

1900.
VICTORIA.

REPORT

FROM THE

SELECT COMMITTEE

ON

RAILWAY SPARK ARRESTERS;

TOGETHER WITH THE

PROCEEDINGS OF THE COMMITTEE AND MINUTES OF EVIDENCE.

Ordered by the Legislative Assembly to be printed, 29th August, 1900.

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EXTRACTED FROM THE VOTES AND PROCEEDINGS.

WEDNESDAY, 25TH JULY, 1900.

9. RAILWAY SPARK ARRESTERS.—Mr. McKenzie moved, pursuant to *amended* notice, That a Select Committee be appointed to inquire as to whether a better "spark arrester" than the one now in use by the Railway Department could be adopted; such Committee to consist of Mr. Bowser, Mr. Gavan Duffy, Mr. Graves, Mr. Kennedy, Mr. Morrissey, Mr. Sangster, Mr. Wheeler, Mr. H. R. Williams, and the Mover, with power to send for persons, papers, and records, and to sit on days on which the House does not meet; three to be the quorum.
 Debate ensued.
 Question—put and resolved in the affirmative.

THURSDAY, 2ND AUGUST, 1900.

5. RAILWAY SPARK ARRESTERS.—Mr. McKenzie moved, by leave, That leave be given to the Select Committee appointed to inquire as to whether a better "spark arrester" than the one now in use by the Railway Department could be adopted to report the minutes of evidence from time to time.
 Question—put and resolved in the affirmative.

APPROXIMATE COST OF REPORT.

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REPORT.

THE SELECT COMMITTEE of the Legislative Assembly appointed to inquire as to whether a better "spark arrester" than the one now in use by the Railway Department could be adopted has the honour to report to your Honorable House as follows :—

1. Your Committee has examined the Chief Mechanical Engineer, the Engineer for Existing Lines, and several other Railway officers and employés. Numerous communications have been received from persons desirous of giving evidence on the question remitted to your Committee for inquiry.

2. Your Committee finds that it will not be possible to complete the inquiry and report to your Honorable House before the close of the Session.

3. It is, in the opinion of your Committee, desirable that the evidence which has been proffered should be given on oath.

4. For these reasons the Lieutenant-Governor in Council has been pleased to appoint the members of your Committee a Royal Commission.

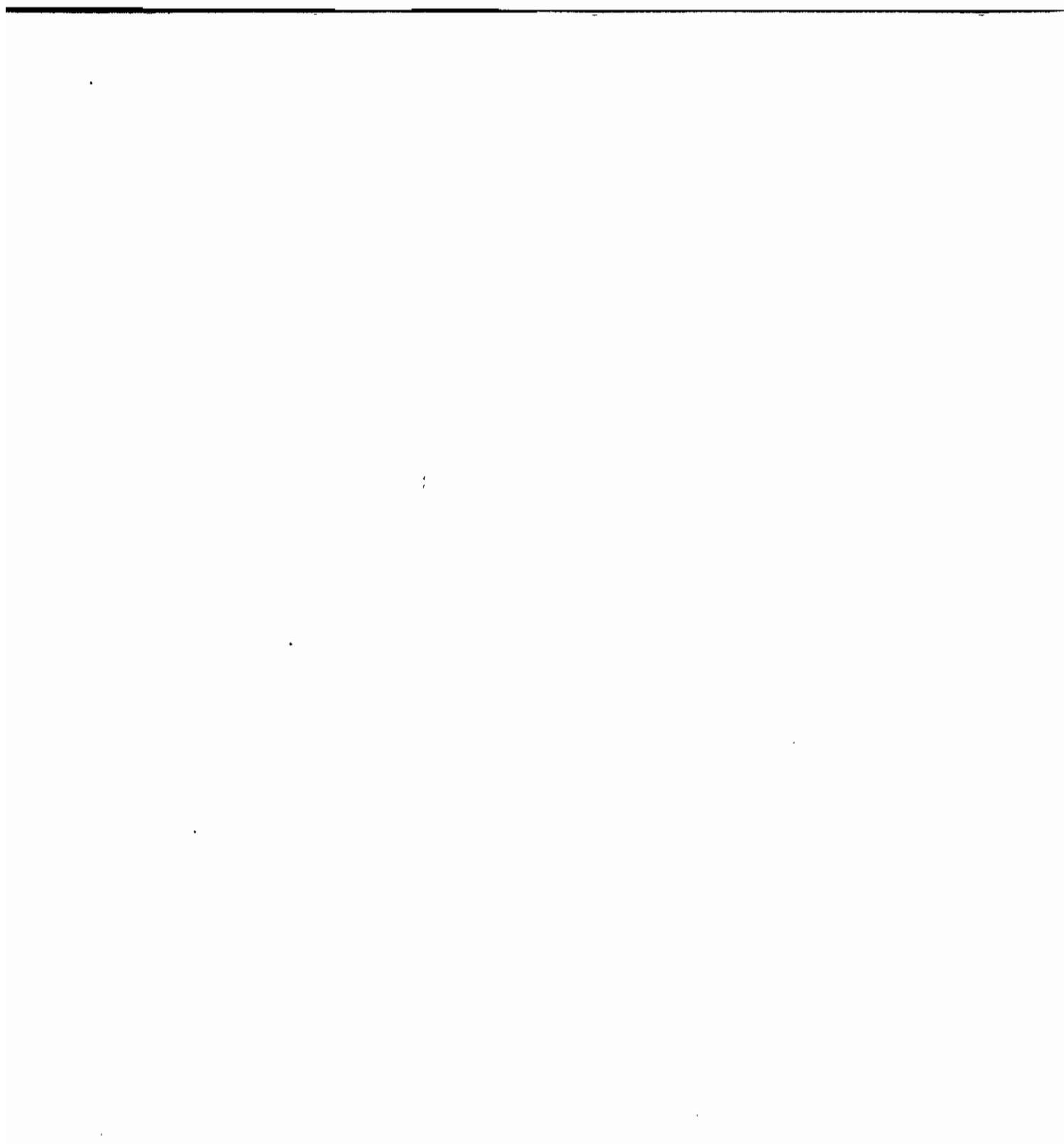
5. Your Committee has now the honour to lay before your Honorable House the Minutes of the Evidence taken.

6. During the progress of the inquiry, the "Instructions for the Guidance of Inspectors in the Existing Lines Branch" have come under the notice of your Committee. Regulation No. 143 of these "Instructions" prescribes that "The burning of grass must be commenced as soon as patches become dry, as by so doing the continuity of fire is checked. The burning-off must not be commenced *before Two p.m.*" This hour is fixed in accordance with the provisions of section 22 of the *Police Offences Act 1890*.

Your Committee is of opinion that it would tend to diminish the risk of fires spreading when burning-off operations are in progress if the hours for burning off were left to the discretion of the inspectors.

Your Committee, therefore, recommends that section 22 of the Act in question should be amended accordingly.

Committee-room,
29th August, 1900.



PROCEEDINGS OF THE COMMITTEE.

WEDNESDAY, 1ST AUGUST, 1900.

Members present :

Mr. Gavan Duffy,
Mr. Graves,
Mr. Kennedy,
Mr. McKenzie,

Mr. Morrissey,
Mr. Sangster,
Mr. Wheeler.

The Clerk of Committees read the extract from the Votes and Proceedings of the 25th July, 1900, appointing the Committee.

Mr. McKenzie was called to the Chair.

Committee deliberated.

Ordered—That the New South Wales Railways Commissioners be requested to furnish information as to the spark arrester used in New South Wales, with diagram of same, and results obtained; also if Alves' patent fuel economizer is used on the New South Wales railways, and, if so, with what results; and if a New South Wales Railway officer could give evidence in Melbourne if the Committee so desired; Queensland, South Australia, and Tasmania to be also asked for information.

Ordered—That the Railway Department be asked for a return for last five years of number of claims sent in for fire damage, in what district fires occurred, and action taken in each case.

Ordered—That the evidence of some of the Railway officers be taken on Wednesday next, at eleven o'clock; officers of Locomotive Branch to be first examined, commencing with Messrs. Woodroffe, Lewis, and Stinton.

Resolved—That the Committee ask for leave to report the minutes of evidence from time to time. Committee adjourned until Wednesday next, at eleven o'clock.

WEDNESDAY, 8TH AUGUST, 1900.

Members present :

MR. MCKENZIE, in the Chair;

Mr. Bowser,
Mr. Graves,
Mr. Kennedy,

Mr. Morrissey,
Mr. Sangster,
Mr. Wheeler.

An extract from the Votes and Proceedings of the Legislative Assembly of the 2nd August, 1900, empowering the Committee to report the minutes of evidence from time to time was read.

A letter from the Deputy Commissioner of Railways asking for postponement of date fixed for hearing evidence from Railway officers, owing to illness of the Chief Mechanical Engineer (Mr. Woodroffe), was read.

Ordered—That Wednesday next, at eleven o'clock, be fixed for the hearing of the officers from the Locomotive Branch.

A letter from James McIntosh, of Rock Bank P.O., asking to be heard as a witness with respect to fire on his property, was read.

Ordered—That Mr. McIntosh be informed that the Committee cannot inquire into individual grievances, but if he can show that fire was caused by sparks from an engine, he should write stating so, and Committee would then consider desirability of calling him as a witness.

Mr. Hack applied to be heard as a witness with reference to an invention of his own.

Ordered—That Mr. Hack be informed that Railway officers will first be heard.

Applications, in writing, to be heard were also submitted from D. Anderson, J. Crabtree, and H. W. Channing, for Channing's Spark Arrester Company.

Resolved—That after hearing Railway officers, the Committee will consider these requests to be heard before the Committee.

Letter from T. Quinlivan, Coghill's Creek, to Mr. Holden, M.L.A., read.

Ordered—That reply be sent to Mr. Holden stating scope of inquiry and asking for further information re arrester used in traction engines by Mr. Quinlivan.

Telegram from Railways Commissioner, Queensland, re information required by the Committee, read.

The Clerk of Committees submitted the following documents received from the Secretary of the Royal Commission on State Forests :—

- (1) Letter dated 20th February, 1900, from the Railways Commissioner, New South Wales.
- (2) Letter dated 23rd February, 1900, from the Railways Commissioner, South Australia.
- (3) Letter dated 2nd March, 1900, from the Railways Commissioner, Queensland.
- (4) Sample of spark arrester used in South Australia (dated 12th April, 1900).
- (5) Letter from Chief Mechanical Engineer, Victorian Railways, with return as to compensation paid for fire damage.

- (6) Letter from Chief Mechanical Engineer, Victorian Railways, dated 25th January, 1900, with sample of spark arrester of 11 wires to inch 19 B.W.G. used.
- (7) Sketch plan of arrester used in South Australia.
- (8) Sketch plan of arrester used in Queensland.
- (9) Sketch plan of arrester used in New South Wales.

The Clerk of Committees also laid before the Committee an extract from the Eleventh Progress Report of the Royal Commission on State Forests and Timber Reserves as to fires caused by sparks from locomotives.

Mr. Morrissey entered the room and took his seat.

Ordered—That the Crown Law Department be asked to furnish a copy of the report of the judgment given by His Honor Judge Chomley in the case of *Cleary v. Victorian Railways Commissioners* for fire damage, tried at Benalla about 1894.

Ordered—That the Deputy Railways Commissioner be asked to furnish a list of the engine-drivers running the express trains on the North-Eastern, Bendigo, and Serviceton lines and also the names of the drivers of the heavy goods trains on the same lines.

Committee adjourned until Wednesday next, at eleven o'clock.

WEDNESDAY, 15TH AUGUST, 1900.

Members present:

Mr. MCKENZIE, in the Chair;

Mr. Bowser,
Mr. Gavan Duffy,
Mr. Graves,
Mr. Kennedy,

Mr. Sangster,
Mr. Wheeler,
Mr. H. R. Williams.

A letter was read from the Railway Department (Chief Mechanical Engineer) forwarding model of smoke box, showing spark arresters in use on the various Australian railways; model of ash pan arrester now being tried on the Victorian railways; and bag containing cinders taken from the smoke box of an engine fitted with the Department's Standard Arrester.

The Committee proceeded to take evidence on the question referred to it.

Thomas Hale Woodroffe, Chief Mechanical Engineer, Victorian Railways, called and examined.

W. Stinton, Deputy Chief Mechanical Engineer and Workshop Manager, called and examined.

Mr. Bowser entered the room and took his seat.

Examination of witness continued.

Mr. Kennedy entered the room and took his seat.

Henry Lewis, Locomotive Running Superintendent, Victorian Railways, called and examined.

The following letters were laid before the Committee and read:—

From Railway Department, with list of engine-drivers.

From Alexander McLennan, Secretary Morris Fuel Saver and Spark Destroyer Company Limited.

From J. C. Bowring, Secretary Fuel Economizing Company Limited.

From Henry Allibon, Deniliquin, re his arrester used on the Deniliquin and Moama Railway.

From D. Anderson, asking to be allowed to exhibit a model of his arrester.

From Anthony Roberts, St. Arnaud, through Mr. McBride, as to a spark arrester used by him on traction engine.

From E. Richardson, for leave to submit an invention for arresting sparks.

From A. F. Hack, asking leave to submit his invention for arresting sparks.

From General Manager, Tasmanian Railways.

From Commissioner of Railways, South Australia.

From Commissioner of Railways, New South Wales.

From Thomas Short, C.E., to be heard, re his invention for spark arresting.

Received.

Committee deliberated.

Ordered—That the Engineer for Existing Lines (Mr. Norman) and the Chief Assistant Engineer (Mr. Sims) be called for two o'clock to-morrow.

Committee adjourned until to-morrow, at two o'clock.

THURSDAY, 16TH AUGUST, 1900.

Members present:

Mr. MCKENZIE, in the Chair;

Mr. Bowser,
Mr. Gavan Duffy,
Mr. Graves,
Mr. Morrissey,

Mr. Sangster,
Mr. Wheeler,
Mr. H. R. Williams.

Charles Ernest Norman, Engineer for Existing Lines, called and examined.

George W. Sims, Chief Assistant Engineer, Existing Lines, called and examined.

Ordered—That two inspectors of permanent way and six engine-drivers be called to give evidence on Wednesday next.

Committee adjourned until Wednesday next, at eleven o'clock.

WEDNESDAY, 22ND AUGUST, 1900.

Members present :

MR. MCKENZIE, in the Chair ;

Mr. Bowser,
Mr. Gavan Duffy,
Mr. Graves,

Mr. Kennedy,
Mr. Sangster,
Mr. Wheeler.

Henry Parsons, Inspector of Permanent Way, Victorian Railways, called and examined.

William Ley, Inspector of Permanent Way, Victorian Railways, called and examined.

John Ryan, engine-driver, Victorian Railways, Northern line, called and examined.

John Mitchell, engine-driver, Great Southern line, called and examined.

James Keck, engine-driver, Northern line, between Bendigo and Melbourne, called and examined.

Edward Fitzgibbon, engine-driver, Sydney express, between Benalla and Melbourne, called and examined.

Mr. Sangster entered the room and took his seat.

Examination of witness continued.

Ordered—That the Railway Department be asked for the papers respecting fire at Faithfull's Creek Station, about four or five years ago.

Mr. Gavan Duffy entered the room and took his seat.

James Hodgkinson, engine-driver, Eastern line, called and examined.

Mr. Wheeler entered the room and took his seat.

Examination of witness continued.

Patrick Minogue, engine-driver, Great Southern line, called and examined.

Committee adjourned until Wednesday next, at eleven o'clock.

WEDNESDAY, 29TH AUGUST, 1900.

Members present :

MR. MCKENZIE, in the Chair ;

Mr. Graves,
Mr. Kennedy,
Mr. Morrissey,

Mr. Sangster,
Mr. Wheeler,
Mr. H. R. Williams.

The Chairman submitted his Draft Report.

The Report was read.

Paragraphs 1 to 5 again read, and agreed to.

Paragraph 6 again read, amended, and agreed to.

The Report, as amended, was adopted.

Resolved—That the Chairman present the Report to the Legislative Assembly.

Committee adjourned.

MINUTES OF EVIDENCE.

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MINUTES OF EVIDENCE.

WEDNESDAY, 15TH AUGUST, 1900.

Members present:

MR. MCKENZIE, in the Chair;

Mr. Bowser,
Mr. Gavan Duffy,
Mr. Graves,
Mr. Kennedy,

Mr. Sangster,
Mr. Wheeler,
Mr. H. R. Williams.

Thomas Hale Woodroffe, examined.

1. *By the Chairman.*—What is your occupation?—Chief Mechanical Engineer, Victorian Railways.
2. I understand that the evidence to be tendered by the Department has been formulated, so you might just give it in your own way, and questions can be put to you by members of the Committee afterwards?—I would suggest that course. I have prepared a statement showing the history of the spark-arrester question up to the present time on the Victorian railways and in other countries, as far as I have been able to gather from various scientific papers and discussions of the day. I propose to deal with, first, the various arresters that the Department have used in the Department from the early days. This information has been obtained from officers of the branch from records and from my own personal knowledge. The information dates back to 1862, and I propose to trace the history of the question up to the present date. The descriptions are illustrated by small sketches on the margin of my notes.—[*The witness read the following:—*]

Victorian Railways,
Chief Mechanical Engineer's Office,
Melbourne, 13th August, 1900.

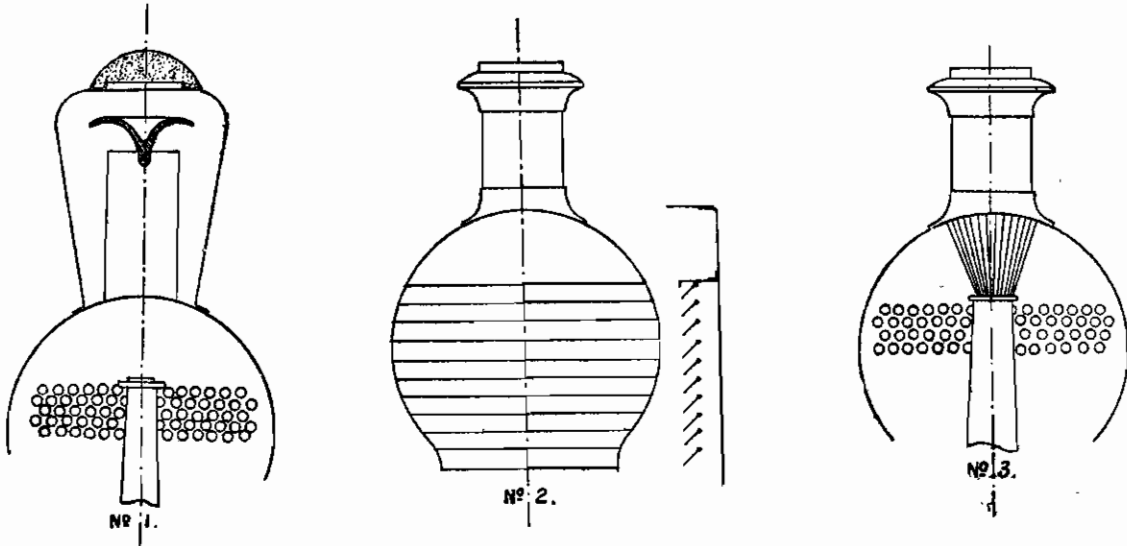
GENTLEMEN,

STATEMENT RE SPARK ARRESTERS, VICTORIAN RAILWAYS.

With a view of facilitating the work of the Committee, I have prepared a statement which will show the information in the possession of the Department up to date, in connexion with devices tried and in use for preventing the escape of sparks from the chimneys and cinders from the ash pans of locomotives in this and other colonies and countries.

A full-sized model of the smoke box of a "Y" class (heavy goods) engine with the departmental standard double arrester fixed therein, also tracings showing arresters, samples of netting, perforated plates, &c., used in other colonies and countries are also exhibited for the information of the Committee.

From the information furnished me by officers of the branch and from records, and also from my own knowledge, I find that the various contrivances used by the Department since 1862 were approximately as follow, and shown by small sketches below:—



No. 1 was a cast-iron concave deflector, fixed near top of the chimney (in conjunction with a wire bonnet placed on top of the chimney), and which were supposed to cast the sparks down into a receptacle built round the chimney.

This was a very early application.

This arrester was supplied with engines received from England about 1862, and was not successful.

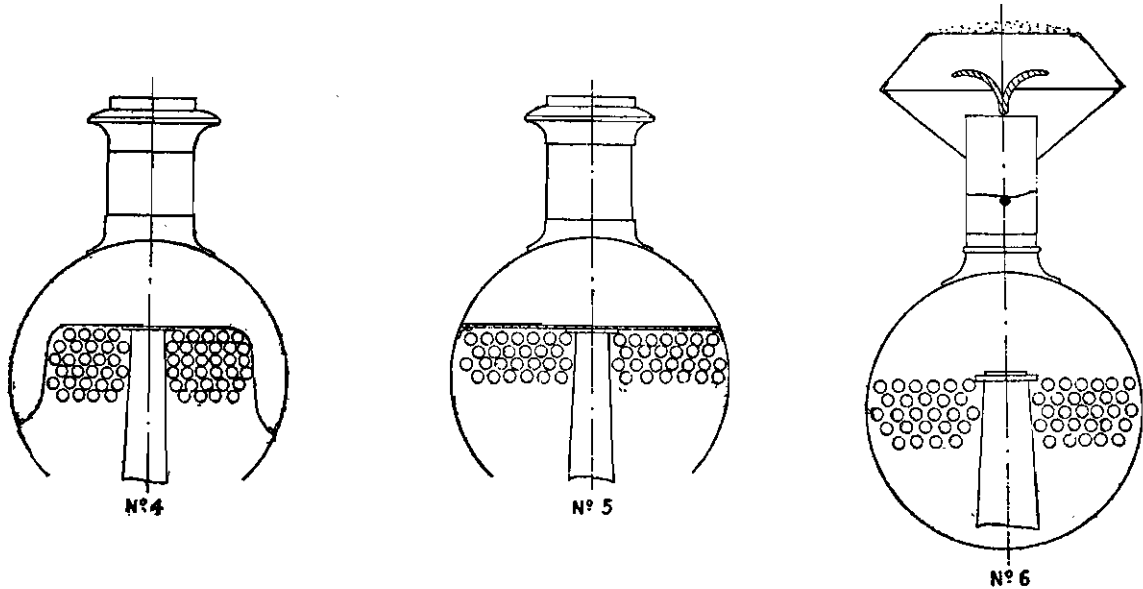
And was not adopted.

No. 2 consisted of venetian shutters or baffle plates placed inside smoke box against the tube plate. They were supposed to throw the sparks down into bottom of smoke box.

This arrester was also supplied with the engines received from England about 1862, and had to be abandoned.

It interfered with the steaming.

No. 3 was a conical cage constructed of about $\frac{3}{8}$ -in. round iron, made fast to top of blast pipe, extending upwards into chimney. This was put into use about 1870, and was in use several years, but did not prove very effective in arresting dangerous sparks.



No. 4. About 1875 a curved grid or grating, made with bars of about $\frac{3}{8}$ -in. round wire, spaces $\frac{1}{8}$ inch, and made fast to top of blast pipe and sides of smoke box, was introduced.

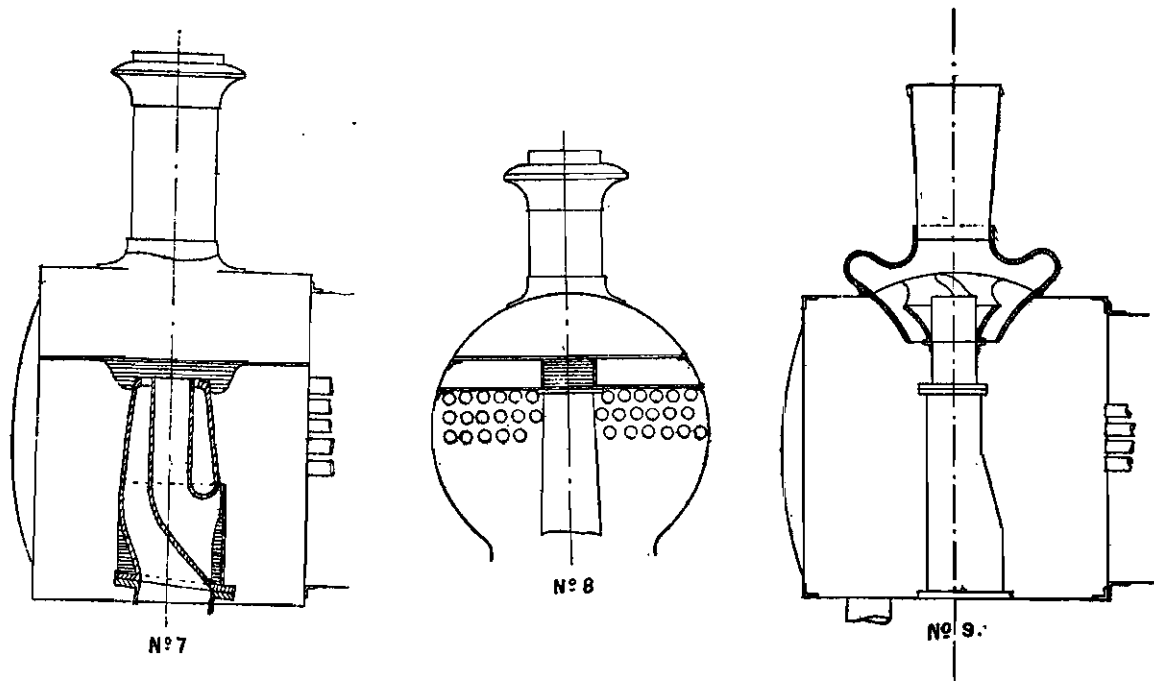
This was in use several years and gave better results than those formerly in use.

No. 5 was made from similar material to No. 4, but was flat and fixed horizontally across the smoke box. The wires in this arrester were about $\frac{1}{8}$ inch apart and spaces the same.

This arrester was in use in 1880, and proved more successful and easier made than the foregoing.

That is practically the beginning, I presume, of the horizontal arrester, 1880.

No. 6. Fifteen American engines manufactured by the Baldwin Locomotive Company were imported from America in 1880. This spark arrester consisted of a wire netting $\frac{1}{8}$ -in. mesh on top of the chimney, with a cast-iron deflector, very similar to No. 1. These arresters were used for some years, and did not give such good results as the departmental arresters.



No. 7. "Vortex" blast pipe. Patented by Mr. W. Adams, Locomotive Superintendent, London and South-Western Railway, and fixed in some of the engines in 1889. The inventor claims for the patent that the velocity of the exhaust is reduced and softened, the lower boiler tubes are brought more into action, less fuel is consumed, and spark arresters can be dispensed with.

A large number of engines in England and Europe are, I believe, fitted with the "Vortex" pipe. The ten (10) engines running here with this pipe are all fitted with a single departmental arrester, same as in South Australia.

They have some running there, and find they can do with one arrester instead of two.

No. 8. About 1889 some modifications were made in No. 5, and it was decided to fix two (2) grids in the smoke box, one above the other, 5 to 6 inches apart, during the summer months. The wires in the top arrester were placed at right-angles to those on the bottom.

A further improvement was made in 1894, when the diameter of the wire was reduced to No. 6 gauge, spaced 40 to the foot, giving spaces of $\frac{1}{8}$ inch bars. The wires are held together by transverse bars which vary from $3\frac{1}{2}$ inches to 6 inches apart.

That is practically the arrester shown there. One is used in winter, and in summer the two are used with a conical cage between them.

Two arresters are used in 424 of the running engines during the summer months, that is from September to April, somewhat varying with the district.

We leave it somewhat to the discretion of the inspectors, according to the rainfall of the districts.

The spaces between the two arresters are from 5 inches to 6 inches, and bars are placed at right-angles. The space between the two arresters at the blast pipe is enclosed by a wire conical cage made of the same material. Great care is taken to cover up all holes and corners round the pipes, &c.

Each engine is supplied with a wire brush for cleaning the arrester, and strict instructions are issued regarding its use.

Some of the engines have been fitted with wire netting, $\frac{3}{8}$ -in. mesh, made of wire No. 12 gauge, American pattern, instead of parallel wires, which have given similar results as regards stopping sparks as the departmental arrester, but its life and durability are considerably less than that of the latter arrester; besides, it is very difficult to clean it without injury, which is not so with the departmental arrester.

Trials have been made with an engine fitted with a single fine horizontal grid, 60 wires to the foot, spaces about $\frac{1}{8}$ inch, with movable deflector plate over upper rows of tubes, and extended smoke box.

This was effective as regards stopping sparks, especially from wood, but has been found in practice with coal to require more attention in cleaning than the departmental arresters, and it was considered that the double arrester was a more effective safeguard.

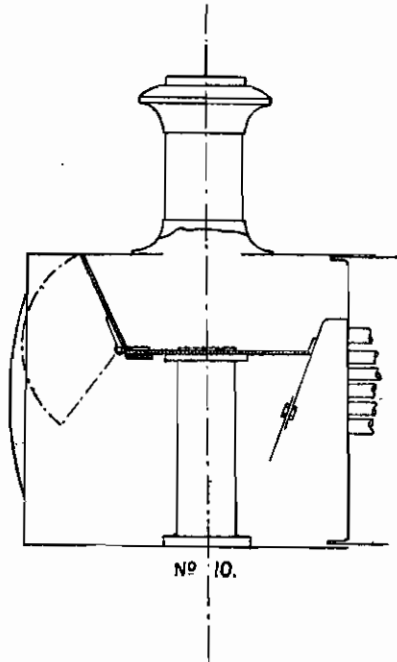
No. 9. Trials were made in 1896 of an arrester used on the Swedish Government railways, which was said to be the outcome of many experiments on the Swedish railways, and adopted by the authorities there.

The railways there run through pine forests, and it is very important that few sparks should be thrown.

By this construction the products of combustion pass through a spark chamber furnished with curved vanes, giving a rotary motion to sparks, thereby grinding against the walls before reaching the chimney proper. This was fitted to 433 "Y" class engine in December, 1895, and found to materially interfere with the steaming of the engine, and was taken off.

We took a great deal of trouble with this arrester. We got the Norwegian Consul to get drawings sent out, and made a contrivance exactly to the drawings, but found that with a full load the engine would not steam with it.

3. *By Mr. Gavan Duffy.*—Has it that effect in Norway?—I do not know whether they tax their engines up to their full capacity or not. They speak very highly of it, but we could not make it do here.



No. 10. Recently one broad-gauge engine and two narrow-gauge engines have been received from the Baldwin Locomotive Company, fitted with deflector plates in front of the top rows of tubes and a wire netting, $\frac{3}{8}$ -in. mesh, No. 12 gauge wire, placed across the smoke box. These engines have not been running very long; the results will be carefully watched.

I understand this arrester is the one generally used throughout America, with various modifications.

4. *By the Chairman.*—Was it put in the smoke box when the engines were manufactured?—Yes; and came out.

5. Was it in the specifications?—No; the specifications were that they were to be fitted with the best in use in America. I may say that one of our officers, on a trial the other night, reported to me that a great many sparks were emitted.

6. Sparks that would be dangerous in the summer?—I cannot say.

7. You do not propose to stop all sparks, only the dangerous ones?—Just so. That is about all we have tried departmentally. There are a lot of outside inventions which I will deal with presently, but those submitted cover pretty well all we have tried departmentally.

The reasons for the adoption of grids formed of parallel wires as against netting or perforated plates are because the greater durability, lesser liability to get out of order, lesser liability to choke, and facilities for cleaning, beside which they cannot easily be tampered with.

We consider it a very important thing in a spark arrester for it to be a fixture so that it cannot be tampered with on the road.

8. *By Mr. Wheeler.*—What do you mean by that; is there some mechanical contrivance that can be thrown out of gear?—Some have doors.

9. For what purpose?—One is fitted with a door for the purpose of getting up steam. I think any such contrivance is fatal to any arrester. We have a very good and honest lot of men to deal with as a

whole, but amongst a large body of men there may be some who, if they were stuck up on a bank with a heavy load and could not get on, would feel a very great temptation to open the arrester. This is one objection I have to the American arrester—I notice there is a big door that can be opened and shut.

10. *By Mr. H. R. Williams.*—Is that door in the arrester in the narrow-gauge engines supplied by the Baldwin Company?—Yes. I believe it is not to be in the last compound and other three engines. I might state that this subject, as you will learn, is one that is engaging not only us in Victoria, but the American authorities and European engineers, and is one that is going to be brought up before the International Railroad Congress to be held in Paris next September; the discussion on the various means that the various companies have adopted all over the world with the view of determining which is the best. There are a multitude of contrivances, but there are none yet agreed to as the best.

Mr. E. Sauvage, who is reporting on behalf of a large number of European railways to the International Railroad Congress on the subject of spark arresting, concludes—“Parallel rods offer less obstruction to the draught of locomotives than wire-work and perforated plates.” (See *Railroad Gazette*, 25th May, 1900, page 332.)

I mention that as some corroboration of our opinion as to parallel bars being the best.

The Victorian Railways Department has at present about 424 running engines fitted for double spark arresters, and 51 engines fitted for single spark arrester, and 10 engines with single arrester in combination with the “Vortex” blast pipe.

Most of those fitted with single arresters are shunting engines not doing much work, and some American engines.

The cost of the double arrester is about £4, fitted and fixed.

That is similar to the one in the model now before you.

Further appliances which are claimed to have an appreciable effect on the diminution of sparks are brick arches in the fire box and baffle plates, or smoke shoots at the fire hole doors, which are fitted to the fire boxes of all the principal running engines.

The brick arch is for better combustion and to save fuel; but it is claimed it has an effect on spark throwing.

As a further precaution, the Department, in October, 1895, entirely discontinued the use of wood for steaming, coal alone being used.

Prior to 1895 we used wood in the winter months, but we have discontinued that practice.

11. *By Mr. Graves.*—Was that the year you had to pay so much for damage?—It was during the great coal strike in 1891.

As regards the devices for preventing cinders falling from the ash pan (though, personally, I do not think cinders from the ash pan are the cause of fires outside the railway fences, drivers being instructed to take every care in this respect, see Instructions)—some cases have occurred of sleepers and rubbish left on the permanent way being set fire to, and such have been ascribed to the escape of cinders from the ash pan.

To deal with this, the Department some time ago commenced to fit engines with fixed wire doors over the opening to the ash pan, such as are fixed on the New Zealand railways (see Tracing marked 1355a). This appliance materially affected the steaming of the engines, and the making of them was discontinued.

12. How many of them were so fitted?—There were fifteen fitted at that time.

13. Including the Great Southern line?—I could not tell you that just now, but we can furnish you with a return showing that.

14. There were fifteen fitted?—Fifteen made with that particular grid. We found it materially affected the steaming of the engines. They got warped and choked, and we discontinued it; we are now trying a movable curved perforated plate in front of the ash pan door—[*explaining by means of the model*]. This is used in New South Wales, and, I was informed by Mr. Thow, with success.

15. *By Mr. Wheeler.*—Would it cost much to adopt it to your engines?—A couple of pounds per engine, I suppose.

16. *By Mr. Graves.*—They can put it up and down to clean it out?—It has that disadvantage, that it is under the control of the driver.

A movable curved perforated plate in front of the ash pan door, used on the New South Wales railways, has recently been fitted to a number of engines (about 80), and this is said not to interfere with the draught. Sufficient time has not elapsed for me to be able to say if the advantages warrant the outlay.

As far as I can ascertain from examination of published drawings of locomotives, and the discussions at the meetings of the various Locomotive Engineering Associations in Europe and America during the past few years, it does not appear to be the practice to fit English, European, or American engines with ash pan protectors.

I cannot find any information or drawings in regard to it.

The three engines recently received from the Baldwin Company are not so fitted.

In order that the arresters may be properly looked after and kept in order, the following rules and instructions bearing on the question are issued:—

72. Spark arresters.—District Loco. Inspectors will arrange as to the months during which engines may be run with single spark arresters. (See instruction 134.) They will also see that every facility is given to the boiler inspector for the examination of all arresters.

133. Precautions to be observed when steaming wood is used.—Should it be necessary to burn wood for steaming purposes, fire bars must be properly regulated and kept as close as possible; blast pipes must be kept clean, and drivers should be instructed to run with the dampers as close as possible to prevent sparks escaping from chimney or ash pan. They must also be instructed to carefully examine spark arresters every day to see if there be any holes through which sparks might escape. Use of wood for steaming purposes abandoned in 1895.

134. Spark arresters.—No engine is to be permitted to run unless fitted with a spark arrester or arresters in good condition. They must be kept perfectly clean, and brushed with the wire brush supplied for that purpose at least once every day by the fireman; the driver being responsible that this is done. In all cases engines may be run with single arresters only during the months of May, June, July, and August, inclusive, in the northern districts; and from April to September, inclusive, in the southern districts. This matter to be arranged by the District Loco. Inspector. Arresters when taken out for storing should be carefully labelled with the number of the engine to which they belong, and must accompany the engine when transferred to another station.

135. Examining spark arresters.—The boiler inspector has been instructed to examine the spark arresters of all engines. Every facility and assistance for doing so is to be given him. It is to be distinctly understood that this order does not relieve the Loco. Inspectors, foremen, boilermakers, drivers, firemen, or others from any responsibility in connexion with spark arresters, and they will be held responsible for any neglect of duty in this direction. The boiler inspector has received strict orders to report any such cases coming under his notice.

136. Cleansing of blast pipes.—During the dry season special care is to be taken to keep blast pipes thoroughly clean for at least twelve inches from the top while in position.

137. Boiler tubes and blast pipes.—The tubes of all engines are to be thoroughly cleaned every day, and the blast pipes taken down once every three months to permit of those tubes being cleaned, which cannot be otherwise reached.

The blast pipes are to be burned out before being replaced. When the blast pipes of Q class engines are removed the nuts of the studs that fasten the cylinders together in exhaust cavity must be carefully tested with a spanner to see that they are secure.

138. Brick arches and baffle plates to be kept in good order.—Brick arches and baffle plates must be kept in good order, and are to be replaced when worn out. The boiler inspector to report any case of neglect.

139. Suitable fire bars to be supplied.—Locomotive foremen and drivers in charge are held responsible for seeing that the proper and most suitable fire bars, which will be determined by the Chief Mechanical Engineer, to suit the various classes of coal used by the Department, are supplied to the engines under their charge, and that they are maintained in good condition.

233. Precautions against fire.—The utmost care must be taken during the dry season to have fire bars as close as possible, to prevent fire dropping out on the road. The admission of air by the fire box shoots must also be carried out to the fullest extent practicable, so as to enable the engine to run with damper nearly closed.

Spark arresters, smoke boxes, tubes, and ash pans are to be kept clean, and blast pipes are to be kept clean and to their full size.

234. Fires caused by knocking out ashes.—Complaints have been made of drivers knocking out their fires on the road with the dampers open, thereby causing the ashes to drop from the ash pan and set fire to the grass. Drivers must run with their dampers as close as possible consistent with getting steam, and on no account must the pricker be used on the fire with the damper open.

235. Fires to be reported.—Enginemmen must, at all times, keep a sharp look out for fires occurring close to or anywhere near the railway line, and report the same as soon as possible to their locomotive foreman, giving full particulars as to locality and cause of fire, so that immediate inquiry may be made into all the circumstances connected therewith. Reports to be sent by telegraph, if necessary, and the nearest permanent-way repairer notified. Any driver failing to report fires as here instructed will be severely dealt with.

277. Ash pans and smoke boxes to be thoroughly cleaned before engine is put away.—Before putting their engines away drivers must see that their firemen thoroughly clean their ash pans and smoke boxes, and also that their engines are supplied with sufficient fuel, and thoroughly equipped for the next day's work, unless specially instructed otherwise by the locomotive foreman.

278. Fires to be dropped at ash pits.—Fires are to be dropped and ash pans cleaned at the ash pits at coal stage, and any driver doing his work elsewhere, particularly in the proximity of wood heaps, will be severely punished.

Those instructions are to the effect that the drivers, who are primarily responsible, are to see that all those appliances are kept in proper order; and if they are not, it is their duty to report any defect or anything wrong in the Repairs-book, after they run their trip. And then the foremen of the various sheds are also responsible, and the superintendents are also responsible, to see the others carry out their duties, and, as an independent check on those men, I, some years ago, instructed an officer who goes round inspecting the boilers, and who is not under the control of the running men, but under the control of the Newport officials, to also inspect spark arresters and report anything he found wrong.

17. *By the Chairman.*—Did you ever receive any report to the effect that the boxes are not properly looked after?—Yes, there have been cases; in fact, I have examined certain boxes myself. In one case in particular, when I saw an engine throwing sparks, I traced the thing up and found the arrester was not in proper order. This is a circular that is sent out at the commencement of the dry season in addition to the usual instructions.

CIRCULAR TO LOCO. INSPECTORS AND FOREMEN, No. 78/94, DATED 29TH DECEMBER, 1894.

Circular No. 65/94 re-issued.

Re Circulars 54 and 58/94, now that the dry season has commenced, please instruct enginemmen to keep a sharp lookout at all times for fires occurring close to or anywhere near the railway line, and to report the same as soon as possible to Loco. Inspector or foreman, giving full particulars as to locality and cause of fire, so that immediate inquiry may be made into all the circumstances connected therewith. Reports to be sent by telegraph if necessary.

Also please instruct enginemmen to take every precaution to prevent fire escaping from the ash pan as well as from the funnel, as directed in the above-mentioned circulars.

Several cases have recently come under my notice of enginemmen failing to report fires as above instructed; all drivers are now informed that any future omission of this kind will be severely dealt with.

CIRCULAR TO LOCO. INSPECTORS AND FOREMEN, No. 45/95, DATED 24TH OCTOBER, 1895.

Re Instructions 96, 97, and 156, and previous circulars, now that the dry season has commenced, please instruct enginemmen to keep a sharp lookout at all times for fires occurring close to or anywhere near the railway line, and to report the same as soon as possible to Loco. Inspector or foreman, giving full particulars as to locality and cause of fire, so that immediate inquiry may be made into all the circumstances connected therewith. Reports to be sent by telegraph if necessary.

To minimize the risk of fire, the use of steaming wood is to be discontinued until further orders. Spark arresters of all locomotives under your charge are to be kept clean and in first-class order, and blast pipes well cleaned out at least twelve (12) inches from the top whilst in position. Also please instruct enginemmen to take every precaution to prevent fire escaping from the ash pan as well as from the funnel as directed in the above-mentioned instructions and circulars. Enginemmen failing to report fires as above instructed will be severely dealt with.

In November, 1896, this circular was issued without alteration.

Since 1896, a committee of all the principal loco. officers meets every month, when the above matters are discussed and dealt with.

As far as we can, the officers and men are impressed with the importance of taking every precaution.

A very large number of inventions for arresting and extinguishing sparks have been submitted to and investigated by the Department. I herewith furnish a statement of those dealt with during the last ten (10) years, with abstracts from the reports on each. There were a large number before this period. Of course, all the original papers can be readily obtained if the Committee so desire.

I have had this taken from the papers, giving the dates, the names, the trials, and comments.

The list shows that 123 proposals have been submitted, 29 of which had frequent trials. Some a great many. Of the remainder, facilities were offered where the invention was thought worthy of it, but they were not availed of. None of those that were tested were considered to be as efficient as the departmental arrester.

Considerable care has to be taken by the Railway Department in granting trials to see that *bonâ fide*, but too sanguine, inventors and their financial backers are not run into useless expense in testing worthless inventions, and, on the other hand, to avoid giving speculating syndicates power to make capital out of departmental trials of so-called inventions or promises of trials.

18. *By Mr. Wheeler.*—Have you charged all the inventors for the trials?—Since a certain date.

19. *By the Chairman.*—And those who were offered trials and declined, on what ground did they decline—because they had to pay?—I imagine that was the cause. They were told if they paid they could have a trial, although, perhaps, we did not think much of the invention.

20. *By Mr. Wheeler.*—How many trials have you given to the 29 referred to?—They are various, some ten or twelve.

21. *By the Chairman.*—Will the information take long to give us in regard to the 29?—They are all here in the paper.

22. *By Mr. H. R. Williams.*—In the long list of all the patents, applications for which have been made for trial, will you indicate by some mark the 29, so that we could look over them?—It is all made clear, the name of the patentee, description of arrester, trial, and comments on it. I will read the first one on the list, that of W. D. Davies. I do not know anything about this personally, as it was before my time—[*reading from the list handed in*]. Without the papers I do not know what was done in that matter, whether there were other trials or not. The next was an invention by a Mr. Crabtree—[*reading again from the list*]. The third was by Mr. Cowderoy. The next one is one introduced by Mr. W. B. Shaw, I think the manager of the Phoenix Foundry, but since dead—[*reading further from the list*].

23. *By the Chairman.*—Will you indicate by some mark the 29 referred to in the list you have handed in?—I find on the face page there is a summary of all those that have had a trial, so you can trace them from that. There are not only those that have had trials, but the number of trials each have had. Of course you can get any further information you require from the Department. I might say, before leaving this, that there is naturally a great deal of difficulty in convincing any one of the inutility of their inventions, and that sometimes gives rise to disputes, correspondence, and statements of unfairness; but I may say we have every desire to be fair, or to give every one every facility for trying their inventions. When I went to the Department in 1893, I went with a free mind and a free hand. I was not in favour of any spark arrester. I only wanted the best, and I gave full facilities for all those inventions that came under my notice to be tried.

24. In the case of any of the gentlemen who applied for trials, were their inventions in use in any part of the world formerly, or are they now?—I cannot say now, but I think it is exceedingly probable.

25. Some have applied to the Committee who had them in use?—I am reminded that Mr. Allibon has one in use on the Deniliquin line. His trials are shown in the paper I have handed in.

26. Will you please read that one, as it is an important one?—Yes—[*reading the same*].

27. *By Mr. Gavan Duffy.*—I notice you tried it with wood; are the drivers giving those reports comparing the steaming with other engines using coal?—In some cases those reports are made after using coal. In some cases they might do what you say. Of course this arrester was tried with coal, and would not steam with coal.

28. You notice the man Oakley used coal and reported more favorably?—Yes.

29. *By the Chairman.*—You know on the Moama and Deniliquin line they use wood and coal, and they use that arrester?—Yes; I know that. If you wish that particular file of papers or any other, we have them, and they can be produced. I have merely condensed from them. I go on to say in my notes:—

There is also the extreme difficulty, if not impossibility, of convincing introducers of patents. Many of them knowing nothing whatever of the conditions under which the contrivance has to work. Further, a contrivance which might be fairly successful on trial might utterly fail under every day conditions.

The next information I have to give is a description of the arresters used in the adjoining colonies. They are shown here, and I have a tracing of them which is made in such a form that they can be easily compared. The Committee can have that if they wish. Of course there are no two of them exactly alike, but the Committee can compare them for themselves.

Of the arresters used in other colonies the following are the descriptions as shown by drawings presented to the Conference of Locomotive Officers held in Adelaide last year:—

NEW SOUTH WALES.—Double arrester, horizontal and vertical conical wire, No. 12 Birmingham wire gauge, size of mesh $\frac{1}{4}$ inch.

SOUTH AUSTRALIA.—Double arrester, horizontal and vertical conical. Horizontal arrester—wire, No. 14 Birmingham wire gauge; size of mesh, $\frac{1}{8}$ inch. Vertical arrester—wire, No. 6 wire gauge ($\frac{3}{8}$ inch full), $\frac{1}{2}$ -in. spaces.

QUEENSLAND.—Plate, $\frac{1}{4}$ inch thick, perforated with $\frac{3}{8}$ -in. holes, $\frac{1}{2}$ -in. pitch, with deflector plate.

WEST AUSTRALIA.—Horizontal netting on iron frame—wire, No. 16 wire gauge, 4 meshes per inch; size of mesh, $\frac{1}{8}$ inch.

TASMANIA.—Horizontal plate, $\frac{1}{4}$ inch thick, perforated with $\frac{1}{8}$ -in. holes, $\frac{3}{8}$ -in. pitch, and vertical conical arrester—wire, No. 9 W.G., $\frac{1}{4}$ -in. pitch at top.

NEW ZEALAND.—Class "B." This arrangement consists of a plate perforated with rectangular holes $\frac{1}{4}$ inch by $\frac{1}{2}$ inch long, fixed longitudinally across the smoke box above the top row of tubes. Class "W" for soft coal burning. These engines are from the Baldwin Company, America, and the spark-arresting apparatus consists of a cast-iron cone with concave top fixed on top of chimney proper, by which the products of combustion are deflected, the sparks striking the outside shell of chimney and dropping into a space between inside and outside shells, and thence back into smoke box by means of cinder shoot. The top of exhaust pipe is placed very low, and a short adjustable petticoat chimney is fixed on top of exhaust, thus distributing the draught evenly through upper and lower rows of tubes.

30. *By Mr. Graves.*—Is that a similar one supplied in the engines supplied to us?—Similar to those that were supplied originally, as far as the cone arrangement is concerned. I may state that the last two years we have had conferences of the leading railway officers of the various colonies. The locomotive men have met, and have discussed kindred subjects; also the traffic and permanent-way officials; and afterwards the Commissioners.

Tracings of the above are also attached, also tracings of the New Zealand ash pan arrester and the one now in use by the Victorian Railways.

The question of spark-arresters was fully discussed at the conference of principal railway officers and Commissioners, held in Adelaide in February and April last, and the following minute was recorded:—

"In all the colonies either perforated plates or wire screens are laid horizontally in smoke boxes. In some of them an additional conical spark arrester or horizontal screen is also used. In a few of the colonies screens are used in front of the ash-pan doors to catch cinders which might otherwise escape.

"Claims for compensation for damage alleged to be caused by sparks are not recognised in any colony."

Of course each one thinks their spark arrester the most efficient, but we all thought either of them complied with the law.

31. *By Mr. Gavan Duffy.*—You state facts in the minute, but do not make any recommendation?—No.

32. Did you attempt to arrive at any decision?—The question was discussed as to which was considered the best, but no decision was arrived at. It was generally agreed that each one complied with the law.

33. Do you keep minutes of your conferences ; would the discussion be obtainable ?—Yes, I think so. I will endeavour to get it for the Committee.

34. *By Mr. Wheeler.*—Have any colony since that conference adopted any other than their own ?—I think not, because the Forests Commission appears to have been in communication with them, and the descriptions of the arresters given agree with what was exhibited at the conference.

35. *By the Chairman.*—The practical result was that each colony thought its arrester the best ?—Yes, though I do not know that there was any positive statement to that effect.

36. *By Mr. Gavan Duffy.*—They did not agree to that, but that they were good enough ?—Yes, that was the outcome of the discussion. For instance, there has been a law case in New Zealand lately. I have got what they say about the spark arrester there ; they say that they have the very best in the world.

37. *By Mr. Graves.*—Did that case go before a judge and jury ?—It went before a Commission.

38. *By the Chairman.*—New Zealand was not represented at the conference ?—No.

39. *By Mr. Wheeler.*—Have you their plan ?—Yes.

40. *By Mr. Gavan Duffy.*—I gather from what you said, in New South Wales especially, besides the horizontal arrester they have a conical arrangement. Would it not follow if the same steam could be got it would be a double safety ?—We put another screen across the smoke box, which gives the same effect.

41. *By Mr. Wheeler.*—You use one in winter, and when the dry weather comes you put the other in ?—Yes.

42. Are your engines all fitted that way ?—Yes. As regards the English practice, they do not seem to be very much used.

43. *By Mr. Graves.*—In England it is generally raining in some part of it ?—Yes ; but there have been some very large fires there. This is what Mr. Webb, the Chief Mechanical Engineer of the London and North-Western Railway, says :—

“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 door plate, 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 interual chimney base. The fire-hole door in our engine forms the deflector door plate. 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 door plates, forms an effective smoke preventer ; in fact, we consider the whole arrangement an essential part of the modern coal-burning locomotive.”

As a matter of fact, we have the brick arches, the deflector fire box door plate, and the grid in addition.

On American railways, as we are all aware, this subject has been most extensively treated for years ; every conceivable form of screens, baffles, extinguishers, cones, cages, bags, deflectors, &c., &c., having been tried, during the last 40 or 50 years.

In 1883, a committee of the American Railway Master Mechanics' Association inquired into the question of spark arresters, and reported that the United States Government had at that time granted more than 600 patents for spark-arresting appliances, and over 300 others for improvements in appliances for consuming smoke, and yet no competent authority had said that any of these 900 improvements were worthy of general adoption.

The committee reviewed and discussed 115 patents, which are given with illustrations in the proceedings referred to.

In December, 1899, or sixteen years later, *Locomotive Engineering*, an American railway paper of authority, states that—“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 a 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.”

From my reading of the discussion on the subject the above is the opinion of most of the American locomotive engineers.

I observe that the subject of spark arresters is to be discussed at the meeting of the International Railway Congress to be held in Paris in September next.

Mr. E. Sanvage, on behalf of a large number of European railways, will report as follows :—

* “The treatment of front end nettings and extended front ends in their relations to the arrest of sparks, and the obstructions offered to draught, contains nothing essentially new. The devices used are various forms of netting, the chief points of difference being that some nettings were fixed vertically, some horizontally, and others at various compromising angles.”

Mr. Quereau, on behalf of the United States and other American railways, will report, amongst other conclusions, that for preventing fires caused by sparks from stack that :—

†23. “The baffle plates and netting should be so designed as to extinguish the sparks, break the cinders up, and then discharge them into the open air.

24. “Systematic and competent inspection of front end arrangements, especially the netting, at regular intervals in connexion with a permanent record showing the condition at the time of inspection and the repairs made.

25. “The use of fire guards made by ploughing two or three furrows as far from the track as possible, and then burning over the ground between the tracks and furrows.”

It will be seen from the conclusion 25 in the latter's report that after all these years of trials of a multitude of inventions, one of the precautions recommended is the cutting of furrows outside the fences, thus practically admitting that no American contrivance is perfect.

The arrester most common on American engines is the deflector plate in front of the top rows of tubes combined with a single wire netting in various forms and angles across the smoke box.

Mr. Quereau, in above, reports that petticoat pipes may be substituted in the future for the deflector.

44. *By the Chairman.*—When you speak of cutting the grass, you refer to chipping between the fences ?—Yes ; and the land-owners in addition put two or three furrows.

45. That would not be much protection ?—Probably if the grass was burnt between the furrows and the fence it would increase the protection.

46. That is on the private land outside your fence ?—Yes.

47. *By Mr. Gavan Duffy.*—Can you give us to understand what a deflector plate is ?—It is sometimes called a diaphragm—[*explaining on the model*]. The tendency is for the bulk of the flames to come through the upper rows of the tubes ; the idea of the deflector is to baffle this and cause them to flow through the lower tubes, and thus distribute the heat better.

* See *Railroad Gazette*, page 450, 29th June, 1900.
† See *Railroad Gazette*, page 33, 19th January, 1900.

48. Are all your engines fitted with them?—No, not all; but there are baffle plates at the fire box end.

49. I thought you said they were built with brick arches and baffle plates?—That is another plate. The object of it is that when they open the fire, instead of the cold air going through the tubes, it is thrown down on the fire. In Mr. Webb's case, of which he speaks, that plate is fixed on the fire-hole door. We use a separate plate. That is shortly the information I have in connexion with railways. I thought that I would say what my opinion of a perfect spark arrester is.

The requirements of a perfect spark arrester, in my opinion, are—

1. That it should prevent all sparks from escaping from the chimney that would set fire to goods, &c., on train, or grass, &c., adjoining the line.
2. That it should not interfere with the free steaming of the engine up to its fullest tractive power, and without increasing the consumption of fuel.
3. That it should be strong and durable, easily fixed, and easily kept clean and in good order.
4. That it should not be capable of being manipulated or tampered with in service.
5. That it should provide easy access to the tubes and other fittings in smoke box.

I consider that the departmental arresters, when in proper order, fairly comply with four out of five of these conditions, and even the double arrester does not very appreciably increase the consumption of coal.

I do not say that it does not interfere with the coal consumption to a certain extent. The double arrester does, the single arrester does but very little. The double arrester somewhat increases the consumption of fuel.

50. *By Mr. Gavan Duffy.*—Could you fix the percentage of increase?—No.

51. *By the Chairman.*—Every one would interfere more or less with the draught; that was the opinion of Mr. Webb?—Yes.

52. The putting in of a grid obstructs the draught?—Yes.

53. *By Mr. Wheeler.*—Can you give an idea of the consumption of coal when you have the two arresters in use, the additional quantity of coal used?—I have not taken that out, but I dare say about 1 per cent. or $1\frac{1}{2}$ per cent.—something like that. The only other remarks I wish to make are, that I was under examination by the Forests Commission, and all my evidence is there, which could be taken if you wish. Then I wanted to say that I thought the use of compound engines would lessen considerably the liability to spark throwing. Compound engines are on their trial just now, but they are coming into use largely in America. I read the statement the other day that about half the engines in America are being made compound. They are being used on the Continent too, though in England they do not seem to be taking much to them. The object of them is they economize steam. The steam is used in two cylinders, and the effect is the steam is exhausted at a low pressure, and the blast has not the same tendency to draw the sparks through the tubes as in a simple engine. We have two or three of those compound engines on trial, and propose to make some of them.

54. *By the Chairman.*—Have you any of the Phoenix engines finished yet?—One is finished and delivered; but they are not compound, they are simple engines.

55. You propose to have some made?—Yes, but the contract is not let yet. The only other point is this: For the entire doing away with sparks, it appears to me that the use of liquid fuel is the solution of that difficulty, provided, of course, that the petroleum refuse could be got at a cost not prohibitory. There is no doubt that liquid fuel is the ideal fuel, as there would be no sparks, a lesser quantity used, a lesser quantity to handle, and no smoke, and other advantages.

56. *By Mr. Gavan Duffy.*—Where is that used?—On the Great Eastern Railway in England for many years, on a great number of steam-boats, and on the Russian railways. It has also been experimented with in the States, and in Germany.

57. *By the Chairman.*—Have you any idea of the relative cost. Of course, it would be dearer here?—Yes. I am speaking of petroleum refuse.

58. *By Mr. Graves.*—They are making petroleum from the Moe coal, and experiments are now going on in Germany with it?—I have an idea the Shell Transport Company supply, among other products, lubricating oil and refuse for burning. The manager of the company told me some time ago that he expected to be able to deliver liquid fuel here which would compete with coal, but, of course, that remains to be seen.

59. *By Mr. Gavan Duffy.*—Would the engines want to be converted?—Yes, a very little alteration of fire boxes, and tanks instead of coal bunkers.

60. I suppose some of the engines in the worst districts could be used in the summer time. Even if it were dearer the extra expense would not be very great?—I do not know; it depends on the price they could deliver it at. It would have to be delivered here at from £1 to £1 5s. a ton of good quality before it could look at coal.

61. *By the Chairman.*—You said you did not think that fires originated from the fire boxes?—Yes, that is my opinion—that is, fires on adjoining properties.

62. Of course, I presume you must be assuming that the grass is burnt between the line and the fence?—Yes; of course, that would be part of the assumption.

63. Because, supposing there was a very strong hot north wind, as on the 23rd December last, when several fires occurred, do you not think it would be sufficient to carry the live embers and sparks large enough to cause fires, even across the line, and into the paddocks outside?—It is exceedingly doubtful. They fall between the rails.

64. *By Mr. Wheeler.*—Do you not chip outside the rails. I saw men at work the other day just outside the permanent way. A little way from the sleepers you chip?—Yes.

65. That would effectually stop any fire from going over?—I should think it would; I should think the cinders would keep inside the rails.

66. Was that the object you had in view in doing that chipping?—It is for drainage. Every well-kept road should have the cess kept clear for drainage.

67. Should it not be done all along the lines?—Yes. I think it is done generally.

68. *By Mr. H. R. Williams.*—Do you not clear the lines of all growth just before the summer?—Yes, they are all weeded.

69. All through the year, not only through the summer time?—Yes.

70. *By Mr. Wheeler.*—You tried that arsenic on them, did you not?—Yes.

71. How did you find that answer?—It answered in some formations, and not in others, and it was very expensive.

72. Was it more costly than weeding?—Yes.

73. What did you pay for it per ton; I understand you got it from the Pyrites Works?—My recollection is about £6 per ton.

74. You used it in solution?—Yes, and caustic soda with it.

75. That cost more than actually weeding?—Yes; it is some time ago since I had to do with it, and there have been trials since. The other officers could tell you exactly about it. My recollection is that it was too expensive, even if efficient, and it was not efficient with some weeds.

76. Perhaps you could not get water handy always?—Yes, that was the difficulty, the time taken to fill the train.

77. *By Mr. Graves.*—You mentioned that you did not think that fires were caused by the ashes or cinders from the ash pan; is that correct?—Yes; that is, fire outside the fences.

78. Your reason was that you thought the cinders dropped between the rails on the permanent road?—Yes.

79. I think you also stated that in some districts or places sleepers were set on fire and burned, and had to be replaced?—I do not know whether those particular sleepers had to be replaced, but we had cases of burnt sleepers.

80. If that was the case, we will assume they had to be replaced. Would they burn at once, or would it take some time to consume a sleeper before it was put out?—It would depend on the character of the sleeper, and the age of it.

81. Do you know the Donald line?—Yes.

82. The sleepers there were trees cut in two. On that line is it a fact that you suffered largely from the fact of sleepers going on fire?—I do not know.

83. If a sleeper goes on fire, and the fire lasts, in hot weather would it be possible to confine the fire or sparks to that sleeper between the rails, or would they go, in hot weather with a high wind, into adjoining paddocks?—Yes, it is possible.

84. Then it is possible that fires might originate from that cause?—Yes.

85. Do you know whether it is the view of the men driving the engines that very few sparks come to the ground alive; that when a spark goes from the funnel it is soon cold?—Yes, that is what we think with the double arrester.

86. Are men who drive the engines paid a consideration for doing the most work with the least coal?—No.

87. Do they get nothing extra?—There are consumption sheets published every week showing the men who have the lowest record. We class the engines on the different roads, and the man with the lowest coal and oil consumption is shown in the margin. We do that for the establishment of a spirit of emulation among the men.

88. Supposing that you established a certain spark arrester, would that not to a certain extent more or less damage the steaming power of the engine?—If you stop all sparks, you stop all steam.

89. Therefore would it not be to their interests if the men were paid in character on consideration not to have a spark arrester if they could do so with safety. Would they not get better results with a spark arrester?—They would, of course. In connexion with that subject, as I say, we have the consumption sheets of each man, and each particular running, keeping them as much as possible alike, and the men's names are published each month.

90. That is not to his discredit?—No, but the loads of their engines are fixed, and the time. If a man is behind time, or does not take a full load, he is taken to account.

91. *By Mr. Wheeler.*—What is the difference between running on one line with a heavy gradient and on a line comparatively level?—The difference in load.

92. You make the load up so much more, and there is the same coal used?—There would be a little less.

93. On heavy gradients there would be less loads?—Yes.

94. And on the level roads you put on more, so the consumption would be about the same?—It would vary.

95. *By Mr. Gavan Duffy.*—The Chairman mentioned fires on the 23rd December, and the assumption is the fires were caused by some defect in the engine. There were three fires caused by the same engine, or when the same engine passed along the line, and there was supposed to be some defect in it. Could you produce some reports concerning that engine by the driver of it?—Yes, we can produce all the papers.

The witness withdrew.

Walter Stinton, examined.

96. *By the Chairman.*—What is your occupation?—Deputy Chief Mechanical Engineer and Workshops Manager, Victorian Railways.

97. Have you your evidence formulated; would you like to make your own statement to the Committee?—I heard Mr. Woodroffe's evidence, and I agree with it.

98. Do you have the direct supervision of those arresters and the engines?—As regards fitting them to various locomotives.

99. Not afterwards?—Not afterwards, as a rule.

100. Mr. Lewis has control of them, then?—Yes, as a rule. I have seen a great many of those arresters after being fitted.

101. You have no further responsibility after being fitted, unless they come back for repairs?—No. It never came within my province until lately.

102. Have you had anything to do with supervising them, or seeing whether they do the work properly?—Only seeing the papers.

103. You have no personal knowledge of their practical working?—No.

104. Can you give us any additional information to that already supplied by Mr. Woodroffe?—No, any more than that I travelled all of the adjoining colonies and New Zealand, and saw the spark arresters in use, and examined them and got a great deal of information, which was readily given by the officers in charge of the engines.

105. That information, I presume, has been tabulated and given to us by Mr. Woodroffe?—Yes.

106. There is nothing that you can say to supplement what has been already given?—No, I think not. I can, perhaps, explain the model now in the room to the Committee if they desire it—[*explaining the same*].

107. *By Mr. Sangster.*—Do you think if the spark arrester were not used in the smoke box you could increase the size of the exhaust?—Not much. In the “Y” class engines the original drawings show $4\frac{1}{2}$ inches in the blast pipe. We have increased that to $2\frac{3}{4}$ inches; that is because we have a lighter atmosphere here than at home.

108. *By Mr. H. R. Williams.*—Is it possible for a driver if he goes out with a double gridiron, if he has difficult steaming, to take one of those grids out?—No, he would have to have special tools to do that.

109. You have never found that to be done?—No, not unknown to the loco. foreman. It would be the duty of the men who clean the fire boxes and smoke boxes to report that if they found it had been done, as those receptacles are cleared out every night.

The witness withdrew.

Henry Lewis, examined.

110. *By the Chairman.*—What is your occupation?—Locomotive Running Superintendent, Victorian Railways.

111. Have you formulated your evidence?—No, I cannot say that I have. I have heard Mr. Woodroffe's evidence, and I quite agree with all he said. I may mention that I have had an exceptional opportunity of testing most of the spark arresters that have been tested by the Department. In addition to being a mechanical engineer, I have the advantage of being a driver on the main line passenger trains, so I think I understand the subject as well as anybody.

112. You have seen tests made of the various arresters in the other colonies?—Not in the other colonies; my experience is confined to this colony.

113. Have you had any experience of the other arresters other than as a driver?—I have tested them myself. I think all of them submitted for testing I have made the test.

114. Were the arresters in use in the other colonies tested here?—No.

115. You have had no experience of those?—No.

116. You are not in a position to express an opinion as to their merits as compared with those in use in Victoria?—No.

117. You are in a position to express an opinion in regard to those submitted to the Department?—Yes.

118. Do you consider any of those have any particular merits?—No, I do not.

119. There is one we noticed to-day, the invention of a Mr. Davies. Your report on that seems to be favorable?—It might be favorable in regard to its catching the sparks, but if the engine will not steam with it it is useless.

120. It seemed, from what you said, that it did not seriously interfere with the steaming?—It is a long time ago now, and I cannot remember. I have recorded on every test I have made, and am prepared to substantiate every word I have said.

121. Some you consider better than others as arresters, but they interfere with the steaming?—Yes.

122. Do you consider that fires do originate from the locomotives in any way, either from the funnel or the fire box?—I doubt it.

123. Are you aware it is admitted by the Department that fires have originated?—Yes, and the engines have been blamed.

124. Taking the Department's own admission, they have admitted that the fires have originated?—Not from sparks from the locomotives. I am not aware that they have admitted that.

125. Either from the funnel or smoke box. We have a return furnished to the Forests Commission admitting it, and that claims have been made?—Yes. I was not aware of that.

126. There was a case at Benalla?—I think I gave evidence there.

127. It was proved to the satisfaction of the court that the fire had originated from the locomotive?—I did not know that. The verdict was in favour of the Department.

128. On what grounds?—That the Department had taken all the precaution possible to arrest sparks, and that the spark arrester used was the best known.

129. As a matter of fact, was it not proved that the fire originated from the locomotive?—I do not know of that. We have evidence—for instance, the evidence in this case—of admission by the Department itself that fires had originated, and they had paid compensation. I will ask the secretary to read the statement I refer to by the Department.

The Clerk.—In 1890–91 the amount paid for grass fires caused by locomotives was £3,251 10s., and the same year for damage to freight in transit, £1,302 14s. 3d. In 1891–2 £6 was paid for fires caused by sparks from locomotives. There is a doubtful case, £98 3s. 6d., compensation paid. Since then nothing has been paid by the Department for damage caused by sparks from locomotives; there has been for damage to freight in transit, but not for grass fires.

130. *By the Chairman (to the witness).*—According to that, there was only £6 paid since 1891. We cannot accept 1891 as a fair test, because wood was being used then very largely. There was a sum of £98 paid in a doubtful case, but I think the doubt would be very much in favour of the man owning the paddock. However, the fact remains that fires have originated, and there was the case in Benalla in which I am not prepared to state definitely of my own knowledge, but I have heard repeatedly that the fire originated by a locomotive. The point is—how do you think the fires do originate. If you do admit,

for the sake of argument, that they do originate from the locomotive, where do they come from—the funnel or the fire box?—With regard to the fire box, I may state there is one thing that Mr. Woodroffe did not mention, that on the Hobson's Bay line they never had an ash pan, and the fire dropped on the line. I do not believe they ever used an ash pan, and no fire I ever heard of originated from those engines.

131. Then you think, if fires do originate from the engines, it is from the funnel?—Yes, if at all. If the ashes come out on the top of a bank, they may roll down the bank, but I never knew of cinders to roll outside the fence.

132. If a strong hot wind were blowing might they not be carried outside the fence?—They would not go outside the fence. The impetus would be in the direction the train was travelling.

133. Your opinion is that fires do not originate from the fire box?—Yes.

134. If they do originate from the locomotive it must be from the funnel?—Yes.

135. *By Mr. Gavan Duffy.*—The Department have never experimented with any spark arrester in use in any other colony or country?—Not that I am aware of.

136. And you have conducted all the trials?—I have conducted most of the trials on the Victorian railways since I have been in the Department—38 or 39 years—and I have been in the running branch for 36 or 37 years.

137. *By Mr. Wheeler.*—Are you still in the service?—I am on holidays now, but am still in the service.

138. *By Mr. Kennedy.*—Have you subjected an engine under those conditions to any practical test as to the possibility of cinders escaping from the ash pans causing fire?—We can see that from engines running every day on every day trains whether the cinders come out of the ash pans or not.

139. But as to the liability to cause a fire in grass or timber, or inflammable material such as grass blown up by the wind on the side of the line. Have you had any practical test as to the possibility of fire originating under such conditions?—We have a practical test every day, as the trains run every day, and we could not have any other test. If the grass is dry, and alongside the line, and a live cinder touches it, that would cause fire.

140. Are you satisfied there are cinders with sufficient vitality to cause the fire in dry grass, escaping from the ash pan?—Yes. They escape on to the permanent way and perhaps a little beyond, but I have not known them to go beyond the fence. There would be sufficient vitality in them sometimes to set fire to dry grass.

141. *By Mr. Gavan Duffy.*—Have you known it where set on fire?—Only where a driver broke the regulation, and knocked the fire out on the line.

142. We heard that sleepers made of timber just cut in two on the Donald line were set on fire; have you heard of that?—I hardly credit it that a sleeper could be set fire to by cinders from the ash pan. It can only be done where the drivers knock the fire out of the ash pan and the cinders roll out of the same.

143. *By Mr. Wheeler.*—Is that done when standing or running?—Standing at stations or sidings.

144. What is the reason they made an alteration in the ash pan?—The only thing I can say is, they wanted to be doubly careful.

145. The driver can command it at any moment wherever standing?—Yes.

146. Therefore there is no security; if he wants more draught he will get it?—If he is likely to stick up for want of steam he will use it.

147. *By the Chairman.*—That is where we want your opinion. It is alleged that the drivers, when they find themselves in a tight place, often throw open the fire box to get an increased draught. Would that modify your opinion?—The driver is justified in opening the damper as wide as it will go.

148. What would be the effect of his doing so?—The ashes are more liable to roll out of the ash pan.

149. Would that be liable to create a fire?—There would be a greater number of cinders come out of the ash pan, but no great liability of cinders getting outside the fence.

150. Would it be more liable to cause fire on the permanent way?—If there were any very dry stuff such as grass or other material it would have a tendency to set fire to it certainly.

151. Have you control of the men who burn off?—Nothing whatever; that is the permanent-way branch. I have nothing to do with them, but all to do with the engines outside of the Newport shop.

152. *By Mr. Sangster.*—If a driver finds himself in a tight place for want of steam, he would open his damper as far as he could. He might have coal that was dirty, and the stoker might put in his dart and touch it up, and there is a liability of cinders getting out, and with a stiff breeze blowing, would there not be a tendency to lift them over the permanent way?—No. The way they get over is that they bounce, but I have never known any to get to the boundary fence, and the only time I have known them to leave the permanent way is on a bank when on the down grade.

153. Have you ever tried getting an engine in such a position, and putting the dart in and having people to watch the effect?—If that were done while the engine was standing, not a cinder would leave the rails, and if they did they would go into the 5-ft. way.

154. *By Mr. Wheeler.*—Have you ever known a sleeper set fire to?—Yes, I have. When fire has been dropped, or even stirred up, as Mr. Sangster states, the cinders out of the ash pan would set fire to a sleeper, but I have never known a sleeper set fire to when the engine was travelling by the cinders from the ash pan, because it would only be one or two here and there; there could be no quantity of them at a time.

The witness withdrew.

Adjourned to to-morrow, at two o'clock.

THURSDAY, 16TH AUGUST, 1900.

Members present :

Mr. MCKENZIE, in the Chair ;

Mr. Bowser,
Mr. Gavan Duffy,
Mr. Graves,
Mr. Morrissey,

Mr. Sangster,
Mr. Wheeler,
Mr. H. R. Williams.

Charles Ernest Norman, examined.

155. *By the Chairman.*—What is your occupation?—Engineer for Existing Lines, Victorian Railways.

156. Have you formulated any statement?—No.

157. I understand that you would prefer Mr. Sims to give the complete evidence, as he has been examined previously?—He was examined before the Forests Commission, and gave evidence on a somewhat similar subject as you are on; and, as he was asked for certain evidence, he got up some particulars, and would be ready to give evidence before you.

158. We thought we would like to ask you, as head of the Department, some questions; one is as to the hours fixed for burning off the grass between the railway line and the fence. In the regulations the hours shall be from two to six?—Not before two o'clock p.m. That is in accordance with the Police Offences Statute, the part dealing with the careless use of fire. We follow that rule.

159. That is the basis of your regulation?—Yes, to comply with law.

160. Of course, you are aware that this gives a great deal of dissatisfaction; a great many feel the hours are not correct ones, and earlier hours would be more suitable?—We feel that very much ourselves. We would greatly prefer to have a free hand to burn off when the conditions are most suitable, instead of being compelled to lose the morning, when the wind is not so strong as in the afternoon, and we have to wait till after two o'clock.

161. There is another point; you fix a certain day, and instructions are sent out to the ganger that on a certain day he shall burn a specified portion of the line, and when that day comes, no matter what sort of wind is blowing, a hot wind or anything else, he has to proceed with the work?—No; the ganger has no such instructions. The responsibility rests on him to select the best time. By the law he has to give 24 hours' notice to the adjoining land-owners, and by the time the 24 hours expire the weather conditions may change. There may be exceptional circumstances, and he should wait if the conditions change, and give fresh notice.

162. Has he freedom to do that?—Perfect. Not even the inspector in charge of a district in which the ganger is interferes in that respect.

163. *By Mr. Bowser.*—Along the line, in the railway reserves, in many places there are stumps that have been there for a great many years, and are dry. I understand that every year the grass is cleared from around those stumps?—Yes, that is part of our instructions to the gangs. The ganger has to see that the grass is cleared for 3 feet along the railway fences, and 3 feet around the stumps or buildings of a character that might take fire.

164. How long has that been in force?—For at least ten years.

165. Do you think if the money that has been expended in clearing round the stumps had been devoted to taking them out, it would have been less?—It might have been if done in the first place, but year after year they go on taking the stumps out for firewood, and they are disappearing by degrees.

166. Would it be a good policy to take the stumps away?—I have not gone into the cost. There is no cost in our chipping round the stumps; it is done by the ordinary gangs. The matter is not of sufficient magnitude to save any additions to the staff.

167. It was alleged that the Beechworth fire was started by a stump, and although no fault of the men—who took the ordinary precaution of damping the stump when they left—but at midnight a breeze sprang up; evidently a spark still there was fanned into a flame, and the stump threw up sparks which went into the high grass in the field adjoining, and it was in the hills before it could be stopped; it then occurred to the farmer that, as the stumps are so old and like tinder, it might be better to take them out?—I think it is well worth looking into, as to whether it would not pay the Department to burn them out in the proper season.

168. *By Mr. Wheeler.*—Where would you get the wood to burn them out?—We could get the wood alongside in many cases.

169. It would cost more than grubbing them—it would be a costly proceeding?—I do not think so.

170. Would there be any liability of those stumps getting on fire by a spark getting into the decayed stumps?—A stump would have to be very dry for that to happen. I have not heard of any cases of that.

171. *By Mr. Graves.*—To what extent are sleepers damaged by fire?—By bush fires?

172. Any fires?—We scarcely have any cases of them being damaged from engines, excepting in cases where engines stand for some time and the ashes drop out of the fire box. For instance, at stations the ashes drop down and burn the sleepers a good deal, or char them, and they have to be taken out, but we have never had any cases of sleepers burnt on the lines, except by bush fires. There may be an odd case that I never hear of. We might have one sleeper in a 100 miles of line in the year, but we have had bush fires, such as in the celebrated bush fire down in Gippsland a few years ago, and on the Camperdown line, where sleepers were burnt.

173. You mean by fires that came across the line?—Yes.

174. It has been stated that a great number of sleepers were burnt on the Donald line in consequence of the sleepers not being sawn sleepers, but split from the ordinary wood without the bark being taken off; is that true?—I never heard of it. That must be before my time. The sleepers on the Donald line were redgum, cut into any shape, but all sawn.

175. *By Mr. Wheeler.*—Which are the more liable to take fire?—The split ones I should say; there are more splinters about them.

176. *By Mr. H. R. Williams.*—You were in America last year?—Yes.

177. When there, did you make any inquiries as to their spark catching affairs?—I did not go into the spark catching question. I am sorry I did not, but I had a good many things to go into. It is outside my branch. I made inquiries into matters outside my branch, but not the spark catching question.

The witness withdrew.

George Wrake Sims, examined.

178. *By the Chairman.*—What is your occupation?—Chief Assistant Engineer for Existing Lines.

179. Have you formulated your evidence; would you like to make a statement to the Committee?—Only so far as this, that I think the best evidence I can give is to read a few rules that are issued to inspectors and gangers, bearing on the subject, as they seem to me to be so complete as to somewhat exhaust the subject. The book I intend reading from is issued from the Existing Lines Branch, and it gives instructions for the guidance of inspectors. It is issued not only to inspectors, but to all gangers as well—[*reading as follows:—*]

139. The chipping of grass along railway boundaries for a width of 3 feet from fence line, whether the land is leased or not, is to be done before grass burning is commenced.

140. Every precaution and vigilance must be observed to avoid the occurrence of fires on railway premises.

Undergrowth, or anything which might promote the possibility of fire, must not be allowed in the vicinity of buildings, platforms, bridges, culverts, &c.

Special precaution is to be taken in regard to the storage of goods of every description.

Employés are not to light fires in the open air adjacent to station buildings, except for burning off grass, &c.; when necessary to have a fire, it must be lit in a fireplace if available; and, if not, a fire-pot may be placed in the safest position that can be found, away from all buildings and other inflammable material.

In all cases the employé lighting the fire will be held responsible for preventing it from spreading, through the action of the wind or otherwise.

141. Inspectors and gangers are responsible for the proper serving of notices on all owners or occupiers of land adjoining the railway line not less than 24 hours before commencing to burn off grass (see clause 413, Book of Regulations). Where it is not possible to personally serve such notice, because of the owners living too far away, gangers must be supplied with franked envelopes, and instructed to forward the notices by registered letter. A separate notice must be given for each day's burning off, and the men serving such notice must be in attendance at the hour and place named.

142. Inspectors must take care that all grass and rubbish lying between the fences on any part of the railway property shall be burnt off whenever the weather may render it safe and practicable to do so; and, if the lands outside and adjoining the railway fences should be the property of the Crown or the Railway Department, the grass must also be burnt off such lands for a distance of at least 30 feet from the fences; but previous to any grass being so destroyed, a notice must be served on the owners and occupiers of the adjoining lands or premises, in accordance with the provisions of the Act to Restrain the Careless Use of Fire.

143. The burning of grass must be commenced as soon as patches become dry, as by so doing the continuity of fire is checked. The burning off must not be commenced before 2 p.m. Inspectors must, therefore, arrange for their men to commence work later during the burning season, in order that they may burn until 6 p.m. each day, or later if necessary; and, as far as possible, the burning should be done on the windward side of the line. Burning off grass must not be done on very hot days with a strong wind blowing; but the men should, if necessary, be distributed over the most dangerous parts of their lengths when trains are passing, to prevent fires from spreading.

144. When a fire occurs, the inspector must make himself acquainted with its origin and extent, and report to the Engineer for Existing Lines immediately, giving full particulars as to whether the grass within railway fences had been properly chipped and burnt off prior to the fire, the time the fire started, what period elapsed between the time it was first observed and the previous train had passed, the distance from line where it started, full details of damage done, and any other information that it is considered desirable to convey.

145. Every precaution is to be taken to prevent gate-houses or other buildings, whether occupied or empty, from catching fire; a breadth of not less than 12 feet all round each building must be cleared from grass and rubbish, and all loose grass removed. Employés must see that empty houses are not used by tramps.

146. Inspectors must instruct gangers to be careful when burning off not to destroy the trees planted at stations. Steps must be taken to protect these trees from fire, and should any be destroyed whilst burning off the ganger in charge will be held responsible and dealt with accordingly.

Those are the clauses in this book of instructions, and it refers in one case to the leased land; it says—“Whether the land is leased or not.” In the printed forms that are used where land is leased along a line for grazing purposes the latter portion of one clause reads thus:—“And I agree to allow the Commissioner, by his officers or servants, to enter upon the land and burn off the grass should they consider it necessary.” So, although the land may be leased, our men have perfect right to go and burn off if they consider it necessary. Here—[*producing a document*—]—is a form that the men fill up when they wish to give notice of burning off. It reads thus:—

RAILWAY DEPARTMENT,

EXISTING LINES BRANCH,

1 .

SIR,

You are requested to take notice that (weather permitting) it is intended to burn the grass within the Railway Fence and contiguous to your land at _____ on _____ next, the _____ day of _____, between the hours of _____ and _____, and that the requisite precautions will be observed in doing so.

C. E. NORMAN,

Engineer of Existing Lines.

To

That is the form that the gangers fill up and deliver to the adjoining land-owner. In a book called *Regulations for Employés*, issued to everybody in the service, there are two or three clauses bearing on the subject, one referring to guards on trains. If a guard notices a fire along the line, he immediately reports to the nearest gang of repairers. The latter part of Regulation No. 280 reads thus:—“Guards seeing fire by the side of a line, or in any adjoining field, must signal the fact to the nearest repairers, and make a special report on arrival at their destination.” There is another clause that reads exactly the same as far as drivers and firemen are concerned. I think, so far as I can see, there is very little, if any, to add to what I have read out from those books.

180. There is an impression that the grass is not burnt off as early as it might be in many instances; in fact, I have known a good many instances myself where it was very dry before being burnt off. Is the ganger the judge of the right time for burning off?—No, I think it is the inspector who travels up and down the line every day, who would be the judge of the time when the grass burning should be commenced. I think the ganger is responsible for starting it at a certain hour or a certain day, but the inspector would say—“It is about time to start it.”

181. I have known cases myself, travelling up and down in the train, where the grass was being burnt by a gang of men on a very hot day with a strong north wind blowing. I have often remarked that it seemed a dangerous time for burning off. Others have made the remark too, and that has led to the impression that when a day was fixed the grass was burnt off in spite of conditions?—It is entirely contrary to regulations to burn off on a very hot day when the wind is unfavorable.

182. Do you concur with Mr. Norman that the law should be amended?—Yes; it would be much to the advantage of the Department if we had a free hand in regard to the time. In some districts the prevailing wind is one side in the morning, and from another in the afternoon. If you can only commence burning off after two o'clock you may have the wind contrary to what you want, and by waiting the grass gets very dry, and that sometimes puts the ganger in a very awkward position.

183. That accounts, perhaps, for what I speak of?—We would appreciate the alteration very much if made.

184. *By Mr. H. R. Williams.*—Do you find that the railway is made use of by tramps, to walk over the line?—I must admit I have seen men walking along the line, but it is contrary to the regulations.

185. Do they camp under bridges, and so on?—We are in the office, and I do not know, but it is not permissible. I must say, in travelling along the lines, I have seen men walking along inside the fence.

186. Have those men ever been prosecuted by the Department for trespassing?—I think so, on the coal line at Korumburra, where they gave some trouble; but it was represented to be such a wet place in winter that the only clean place was the railway line, and I do not think anything was done to them.

187. *By Mr. Bowser.*—Approximately, how many cases during the last five years have you had of damage done by fire?—A return is being prepared giving you all that information. I do not know whether it is here yet; if not, you will have it in a day or two. I think something like £200 has been paid in compensation during the last five years.

188. Could you give us an idea of the proportion of the claims made and the amount paid?—I could not tell you that.

189. Suppose that after a gang has started burning on a hot day the wind should change, what provision is there; have you water on the spot or anything to put the fire out?—I think they have bags and all those appliances, in fact, I am sure they have, because I have seen them beating out a fire.

190. Do they bring water to it?—I am not sure about water.

191. If you did burning off in the midst of a hot summer, next to fields of ripe standing corn, would it not be dangerous?—I think they have water sufficient to wet their bags; that is my impression, but I would not be sure about it.

192. Did you hear the question I asked Mr. Norman about the stumps?—Yes.

193. What do you think of the suggestion that the stumps should be taken out at once?—I think it would be a very good thing, if it is not too costly.

194. Are they not so old and so dry as to be a great danger; is it not often the case that those stumps catch fire, and the fire remains after the workmen leave in the evening, and it is smouldering secretly, and they cannot notice it?—It is a possible case, and I think it would be better if the stumps were removed; but Mr. Norman is going to inquire into the matter.

195. *By Mr. Graves.*—They do burn some stumps?—Yes.

196. You said that a notice had to be given, and Mr. Norman explained why the two o'clock was fixed as being in accordance with the Police Offences Statute. A man gets notice—"I hereby give you notice that I shall start at two o'clock to-morrow to burn." And if they make changes they must give fresh notice, to renew the notice?—Yes.

197. If it were given at an earlier hour it would be a much greater convenience, both to the man occupying the land and the men who have to be sent to attend the fire?—Yes, very much.

198. *By Mr. Bowser.*—If the men burning off between two and six found, when their time came to leave off at six o'clock, that the wind and other conditions were favorable for burning, would they knock off at that hour?—I think they are bound to knock off burning at that hour. They would remain in attendance after that, if necessary.

199. What I mean is, would they just knock off, at the end of the day's work, in the midst of a fire, and then begin again, and do the other half of that section the next day?—If I understand you rightly, they would have to do that. They cannot start burning after six o'clock. It must be between two and six, and if they have not finished at six o'clock they must resume another time.

200. Do you not think provision should be made in the case of a section 5 or 6 chains in length if you had three-fourths of the section burnt, and 1 chain or 2 remaining, do you knock off promptly at six o'clock, and then resume the next day?—That is a detail with which I am not acquainted, but I know that they do not make a fresh fire after six o'clock. I am not aware that they have sections as you try to describe.

201. *By Mr. Graves.*—Is it not a fact that the notice points out where they are going to commence, at such and such a mile-post?—Yes.

202. They say—"I beg to give you notice it is the intention of the Department to commence burning at such and such a mile-post"?—Yes.

203. What time are their hours on those summer days when they principally burn; have they different times at different seasons of the year?—Apparently, the rule provides that they must begin later and work later.

204. While burning off?—Yes.

205. On an ordinary day they finish their work at five o'clock?—At half-past four.

206. On "burning" days they remain on for a longer time?—As long as necessary to put the fire out.

207. The usual termination of their day's work is five o'clock?—No, half-past four.

208. And sometimes it ends earlier, and sometimes later; in the summer days it is a longer day's work?—It is the same length of day, but they commence earlier.

209. *By the Chairman.*—Are the lines kept perfectly free of weeds between the rails?—I cannot say that they are.

210. Of course, we do not know whether the state of things we have heard of exists at the present time, but I have heard of lines with the grass growing up between the sleepers, and the live embers fall down and set fire to them?—It would be impossible to keep all the weeds down, but if a man has several miles of line under him he endeavours to keep them down.

211. You do not know whether such a state of thing is possible, as the weeds growing up to such an extent that the fire falling from the fire boxes would set fire to them, and some of the fire blows across the fence?—I do not think it is very probable.

212. Do you think it is possible?—Of course, that may be possible.

213. *By Mr. Gavan Duffy.*—What is your allowance of men in proportion to mileage?—For a single line a ganger and two men would have about 5 miles.

214. Is that the usual proportion; I thought it was a mile a man?—Of course on the double and busier lines it is a little less mileage to a gang. In some cases it is even more than that.

215. Is there any general provision allowed in railway statistics?—It depends on the amount of business done. If there is only one train a day the line does not require as much attention as if there were many trains.

216. *By Mr. Graves.*—Is not that varied very much as to management. When you were on the economical system, were there not many men less employed on the gangs?—Yes, I think so.

217. Is it not a fact that they reduced one man in every five?—They did make a reduction, but I do not know to what extent.

218. You do not know that the weeds, when that was done, became a very dangerous item in the matter?—No, it was before my time.

219. *By Mr. Bowser.*—Is there about the same number of men employed in a gang in New South Wales as here?—I think the practice is about the same.

220. *By Mr. Graves.*—The head ganger has to go over every portion of the line, absolutely every inch of his section, once a day?—Yes, once a day; I am not very sure whether the ganger has to do it absolutely.

221. He is responsible; if he does not go he must send some other man?—The ganger, or one of the men in the gang, has to go over the whole length of the section.

222. *By Mr. Bowser.*—Who is responsible for any unreasonable or negligent act in burning off?—The ganger of the length.

The witness withdrew.

Adjourned to Wednesday next, at two o'clock.

WEDNESDAY, 22ND AUGUST, 1900.

Members present :

MR. MCKENZIE, in the Chair ;

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| Mr. Bowser, | Mr. Kennedy, |
| Mr. Gavan Duffy, | Mr. Sangster. |
| Mr. Graves, | |

Henry Parsons, examined.

223. *By the Chairman.*—What are you?—Inspector of Permanent Way on the Victorian Railways in charge of portion of the Gippsland district, located at Sale.

224. How long have you been in the position of inspector?—Over eleven and a half years Existing Lines, and about three years on Construction.

225. Have you been in other districts during that time?—Only six months from Caulfield and Mordialloc and round Mornington way.

226. Your experience is confined to the Eastern district of the colony?—Yes.

227. Have you had any direct experience in connexion with fires that have been alleged were created by railway locomotives?—There have been fires in the district supposed to have been caused by locomotives.

228. Did you make inquiries into those causes yourself?—No, the mode is to report to the Melbourne office. We endeavour to find out what particulars we can, but have never found any direct evidence that the locomotive caused the damage.

229. When the allegations were made you reported to your chief?—Yes.

230. Were you then instructed to inquire into those causes?—As soon as a fire occurs the instructions are to make ourselves acquainted with the origin of the fire, if possible—we do that.

231. Then you did make inquiries as to the origin of those fires?—Yes, as well as we could.

232. How many did you have to inquire into?—I dare say a dozen or more.

233. Where persons alleged the fires were caused by the locomotives?—No. There have been no claims with the exception of one; that is the late Cowwarr fire, but the inquiries would take place independent of any claim sent in by the property-holders.

234. What would cause the inquiry to be instituted?—To endeavour to find out the origin of the fire as well as possible.

235. Without any prompting on the part of the land-holders?—Yes.

236. Or any claim or allegation on their part whatever?—Yes.

237. Do I understand that your Department inquires into the origin of all fires that have been destroying the grass and paddocks close to the railway lines?—We endeavour to do so as well as we can.

238. Without any complaints being made by the land-holders?—Yes; that is a standing instruction.

239. In carrying out these inquiries have you ever had occasion to believe that the fires were caused by a railway locomotive?—It is very doubtful.

240. Have you ever had any evidence such as you could regard as direct evidence that the fires were caused by the railway locomotives?—In one instance I believe I had.

241. What happened in that case?—It was a very dry day; the men were on the look out for any fire occurring on the length the engine passed and a fire occurred immediately after the engine passed. The repairer said he was on the fence watching it, but I had only the repairer's word for it.

242. Did that create much damage?—It burnt several hundred acres of grass.

243. Did the Department pay compensation?—Not that I am aware of.

244. Did they refuse to pay it?—I am not aware that there was any claim.

245. In making such inquiries, you are instructed to obtain evidence as to whether the fire originated through a railway locomotive ; what would you call direct evidence. If it could be proved that the fire originated about ten minutes after the train passed close to the line, would you call that direct evidence ?—It may be direct evidence that the fire came from the train, but not direct evidence that it came from the locomotive.

246. If it started five minutes after ?—Even if it started immediately, that is no direct evidence that it came from the locomotive.

247. You think it might have originated through the butt of a cigar being thrown out, or anything of that description ?—I do.

248. Suppose the fire originated outside the fence, would you think the butt of a cigar would have been thrown that far ?—I should think not.

249. Would you call that direct evidence ?—A cigar or a match might be blown there by the wind.

250. What would you regard as direct evidence that the engine had created the fire ?—I do not know that I could express an opinion on that.

251. It would have to be that a spark was seen to leave the engine, and seen to touch the grass and start the fire ?—That would be direct enough.

252. Would anything short of that be ?—I do not think it would.

253. Then it is practically impossible to get direct evidence that any fire has been lit by a railway locomotive ; that was the only experience that you had where it was admitted that it came from the locomotive ?—No, we would not admit it even then.

254. On what grounds ?—We were never asked to admit it.

255. Your own employé said he saw the fire start ?—Yes.

256. And he attributed it to a spark from the engine ?—The fire commenced immediately after the engine passed.

257. What did the repairer attribute it to ?—He would not give an opinion ; he simply reported in the usual way.

258. That the fire had started immediately after the train passed ?—Yes.

259. He did not express an opinion as to whether it was a spark from the engine, or an ember from the fire box, or a cigar butt ?—In this case it was simply an engine without any van.

260. Then it had to come from the engine in some form ?—Yes, in this case.

261. *By Mr. Kennedy.*—Have you had any actual tests, under your own observations, as to the possibility of escape of sparks of a dangerous character, or cinders from the fire box ?—That would be more for the engineers to say.

262. Have you had any carried out under your observation ?—No.

263. Then you cannot say from your own observation as to whether it is possible whether sparks of a dangerous character can escape through those arresters that are in use, or through the ash pan, as ordinarily used on the line ?—No ; I cannot say for certain. Fires occur, but it is difficult to trace them.

264. Under your own observations, have any tests been carried out as to the possibility of fires arising ?—No.

265. *By Mr. Graves.*—You said that the repairer reported a fire ; did you go to see it ?—No, I sent a ganger to count fencing posts burnt, &c.

266. Did you go to that at any time ?—I passed by it in my ordinary duty.

267. Did the fire take place on the line ?—In the paddock.

268. Then the probabilities are that that was a spark ?—Yes, there is the possibility.

269. Can you say as to those other fires whether they were outside or inside the fence ?—Outside the fence.

270. Have you found, in your experience, that cinders from the engine, from the ash pan, have set fire to the permanent way under your management and control ?—Not directly. Still, I am of opinion that the cinders do drop from the fire boxes.

271. Do they sometimes burn the sleepers ?—Not the sleepers ; they may ignite the grass ; I do not say they do, but it is possible.

272. Sometimes those fires smoulder for hours and hours ?—They would not smoulder very long.

273. *By Mr. Bowser.*—You are in charge of the burning off ?—Yes ; the gangers are under my charge.

274. The regulations, I understand, provide for your burning off in the summer between two and six ?—Or later, if necessary.

275. Suppose you are burning off, and the wind has changed about six o'clock, do you continue the work after six, if necessary, or do they knock off ?—The gangers are instructed ; it is left to their judgment. If they can, with advantage to the Department and safety to the country, burn off to advantage, they do so as late as they choose.

276. They knock off when it is safe ?—Yes.

277. There are a considerable number of stumps along the line in the reserves ?—They are getting fewer every year.

278. You are not making any attempt to take them out ?—Only in a few cases ; some gangers do ; we chop round the stumps every year.

279. How many years have you been doing that ?—Several years.

280. Are those stumps dry now ?—Yes.

281. In fact, they are like tinder ?—Some of them are pretty dry.

282. In burning off, after a day's work is finished and they are putting out the fires, is there not a great danger of sparks lurking in those stumps and being blown into a flame about midnight in the summer by the breeze that comes often at that time ?—The idea of chopping round them is to keep the fire from getting in them at all.

283. Have you ever known of a stump igniting during the night ?—No ; it may have occurred without my knowing it.

284. In my district there was a case where a stump remained in the midst of the burning off which was supposed to have been put out, but at midnight a breeze sprang up and put the whole country afire ; would it not be safer and more economical for the country if the Department took the stumps out entirely ?—In the long run I dare say it would.

285. If there are standing crops where the line runs through in the summer, do you still continue burning off the grass on the reserve?—We have only a few cases in my district with standing crops next the line, along the line; it is mainly grass.

286. You have had no experience of the districts where the crops are growing along the line?—Only in one case on the Boisdale Flats; the land on the line in that case was cropped by the tenant, and the crop is cut while green.

287. Do you think the safest way of controlling the grass on the reserves is by burning off?—I think the system adopted by the Victorian Railways cannot be very much improved on, because it is a fire-break throughout the length and breadth of the country, a national fire-break. If there were no burning off, a fire would come from the bush, cross the line and go over a very extensive tract of country, whereas at present when a bush fire is approaching, the line repairers see the smoke, and they do what they can to arrest the fire and put it out.

288. How many men are usually in charge of the burning out?—There are gangs, some three, some four.

289. What is the length of a section?—Four men, 6 miles.

290. Might they be burning on a hot-wind day?—No; that is against the regulations.

291. They may burn in the middle of summer?—Yes, in suitable weather when the wind is blowing in the right direction.

292. Suppose that in the midst of their work the wind changed, and the grass suddenly got beyond their control, what provision have you for extinguishing the fire?—None at all.

293. Do you not take tanks of water?—The ganger may take a bucket or two of water on his trolley to wet the bags.

294. Is it not rather dangerous where there are standing crops and the grass 2ft. 6in. in the reserves that you have in the middle of summer no provision to check a fire that may get beyond your control?—It certainly would be better to have some provision; but what could you have?

295. You could have a truck of water?—It would be very expensive. An engine with water train would have to be employed.

296. You have no provision to check the fire with water if it got beyond the control of the gangers?—No. I think the provision would be for every land-owner to try and protect himself as well as for the Department to protect him. Our experience is that the land-owners do not care about it at all; they are not even present. They get 24 hours' notice to be present. There are only two persons in my district who do anything to prevent fires coming from the railway on their property, and this on only 5 miles out of 130 miles that I have. The land-holders practically do nothing. The Railway Department have to do everything.

297. *By the Chairman.*—As to those land-holders who do nothing, do not you think they have a right to expect that if the Department is burning off it will prevent the fire encroaching on them; they naturally look to the Department when burning off to do the work themselves?—The Department do all the work, and then take every precaution that is possible, within reason.

298. But do not you think that the land-owners have the right to expect that if the Department undertakes to burn off they will do the work without applying to them?—Yes, but I think that it is only reasonable that every man should try to protect himself.

299. If they think there is danger; have you known any cases in which the fire has got away from your men?—Only in one case it is alleged to have got away.

300. Do you not admit that it did?—The ganger was present; I was not. He admitted that it burnt a few acres on the side of the line; that is the only case of the kind I can remember.

301. You are compelled, according to the Police Offences Statute, to burn off after two o'clock; you cannot burn before; do you think that condition hampers you in burning off?—Yes, I do, very much. I think that is a mistake.

302. If that is so with the railways it is so with land-holders generally, that according to the Police Offences Statute no one can burn off earlier than two o'clock in the day; you think you should be at liberty to burn off at any hour of the day that suits you by giving due notice to the adjoining land-holders?—Yes.

303. *By Mr. Graves.*—You said that the land-owners did not take much interest in the matter; is it not common sense that having got notice it is then for them to be prepared to protect their own property?—I should think that to be the object.

304. You said the line acts as a break for fires; are you aware whether it is a fact that constantly fires come in towards the railway, and stop at the railway fence in consequence of this break?—Yes.

The witness withdrew.

William Ley, examined.

305. *By the Chairman.*—What are you?—Inspector of Permanent Way, stationed at Seymour. I have charge of portion of the North-Eastern district—from Essendon to Avenel and Rushworth.

306. How long have you been inspector?—Eleven years.

307. Where have you been stationed during that time?—Seven years on the relieving staff all over the colony.

308. During that time have you had occasion to inquire into the origin of any fires alleged to be caused by a railway locomotive?—Not to make technical inquiries from the adjoining property-owners, but from a railway point of view I have made inquiries.

309. Have you had to make many such inquiries where it was alleged the fires were caused by the locomotives?—I can only remember two.

310. Did you inquire into cases brought under notice by the gangers?—Yes, a number of those—I have not any idea of the approximate number—there would be a dozen, or more.

311. In regard to those two particular cases, were there any railway officials associated with you in the inquiries?—Yes; there were Mr. Taverner, the surveyor, and the district inspector. The case was at Tungamah some years ago—I almost forget about it. The result of the inquiry at Tungamah was that the fire broke away from the ganger when burning off.

312. Did the fire do much damage?—Yes, it burnt some 150 acres.

313. Was any compensation allowed to the persons who suffered?—I cannot say.
314. What was the date of that inquiry?—I cannot give that without referring to my diary. I will send the particulars to the Committee.
315. Did the Department admit that the fire had been caused through the fire getting away from the ganger?—Yes. The recent case is the Broadford.
316. What was the result in that case?—I cannot say what the result is. I was not appointed to take the evidence of the Board, but only to render assistance in my capacity as Permanent Way Inspector.
317. You know the finding was that there was no direct evidence of fire?—Yes.
318. Can you tell us what would be regarded as direct evidence that the fire had been caused by a spark from a locomotive from the fire box or the funnel. If a train passed and a fire broke out ten minutes afterwards, would you think that direct evidence?—I would hardly think that direct; if I were present and observed the conditions and surroundings I might be able to say.
319. You heard the evidence of the last witness?—Yes.
320. Do you endorse his views in the matter that nothing short of seeing a spark leave the engine and alight on the grass would prove it was caused by a locomotive?—Yes, I think that would be evidence. If a person were on the ground standing there and saw the surrounding conditions he might say whether it was caused by the engine.
321. I understood him to say unless you could trace the spark from the engine to the grass that the fact of the fire originating immediately after the train passing would not be proof, as it might be due to a cigar-butt, or anything?—I recognise it is almost impossible to see a spark in the day time, but if a person were standing close by and saw the circumstance in the place where the fire originated he might be able to determine then.
322. You agree with him that it is very difficult to get direct evidence?—Certainly.
323. In regard to the sparks from the funnel or fire box, have you had experience in that matter to enable you to express an opinion as to whether the fires are more likely to originate from the fire box than the funnel?—Of course, there is always a certain liability of the fire getting out of the fire box of a train travelling at a great rate, but I have never known of a case where the fire has burnt outside the railway fence from that cause.
324. Would you regard it as an impossibility for a spark to be dropped by a train and conveyed by the wind outside the fences?—In some places it would be almost an impossibility; in others the line is much narrower, and then there are embankments.
325. In such cases it would be possible?—It may be.
326. You heard what Mr. Parsons said as to the hours of burning off; do you approve of his views?—I certainly think we are hampered as to burning the grass, two o'clock being the hottest part of the day, and there is more likely to be a change of wind at that time; the danger is increased by having to comply with those conditions of the statute.
327. You have noticed in the weather conditions that frequently in the forenoon the wind is blowing from the south in the summer; I understand you burn off in order to take advantage of the wind, to have the wind blowing on to the rails?—The regulations and instructions to gangers are that in no case is a fire to be lit when the wind is blowing high or contrary to the side of the line where we want to burn.
328. It might so happen when you wanted to burn on the south side of the line that the wind might be blowing for several days from the south in the morning and the north in the afternoon; the result might be that you might not be able to burn one side of the line for several days, and during that time the grass would be getting rapidly dry and into a dangerous condition for burning; has that ever happened in your experience?—It happens every year.
329. You regard that as being almost entirely due to the regulations under the Police Offences Statute?—Yes.
330. *By Mr. Graves.*—You heard the evidence of the previous witness where he said the land-owners do not take any care about the matter; do they on your line?—No.
331. In your district the fires would be disastrous to the land-owners?—Yes.
332. In the engines on your line, have they protection to the fire boxes?—Yes, as far as I know.
333. Was that precaution taken believing that damage might be done by the cinders?—I cannot say; I know it is a preventive.
334. You think it has been so?—Yes.
335. Have you seen the sleepers burnt by the fires on any of the lines?—Yes, I have noticed sleepers charred by the fire.
336. If a cinder falls on a particular kind of ironwork it does not burn so quickly, but on grey or red box it would slumber for some time?—There would be a tendency for it to smoulder; it could not create a flame owing to being surrounded by the ballast.
337. Have you ever seen the stumps that have been burning a day or two after a fire?—No.
338. Do they not take water to put those out?—Yes.
339. That water is brought up on a trolley?—Yes; it is obtained at the gate-houses, or where water is stored on the line.
340. They take sufficient to put out those stumps?—Yes; they are all chipped round. I know on the Goulburn Valley line they have been burning the stumps off there for the last twenty years.
341. They are principally box, and when they get alight they will smoulder for days?—Yes, you must use the water to put them out if they should happen to get alight when burning off.
342. One of those stumps would burn for feet into the ground?—Yes, if left alone.
343. Was it suggested to you that there could be anything done to mitigate those fires?—Yes. One thing I would suggest is that we be empowered to use our discretion as to the hours of burning, and that the property-owners be obliged to render assistance when we are burning. We are compelled before we can start any fire to give them in person 24 hours' notice that we intend to burn. It is a common thing for us to supply notices six or seven times, owing to the wind being unfavorable, and in none of those cases do the people turn up to render assistance. There are some isolated cases where the farmers take the precaution to plough along the line, but in 90 per cent. they take no notice of the notices.
344. Do you know whether the owners adjoining put plough furrows outside the line to protect themselves?—There are a few who do.

345. Do you know that private owners who burn on the land have to give notice to their neighbours?—Yes; I know there is no notice supplied to the Department when they are burning off.
346. Consequently the railway is damaged by fires coming across it?—Certainly.
347. You do not know how these fires arise?—No.
348. Would not a man be as likely to be called in question for the damage as you would?—Yes.
349. You think the course ought to be altered?—Yes.
350. And made compulsory on the owners to attend where you are burning off?—Yes.
351. *By Mr. Bowser.*—Do you not think that if you were burning in summer it might be a great inconvenience to the farmers to leave at harvest. If you had to do in the future as you have in the past, give notice six times without being able to burn off, would not that be a loss to a farmer in the middle of harvest?—Yes. The notice says—“We will burn, weather permitting.” If the wind is blowing on towards his property, he will know we will not burn.
352. He might make arrangements to go and then find you did nothing. In that case he would employ a hand six times to take his place?—Yes.
353. However, you think that in the main assistance could be given to you and protection to the farmer himself by his being on the spot?—Yes.
354. As to the stumps, would not it be a safer thing and cheaper in the long run to take the whole of the dry stumps out?—It would be much safer, but when you come to consider that, there would be some millions of stumps on the lines throughout the colony.
355. Is not it a very great danger considering the dryness; I speak of when the line was first made and their being burnt out from year to year?—The majority of those in now would not burn; they are big solid stumps that would take a considerable amount of fuel to light them. The telegraph poles and the bridges, and the culverts, and stumps have to be chopped round to prevent fires.
356. That shows you think the stumps a danger?—Yes.
357. Every year they are becoming drier and more dangerous?—They are getting fewer every year. We have removed hundreds of them the last few years in the winter time.
358. Do not you think from your experience it would be better if the Department took the whole of those stumps out at once?—Yes, I think it would be better; it would obviate the necessity of chopping round them.
359. *By Mr. Graves.*—I suppose the objection to taking out the stumps would be the extra expense to the Department?—Yes.
360. Have you any idea about what the contract price for taking out stumps is, ordinary stumps?—No.
361. Would you be surprised to learn it is about 5s. a stump?—I have no knowledge of that.
362. Do you know that contracts are let by farmers and the Railway Department at that price to take them out?—No.
363. *By the Chairman.*—Do you give notice to the land-holders on both sides of the line when burning off?—Only the side adjoining the owner where we intend to burn off.
364. The wind is blowing from those land-holders towards the line?—Yes.
365. If the wind suddenly got very strong, which would be in most danger, the one across the line or the one behind the wind?—If the foreman in charge of the burning-off considered the wind dangerous, he would have the fire put out.
366. Still, as a matter of fact, do not you think there is very little danger of fire breaking out in the direction from which the wind is blowing?—Yes. There is a large element of danger in setting fire to the railway ground during summer months, but we use the utmost vigilance to keep it under proper control.
367. Have you known a case where a fire did get away during the burning off?—That Tungamah case was the only one.
368. You do not remember whether that fire originated from sparks across the line or burning backwards from the side he was burning?—It originated on the side he was burning.
369. Do you remember whether it was due to change of wind?—It was an embankment of 12 or 14 feet. In burning along the cutting it would not have such a clear course as in the open plain, and it was in a case of that sort where it broke away from the ganger.
370. In that fire at Broadford was there any definite allegation as to where the fire came from?—No.
371. *By Mr. Graves.*—You have been eleven years in your present position. I notice the tracks are much clearer of weeds and dirt than they used to be eleven years ago; is there instruction now, more than in the past, to keep the lines clean?—Not any closer instructions. The only fresh instructions that I can think of that are in existence now and were not eleven years ago are that the system of weeding is kept distinctly separate from other items of maintenance. For instance, repairing a line, repairing the fences, burning the grass, chopping the grass, all those things are kept separate; each ganger keeps the items separate in his diary.
372. Is it not more expensive now in keeping the road between the rails cleaner than it was some years ago?—Some five or six years ago, speaking from memory, when Mr. Wheeler was Commissioner of Railways, he authorized some poisoning process, and the weeds were allowed to grow; that is how the roads became so dirty; it has taken years to clean that off.
373. It appears to me that the North-Eastern line is as clean as a walk in a garden; it was not so some years ago; was that advancement made to preserve the sleepers or to protect from fire?—It is one of the essentials of maintenance to keep the line clear of weeds in the interests of drainage and dryness of the road bed.

The witness withdrew.

John Ryan, examined.

373A. *By the Chairman.*—What are you?—An engine-driver, stationed at North Melbourne. These last two years I have been running on the suburban lines; before that on all lines, the North Eastern and Ballarat, and all other main lines.

374. There has been a difference of opinion expressed to the Committee as to whether fires are more likely to originate from the sparks of the funnel or the fire box—which do you think is the most likely to emit dangerous sparks?—The sparks come from both, but if the regulations are carried out properly, using coal, there are very few sparks from either.

375. Is it possible for a live spark to be carried from the coal box to the grass outside the line?—
I do not think so, if the regulations are carried out.
376. Not under any circumstances?—No.
377. Such as the train passing over an embankment and the box being opened to get a good draught to get over a pinch; would it be possible then?—There might be some drop down the bank, but if the instructions are carried out as to the damper no harm would result.
378. Suppose the instructions are not carried out, would it be possible then?—Not if the instructions are carried out.
379. If a man has a difficulty in getting his engine up a stiff embankment?—You require more draught on a flat; it is harder steaming than going up a bank; you get a bigger blast on the fire, and the engine steams better.
380. There is more strain on the engine?—Yes.
381. You require a greater blast getting up a pinch than on the level ground?—Yes. If any sparks came up it would be from the funnel and not from the ash pan. The only possibility of fire from the ash pan would be coming down an incline where the engine is rolling, and if the damper is down to the first notch they will strike the damper forward and will not go outside the line, but will stay in between the rails.
382. Do you think it is possible for sparks to come from the funnel to create a fire outside the fence?—I have never seen it.
383. In your experience you have never known of a fire to originate near a line which there was reason to suppose was caused by the locomotive?—Only once, on the Ballarat-Ballan line. On that occasion I do not see how it was possible for the fire to originate with the engine, because there was only one van on.
384. Have you ever known of any of the rolling-stock behind the engine taking fire?—No; I have seen tarpaulins, not on the train but stored at stations, burnt, with little holes on them.
385. Would they be as far from the permanent way as the fence usually is from the line?—Yes, about four trucks.
386. And have you never known cases in which tarpaulins were burnt on the train behind the engine?—No.
387. Or trucks of straw set on fire?—I have heard of cases, but have no personal experience of it.
388. Have you had any experience of other spark arresters besides the one now in use by the Department?—Yes.
389. Some inventions that the Department has been asked to adopt?—Yes.
390. Have you tested them?—Yes.
391. What ones have you tested?—Mr. Anderson's.
392. You used an engine with that one?—On one occasion.
393. How did you find it act?—It was in 1893. I put in a report the day after in reference to the trial, and I almost forget the circumstances; you can get that report. There were some ten or twelve arresters I tried; some we could get 3 or 4 miles with, and some 8 or 10; others we got to Sunbury with; but we had to stop to replenish with wood, and they all put wood sparks out of the funnel.
394. Did you find that those arresters you tried were more effective in preventing sparks than the one used by the Department?—There was one that prevented the sparks, but also prevented steam and everything else.
395. Of course, there would be no difficulty in inventing a spark arrester better than the departmental arrester, but might prevent the steam too?—Yes.
396. Do you think any of the arresters tried were equal to the departmental arrester?—No, I think the departmental one gives the most satisfaction.
397. Can you give particulars about any other arresters?—There was Allibon's; we could not get along with that at all.
398. It is still in use on the Moama line?—He was on the engine, and I left with 140 lbs. of steam at North Melbourne, a first-class fire, and I dare not put any water till I had gone some distance; if I had put any in anywhere else it would have stopped. There was another trial at the Royal Park; I had the same experience there. We had 250 tons of coal on. There is a grade to Footscray right from South Kensington.
399. Not a heavy one?—It is heavy enough with a load on.
400. It appears strange that a spark arrester that has given satisfaction for a number of years, and is still used by a private company running from Moama to Deniliquin, and carrying heavy stock loads, should have given you that result. They use nothing but wood there?—We were steaming with wood on this occasion that we used Allibon's arrester; we used wood on all the trials.
401. That is not so good for keeping up steam as coal?—No.
402. You had experience during the coal strike; was it not a fact that during that time the ordinary trains were frequently stuck up with the departmental arrester?—Yes; not actually stuck up, as they went on to a spot where they knew they could start, and filled the fire up again; the fire boxes were not constructed for wood. We had to stop after going 8 miles, and then fill the box up again.
403. It was not such a great failure on the part of Allibon's if you got as far as Sunbury?—We only got as far as West Footscray with his.
404. Do you remember whether you had to stop at Footscray on any occasion during the coal strike with the departmental spark arrester on?—No.
405. As to any of the other arresters, do you remember the particulars?—They were mostly all the same. Some we got to West Footscray with; we had to fill with water there.
406. Was Mr. Allibon present himself?—Yes, to the best of my belief. As all inventors were on at the trial of their arresters, I think Mr. Allibon was also.
407. Did he supervise the firing?—He did not object to anything; he looked on, and saw the fire before we started.
408. You say you only know of one fire caused by the engine you were on?—They put it down to that. I could not believe it was that, because I had only a very light draught on. I reported that I saw no fire on the journey to Ballan, but on coming back I saw where about an acre had been burnt; it had been noticed, I suppose, by somebody.

409. *By Mr. Graves.*—Can you suggest anything that would make those accidents less numerous?—No, I do not see that the Department can do any more than they do. I have been driving seventeen years.

410. You say you did not see, from trials, any arrester that impressed you as more advantageous than the Railway Department arrester?—That is so.

411. That present improvement that we have the model of here was not all adopted at once?—In the winter time the Department only uses one grid, the bottom one; that is fixed lower. It is more perfect now than it was at the commencement.

412. Are fires less numerous now?—Yes, I very seldom hear of a fire.

413. Can you suggest any way of giving greater protection?—No. The regulations of the Department as to the fires are very strict in the summer time; the box to be kept like that—[*explaining*]*—*the fire boxes worked close, and the damper working at the first notch.

414. That means the protection that when the cinders drop they drop down on the track?—Yes; there are three notches on the engine—[*showing*]. There is only a small space then between the ash pan and the damper. Anything rolling down hits the damper and goes to the ground.

415. Are not the sparks more numerous on climbing up an embankment?—The idea is in that case it is from the funnel, but I do not see how they can come out of the ash pan going up an embankment.

416. As to opening to get a draught, you say that is not done going up a bank?—No. I find the engine steams better going up the bank.

417. What is the reason they stick up going up the bank?—Sometimes it is caused by an engine being overloaded, and other times by the fire getting thick and getting low in steam; some coal steams leaving a clean fire, and other fills the box with dirt, which makes it more difficult.

418. That cage—[*pointing*]*—*has to be cleaned out?—Yes. When cleaning out the ash pan you clean it with a hose.

419. That is at the option of the driver whether he uses it or not?—It turns up with the damper. I have not been driving with one like that.

The witness withdrew.

John Mitchell, examined.

420. *By the Chairman.*—What are you?—Engine-driver, stationed at Prince's-bridge, running through on the Great Southern line through to Port Albert. I have been driving between sixteen and seventeen years.

421. *By Mr. Graves.*—As to that ash cage, of which we have a model, what is the object?—To prevent cinders from falling through the fire bars on to the line.

422. Is that any detriment directly or indirectly to the engine working?—It is detrimental to the engine if you have bad slack fuel, because it drops through the bars, and that cage gets full up and prevents the draught.

423. Then if it is not full it is even slightly detrimental?—Yes.

424. Is that permanently fixed to it, or can any driver move it so that he can run without it?—Yes, he can lift it and keep it on. It is under his control. He is supposed to keep it there in the summer months.

425. Is there any benefit to a driver who has a certificate in being the man who will do the most work on the least fuel?—No. They bring out the consumption sheet quarterly, and each man is placed on this sheet according to the amount of fuel and oil he uses.

426. Supposing that you drive and go a certain number of miles, and use 20 tons of coal, is the man who goes the same distance and uses 18 tons of coal supposed to be a better driver?—It is only for the matter of accounts, because there are great differences in the engines. I might with one engine run 100 miles on 5 cwt. less coal than with his engine, dragging the same load.

427. Then it depends on the engine?—Yes, and the driver also. Some drivers might work an engine a little heavier than others.

428. Do you know of your own knowledge that any fires have been caused by the cinders dropping down on the line?—I have never known of fires being caused outside the railway fences, but I have witnessed fires being caused from the ash pan or the fire inside the railway fence, not the sleepers alone, but the grass.

429. On the Great Southern line there are always fires during the summer?—Yes.

430. I suppose, last year, the fires either by the railways or other sources improved the value of the land hundreds of thousands of pounds?—Yes.

431. So they are not so particular as on the Great Northern line about the fires; they rather like them?—Yes.

432. Can you suggest any way by which this damage may be lessened?—I can only suggest that the railway line inside of the fences be kept much cleaner than it is at present.

433. That means extra expense?—Yes.

434. How many men are there engaged?—Three men in each gang on the Southern line, and they have about 7 miles of railway.

435. What do you mean by clean?—I would not take the stumps into consideration so much as the undergrowth, the scrub, and grass.

436. You think that the fires would be less frequent if the Railway Department expended money on keeping down undergrowth?—Yes.

437. *By Mr. Bowser.*—Is that ash cage fitted on to all the engines?—No, not all; it might be fitted on to one-third of the engines they have in use.

438. Is it a recent innovation?—About two years old.

439. I suppose it is designed to make a further check?—Yes.

440. Has it been found, in your experience, an effective check?—Undoubtedly, it is a more effective check.

441. Why has it not been extended to the other engines?—I cannot say.

442. You mentioned that you would save coal on one engine and on another not. Suppose you had three engines of the Y type, all of the same pattern and driven by the same man, would they all steam

alike?—No. With one engine you might have no trouble to get along at all, and with the other engine be struggling the whole way. It might be the difference in the construction, or the engine might be out of order, the pistons or valves might be blowing through; many things might cause it.

443. Is it true that engines have humours; if you had three now engines they would be all different in the steaming power?—I cannot say that.

444. You think, from your experience, that the use of ash cages might be well extended?—Yes, I think so.

445. *By the Chairman.*—Do you think that engines are like watches, in two of the same make there might be a great difference?—Yes, a great difference; one may turn out a good one and the other a duffer, though they both look the same.

446. *By Mr. Bowser.*—What improvement would you suggest in the system of burning off?—Speaking for the line I am on, I should suggest that a gang of men be sent; there is scrub and undergrowth there 3 and 4 feet high.

447. From the stumps?—No, the undergrowth from the scrub cut down when the line was constructed; it is always growing up, and that requires to be cut down every year; it is impossible for three men to keep the line in proper order for 7 miles, and keep that scrub cut down.

448. *By the Chairman.*—Have you ever known cases in which fires were alleged to have originated from the locomotive you were in charge of?—No.

449. Have you had any experience at all as to fires of that description?—No; I have often reported fires; according to the regulations, if we see a fire on the line, or outside, within a reasonable distance, we are supposed to report it, and call the attention of the permanent-way men to it.

450. You know of cases of fires caused within the line from sparks from the fire box?—Yes.

451. Not from the funnel?—No.

452. In that case it ignited the grass?—Yes.

453. Have you tried any of those other arresters?—Yes, I used Thornton's, and found it act very well. I tried that on the Great Southern line; I was running with it for three or four months in the summer time.

454. Were any fires caused through it?—No.

455. Were there fewer sparks emitted than from the departmental arrester?—Yes.

456. Did it interfere with the steaming power of the engine?—I did not find it so.

457. Your experience of it was satisfactory?—Yes. I put in a report to the Department at the time to that effect; that was about six years ago.

458. Do you think Thornton's was as good as the departmental?—I think it was superior.

459. *By Mr. Graves.*—In what way is it superior to the departmental?—For one reason, the spark arrester is self-cleansing; it is a chain spark arrester, attached round the funnel, and the whole time the engine is running it shakes like small chain mail, the spark cannot get through.

460. Does it stop the power of the engine in any way?—I did not find it so. The one I had it attached to was a good steaming engine, one of the best. I never had any difficulty in any way with the steam.

461. The shaking kept it clear of dirt?—Yes.

462. And the spark went through that chain mail and the shaking kept it clean; that is the whole invention?—Yes; it was one of the old R class engine, 443.

463. Would that be a more difficult class to work than Y's?—No; it could be attached to any engine.

464. What portion of the engine was it attached to?—*[The witness showed.]*—The draught has to pass through it; I tried it with wood, and with the use of coal you could give full steam with a fair load on going up a bank of 1 in 50, and you would hardly recognise a spark from the funnel.

The witness withdrew.

James Keck, examined.

465. *By the Chairman.*—What are you?—An engine-driver.

466. What line are you stationed on?—Running between Bendigo and Melbourne. I have been on that line, off and on, seventeen years. I have also been on other lines.

467. Have you known any fires caused, or alleged to be caused, by an engine you were in charge of?—Yes, on one occasion only; that was on the Heathcote line; there were reports obtained; I do not think there was any departmental inquiry.

468. Did the land-owner complain and claim damages?—He put in a claim for 5 acres of grass being consumed.

469. Was any damage allowed?—Not that I am aware of.

470. You are not aware whether it was proved that the engine had caused the damage?—They came to the conclusion that the fire was not caused by the engine.

471. Do you think it is possible for a fire to originate from the fire box, a spark to be blown across to the grass outside the fences and ignited?—No, because if the coal came out of the fire box it would be forced in the direction you are running, that is along the line, not at the side; out of the funnel it could blow sideways. I do not think with the spark arrester we have now, if it is in good order, that a fire could be caused by a spark from the funnel; they are very strict as to keeping them in good order at Bendigo; it is possible a fire might originate from the fire box.

472. Have you had any experience as to any of the other spark arresters?—Yes. I have tried two other than the departmental; I do not know the names, but they were both failures.

473. *By Mr. Bowser.*—Do you think that fires might be caused and put out before you came back and you know nothing of them?—It would be possible. A fire might occur after we passed and be extinguished before we came back and we not know anything about it.

474. You have heard of only one complaint?—Only one since I have been driving.

475. Is your engine fitted with an ash cage?—No; they are not generally adopted.

476. Have you ever tried an engine with one?—Yes. I think they stop coal from getting out and are effective. When you examine them after you run a certain distance you find cinders in them, but that is not to say they were alight when they got in.

477. Live coals do fall in them?—Yes.
478. In the engine you have at present the live coals drop on to the permanent way?—They could.
479. They do?—I have not seen; I have seen coal drop on to the permanent way and jump about, but it has always occurred in the direction we are running; it does not scatter.
480. Would there be long grass growing at the time it would fall out?—It is always burnt off in the summer time, but should the coal escape there is always danger. On the Bendigo line they burn off the grass before it gets too dry.
481. Then with the present appliances there is always an element of danger both from the funnel and from the ash pan?—From the ash pan it is probable the ash could get away without that grate.
482. In your experience do any large cinders get up through that appliance into the funnel?—No, not with the spark arrester; should they escape, you see them only 6 or 7 feet from the funnel, and then they go out. I have never seen them reach the ground with that spark arrester.
483. *By the Chairman.*—Did you get stuck up during the coal strike through using wood?—No, I have never stopped on a locomotive yet.
484. *By Mr. Kennedy.*—Do I understand you to say in your experience that coals practically from the time they cease to ascend are dead?—Yes, as soon as a spark leaves the funnel, and the upward progress is stopped, it begins to waver, and the spark is dead instantly.
485. *By Mr. Bowser.*—You think the danger is greater from the ash pan than the funnel?—Yes.
486. You think that would be entirely prevented by having that grate?—It would be an additional preventive, but that is under the control of the drivers; they can keep it up or down as they like.
487. Would they need to remove it to get the draught?—I think not. An arrangement like that would soon get dirty, and clogged through the dirt and grease thrown on it.
488. Taking one of those on the express train and with good coal, would they need to clean it between Melbourne and Bendigo?—No, I do not think they would; they would have to tip it up at the station when they were standing.
489. That is a simple operation?—Yes.

The witness withdrew.

Edward Fitzgibbon, examined.

490. *By the Chairman.*—What are you?—Engine-driver, for about sixteen years; I am stationed now at Benalla, running on the Sydney express from Benalla to Melbourne.
491. Have you been long on that line?—All my time since I went into the service; I was in Melbourne on the suburban lines for about three years.
492. Have you known of any fires alleged to have originated from the engine while you were in charge?—Yes, once, between Violet Town and Euroa.
493. Was much damage done?—About three-quarters of an acre burnt.
494. Was any claim made on the Department for damages?—Yes.
495. Was there an inquiry into it?—Not that I am aware of.
496. Did the Department refuse to recognise the claim?—No, there was only the usual reporting between myself and the officers of the Department.
497. Did you report that in your opinion the engine had not caused the fire?—Yes.
498. What is your opinion of the present arrester, do you think it is effective?—I think it is a good one.
499. Do you think that any dangerous sparks can be emitted by an engine fitted with this arrester?—I think not.
500. Do you think there is danger from the live embers from the ash box?—I think it is possible there may be.
501. Carried by the wind to grass outside the line?—Not outside the fence; I do not think that possible; they may be carried to the grass within the fences.
502. You think there is more danger of fires originating from the ash box than from the funnel?—Yes.
503. Have you had any experience of any other arrester?—No.
504. *By Mr. Graves.*—Was it the fire on my property you referred to, Faithfull's Creek station?—Yes.
505. When was it?—Three or four years ago.
506. It was before the incline was cut down?—Yes.
507. *By Mr. Sangster.*—You say it is possible for live embers from the ash pan to fire the grass within the fences, and not outside?—Yes.
508. Why could not they go outside if the wind can carry them from between the rails, and fire the grass inside the fence; is it not possible for the wind to carry them outside?—If the engine is going slowly the ember stops where it escapes, and going down a bank, the train goes so fast the ember cannot get from between the wheels, say, 40 miles an hour; it would not have a chance to get off the track.
509. *By the Chairman.*—Have you noticed grass between the rails?—Yes, not lately; they keep the lines very clean now to what they used to.
510. You were driving other engines before you drove the express?—Yes.
511. Do you think the engine on the express train is more likely to cause fire than the others?—No, I think not.
512. *By Mr. Graves.*—Have you an ash cage?—They are not placed on the express trains yet. I do not know whether they are going to be.
513. *By Mr. Bowser.*—Would not a fire that caught in the railway reserve extend to the grass outside?—It might, it would depend on the wind.
514. If a strong wind were blowing the coals far from the ash pan, would not they be likely to be blown on to the reserve at the side of the line?—They might.
515. If you had that ash cage, do you think it would be more effective than the present ash pan?—It would prevent the ashes dropping on to the track. I do not think it would interfere with the draught if it were kept thoroughly clean.

The witness withdrew.

James Hodgkinson, examined.

516. *By the Chairman.*—What are you?—An engine-driver.
517. How long have you been engaged in that?—Nearly 30 years; all the time on the Victorian railways; I am stationed now at Prince's-bridge at present; I fill the duties of a foreman.
518. Have you had experience of most of the lines of the colony?—Yes, the North-East, Great Southern, and Bendigo.
519. Have any fires been alleged as caused by the engines you were in charge of?—No.
520. Were no complaints put in?—No.
521. Do you know of any case where a fire started beside the line after your train passed that you saw when you came back?—On the North-Eastern, I remember, in the summer it was a common occurrence for fires to spring up beside the line, and a common occurrence to see a swagman camping beside the line.
522. You connect those two circumstances together?—Yes.
523. It was also a common occurrence to see an engine running past?—Yes.
524. The engine you were in charge of was always fitted with a gridiron arrester?—There have been various descriptions. The first spark arrester I remember was about 25 years ago; that was a complete arrester; it caught all the sparks, not one could possibly escape; that is not the one in use now. It was a cage adjusted in the spark box; we caught them there, not one escaped.
525. Did it have any prejudicial effect on the steaming of the engine?—Yes, we had to cut a hole in the cage and let them escape; we could not get the engine back into the stable till they were let out; they were all dead before they were let out. It was a useless affair as to the running of the train; it was condemned like a good many more; I do not think they gave that a name; I think it was about the first that was ever tried.
526. Was that before the one that is in use now was adopted?—Yes, I think it was the first experiment tried in the Department.
527. Mr. Woodroffe said the first had a deflector at the top of the funnel?—Yes, something on the American principle; all of those proved to have their drawback.
528. Was all the apparatus inside the funnel?—No, it was simply a cage adjusted over the blast.
529. What was the next you had experience of?—The gridiron that is in use now is the one I have had most experience with. The others that have come into the sheds we have had a certain amount of knowledge of.
530. Did you conduct any tests yourself of any of those others?—No.
531. You cannot speak from experience of those?—No.
532. Do you think, admitting for the sake of argument that an engine may start fires, that they would be more likely to originate from the funnel or the fire box?—I do not think there is much danger of sparks or ashes from the fire box.
533. You heard Mr. Mitchell state that on the Great Southern line fires were caused within the fences by embers or sparks from the fire box?—Of course, if the grass is allowed to grow within the rails embers do fall out, but the construction of the ash pan is with a lip, and the draught as you run has a tendency to keep ashes back till they die out, but any one watching a train travelling along the line can see that any fire falling out of the ash pan would generally follow the engine and follow the train; it will not leave the train on either side owing to the suction from the train, and if even it got behind the last vehicle you can see by papers, or anything like that, that the express train will gather them up and carry them along; so embers cannot get away till the fire is practically knocked out of them.
534. Do you think fires are more likely to occur from the funnel than the fire box?—As far as fires occurring, I suppose there has been such a thing, but I think the proportion of fires that occur from the sparks is very small in proportion to the claims that are sent in.
535. Do you think fires are more likely to originate through sparks from the funnel than through sparks from the fire box?—More likely from the funnel.
536. *By Mr. Gavan Duffy.*—Some embers would be too heavy to be sucked along?—They generally follow. As they strike the ground between the sleepers they generally bounce, and once they start bouncing the current of the train keeps them bouncing and carries them along with it; you can watch them for yards and yards.
537. Are not the heavier ones left behind?—I do not think it makes much difference, because the draught is very heavy under the train when running.
538. Is it a common practice to open the fire box going up a pinch?—In working the damper you can work it either in going up a bank or going along a flat; the greatest difficulty in keeping steam up is along flat country against heavy winds; climbing banks is easy in proportion to flat country.
539. We have large experience of trains not going up a bank?—That is quite possible, because the load of a locomotive is almost the maximum, a fine weather load.
540. Suppose the driver is overweighted, and comes to a bank, and has to make a special effort to get up, could he do anything dangerous to an engine in the way of opening the damper or fire?—No; you can open everything wide open. In climbing banks or pulling trains, as a rule, enginemen always prepare to have a good supply of everything in good order to run.
541. Suppose a case where they were not quite prepared, would they then open the fire box and cause the danger?—No, they could not, because they have not the same draught. They do not use the same steam as they do along the flats, the blast is so slow; there is almost a space between each exhaust, whereas along a flat it is one steady flow of exhaust, and the rate you are travelling at gives you so much increased pressure of air from the force of pressure underneath, whereas you lose that on the banks. If an engine-driver runs short of steam on a bank, which may be through inexperience of the fireman, they get the idea that they must have something enormous to go up a bank, and as a result they get so much coal in the box that they do not know what to do with it, and it is not a fire suitable for generating steam. Instead of light and bright, as it should be, they have it full of black coal, and have not the force draught underneath to burn it. Naturally a stiff pressure is required to its full extent to keep the load going, and, the fire is not sufficient to keep it up. The steam reduces in pressure, and the water must be kept up therefore the train comes to a standstill.

542. The general impression is that the engine-driver, in a difficulty of that sort, throws open the fire box?—No; it is generally the fault of putting on too much fire; he has then to wait and burn the fire up by putting on the force draught that you have from your boiler.

543. The impression is that at those banks a larger display of fireworks is seen?—Simply because the exhaust from the cylinder is much greater; the driver opens the exhausts so much more than running along the flats, therefore the blast from the top of the chamber is so much heavier that it causes a more irregular blast from the surface of the fire.

544. Then there is more danger from sparks at the bank?—Yes, from the funnel, not from the fire box.

545. *By the Chairman.*—Is the fire box door ever opened under such circumstances to improve the draught?—The higher you raise the damper the more the draught, and the faster you are running, the higher the damper and the greater the force draught under the fires.

546. Would not there be greater liability of live embers falling out under those circumstances?—The more the draught going on to the ash pan, the greater the pressure on the lip, and that keeps the embers back, forcing them back; the greater draught going in underneath, the less liability of the embers to get past, because as they come down near the lip of the ash pan the forced draught going in drives them back, curls them over again until, after doing a journey of 100 miles, you might have half a barrow load of ashes in your pan when you come to the terminus, all dead and thoroughly extinguished. You have noticed that they all carry the lip in the front; the ashes fall into that hole, and along the edge of the lip, and the force draught comes in. The draught is so great that at a high rate of speed, with a head wind, it requires a good strong pull to raise your damper, to force it against the current; therefore, that strong current passing over the edge of the lip, the embers cannot get out unless they pass that forced draught.

547. *By Mr. Bowser.*—Assuming all the engines to have one spark arrester, would one engine give more sparks than another?—Yes; there are no two engines alike on the railways. The spark arrester may be the same, but the working of the engine may be different, though they may be engines constructed by the same contract and out of the same firm.

548. They would give a different experience with the same spark arrester?—Yes, every engine has its own peculiarities.

549. Would it be a very great variation?—No, not very great; it would be reported, and they would rectify defects when they were brought under notice by the men running the engines.

550. Then a good spark arrester might still be defective if the engine were not equal to its work?—The same spark arrester may have in one case half the number of sparks and double the number in another, and yet be doing the same amount of work.

551. You mentioned that the embers falling from the ash pan bounced, but do not you think that the swirl which kept them within the lines under the carriages while the train was passing would be similarly strong enough when the guard's van had passed to swirl them out to the side of the line?—I have never known them leave the track; I have watched them. I remember one instance where quite a shovelful of fire dropped while running, through the burning of the fire bars, and it allowed a lot of good fire to fall through. The embers that fall generally are the refuse; the fire is above the embers, but when the two fire bars burnt off it brought down the live fire with it. I watched the effect in that case, and I do not suppose there was a particle of it left more than 6 feet away from the train—you could see the reflection of it underneath the train while you were running, but I have never known them to leave the train or travel away from the track.

552. Would not it vary with a hot wind coming across the train?—It would vary according to the rate of speed. If you were going slowly with a strong cross-wind it might have an effect, but I do not know that any injurious results would follow.

553. *By Mr. Graves.*—I understand your experience is that very few fires are caused on the railways at all by the engines?—As far as I know.

554. It is possible that swagmen along the line have caused fires?—I am sure of it.

555. I think you drove on the Great Southern line?—Yes, I opened that line.

556. You have seen fires constantly on that line?—I saw the heaviest fire the other side of Foster.

557. You know the steep bank coming up the Hoddle Range?—Yes.

558. The dried undergrowth grows quite close to the carriages?—Yes, and it grows very quickly.

559. How do you think those fires occurred?—The whole country appeared to be on fire.

560. Have you any recollection of the fire being confined along the side of the railway there?—No.

561. You think the fires that came close to you when driving were not created on the railway but came across to it?—I cannot say.

562. You know of no case where the fire was confined along the side of the railway?—No.

563. *By Mr. Kennedy.*—Have you had any departmental tests as to the cinders or coal escaping from the ash pan?—No. Of course, the better quality of coal supplied to the engines the less danger there is of embers or sparks.

564. When a train is leaving slowly near a station and a strong cross-wind blows, it takes the cinders out on to the side of the line at the crossing?—That is possible; there would be nothing to prevent them going with the wind.

565. Is it a usual thing for fire bars to shift in the fire box and let out an undue proportion of cinders?—Not shifting; they do sometimes burn the ends off them; enginemen generally watch for things of that sort, because it causes trouble for them, and they take the precaution to examine them at the sheds when the fires are laid, and they are then put in order; but sometimes there is no telling the cause. The fire will get in between the bars and burn the ends off, and then there is nothing to keep the bar from dropping.

566. In stoking, have you found the possibility of moving the bars, or so altering them in their position, as to cause an undue proportion of cinders to go through?—The grid is so adjusted that the bars are made to give a clearance between each bar. Each bar carries its own lug, and they are so constructed that when the full number is put into the box the box is full; the lugs are close to each other, and that gives the regulation quarter of an inch between the bar.

567. Has your experience shown you that the life of even new fire bars is very short, that you find them bent and two adhering together, instead of being the proper size?—Such a thing can be done in one shift; the whole set of bars can be destroyed. I have known such an occurrence on a locomotive.

568. Do you use that cinder cage?—They are fitting those to engines as they go down to the Newport shops for repairs; I believe the whole of the main line engines are sent out with those grids.

569. Do you consider that an improvement?—I think it is a great improvement in the regulation of the draught in itself, because in running round curves on long lines you vary in the current. Sometimes the wind is direct ahead and sometimes across, and with the wind all blowing from the same direction, if you regulate your draught from the damper for a cross-wind you want a great deal more damper than with a head-wind, and with those variations of curve, you have a variation in the fire with those crates. I think the wind is regulated through having to pass through those small holes; and the saving of ashes falling on the line is another advantage.

570. *By Mr. Graves.*—You said the engines were examined—suppose you start as you have done in the morning at seven and at five o'clock get to Port Albert, and you hand over the engine to the cleaner, have you to examine the engine yourself?—The cleaner at Port Albert simply cleans, the driver is responsible all the time for the engine till he gets back; there is a shed day. The run to Port Albert takes twelve hours, and the run back twelve hours; in order to give the driver a rest day, they give him a shed day; you go in the shed, and do all the necessary work to your own engine, inspect the re-fitting to see everything is in good order before you go away the next morning. That is the rule with the main line men, and if the men cannot do it themselves, there are other responsible men who do the work.

571. So that if there is anything wrong with the spark arrester or the bars it is your duty on shed day to see that it is all right?—Yes. This gridiron spark arrester has one good quality. It is the case with all men on the railways; anything that is adopted must be made self-acting, unbreakable, and not requiring any attention, because the engineman has enough to do on the road to attend to the compulsory things. With this spark arrester, if you do not give it a brush, and keep its face free from soot, the fewer sparks can get through, the narrower the spaces get, and the harder it is for you to get steam—you can allow it to close slightly—therefore you keep it clean for your own safety, and if you do not clean it, you have no sparks at all, and have to answer for not getting along well enough in your steaming.

572. *By Mr. Sangster.*—You say your regulation bars are close up; do you take the bar out with any class of coal?—The bars can be taken out.

573. Is there any class of coal used on the Victorian railways through which you require to take the bar out?—Yes; the engines that are burning this light class of coal are supposed to have a broader lug to keep the bars further apart than the ones burning Newcastle coal. The engines are not supposed to be running with the spaces between the bars; the lugs are supposed to be made suitable for the coal the men have to burn.

574. *By Mr. Gavan Duffy.*—Is that class of coal more dangerous than the ordinary class for causing fires?—The lighter the coal the greater the danger I think.

The witness withdrew.

Mr. Gavan Duffy here took the Chair.

Patrick Minogue, examined.

575. *By the Chairman.*—What are you?—An engine-driver in the Railway Department. I run over all the lines, principally the South-Eastern—the Great Southern; we generally run to Nyora on that line, goods trains.

576. Have you known fires to be caused on your line?—Yes, on one occasion I knew a fire to occur in a truck of firewood as I was coming from Heyfield; we were burning wood; it was at the time of the coal strike, and coming to Traralgon I noticed a fire on one of the trucks, and I think it must have come from the engine; that is the only instance I know of fire coming from a locomotive; I am not sure in that case, but it was my opinion; we were burning wood on the engine. I have known of no cases where we have used the ordinary coal.

577. Have you seen fires alongside the line?—Yes.

578. Have you not known how they were caused?—No.

579. Assuming that fires are caused by the engine, would you think it more likely they were caused by sparks coming through the funnel or the fire box?—Through the funnel if they occur at all, because sparks or embers coming from the ash pan, as a rule, drop into the 6 feet between the rails, and, as a rule, between the rails is very clean.

580. Assuming that there were dry grass or any inflammatory matter on the track, a fire might be easily caused?—Yes.

581. There would be enough cinders coming through to cause a fire in that way?—Yes.

582. You heard the evidence of the last witness as to the difference in steaming along a flat and up a rise; do you agree with what he said?—Yes, to a great extent.

591. You think if the danger of sparks getting out does occur it is less likely on a rise than a flat?—Yes, from the ash pan, but the danger from the funnel, if there is any, is the sparks will come through more going up a hill because of the great draught; the liability is less through the ash pan, because you are travelling at a lower rate of speed.

584. A train slowing down into a station, or out with a cross-wind then the cinders out of the ash pan might fall outside the track; have you had experience of that?—No, I think it would be hardly possible for them to fall outside the rails; they might, but in my opinion it is rather far-fetched.

585. I suppose, from your position on the engine, you could not fully see what became of the sparks once the engine passed?—If you are looking for them you would, but in the ordinary course of things you would not see them at all; you could stand on the side of the engine and look at them if you wished to make an experiment.

586. You sometimes do try experiments with the bars?—No; we know what they are without trying any experiments.

587. Suppose you had bad coal, would not you take out a bar?—No.

588. Have you never done it?—No. The only way with bad coal is to wait at the station and clean your fire.

589. Have you had any experience of arresters besides the one in use by the Department?—Yes, two others. I do not know the names of them; that would be about 1892-3; I know one was no good at all. I was travelling with it and had to stop half-a-dozen times on the way to Woodend. The engine, a Y, had a bell funnel, and the spark arrester was placed on that funnel; it was a close mesh, a fine wire, too close to allow a spark to escape. It would catch sparks, but it caught everything else, but the engine would not generate steam enough to draw the train. I stopped at St. Albans for about 25 minutes; I was losing water; the water was leaving my boiler; the decrease of water means the decrease of power.

590. Did you try that on more than one trip?—Two trips; I sent in a report on it. I think that would be in November or December, 1893. I did mention about the defective spark arrester, because I got late to Woodend and late coming home, and I put it down to this defective spark arrester, the way it interfered with the engine steaming. I was a couple or three hours late.

591. What was the other spark arrester?—I was firing on that with Ryan, a witness to-day. I made only one trip to Sunbury. I do not know the nature of that.

592. *By Mr. Sangster.*—What spark arrester had you when the truck caught fire?—The present double-grid departmental spark arrester. They take one of those grids out in winter time. It is very difficult to steam the engine with this double one, because the mesh of the wires prevents any decent draught getting to the coal.—[*The witness subsequently sent the following memorandum with reference to his answer to this question:—*]

VICTORIAN RAILWAYS.—LOCO. BRANCH.

Memo. for C.M.E., Spencer-street.

Subject.—Spark Arresters.

North Melbourne Station, 26th September, 1900.

SIR,—Re truck taking fire coming from Heyfield. I do not recollect now whether the spark arrester was a single gridiron or a double one, or if it was a gridiron at all. In fact, I cannot call to mind what kind of arrester was in use at the time, as this incident occurred about ten or eleven years ago, therefore I wish to correct the evidence given before the Commission on this point.

I am, yours obediently,

P. MINOGUE, Driver.

27th September, 1900.—The C.M. Engineer.—Forwarded.—J. T. Hall, Loco. Foreman, North Melbourne.

593. *By the Chairman.*—When you put on the second grid in summer, what difference does it make?—It means you have double the resisting power against any sparks that might try to come out. You may burn a little more coal. We take the same load, but we very often have to stop at stations, and wait to fill the boiler with water, and have another go.

594. You would not be as late as with that other one you tried?—No.

595. Even with the double grid you are late?—Sometimes. The other witnesses have said that engines will steam differently. One engine might steam with this double grid very dully, and take one out and the engine will steam well.

596. *By Mr. Graves.*—Have you ever been late with that double grid, when that was your reason for being late?—Yes, I think so. I cannot call to mind any particular case.

597. Have you assigned that as the reason for being late, the double grid of the spark arrester?—No, I cannot remember any case.

598. You say it does cause delay, that under equal circumstances with the double grid you might be delayed by that cause?—Yes. On goods trains there are a good many opportunities to keep the grid clean, say, Broadford. They stop at every station and do shunting. You know you are in difficulties with the spark arrester; it is dirty, and the first thing you clean it, and it will hold good for another 35 miles. The next opportunity you clean it again. I have known cases going from Bacchus Marsh to Ballan, where they had difficulties; that is a very heavy hill. Before that 14 or 15 miles is completed the spark arrester is dirty, and you have a lot of trouble with the double one, or with the single one if it gets dirty; the double is more likely to get dirty than the single.

599. *By Mr. Sangster.*—What class of coal is the most likely to make the grid dirty, the Newcastle, Outtrim, or Coal Creek?—The Coal Creek would fill it up quickest, because it is the lightest, and so much more would stick on this gridiron. That is my individual opinion, without making actual tests.

600. *By the Chairman.*—Do the fire bars often burn through?—Very seldom; I have had them only once or twice.

601. If it did occur, the live coal might fly about on the track?—Yes.

602. *By Mr. Sangster.*—Supposing you had coal inclined to clinker, and coming with as much of a load as your engine could take, and facing a hill the fireman put in an extra draught, is there not a likelihood of that stuff going into the ash pan?—Yes, if it got down on to the bars and you raked them.

603. Then would not there be a good deal of those embers going out of the ash pan if it was pretty full?—Yes, there would be a danger of it getting out.

604. You do not think it would leave the rails?—No; I am very strong on that; I do not think it would get beyond the rails.

605. *By Mr. Graves.*—What is the distance of the drop from the pan to the surface of the soil?—A foot.

606. *By Mr. Wheeler.*—You have tried only two of the new spark arresters?—Yes.

607. Have you seen most of the new inventions that are at the Railway Department?—I have seen some of them.

608. Could you give us an opinion as to those you have seen; are they likely to be as good as the gridiron you have in use now?—No.

609. Have you seen any yet equal to what you are using now?—No.

610. You consider that is the best spark arrester you can get?—It is the best I have seen.

611. Have you seen any in use in the other colonies?—Not practically; I have an idea of what they use, but have not seen them used.

612. You do not know of your own knowledge that they have anything better than ours?—No.

613. I suppose an engine steams better with one grid out?—Yes.

614. But it is safer when the two are in?—Yes, as far as the sparks are concerned.

615. You said you had never noticed fires take place from the ash pan; you know they open at the ends and let the ashes out; is there no danger at that time of the fire flying out when the engine is travelling at a good speed?—Yes, there is a danger of the fire dropping out. I have seen sleepers on fire, and do not know any other way they could have got on fire except that.

616. *By the Chairman.*—You have never tried any actual tests except those two?—No.

617. *By Mr. Wheeler.*—You are satisfied that the two you tried would be of no use?—Yes.

618. You do not know who were the inventors?—No; I did not have much of a practical trial of one; we only went to Woodend, and could not get enough heat with the wood, because of the brick arch in the engine. They took that out, but I did not run the train the next night, so I cannot say the effect when the engine would be working heavily on a heavy grade; that is the time when there is the chance of sparks through the funnel.

619. *By Mr. Sangster.*—Was the inventor on the engine with you at the time you had the test of the bell-mouthed funnel with the small mesh in the arrester?—I was not testing; I simply had the engine given me to run. The next man who took the engine was going to Seymour, and he went only to Essendon; he said he would not go without another engine; he did not want to spend all his lifetime on the road, so they took the thing out the next day; it caught the sparks right enough, but you could not get up any steam.

The witness withdrew.

Adjourned.