford district : Crops, grass, and fencing.

Bairnsdale district : Private grazing lands and forest reserves burnt.

January, 1900.

Hamilton district : Extensive grass fires, Portland road, Monivae, Violet Creek, Ardachy, Arrandoovong, Keet Bank, Bochara, Penshurst. Grass fires (one estate 1,000 acres burnt).

Bealiba district : 2,000 acres grass and fencing burnt.

Warrenbayne district, Delatite : Large areas of grass burnt.

Laceby and Greta—Wangaratta district : About 5,000 acres grass and fencing burnt.

Euroa district (Gooram) : Grass fires ; two large bridges, and sixteen culverts destroyed.

Warrnambool district : "Greatest fires since Black Thursday." About 500,000 acres of grass burnt ; six woolsheds, many miles of fencing, 20,000 sheep, 300 cattle, and a number of horses destroyed. Damage variously estimated at from £100,000 to £200,000.

February, 1900

Meredith—Steiglitz district : Grass, timber, grain, straw, telegraph lines destroyed. At Elaine, grass, fencing, and hay destroyed.

Warrnambool district (Cooramook and Ballengeich) : Chiefly grazing lands, 50 persons burnt out ; grass, haystacks, vehicles, farm buildings, fencing, and some live stock burnt. Estimated area fire-swept, 50,000 acres and 100 miles of fencing. Estimated damage about £15,000.

Pyrenees Range—Avoca district : Dwellings, hay stacks, grass, fencing, and live stock burnt, and large areas of valuable timber in forest reserves damaged or destroyed.

GIPPSLAND.

Glenmaggie, Upper Maffra, and Briagolong districts : Three persons burnt to death ; about 40 miles of country fire-swept ; live stock, homesteads, bridges and culverts destroyed ; fencing, haystacks, and grass burnt.

Fernbank district : Homesteads, live stock, fencing, crops, and grass burnt.

Foster district : Scrub and grass fires ; homesteads, grass, and fencing burnt.

Carrajung district : Carrajung township almost destroyed ; fencing and grass burnt ; culverts on shire roads destroyed.

Tambo River district : Homesteads, fencing, crops, stacks, grass burnt ; damages estimated at £20,000.

Stratford district : Some thousands of acres of grass, large quantities of fencing burnt ; cattle and sheep destroyed.

Plenty River district : "Greatest fires since Black Thursday." Thousands of acres of grass, many miles of fencing, and homesteads burnt ; live stock destroyed.

Kilmore district : Many thousands of acres of grass and fencing burnt ; cattle and sheep destroyed.

Gordon-Lal Lal district : Over 10,000 acres grass burnt, and much fencing destroyed.

V.—NEW LEGISLATION RECOMMENDED.

After careful investigation we have come to the conclusion that early legislation is imperatively necessary, and we therefore recommend the submission to Parliament next session of a Bill which, *inter alia*, shall contain the following provisions :—

Supervision.

That the Chief Commissioner of Police, for the time being, be constituted Chief Fire Warden in and for Victoria.

That all members of the police force stationed in country districts, all forest officers, and Crown lands bailiffs be constituted fire wardens in and for Victoria.

That in localities where no police constable, forest officer, or Crown lands bailiff is stationed, such other fit and proper persons as may be selected for the work by the Chief Fire Warden be appointed fire wardens in and for Victoria.

That it shall be the duty of such Chief Fire Warden and fire wardens to prevent, as far as possible, the commission of offences against the Act ; to take prompt steps for the extinction of all forest, scrub, or grass fires ; to bring offenders against the Act to justice ; to conduct all necessary prosecutions, and generally to carry out and enforce the provisions of the Act.

Precautions against Fire.

That during the months of November, December, January, February, and March the following precautions shall be taken :—

The making and maintaining of effective fire-breaks not less than half-a-chain in width—

(*a*) by all owners or occupiers of grass land within and along the boundary fences of such land in their respective holdings, except owners or occupiers of such land situated in forest scrub districts. This provision to apply to all grass land having an area of 50 acres and upwards, and also to grass land having a less area than 50 acres when, in the opinion of the local fire warden, the making of such breaks is necessary for the protection of adjacent land from danger of fire ;

(*b*) by the Commissioner of Railways between each railway line and the boundary fences of the railway right-of-way on either side of such line ;

(*c*) by the Commissioner of Crown Lands and Survey in thickly settled districts along the boundaries of State Forest, Timber, or other Crown reserves, or large areas of Crown land not occupied under licence or lease wherever, owing to the open character of the forest or woodland there is a growth of inflammable grass, herbage, or scrub along the boundaries of adjacent private lands.

The use, fixture, and maintenance in an efficient condition in all locomotive engines running on the Victorian railways of—

(*a*) such arresters as experience and comparison with the latest pattern of arresters in use on the principal railway systems of North America and Europe, show to be most effective in preventing the escape of dangerous sparks from such engines ;

(*b*) such appliances as are most effective in preventing the escape of live coals or hot ashes from the ash-pans of the said engines.

The use and maintenance in an efficient condition in all threshing or other portable engines of effective spark arresters and the complete quenching or extinguishing of all live coals or hot ashes taken from such engines by the persons in charge of them.

The selection by the local fire wardens on the principal public roads or water reserves of the colony of suitable camping places for travellers. The spot for lighting fires at such camping places to be where practicable in the dry bed or channel of some creek, or on the edge of some running stream, lake, lagoon, dam, or other body of water, and no fire to be kindled thereat at any standing tree, stump, fallen trunk of a tree, limb, or large log, but to be kindled and fed with small wood only, and to be completely quenched or extinguished by such travellers before leaving such camping places. Where no such camping place is set aside and indicated by public notice posted in the immediate neighbourhood thereof every traveller in choosing a place to camp to select a clear space, having a radius of at least 10 feet, or to make a clear space having such radius, to kindle and feed a fire thereon, when such is required by him, with small wood only, and before leaving such camping place to completely quench or extinguish the fire thereon.

That the following acts be forbidden during the months of November, December, January, February, and March :—

The use of any ignitable or combustible wads or wadding in any gun, rifle, pistol, or other firearm.

The blasting of trees, wood, or timber with any explosives, unless at least two persons are present to prevent the spread of any fire arising therefrom.

The burning of trees, live or dead timber, scrub, or undergrowth, for the purpose of clearing land, except in such districts as may be proclaimed by the Governor in Council as forest scrub districts.

The burning of stubble, dry grass, or other herbage, except for the sole purpose of making such fire-breaks as are provided for by law.

The lighting or smoking of any pipe, cigar, or cigarette in the open air within 20 yards of any standing crop or field of hay, corn, straw, stubble, or other inflammable vegetable production.

The throwing down or dropping of any lighted or unlighted match, or lighted tobacco, pipe-ashes, cigar, cigarette, or other burning substance, unless the fire of such be at once extinguished on the spot.

The preparation or use, for the destruction of vermin, by owners or occupiers of land, their servants, employés, or agents, of any material in which phosphorus is an ingredient, except such material be chemically manufactured with some non-combustible material, and certified by the Government Analytical Chemist or by an analyst appointed under the provisions of the *Health Act* 1890 to be without free or lumpy phosphorus and safe for use on grass or other lands during the summer season.

That the following acts be forbidden :—

The lighting or smoking of any pipe, cigar, or cigarette in or within 20 yards of any stable, or within the same distance of any rick or stack of hay, corn, straw, or other inflammable vegetable material.

The placing, throwing, or dropping of any inflammable, combustible, explosive, lighted, or burning matter or substance, for the purpose of causing a fire with intent to damage person or property.

The burning of grass, stubble, herbage, timber, or scrub on a Sunday for the purpose of clearing the same.

That the Governor in Council have power to proclaim certain districts as *Forest Scrub Districts*, and to repeal, alter, or amend such proclamation when, owing to the clear and open character of the land in any such district, or any portion thereof, it ceases to be properly classed as such.

That no district be proclaimed a forest scrub district unless :—

(1) The land occupied therein by settlers is covered or partly covered with live or dead timber and thick scrub or forest undergrowth ; and

(2) Unless owing to the lateness of the rainy season or general humidity of the climate in such district, the grass and other herbage is green and succulent during the months of November, December, January, February, and March, and the timber, scrub, or undergrowth can be effectively burnt by settlers in the course of clearing their land only during such months.

That no person shall during the months of November, December, January, February, and March set fire to any timber, scrub, or other inflammable matter on any private land or land held under licence or lease from the Crown in a forest scrub district for the purpose of clearing the same :—

(*a*) While a hot northerly wind is blowing.

(*b*) Between the hours of four o'clock in the forenoon and six o'clock in the afternoon.

(*c*) Unless there shall have been cleared around the inside of the boundaries of such land of scrub, grass, or other inflammable herbage, a space not less than half-a-chain in width.

(*d*) Unless he shall have given to the local fire warden and also to the owners or occupiers of all lands adjacent to the land on which he intends to burn timber, scrub, or other inflammable matter, at least 48 hours' notice.

Should the burning of such timber, scrub, or other inflammable matter be regarded by the local fire warden as dangerous, owing to its situation with respect to inflammable matter on adjacent public or private lands, or owing to the state of the weather, the warden to have power to order the postponement of such burning until such time as in his opinion it can be undertaken with safety.

Should there be any tract of dry or inflammable grass or herbage within a forest scrub district which in the opinion of the local fire warden is a source of danger to adjacent public or private lands, the warden to have power to call upon the owner or occupier thereof to make an effective fire-break around the boundaries of such tract in the same way as if it were outside the limits of a forest scrub district.

Protection of Forests.

That in order to secure as far as possible the protection of forests from the ravages of fire, the following acts be forbidden during the months of November, December, January, February, and March :—

(*a*) Lighting or kindling, or assisting to light or kindle, or aiding or abetting another in lighting or kindling, any fire in the open air within a State Forest or Timber Reserve, or on any area of Crown land withheld from alienation for forest purposes, except such fire be required for camping or cooking purposes, when it shall be kindled and fed with small wood only in a clear space having a radius of at least 10 feet, and be completely quenched or extinguished by the person who lit or kindled it before he leaves the spot. Nothing in this provision to prevent a fire from being lit at any saw-mill for the burning of saw-dust, waste timber, or bark stripped from mill-logs, or for any other purpose deemed by the local fire warden to be necessary for the proper working of such mill, provided that due precaution be taken against any such fire spreading and causing damage.

(*b*) Lighting or kindling, or assisting to light or kindle, or aiding or abetting another in lighting or kindling, any fire in the open air within 50 yards of any State Forest, Timber Reserve, or area of Crown land withheld from alienation for forest purposes. Nothing in this provision to prevent the making of any fire-break required by law, or the burning of timber, scrub, or other inflammable matter authorized by law in any forest scrub district, provided that the precautions required to be taken in all such cases by the Fire Protection Act and the regulations made thereunder be duly observed.

Power of Wardens to call Assistance, Fines, and Cost of Protection.

That fire wardens in emergencies, on the outbreak of any dangerous fire, have power to call upon any able-bodied male person over eighteen years of age who may be in the part of the district where such fire is burning to assist in extinguishing it. Should such person refuse without reasonable justification or excuse to render the required assistance, his refusal to be deemed a misdemeanour, and to be punishable, on conviction, by such fine as may be fixed for the offence.

That any fines or penalties recovered from offenders convicted of any breach of the provisions of the Fire Protection Act be apportioned, one-half to the Treasurer of the colony, and the remaining half to the municipality in which the offence may have been committed.

That the cost of extinguishing fires, including the payment of any remuneration or allowance to such fire wardens as are not regularly employed in the service of the State, and also to such persons as are called upon by wardens to give aid in extinguishing fires, be borne in equal shares by the Treasurer of the colony and the municipality in which any such fire warden resides and any such fires may occur. Where a fire spreads to two or more municipalities, one-half the cost of suppressing it to be borne in equal proportions by such municipalities, and the remaining half by the Treasurer. In order to secure prompt payment of all just claims by the wardens for necessary expenses in properly carrying out their duties, such claims to be defrayed in the first instance by the Treasurer upon accounts being furnished by the wardens in due form, but one-half of such expenses to be repaid to the Treasurer by the municipal council or councils concerned within 30 days of the claim for refund being rendered.

Application of Act.

That the Fire Protection Act shall apply to—

(*a*) All territory which is not within the limits of the fire districts under the control of the Metropolitan Fire Brigades Board or the Country Fire Brigades Board.

(*b*) Any territory now forming part of a Country Fire District under the provisions of the *Fire Brigades Act* 1890, which may hereafter be excised from such district by the Governor in Council in pursuance of the provisions of section 5 of the said Act.

Regulations.

That the Governor in Council have power to make, alter, add to, and repeal regulations not inconsistent with the provisions of the Act :—

(*a*) Prescribing more fully the duties of the chief fire warden and fire wardens, and the manner in which such duties shall be carried out.

(*b*) Fixing the remuneration of such fire wardens as are not regularly employed in the service of the State.

(*c*) Fixing the remuneration of such persons as are called upon by the wardens to assist in extinguishing fires.

(*d*) Prescribing the restrictions under which fire-breaks shall be made in any district or municipality, and timber, scrub, or other inflammable matter burnt for the purpose of clearing land in any forest scrub district.

(*e*) For the better working of the Act generally.

VI.—Conclusion.

In any consideration of this subject, the question for final decision in our opinion is not whether destructive forest or grass fires in the hot season can be prevented by any legislation, however stringent, but whether the risk of such fires breaking out can be materially lessened by such legislation, coupled with effective supervision on the part of the persons intrusted with the duty of enforcing it and carrying it out. In other words, can those people who are now grossly careless in the use of camp fires, in using matches for smoking, in setting fire to timber and scrub when clearing land, in employing phosphorus as bait for vermin, and in misusing fire or inflammable material in various other ways, be compelled or induced to study their own and their neighbours' interests when the law requires them under severe penalties to do so, and thus prevent, as far as possible, the annual devastation of large tracts of country, the burning alive of sheep and cattle, and even at times the loss of human life. We believe that a great many of these fires are preventible without interfering to an undue extent with the reasonable requirements of settlers or travellers, and we therefore urge that this Report be taken into consideration without delay. After the favorable autumn and winter, there is already a fine growth of grass in most districts, and there is every likelihood that next spring will be one of the best seasons for pasture we have had for many years. Whether the summer sets in early or late, it is probable that there will be destructive fires when this heavy growth of natural vegetation dries up. It is of the highest importance, therefore, that legislation on the lines which we have sketched out, should be passed at an early date, in order that a fire preventive service may be in working order by the end of the year.

A. L. TUCKER, President.
ALF. S. BAILES.
J. BALFOUR BURTON.
D. J. DUGGAN.
DAVID HAM.
DAVID KERR.
CHAS. SARGEANT.
G. J. TURNER.

Forests Commission, Parliament House,
Melbourne, 18th July, 1900.

APPENDIX.

Accounts of devastation caused in Victoria by the fires of Black Thursday, 1851.

Devastation along McDonald's Track, West Gippsland, caused by the fires of 1898.

Use of spark-arresters in railway locomotives: American, English, and Australian practice.

Enforcement of Bush Fires Act in South Australia.

APPENDIX.

Accounts of the devastation caused in Victoria by the great fires on the 6th of February, 1851 (Black Thursday): Abridged from the narratives of William Westgarth, Rolf Boldrewood, and Garryowen.

I.

The weather had been unusually dry for some days with the hot wind from the north-west. The heat had been increasing daily, and this, as we comforted ourselves, was surely the climax which was to bring the inevitable reversion of the southerly blast and the restoring rain, for it was felt as the hottest day in my recollection. In town we did not hear of much that day, although reports came from time to time of sinister-looking signs from the surrounding interior, whence an unusual haze or thick mist seemed to rise towards the cloudless sky. Next morning accounts began to pour in from all quarters of an awful havoc, in which, sad to say, life to no small extent was lost, as well as very much property. There has never been, throughout Australia, either before or since, such a day as Victoria's Black Thursday, and most likely—or rather most certainly—it will never, to its frightful extent, occur again, for every year, with the spread of occupation, brings its step in the accumulation of protectives. Still, these fires are a terrible and frequent evil, and, even if the towns and settlements are safe, the destruction of the grand old forests is deplorable, and ere very many years will be, indeed, most sadly deplored. What between the unchecked clearances of the fires, and the unchecked clearances on the part of the colonists, I fear that those noble gum trees, the greatest and loftiest trees probably in the world, will have but a poor chance.—*Westgarth*: "Personal Recollections of Early Melbourne and Victoria."

II.

For some weeks previously the summer weather had been unusually hot and dry. There was, for a wonder, a cessation of the coast showers which ordinarily refreshed our pastures [in the Portland Bay district]. The morning was altogether abnormal—sultry, breezeless. The heavily vaporous sky, later on in the day, became lurid and awful. More than one terrified spectator believed that the last day had come, and not altogether without reason. The whole colony of Port Phillip was on fire at the same time, from the western coast to the Australian Alps, from the Snowy River to the Murray. Farms and stations were burning at Port Fairy and Portland. The wife and children of a shepherd on the Upper Plenty rivulet, eastward of Melbourne, were burnt to death, nearly 300 miles in another direction. Far out to sea, Tasmanian-bound vessels viewed with wonder and alarm a dense black cloud overhanging the coast-line like a pall, such as may have hung over the buried cities when the volcano heaved its fiery flood. Many miles from land great showers of ashes fell upon the decks of approaching ships. During the ensuing week tales came in from far and near of ruin and disaster—farms and stations, huts and houses, rich and poor, all had equally suffered in the great fire, which will be long remembered throughout the length and breadth of the land.—*Rolf Boldrewood*: "Old Melbourne Memories."

III.

On the 6th of February, 1851, there was a Black Thursday in Port Phillip, so called from the country being overwhelmed with fire and smoke, as if a destroying angel had winged its way through the air, scattering firebrands far and wide; its wake lit up with flaming forests, the fire and smoke spreading consternation and dismay throughout the province. From an early hour a hot wind blew from the north-north-west, and vast gusts of dust enveloped the town (Melbourne), and obscured the rays of the sun. At 12 o'clock the thermometer was 110 degrees in the shade; at 11 o'clock in another place it was 117 in the shade, at 1 o'clock 109, and at 4 o'clock 113 degrees. All that was observable from Flagstaff Hill and Batman's Hill was a reflected glare from the south and south-east; this was afterwards found to be at Dandenong, where a bush fire rushed the race-course, scattered the sportsmen there, and did such general damage that the inn was the only house left standing in the neighbourhood. It was not long before accounts of woe and desolation came trooping into town, and for a week after every wind bore tales of general ruin, individual losses, and suffering. In the Plenty Ranges the fire, it was said, was caused by the carelessness of two bullock-drivers, who had camped on the Diamond Creek on the preceding evening, and left some logs burning; these setting fire to the parched grass, the flames spread, and, fanned by the hot winds, fired the bush in every direction. The conflagration sped along to the surrounding ranges, and the whole country-side was so rapidly turned into a billowy ocean of fire that the few settlers looked on half-dead with fear. It ran up the highest trees, and the flames leaped from one tree to another. It glided swift as lightning along the margins of the creeks, and some of the people ruined by it never saw it till it crashed in about them with a crackling and roaring clamour. In the Plenty district one settler lost his wife, five children, home, and 1,100 sheep. Another settler suffered much by the loss of cattle, and more than a hundred persons were left homeless and penniless. A third was nearly burnt out, and four men in his employ saved themselves by plunging into a water-hole. One man was with a mate herding cattle when the flames suddenly encircled them. The mate escaped to an eminence clear of timber and grass within a short distance, the other jumped into a creek, where he was found so maimed that he was conveyed to the Melbourne Hospital, and died, after lingering in excruciating agony for a week. Every place was a scene of misery and lamentation, and the dead carcasses of sheep, horses, and cattle blocked up the water-ways and thoroughfares. At Diamond Creek I saw two days after a pile of sheep and bullocks, most of them dead, but some of the bullocks were in the last agonies of life. Among them was a mare, blinded from the effects of the fire, but otherwise uninjured. About twenty bullocks were blind and half-roasted, though alive and writhing with torture, and moaning in a heart-rending manner. The country between Geelong and Ballarat suffered extensively, much property being destroyed in those districts. It was said that not one house in ten was left on the Barrabool Hills, all the small farmers were burned out or ruined, and one settler was burned to a cinder while trying to put out a fire. The quantity of hay lost there and about Geelong was put down at 3,000 tons, and the wheat at 50,000 bushels. The fires reached

northward, as far as the Goulburn, where the sheep on several stations were considerably thinned, one settler alone losing 7,000. Kilmore strangely escaped, the country around for miles in every direction being a black burnt-up desert. Seymour and Honeysuckle escaped, though they were like islets in an ocean of flame for some days. No quarter of the district escaped, for the fires might be said to be general from Gippsland to the Murray, and from the Plenty to the Glenelg. At the Pyrenees, for a distance of 50 miles, the fires skipped along in every direction, playing some curious pranks. The Loddon country was fire-swept, and for six days it lasted on the Wimmera. Colac was not spared, and disastrous news was received from the far West. In the Portland country the bush was on fire in every direction. At Mount Gambier the township was almost wholly extinguished. Westernport and the wild Gippsland country were not spared. The Dandenong division was so devastated that every vestige of tillage or verdure was burnt off the ground.—*Garryowen:* "Chronicles of Early Melbourne."

Devastation caused in West Gippsland by the great fires of 1898.

[Abridged from the Melbourne *Argus* of 7th February, 1898.]

Along McDonald's track, through the Strezleckie Ranges, the fire has ceased its raging, and though great trees are still smouldering slowly, that is an advantage to the selectors rather than otherwise. Throughout the length of the track from Adkins' homestead to Whitelaw's Junction, a broad, black band, stretching far out on either side, shows where the fires passed; and along the whole stretch of that band there is nothing to relieve its funeral aspect, except a couple of small houses which somehow or other escaped. Whitened chimneys mark where fine homesteads stood, heaps of carcasses show where the stock-yards were located, and everywhere the trees are either burned to ashes, are standing black against the sky, or are lying charred upon the ground. Nowhere may a blade of grass be seen.

All along the track the municipal authorities are getting together the dead cattle on the roads, and burying them. Inside the selections the settlers are performing the same office. In a corner of one paddock quite a dozen cattle were crowded against the fence, and were there burned as they stood, vainly trying to break down the fences with their horns. In another paddock, five fat bullocks flying in front of the fire reached a shallow mud pool, in their frenzy, ostrich like, they sought to save themselves by hiding their heads; they were found subsequently roasted as they stood, the five of them with their heads buried in the mud. So, to any length, instances could be multiplied of the saddening experiences of the stock; and to them might be added others dealing with birds, snakes, wallabys, and hares, whose charred remains may be seen all over the fired country, and are now making of it a plague spot.

But sadder still are the stories of half roasted stock which survived the fire, and wandered round, blind and suffering, for days. A mounted constable at Korumburra spent some time riding through the burnt paddocks putting an end to the miserable lives of the dying stock. One bullock he saw charged him and his comrades, and missing them butted into a tree. His horns were broken in small pieces, having been calcined by the heat, and an examination of him, when he had been shot, showed that his eyes had been almost burnt out, that his flesh was charred in many places, that his hoofs had been burnt off, and that he was walking round on the stumps of his legs. Sheep were seen totally blind, and with as little wool upon them as if they were shaved with a razor. Wallabies bearing injuries were no longer scared at the sight of men, but ventured close alongside, dazed out of all fear by the fearful experiences they had passed through.

Spark-arresters, American and English.

[Abridged from reports furnished to the Commission by the Government of the State of Minnesota, U.S.A.]

I.

From Messrs. Burnham, Williams, and Co., Baldwin Locomotive Works, Philadelphia, U.S.A.

The system of spark-arrester which is found most efficient in locomotives is, for coal-burning locomotives, the device known as the extended smoke-box, with straight smoke stack, netting, deflecting plate, and spark ejector. In the enclosed drawing, B is a steel plate secured to the tube sheet above the tubes and to the inside of the smoke-box, and extends outward from the tube sheet and diagonally downwards in front of them at a sufficient distance to allow free passage of the products of combustion. These strike the deflecting plate, and are by it thrown down to the bottom of the smoke-box without interfering with the draught. The netting prevents them from rising and escaping through the stack. They therefore pile up in the lower forward end of the smoke-box over the spark ejector, and are there retained until the end of the run, when they are blown out by means of the spark ejector, or are allowed to drop out through a hopper. The arrangement of the netting and baffle plate is altered by various railroads, but the principle is the same. The purpose of the extension is twofold: first, to obtain sufficient area of netting to prevent the sparks being forced through by the pressure; and, second, to afford sufficient storage space for the sparks.

For wood-burning locomotives the most efficient spark-arrester is known as the Radley and Hunter smokestack. In this the sparks mingle with the products of combustion, rise through the straight pipe marked A in the plan, and strike against the cone B. This cone is provided with special baffle-plates. The force of the sparks is arrested by them, so that they fall into the receptacle D. The gases, minus the sparks, then escape through the baffle-plates attached to the inside casing of the stack, through the perforated plate or netting projecting from the outer opening down into the stack. The sparks are subsequently removed through the hand-holes marked G. There is no patent upon either of the above devices.

No spark-arresting device is absolutely efficient.—The degree of efficiency of any device depends upon the care with which it is maintained in good condition. Fine sparks will escape from either of the above devices when in the best condition, and coarse sparks will escape when in an improper condition. The fine sparks are not dangerous, the coarse sparks are. The straight stack above described for coal-burning locomotives has the advantage that there is nothing in it to destroy the momentum of the sparks, which are thrown vertically into the air, and have time to cool before falling upon the ground. This is less important in wood-burning locomotives, because the sparks are so light that they cannot be thrown far above the stack, and, furthermore, they continue to burn after escaping into the atmosphere. It is, therefore, important to retain them, as far as possible, within the spark-arresting device.

The two devices above described are those most generally in use throughout the United States, and either of them can be attached without difficulty to any existing locomotives at a cost, say, of £20 to £30.

The extension smoke-box is efficient so long as the netting is of proper fineness and remains intact. The size of mesh will depend upon the particular grade of fuel employed. If neglected, the netting is liable to wear into holes within two years. The Radley and Hunter stack is not liable to such deterioration, not depending upon the netting for its efficiency; such a stack should remain efficient until the inner facing is actually worn out by the wear of the sparks, which would not occur within several years. The care which should be given to locomotives to prevent the netting wearing into holes is primarily that of the engineer (driver), who should see that the front end is kept cleaned out; but in case he finds the netting wearing out the fact should be reported to the master mechanic. The work of renewing the netting can be done in any repair shop even with meagre facilities.

It is customary on the best managed lines to keep the record of a weekly inspection of the netting and spark-arresting appliances of locomotives for use in defence of fire suits. We do not consider it expedient to require the use of a specific form of spark-arrester. The general requirement that the railroads shall use the most efficient form in general use is a sufficient safeguard, leaving upon them the burden of proving in each instance that the form of arrester employed meets the requirements of the law.

II.

From Mr. F. W. Webb, Chief Mechanical Engineer of the London and North-Western Railway Company, Crewe, England.

The London and North-Western Railway Company own 2,796 locomotive engines, and do not use any kind of so-called spark arresters in the smoke-boxes. In the engines of this company we rely upon the brick arch and deflector doorplate, coupled with a large-sized blast-pipe, to prevent the emission of sparks. We obtain the latter by the arrangement of chimney bases in the smoke-box, which causes a more uniform draught through all the tubes than the general arrangement of high blast-pipes and no internal chimney base. The fire-hole door in our engine forms the deflector doorplate. The introduction of a grid, either conical or horizontal, in the smoke-box of a locomotive engine necessitates the blast being sharpened, owing to the obstruction caused thereby, and this increases the risk of ashes being drawn from the fire-box through the tubes into the smoke-box; and the brick arch not only prevents the emission of dangerous sparks, but, with the deflector fire-hole doorplates, forms an effective smoke preventer; in fact, we consider the whole arrangement an essential part of the modern coal-burning locomotive.

III.

Comments of the Baldwin Company on Mr. F. W. Webb's letter.

We did not refer to the appliances in the fire-box of locomotives, confining ourselves to the discussion only of spark-arresting devices. It is our practice to fit all coal-burning locomotives with a fire-brick arch, and, where the construction renders it suitable, to project the stack into the smoke-box, as described by Mr. Webb; but a spark-arresting device is always used in connexion therewith. The deflector doorplate has been repeatedly tried in the United States, but has not met with favour. The Adams vortex blast-pipe is known to us. A similar device, known as the Smith triple exhaust, has come into considerable use here. Its effect is to soften the blast of the exhaust. English engines which have been tried in this country have always been fitted with netting, to prevent the escape of sparks of a dangerous character. In the enclosed judgment (Earl Shaftesbury *v.* London and South-Western Railway Company—a claim for damages on account of trees and heather on wild ground being set on fire by one of the company's engines, in which some skilled witnesses swore that spark-arrester were worse than useless) no claim is made by the company that the engines cannot throw sparks, but that the exhaust is not strong enough to throw dangerous ones. It is, however, admitted that dangerous ones can escape. It is the practice here, notwithstanding the use of a mild exhaust, obtained either from the Smith triple exhaust-pipe or from compound cylinders, to use a netting in the smoke-box as an additional precaution, and we consider this additional precaution important. We are of opinion that the use of the compound system, reducing as it does the force of the blast without impairing the efficiency of the locomotive, is most valuable as a spark-arrester, as well as an economizer of fuel.

SPARK ARRESTERS, AUSTRALIAN.

I.

PATTERN OF ARRESTERS IN USE ON AUSTRALIAN STATE RAILWAYS.

Victoria.

Double arrester, grid pattern, fixed horizontally at right angles to each other 5 to 6½ inches apart; wire, No. 6 Birmingham wire gauge, 40 to the foot; size of opening, ⅛ inch bare.

New South Wales.

Double arrester, horizontal and vertical conical; wire, No. 12 Birmingham wire gauge; size of mesh, ½ inch.

South Australia.

Double arrester, horizontal and vertical conical. Horizontal arrester—wire, No. 14 Birmingham wire gauge; size of mesh, $\frac{3}{16}$ inch. Vertical arrester—wire, No. 6 wire gauge ($\frac{3}{16}$ inch full), ¼-in. spaces.

Queensland.

Plate ¼ inch thick, perforated with ⅜-in. holes, $\frac{9}{16}$-in. pitch.

Western Australia.

Netting on iron frame; wire, No. 16 wire gauge, 4 meshes per inch; size of mesh, $\frac{3}{16}$ inch.

Tasmania.

Plate $\frac{1}{4}$ inch thick, perforated with $\frac{7}{16}$-in. holes, $\frac{5}{8}$-in. pitch, and conical arrester; wire, No. 9 W.G., $\frac{3}{8}$-in. pitch at top.

II.

Extract from sworn evidence given before the Commission by Mr. T. H. Woodroffe, Chief Mechanical Engineer of the Victorian Railways.

Q. 41. You are aware that the Railway Department is often accused of setting fire to the country by sparks from the engines. What precautions are now adopted to prevent the escape of sparks from locomotives?—In the first place, for some years past we have burnt nothing but coal. At one time we burnt wood during a certain portion of the year. That was stopped, and we burn nothing but coal, which throws much fewer sparks than wood. All our engines are fitted with spark arresters; we put single arresters in the smoke-boxes during the winter months, and during the summer months we put an additional arrester wherever it can be done. The spark arresters are carefully made in the first instance; the meshes are as fine as possible, compatible with the steaming of the engine, and the drivers and men at the sheds and inspecting officers have all strict instructions to look after these arresters, and see that they are kept in proper order, and as far as I can ascertain that is carried out. Arresters are fitted on all the engines.

Q. 42. Was the adoption of the arrester you have in use made after trial of other arresters?—I believe so. It is the arrester that has been in use in the Department for fourteen or fifteen years—it has been greatly improved, alterations have been made in the shape, it has been made more durable. I may say that during the time I have had charge of the Locomotive Branch I have seen a great number of different classes of arresters tested, but I have not found any that were so efficient or more efficient than the one we have. Comparing it with the arresters of the adjoining colonies, and those in use in America, I think our arrester is as efficient as any.

Q. 43. A great number of inventors have turned their attention to spark arresters?—Yes. There are two things you have to attain; one is the prevention of sparks altogether, if possible, or at all events to break them up so fine that they do not do any damage. The other thing is to avoid interfering with the steaming of the engine; all arresters, more or less, interfere with that; those that we have interfere materially, but we stand the expense of it to avoid throwing any dangerous sparks out of the chimney. If in good order, I think ours is a thoroughly efficient arrester.

Q. 44. After comparison with those in use in other countries, you consider yours is equal to any?—Yes. This is a diagram of the arrester—[*the witness produced and explained the same*].

Enforcement of Bush Fires Act in South Australia.

Chief Secretary's Office,
Adelaide, 29th May, 1900.

SIR,

I have the honour, by direction of the Chief Secretary, to inform you, in reply to your letter of the 10th instant, that the Chief Commissioner of Police reports that the Bush Fires Act is strictly enforced throughout this colony, and that there have been no complaints as to any of its provisions being too severe, and, consequently, no agitation for its amendment on that account.

The Commissioner states also that Section 11 is strictly enforced, and the enforcement has not caused opposition or trouble. [This refers to the provision in regard to smoking in the open air.—*Vide* page 5 of the report.]

I have the honour to be,
Sir,
Your obedient servant,

L. H. SHOLL,
Under-Secretary.

The Secretary,
Forests Commission,
Parliament House, Melbourne.

By Authority: ROBT. S. BRAIN, Government Printer, Melbourne.