THE SUNSHINE RAILWAY DISASTER.

Who was to Blame ? ? ?

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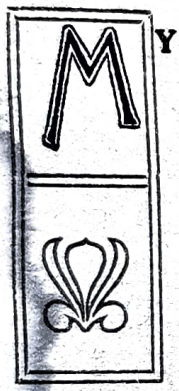

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CORONER'S ENQUIRY

INTO THE

SUNSHINE

RAILWAY DISASTER,

BEING

a Digest of the Evidence in relation to the Westinghouse Brake tendered at the Enquiry conducted by Dr. Cole (assisted by a Special Jury of Eight Melbourne Citizens), at the Law Courts, Melbourne, which covered a period of nearly three months, during which 58 Witnesses were examined.

PUBLISHED BY

W. O. BAGLEY,

Brake Expert, appointed by the Coroner to assist in the Enquiry, to supervise overhauling and repairs to brake and brake-gear prior to running the last four tests; and to personally conduct a number of the tests ordered by the Coroner and Jury.

SECOND EDITION

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1909.

PREFACE.

THE recollection of the dreadful railway disaster at Sunshine on the night of Easter Monday, April 20th, 1908, will not be entirely effaced in this generation. Constituting a melancholy record in being the greatest calamity recorded in the history of railway transport in the Commonwealth, and apparently surrounded with so much that is mysterious and inexplicable; and culminating, as it did, in an Enquiry which for length and thoroughness has left all State records far behind, it needs very little further explanation to justify the publication of this book.

It was thought that both railway men and the public would be glad to have some permanent record of the enquiry into the cause of so grave a catastrophe, especially as many important issues were decided, the reports of which in the press were condensed into so small a space that often only a passing reference was made to most serious matters which had been discussed in detail before the Coroner and Jury.

It is right to say that as the enquiry turned on the question of whether the failure of the Westinghouse brake accounted for the Bendigo train dashing into the Ballarat train at a high rate of speed, only the evidence dealing with this aspect of the case has been presented. Even this has had to be compressed; but extreme care has been taken to prevent

any misrepresentation, and the Editor has been at considerable pains to fairly represent all interests, without allowing his own individual opinion to influence him in deciding just what to put in and what to leave out.

The book makes no pretension to originality. It claims to present in compact form the gist of the evidence dealing with the brake, together with the speeches of Counsel and Coroner. The opinions expressed are for the most part the opinions of more or less interested persons, and the reader will have to arrive at his own conclusion in answering the question, "Did the brakes fail?"

The illustrations were prepared from photographs taken on the spot, and therefore faithfully represent the incidents they are intended to illustrate.

This book is published in the hope that it may find a ready sale amongst those who desire a true and permanent record of a remarkable enquiry, which created a world-wide interest, dealing as it did with a calamity the like of which we sincerely trust will never be repeated in the history of our railways.

W. O. B.

CONTENTS.

THE BAR.

THE CORONER (Dr. Cole) was assisted by Mr. S. McARTHUR (representing the Public).

Mr. H. E. STARKE, for the Railway Commissioners.

Mr. E. J. CORR, for Drivers Milburn and Dolman and Firemen Tomlinson and Deveney.

Mr. H. R. CHOMLEY, for Stationmaster Kendall and Guard Darcy.

Mr. E. W. OUTHWAITE, for the Westinghouse Brake Company.
and several others, who appeared for injured persons and relatives of deceased passengers.

Mr. EVANS, M.L.C., an old and respected engine driver, assisted the legal representatives of the men in many ways. He worked very hard in the interests of the suspended train-crew, and his experience and ability was of great assistance to those engaged in placing the case for the drivers, firemen, guard and stationmaster before the Jury.

THE JURY.

DOUGLAS BUZOLICH, Hatter (Foreman).
WILLIAM ATKINSON, Canvasser.
THOMAS MICHAEL BOURKE, Manager Civil Service Stores.
JAMES DAVIES, Secretary Commercial Travellers' Club.
THOMAS WALKER FOWLER, University Professor.
GEORGE FENNER, Importer and Commission Agent.
WILLIAM HOGAN, Wine and Spirit Merchant.
WILLIAM WALKER, Paper Merchant.
SYDNEY HERBERT NASH, Electroplater.

CORONER'S ENQUIRY

INTO THE

SUNSHINE TRAGEDY.

THE most appalling railway disaster recorded in the history of the Commonwealth of Australia was that witnessed on the night of Easter Monday, April 20th, 1908, at Sunshine (Braybrook), Victoria, when the Bendigo evening train, loaded with holiday-makers returning to the Metropolis, ran past the distant and home signals, which were set at "caution" and danger respectively, and crashed into the crowded Ballarat train, killing 44 and injuring above 400 persons, and costing the Railway Commissioners £125,000 by way of compensation to the injured and relatives of deceased passengers.

It was one of those awful, though fortunately very occasional, tragedies which seem to be inseparable from the handling of railway traffic.

The Bendigo train was composed of two 90-ton engines, six carriages, a postal van, horse-box, "U" truck and guard's van, while the Ballarat train was made up of two engines, eleven carriages, a postal van and guard's van.

Had either train been on time the disaster could not have happened. The Ballarat train (owing, it has been explained, to delays incidental to all holiday traffic), forty-three minutes late on reaching Sunshine, an important junction station, was delayed a further three minutes owing to the length of the train, which, after stopping, had to be moved forward to allow the passengers in the rear carriages to alight. The Bendigo train was also twenty-four minutes behind scheduled time at Sydenham (the block station nearest to Sunshine).

When the collision occurred, the two ninety-ton engines drawing the Bendigo train literally tore their way through the rear part of the Ballarat train for a distance of nearly two hundred feet, totally wrecking the guard's van and four carriages. So great was the force of the impact that the

woodwork of the carriages was smashed into splinters, while the ironwork was broken and twisted into a shapeless mass. A remarkable feature of one of the wrecked carriages (an illustration of which appears elsewhere) was that the roof remained intact, as though it had been carefully lifted from the body of the carriage, which was smashed to atoms. The damage done to the Bendigo train was confined to the leading engine, which had the cow-catcher broken, the forward axle bent, and the front end slightly damaged; it also left the rails.

At Sydenham (seven miles back from Sunshine) the Bendigo train received the 3.1 signal ("Line clear to quarter of a mile ahead of home signal"), which was given by the stationmaster at Sunshine in the belief that it was the 1.5 ("Line clear to home signal, but blocked ahead"), and as the Bendigo train was scheduled to run through to North Melbourne without stopping at Sunshine, the questions were naturally raised: Was the engine-driver mislead into a feeling of false security by receiving the unqualified "Line clear" signal at Sydenham? Did he proceed with less caution and more confidence on receiving the 3.1 signal than he would have had the 1.5 signal been given? Did he, on the strength of the 3.1 signal, attempt to make up time by steaming hard, expecting to get a clear road through? Or was he so intent on performing the multitudinous duties of an engine driver on a fast passenger train that he left himself too little margin in which to pull up his train? These were the questions which troubled the mind of expert and laymen alike, and the press and public emphatically demanded that a searching enquiry should be made to discover what were the causes which combined to make such a terrible calamity possible.

On the day following the disaster, the Chief Commissioner of Railways (Mr. Tait) made the following statement:—"A thorough examination was made of the brakes of the engine and carriages of the Bendigo train as soon as practicable after the accident took place, and the brakes were also tested, with the result that it was found that there was ample braking power on the train, and that the brakes were in good working order. The drivers of both engines and the guard of the Bendigo train state that there was ample pressure indicated by the gauge."

The drivers and firemen of the Bendigo engines were:—

Leading engine: Driver Milburn; Fireman Tomlinson; Second engine: Driver Dolman; Fireman Deveney. Their reports of what happened were short, but emphatic. Following are copies of same, as forwarded to the Railway Commissioners: —

REPORTS OF THE TRAIN CREW.

Milburn's Report.

I regret to report that on running the 6.50 p.m. up Bendigo train, on approaching Sunshine, the distant and home signals were against me, and the starter off. I applied brake to stop in usual manner, and on coming up to the home applied brake to stop, and when I made this application the brake took no effect. I reversed engine and gave full steam to stop at home signal, but ran past, with the awful result.

Tomlinson's Report.

In reference to your note asking for report, I can only say immediately distant signal came in sight at Sunshine Driver Milburn whistled. I then saw the signals were against us. I put my brake on hard. Driver applied Westinghouse and train steadied, and I thought we were going to stop safe. About or just before arriving at home signal she seemed to get away. I then shouted to driver, but although he reversed and steamed she pushed in. Driver on second popped whistle passing home signal. I could not get any more from my brake.

Dolman's Report.

I have to report, for your information, having been at Kyneton on April 20th with stand-by for passenger trains from 7.30 a.m. I was attached at Kyneton to the 6.50 p.m. up Bendigo. Being second engine. I put isolating cock in cut-out position. As we passed St. Albans the pressure gauge was showing 70 lb. air pressure in train pipe. On approaching Sunshine I could not get a view of any signals until close upon the distant signal, owing to smoke escaping from leading engine. Almost at the instant I felt the brake being applied, and the speed was reduced. Under usual conditions should have been able to stop at home signal, but the brake did not appear to be retaining its usual effect. I then put my brake valve handle around in emergency position, but

found the air was gone. I at once reversed engine and gave her steam; by this we were passing the home signal, and was unable to stop before colliding with train at platform at Sunshine.

Deveney's Report.

I have to report being at Kyneton on April 20th, stand-by for passenger traffic from 7.30 a.m. until we left Kyneton attached to the 6.50 p.m. Bendigo. On approaching Sunshine the engine was obscured from my view by the smoke from the leading engine. I felt the train checked in speed approaching the distant signal, which I did not see until passing it. I went then to look how the home signal was, but the action of Driver Dolman told me something was amiss, and I immediately put my hand-brake on as tight as I could. I then looked out of the gangway of engine, and could see no signs of any light, but just before a collision which took place I saw van lights. I may add that an endeavour was made to push train back by Driver Dolman, under instructions from guard, but whether the engines were uncoupled I do not know.

Milburn Expected to Clear Himself.

There was one man above all others who was looked to to supply the true account of the disaster and how it was caused, and that man was Leonard Milburn, the driver of the leading engine. He was a *driver* of twenty-three years' experience, and had a reputation for being a particular and painstaking man, and careful to have his engine always "up to the mark." He was recognised as a man who would leave nothing undone to run on time, and was regarded as having an iron nerve.

When it became known among railway men that Milburn was in charge of the Bendigo train, it was thought that an ample explanation would be forthcoming to clear him of all responsibility in the matter, but no one was quite prepared for the startling statement he made when called on to defend himself against the charge which he knew was at the back of the searching enquiry instituted by the Coroner, Dr. Cole, and referred to the jury of keen, intelligent, and level-headed business men who sat with the Doctor.

It soon became evident that the Westinghouse Brake was to be put on its trial. Milburn's evidence challenged the reliability of the brake; his indictment against it, based on

his experience of that night of April 21, was that it was a brake liable to disorder, and likely to release at the moment it should be exerting its greatest power; and that, as a consequence, it might happen that a calamity such as the Sunshine tragedy would be repeated again and again, under like conditions, because of the unreliability of the brake at the critical moment.

Such a serious possibility called for the most searching and intelligent enquiry; and the Railway Commissioners determined that no expense would be spared to probe the matter right to the very bottom, and to exhaust every possible source of information in the effort to re-establish the faith of the public in the absolute reliability of the Westinghouse brake.

Milburn left no doubt as to his sincerity in taking up the position that the brake failed to hold. He emphatically stated that he had not been misled by receiving the 3.1 instead of the 1.5 signal (except to the extent that he might have entered the section at a higher rate under the 3.1 than the 1.5 signal, especially as he was expecting to run through to North Melbourne without stopping). He says he saw the distant signal at danger half-a-mile away, and also the home signal at danger immediately after passing the distant, and had ample time to pull up his train at the home signal, only for the sensational trick that the brake played in refusing to hold the train for the few moments that its power was needed to pull up the train.

EXPERTS CALLED IN TO ASSIST THE CORONER.

As there was nothing in the statements or reports of either drivers or firemen to throw any light on the probable cause of the failure of the brakes to hold; nothing to relieve the anxiety of those responsible for the safe-running of fast passenger trains, nor to allay the fears of passengers themselves, who up to this time had regarded the power of controling the train committed to the driver through the Westinghouse brake as infallibly reliable, all minds were therefore turned towards the experts, who, it was hoped by not a few of those most interested, would at least be as earnest

and unwavering in their efforts to establish the absolute reliability of the brake as those whose evidence had gone to discredit its effectiveness. Certainly, nothing had so far been said to support the unanimous statement that the brakes refused to hold long enough to pull up the train; and it was felt that on the experts devolved the task of weighing down the scale, either in favour of the crew of the Bendigo train or in favour of those who declared that, whatever else caused the accident, it certainly was not the failure of the Westinghouse brake.

There were three experts appointed, viz.:—

1. W. C. Kernot, Professor of Engineering at the Melbourne University, whose ability and integrity have earned for him an enviable reputation in the engineering world.
2. Mr. F. Selley, representative of the Westinghouse Company in Australia, a gentleman whose theoretical knowledge of the brake could not be surpassed.
3. Mr. W. O. Bagley, who had devoted his life to the special study of the brake, who had had special facilities of dealing with every phase of the brake's "diseases," and who, as a driver with 20 years' experience, could claim some acquaintance with its practical manipulation.

These three experts were given unlimited powers by the Coroner, supported by the Railway Commissioners. They were instructed to make whatever examinations they chose, conduct whatever tests they considered necessary to demonstrate the theories they might form as to the cause of the accident; and, in short, to exhaust every source of enquiry that would help to arrive at a conclusion from which there could be no reasonable dissent.

Since the collision, the brakes of the Bendigo train had not been interfered with. As soon as the train was brought to Melbourne, the working parts had been sealed, and, under the direction of the Coroner, was guarded day and night by police. The engines, also, had not been touched, except to carry out one or two minor repairs absolutely necessary to the running of the same engines in any tests that might be authorised. It will be seen, therefore, that the train the experts overhauled was practically the same one that dashed into the Ballarat train at Sunshine.

WHAT THE EXPERTS REPORTED.

EACH expert made his own thorough and exhaustive examination of the brakes of the different carriages; piston travels were measured with exactness; brake cylinders and triple valves were carefully overhauled; the train pipes were taken down and examined for scale; the connections were closely scrutinised for leaks or other defects; and altogether the brake gear from engine to van was conscientiously overhauled.

PROFESSOR KERNOT'S REPORT.

Professor Kernot commented on the fact that the make-up of the "express" train was peculiar, inasmuch that while five of the vehicles were of modern design, carried on double bogies, the other five were old four and six-wheeled stock.

He gave a most concise description of the parts of the Westinghouse brake, and arranged in such a way that the most untutored mind on the brake could easily follow it; and we believe a reproduction will be appreciated by "lay" readers of the book. The description was as follows:—

The Westinghouse Brake consists of the following principal parts:—

(a) A small pump operated by steam from the engine boiler.

(b) A main reservoir for compressed air placed on the locomotive, and kept charged by (a).

(c) A pipe with the necessary flexible connection running the whole length of the train.

(d) A series of small reservoirs of compressed air fed from (c) and placed one on each vehicle.

(e) A cylinder and piston on each vehicle, the action of which applies the brake blocks to the wheels throughout a system of push and pull rods and levers.

(f) A driver's valve on the engine, whereby air may be supplied from (b) to (c) or may be discharged from (c) to the atmosphere.

(g) A triple valve on each vehicle connecting the main pipe (c), the small reservoir (d), and the brake cylinder (e) in various ways.

(h) A release valve on each vehicle, whereby the brake may be released even if the vehicle is separated from the rest of the train.

The action of the brake is as follows:—First the main reservoir (b) is charged by the pump (a) up to the pressure of, usually, about 90 pounds per square inch.

Second, from this as a source air is passed through the driver's valve (f) to the main pipe (c), whence it finds its way through the triple valves (g) to the small reservoirs (d) at a pressure of about 70 lbs. per square inch. The brake is now effective.

To apply it, the pressure is reduced in the main pipe (c) by means of the driver's valve; this causes the triple valves to move and admit a certain definite amount of air from the small reservoirs (d) to the brake cylinders (e). The brake is now on.

To release it, the pressure in the main pipe is restored by letting in air from (b); the triple valves move back to their original position, letting the brake cylinders exhaust to the atmosphere, thus releasing the brakes, and at the same time replenishing the small reservoirs (d), so as to be ready for the next application.

There are two ways of applying the brake, called "service" and "emergency." In the former, the pressure in the main pipe is reduced about 10 lbs. per square inch, leading to a limited motion of the triple valves and a discharge of but a portion of the air in the small reservoirs to the brake cylinders. The brake is then applied gently, and without discomfort to passengers. In emergency applications the main pipe is fully opened to the atmosphere, all its pressure is lost, and the triple valves move into their extreme position, discharging all the air in the small reservoirs into the brake cylinders, and the brake is instantly applied full force, to the discomfort of the passengers, but possibly preventing a disaster. If the main pipe or any of the carriage reservoirs burst, the brakes apply themselves throughout the train. The guard can apply it by opening a tap in his van.

As the quantity in each small reservoir is limited, the power of the brake may be lost or reduced by either leakage at the piston or too long movement of the piston. With a leaky piston the brake may be applied firmly for an instant, but it speedily leaks off and becomes inoperative. With a too

long stroke, the pressure continues, but is poor, and feeble all the time.

The first of these evils is met by carefully and frequently examining the pistons, keeping the leather packings of the latter well lubricated, and renewing them when worn out. The second evil is a constantly growing one.

Every application wears away a certain amount of metal from the brake blocks, thus permitting the pistons to travel further in their cylinders, and reduce the effective pressure by expansion. To meet this adjusting screws and pins are provided in the connections, and these need constant attention. If these adjustments are wrongly treated or neglected great evils ensue. If the piston travel is too small, the pressure on the brake is too high, and the wheels may be skidded, the result being loss of brake power, and the grinding of flat places on the wheels. If too large, and this is the more likely to occur as blocks wear away, the brake becomes weak, and finally quite useless.

The Westinghouse Company publish instructions on this point, giving the maximum and minimum travel for each type of cylinder. It will be seen from this that these have been neglected in the train responsible for the collision, the travel as measured prior to our tests of the 28th April being in every case, except the second engine and tender, abnormal. I have also to report that, after a careful examination of brake blocks supposed to be effective, on five different occasions, I found that out of eight vehicles only four acted properly every time, two acted four times out of five, one acted feebly and partially out of five, and one never acted at all.

These I regard as most unsatisfactory, and needing rigorous investigation, and must express my surprise that the stops made in the running tests were as good as they were.

Judging by my own personal sensations and recollections of previous experiences, and quite apart from the numerical results of the trials, I should say that the brakes on the Bendigo train were certainly feeble.

F. Selley's Report.

Mr. Selley's report on the standing test carried with it no comment. However, we reprint the result of the standing tests of brakes conducted at St. Albans prior to the running tests on April 28, in the belief that they will be valuable for

purposes of reference. In each of the five standing tests a reduction of 15 lbs. was made.

Horse Box 18F was not braked at all.

Bogie Car, 91AA—1st test, brakes were off; with the other four they were on.

Bogie Car, 8AV—In every test they applied.

Bogie Car 3BV—In every test they also applied.

Bogie Car, 29BB—Brakes applied in every test.

4-wheel Car, 258BH—Brake inoperative, through being "cut out" at Bendigo.

6-wheel Car (braked on four wheels), 30BH—In the first, second and third tests the brakes applied only one end; in the fourth test they did not apply at all; while in the fifth test they applied only one end.

4-wheel Postal, 20E—In all five tests the brakes remained off.

6-wheel Waggon, 568U—The brakes applied in every test.

Bogie Brake Van, 013—In the first test the brakes applied; in the second test they remained off; but in the next three tests they applied every time.

Mr. Selley gave a comprehensive description of the Westinghouse Brake in a short compass, made so simple and clear, that we append it in the hope of further enlightening the uninitiated. He said:—

In the first place, the Westinghouse brake is not a vacuum but a compressed air brake. There is an air pump situated on the engine, which takes its motive power from the locomotive boiler. The air from this pump is compressed into a reservoir placed in a convenient part of the engine, up to a pressure of 100 pounds to the square inch. The engine is also equipped with the driver's brake valve, used for the purpose of manipulating the brake; a brake cylinder, an auxiliary reservoir, and a triple valve. Each vehicle carries also one complete set of apparatus, consisting chiefly of a brake cylinder, a reservoir and a triple valve. A line of piping extends from end to end of each vehicle, and these are connected by flexible indiarubber tubes.

When a driver is preparing his train for service, the hose connections are made good between the engine and the first vehicle, and so throughout the train. The train-cock of the rear vehicle is always kept closed. When the driver is ready to charge the apparatus in each vehicle with compressed air, he allows the air stored in the main reservoir on the engine to

pass along the whole length of train line, by placing the brake-valve handle in the charging position. The compressed air then passes down each branch pipe, on to the triple valve piston. It feeds past a groove in the body, and enters the auxiliary reservoir, where the power is stored ready for application of the brake. When these reservoirs are charged to a pressure of about 70 lb. to the square inch, the brake is ready for operation.

If the driver wishes to apply the brake, a portion of the pressure which is stored in the train line is allowed to escape to the atmosphere through the driver's valve, the amount of pressure so allowed to escape being recorded on the pressure gauge of the engine. Allowing the air to escape from the train line to the atmosphere operates the triple valves, thereby establishing a communication between the auxiliary reservoirs and the brake cylinders. The compressed air then forces out the pistons, the rods of which are connected by a series of levers and rods to the brake blocks. It will be readily seen that when the air enters the brake cylinder the blocks are brought hard on the wheels, and the amount of brake force exerted depends entirely upon the amount of pressure that the driver is carrying in the auxiliary reservoirs and the amount of air he allows to escape from the train line. The brake is automatic, and applies at any time should any part of the apparatus become fractured so as to allow the train line pressure to escape to the atmosphere. The triple valve, which is the operating part of the brake, consists of only three working parts, and the idea of it being a complicated piece of machinery, as is sometimes said, is entirely erroneous. As a fact, it is extremely simple.

The application of the brake can be made instantaneously. In a case of emergency, it is applied more quickly than it would be if a driver is making an ordinary service application of it. Ordinarily, he puts it on gradually and lightly, but in the event of wanting to stop quickly in cases of emergency, he can make one full application, and it comes on with full force immediately. Such a sudden application will bring a train to a stop very quickly. With the ordinary application the train comes to a gentle stop, as generally experienced when stopping at a station platform. In those cases the driver does not have the brake hard on, and is probably only using about 20 per cent. or 25 per cent. of the brake power.

When the brake is ready for application, the pressures on each side of the triple valve piston are equal, and it will be readily understood that any reduction of the pressure, no matter how it is made, must force the piston back, and immediately the brake is applied. So, whether the reduction comes from the engine, from the guard, from any defect of the hose-pipe, or from a passenger pulling the communication cord, the brake goes on and stops the train. In the case of the passenger, the mere pulling of the cord allows the train line pressure to escape, reducing the pressure on one side of the balanced piston, and the brake must apply not only on the one vehicle, but throughout the whole length of the train.

When a driver, after stopping a train, wishes to release the brake, he allows the main reservoir pressure to enter the train line, which operates on the triple valve pistons in such a manner that the cylinder pressure which was allowed to enter the cylinders in the first instance escapes to the atmosphere, and the pressure that was taken from the auxiliary reservoirs to apply the brake is replenished by the pressure that the driver allowed to enter the train line. The auxiliary reservoirs are all re-charged up to their proper working pressure by the time that the brakes are thoroughly released throughout the train. That means that the train starts again with the brake in order.

The result of the application of the brake, so far as the time in which the train is stopped, depends upon many circumstances. The condition of the rails, the grade, the weight and speed of the particular train, the amount of brake power available, are all factors which must be considered in any specific case, and until they are all known and considered it is impossible to give any definite opinion as to the distance within which a particular train would be pulled up.

W. O. Bagley's Report.

Mr. W. O. Bagley reported that, as a result of his first careful and thorough overhaul of the Bendigo train, he came to the conclusion that it was very poorly braked. He found on the second engine a defective brake cylinder, which minimised the effectiveness of the brake; indeed, he reported that "it was rendered practically useless as an aid to pulling up the train." On one of the vehicles the brake had been "cut out" (that is, it had designedly been made inoperative), while another vehicle was not equipped with a brake at all. On the

postal van the brakes were useless, and on another carriage the brakes only acted on an emergency application. On the other vehicles the brakes were in fair order. These weaknesses aroused serious misgivings in Mr. Bagley's mind as to the effectiveness of the brake as a whole, which misgivings were intensified when the piston travels were measured. In not one instance were they under the maximum recognised in railway practice for developing effective brake power; there was an average piston travel of $2\frac{1}{4}$ inches in single cylinders and 1 in. in double cylinders above the *maximum* laid down by the Company with whose brakes the Bendigo train was equipped.

Mr. Bagley further reported:—The standard of travel for brake cylinder pistons is laid down as from 4 to 8 inches for single cylinders, and from 2 to 4 inches for double cylinders. Brake cylinders having a short piston travel apply their brakes harder at each reduction and equalise with their auxiliaries sooner, and at a higher pressure, than those having a long piston travel.

An examination of the piston travel of the various brake cylinders gave the following results:—

Carriage AA91	$9\frac{1}{2}$ in.
Carriage AV8	$10\frac{1}{4}$ in.
Carriage BV3	$10\frac{7}{8}$ in.
Carriage BB29	$10\frac{1}{4}$ in.
Carriage B258	Cut out
Carriage B30 (double cylinders)	$4\frac{1}{4}$ and $5\frac{1}{4}$ in.
Carriage E20 (double cylinders)	$5\frac{1}{4}$ and $5\frac{1}{4}$ in.
Truck, U568	$10\frac{3}{8}$ in.
Van O13	$10\frac{1}{8}$ in.

From this it will be seen that the braking power of the train was considerably lower than what could have been secured if the maximum of piston travel had not been exceeded.

It may be explained that the auxiliary reservoir used is large enough to equalise with the brake cylinder at 50 pounds if charged to 70 pounds, when the travel of the brake piston is adjusted to 8 inches. If the piston travel is less than 8 inches, the auxiliary and brake cylinders will equalise at a higher pressure than 50 lbs., while if the travel is more than the 8 inches they will equalise at a lower pressure.

On making a train pipe reduction air passes into the brake cylinder from the auxiliary reservoir until the pressure in the

auxiliary and train pipe are about equal. In any given train pipe reduction, the same amount of air is discharged into the brake cylinder, whether the length of piston travel be 4, 6, 8 or 10 inches. With a 6-inch travel, however, the air would have far less space to occupy than with a 10-inch travel, and as a result the brake with the short travel will develop the greater pressure.

The following table, which is the average result of several trials made with various piston travels in 10 inch cylinders, with which most of the vehicles of the Bendigo train were equipped, may help to emphasise the point of the foregoing statement:—

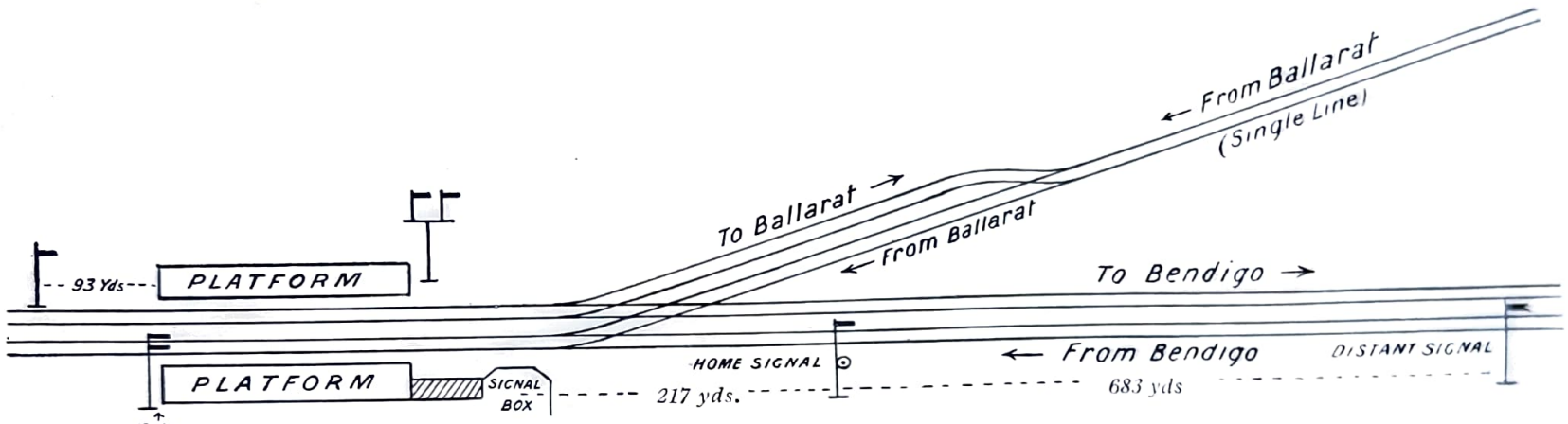
BRAKE CYLINDER PRESSURES.

Service Reduction from 70lbs. train pipe pressure.	Piston Travel.							
	4 in. lbs.	5 in. lbs.	6 in. lbs.	7 in. lbs.	8 in. lbs.	9 in. lbs.	10 in. lbs.	11 in. lbs.
7	25	23	17½	13	10½	8	—	—
10	49	43	34	29	23½	19½	17	14
13	57	56	44	37½	33	29	24	20
16	—	—	54	47½	41½	35	29	24
19	—	—	—	51	47	40	36½	32
22	—	—	—	—	50	47½	44	39
25	—	—	—	—	—	—	47	45

This shows that a train pipe reduction of 7 lbs. will result in a brake cylinder pressure of 25 lbs. with a 4-inch piston travel, but only 8 lbs. with a 9-inch travel. A 10 lb. reduction will give a brake cylinder pressure of 43 lbs. with a 5-inch travel, and only 14 lbs. with an 11-inch travel. It will also be noted that the short travel brakes equalise the quickest, with a less reduction, and exert a greater pressure than the long-travel brakes.

For instance, a 10 lb. reduction will cause all brakes with a 4-inch travel to equalise at 49 lbs. pressure, while an emergency reduction is necessary to apply the brakes effectively with a 10 or 11-inch travel, and then they equalise at only 47 lbs. and 45 lbs. respectively.

It will also be seen that if three brakes, with 6, 8 and 10-inch travel respectively, were on a train, the power exerted by each would vary greatly. If a 7 lb. reduction were made, the 6-inch piston travel would develop 17½ lbs. pressure per square inch, the 8-inch 10½ lbs. pressure, while the pressure



This Plan shows where the Ballarat line converges on to the Bendigo Line at Sunshine. It will be seen that the distant signal is over half a mile from the point of impact (which was just beyond the signal box,) leaving ample distance in which to pull up the train under ordinary conditions of running.

THE BALLARAT MORNING EXPRESS ARRIVING AT SUNSHINE STATION.

in the cylinder having the 10-inch travel would not be sufficient to move the piston out to the full stroke.

The following three points may be emphasised as showing the value of keeping the piston travel well under the maximum of 8 inches:—

1. The short-travel brakes apply harder at each reduction than the long-travel brakes.
2. The short-travel brakes equalise with their brake cylinders with a less train pipe reduction, thus equalising sooner than the long-travel brakes.
3. The short-travel brakes equalise at a higher pressure than the long-travel brakes.

DRIVER MILBURN'S TESTIMONY.

IN ORDER that the position may be clearly understood, it has been thought wise to first of all place the leading points of Milburn's evidence before the readers of this book.

Milburn stated that he was a temperate man. Although on duty for over twelve hours prior to the time of the disaster, he would not say for a moment that he was overworked on that day or that his faculties were in any way affected. Before leaving the Melbourne shed he had tested the brakes of the engine, and later on the train examiner tested the train brakes, and they were proved to be in good order. In point of fact, he had run the train to Bendigo, stopping at all stations, and the brakes had never failed once. It was what he would call a "fairly braked train." On reaching Bendigo he again examined the engine brake. He took up one hole in the push-rod, emptied the drip cup from the triple valve, and got a split pin put in the tyre rod of the left-hand drive and brake hanger. These minor repairs put the brake into good order again. Coming down from Bendigo, on the return trip he was able to pull up everywhere that was required until he came to Sunshine. At Kyneton another engine was coupled on to the Bendigo train, in charge of Driver Dolman, who told Milburn that his brake was in good order.

Milburn was asked whether he had anything to do with the isolating cock at Kyneton, to which he replied: "Yes; after I got coupled up I asked Dolman if the isolating cock was cut out (which is the correct position when running a double banker), and he replied in the affirmative."

How the Brake Acted before reaching Sunshine.

After leaving Kyneton the train was pulled up at Carlsruhe and Woodend, and at both places the brake acted well enough. Before coming into Macedon (which is a fairly heavy decline), Milburn steadied the train down, but seeing the distant signal in his favour, he just let the train roll. However, as he ran past the station he felt a slight application of the brake and then a return, which caused him to put his brake handle on to lap and to leave it there until the train pulled up. It turned out that a passenger had pulled the communication cord, while the guard had also applied the brake from his van. Under these circumstances Milburn said it was impossible for him to judge how the brake acted there. They certainly pulled the train up, but possibly the disc had been pulled well down, in which case, combined with the guard's application, an emergency application of the brake had been made. Milburn got the signal to set back, but could not release the brakes. He then asked the driver of the second engine for more air, but got no reply. It was after that he found out that the communication wire had been pulled, in addition to the application by the guard, and this, as far as he knew, accounted for the fact that he could not get the brakes off. Anyhow, on the way from Macedon he slowed the train down at Riddell, and the brake acted well. At Sunbury he was pulled up by Dolman, of the second engine, owing to the piston-rod running hot. Milburn advised him what to do, after which they made a fresh start.

Milburn was closely questioned as to whether he had noticed any indication of a defective brake up to the time he arrived at Sunbury, but gave a decided negative answer. The fact that he had asked for more air was not an indication that the brake was defective; it was to assist in release. If Dolman gave him more air, he would certainly have to open his isolating cock to do it.

Did Dolman give you any air?

I cannot tell you; I do not know; I did not notice if he did; and I could not swear whether he did.

Milburn said that, after leaving Woodend, he practically never handled the brake alone. He certainly checked the train coming down the inclines, but that was a very different thing from pulling up. The speed of the train from Syden-

ham to Sunbury was about 55 miles per hour. After leaving Sunbury they ran through Sydenham at a fast rate.

Between Sydenham and Sunshine.

Milburn's account of what happened between Sydenham and Sunshine can best be told in his own words:—

"When I left Sydenham, having got line clear, I steamed for some distance, perhaps a mile or so, towards St. Albans, and I shut off and rolled round to the station. After we ran past St. Albans I saw the section was clear, and I bumped the engine up a little, and I gave her some more steam; we would be going about 52 or 53 miles an hour. After we passed Albion there is a pair of gates, and I whistled for the crossing, and on passing through there, coming towards the distant—I would be somewhere about 200 yards when I saw it—and I sounded the whistle for the crossing near the distant signal. I applied the brake gently to check her, and I reduced my speed to the distant signal. When I ran past the distant for some little distance, I again made a further reduction, and put the handle on to the lap, and the train was pulling up to all intents and purposes so that I could stop at the home. While the handle was on lap—I do not think I was 200 yards from the home signal—the train shot me forward, as though the brakes came off; the train seemed to run into me; I immediately put the handle over into the emergency, and it did not take the effect it should have. I thought I was going to stop at the home, but I saw I could not, and I blew the whistle, and reversed the engine, and I got the engine reversed and the regulator opened when I was at the home. I continued whistling from there down. After I passed the home I heard my mate sing out, 'There's the train.' I looked through my window, and I could not see any train. When I was 100 yards away I saw the train."

This was the position Milburn took up, and no amount of questioning, cross-questioning, or suggestive alternatives could shake him in his absolute belief that the cause of the lamentable disaster was solely due to an unreliable brake.

The following examination of Milburn by Counsel will emphasise this point:—

Did you see the distant in plenty of time?

Yes; I could have applied the brake sooner, only I could see nothing in the road.

Did the fact that you did not see the home till after you passed the distant have anything to do with it?

No, nothing whatever; I knew the home would be against me.

Where Milburn Applied the Brake.

Closely questioned in regard to how he handled the brake from the time he noticed the distant signal against him, Milburn said that 200 yards from the distant signal he made a service application, the pressure of air in the train pipe registering about 70 lbs. He was then running at about fifty miles an hour, and by the time the distant signal was reached the speed had been reduced to about forty miles, which indicated that the brakes were holding. Soon after passing the distant signal a second reduction was made, under the impression that it would be sufficient to stop the train at the home signal. It was effective in further reducing the speed to thirty-two miles an hour (about 200 yards from the home signal), when the train suddenly jumped ahead. He then put the handle over to full emergency position. He would not say that he noticed a sound like the popping of a cork when pulled out of a bottle (to which his fireman testified), but he believed all the air was exhausted when he made the emergency application, which was proved by Dolman's statement, that when he attempted to apply the brake in emergency the air was already exhausted.

Do you think the brakes were on at the point of impact?

I believe some of them were, because I did not feel striking the Ballarat train.

But do you think the brakes were holding the Bendigo train rigid when it struck the Ballarat train?

There must have been something holding, or the Bendigo train would have had serious damage done to it.

As both Milburn and Dolman declared they had 70 lbs. pressure immediately prior to the collision, and as the brake was applied, in the first instance, before reaching the distant signal (say, 3,000 feet from the point of impact), it can be seen that the train should have easily been pulled up at the home signal but for the extraordinary failure of the brake at the critical moment.

Did the Signals Mislead Milburn?

Milburn was asked: Did the fact that you got line clear by reason of the signals being off at Sydenham mislead you in any way?

No, it did not. When a man gets line clear, he would probably run into the section a little faster than he would do otherwise, but that does not lessen his responsibility in regard to stopping at signals.

When did you first see the starter (the signal on the Sunshine station which was set for the Ballarat train to proceed on its journey to Melbourne)?

I saw the starter fully 800 yards before I saw the distant and home, and it was then showing a green light.

Did the fact that the starter was off mislead you in any way?

Well, when I first saw it, I thought it was set for me, but on seeing the distant at danger, I knew that the starter could not have been for me, although I had not the slightest idea why it was off. At any rate, it did not have any effect on me trying to pull up.

Enquiries from the Jury.

Is it the usual experience with this train to find the distant and home signals at danger at Sunshine?

I have not had that experience since I have been on it. Sometimes you are pulled up with the home off and the starter against you; another night they would be all off There is a variation in the working of the signals.

How many seconds elapsed from the time you made the first application till you made the second near the distant signal?

About eight or nine.

How many seconds elapsed from the time you made the second application till you made the emergency?

It would be several seconds before I made the emergency.

How many seconds elapsed from the time at which you noticed the brakes not acting and the time you made the emergency application?

I should think the brakes would have been on altogether sixteen seconds.

How many seconds elapsed from the time at which you noticed the brakes were not acting—when she jumped away—and the time you made the emergency application?

Hardly two seconds; it would be immediately I felt it go off.

Are you a "two-application" man?

A two-application man would be one who would apply the brake and take it off, and then apply it again. That is not my way. If I make an application I leave it on, and make a further reduction; that is only one application in all.

Some Possible Causes of the Brake Failure.

Milburn was given every opportunity to advance any theory that he had in mind as to the cause of the brake failing to hold the train under an ordinary service application. He was again asked for his opinion as to whether the brakes were on at all at the time of the collision, and he said he had no doubt that some of the brakes were holding the train rigid—otherwise (as had been stated by W. O. Bagley, a brake expert) a number of the vehicles of the Bendigo train would also have been smashed.

Some causes which could have contributed to the accident were enumerated by Milburn as follows:—

1. The isolating cock might have been opened when he asked for "more air," and left in that position.
2. There might have been some serious leaks in some of the branch pipes.
3. Scale may have temporarily choked up the rotary valve, and prevented the escape of air needed to apply the brake.
4. Faulty brake cylinders may have allowed the brakes to release directly after they were applied.

In regard to the first theory—that of the isolating cock being open—Milburn found it impossible to hold any longer to the opinion that that was in any way responsible for the failure of the brakes, because his fireman went along to the second engine immediately after the accident to see the position of the isolating cock, and found it shut; and as Dolman himself maintained that the isolating cock was shut (as it should have been), he was quite ready to believe Dolman, and therefore must dismiss that theory.

As to the second theory, Milburn was fully convinced of the probability of the brakes having leaked off, and thus shot the train forward instead of pulling it up. He was at once asked if it would not be an extraordinary thing if all the brakes released at about the same moment owing to defects which had not made themselves apparent before? But Milburn's decided "No, I do not," showed his determination to hold on to the position he was taking up, in spite of a sharp examination by Counsel.

Questioned specially as to the brake on the second engine, Milburn was asked: If that brake acted right all the way down to Sunbury, and leaked off suddenly that night, ought it not to leak off again the very next time it was applied? To which he replied, "Certainly!"

Can you explain, then, how it was that a few hours after the disaster the same engine and train was run to Spencer Street, and the brakes acted alright?

It is not a fair comparison, replied Milburn. The man who brought that train to Melbourne from Sunshine probably never drove a passenger train in his life before, and he would travel at about six or eight miles an hour, and make a reduction of 20 to 25 lbs. in one application.

Well, supposing 25 lbs. of air gets into the cylinder right away, won't the brakes leak off just the same?

Of course, but it will take much longer with 25 lbs. of air than with 8 or 9 lbs.

And if the engine brake did suddenly leak off after holding until the speed had been reduced from 55 to 32 miles an hour, would that affect the braking of the other vehicles?

No, but it would affect my judgment in stopping.

To the extent that it did on the night of the disaster?

Not of itself; but several of the brakes on the other vehicles were found to be leaking—and I do not believe they were leaking during the whole of the journey—and these, combined with the extra weight of the defectively-braked engine, probably accounted for the extraordinary failure of the brakes at the precise moment they were needed.

But, Mr. Milburn, did you not tell us that the brake air failed altogether?

Yes; the train appeared to release altogether, and jumped away, as if no carriages were braked.

To this Counsel responded: If your theory is correct, that it might have been due to the defective brake cylinder in the engine, then this extraordinary coincidence had to happen suddenly on every carriage, independently of each other. It seems utterly impossible.

Admitting the leather in the other cylinders (Counsel continued) *did* become defective, and that the accident was due to that causing the train to jump away, can you explain how the very same train, with the very same cylinders, and under as nearly as possible the same conditions in regard to speed, train line pressure, reduction, etc., as obtained on the night of the accident, pulled up between the distant and home signal?

Milburn admitted he could not (although he said it made a great difference as to how much the piston leaks according to the reduction made); neither would he say that a leather which was defective one day would not be defective a week later. But he could not be shaken in his conviction that in some way or another he lost his power owing to a defective brake.

What Took the Brakes off?

Milburn was then questioned closely about the "sticky triple valve" theory. He thought that if any of the triple valves did not move, the air in the auxiliary reservoir (when the train-pipe pressure was reduced) might come back into the train pipe and take the next brake off, and possibly two or three others.

But (he was asked) would it not need three or four weak triple valves to have any effect on the braking power of the train?—Yes.

And do you think it possible, seeing that these triple valve pistons were all right at every stop between Bendigo and Sunbury, that all of them would suddenly get sticky at Sunshine?

I could not say; but something took the brakes off.

Can you suggest any other theory? It is only right that we should endeavour to show the jury what it was that probably made them cease to act.

Lots of small things may have contributed to the sudden failure of the brakes—such as leaky joints, etc.—but I have not the slightest idea what caused the brakes to come off, beyond what I have already told you.

Milburn was again questioned in regard to the unexpected stop at Macedon by the application of the brake by means of the communication cord. Counsel seemed anxious to get to the bottom of the theory hinted at, that in some way or other the driver of the second engine (Dolman) opened the isolating cock and neglected to close it.

Milburn said that when he tried to "set back" into the Macedon station, by pushing the handle right back into release position, which ought to have charged the pipes and released the brakes, he could not move the train. Eventually he was able to move the train, but he did not know what had been done. He asked for more air from the second engine, and directly afterwards somebody said it was all right, and he then moved the train back. At that time his handle was in release position, and he could not be certain whether the train pipe was filled with air from his reservoir or Dolman's. If, when he first put his handle into release position, the disc was still down, that would prevent him releasing the brake, the same as if there were a big leakage in the train pipe. When the disc was put right the brakes would at once release with the handle in release position, but it would be impossible for either himself or Dolman to release the brakes unless the disc was put right, even supposing that Dolman had cut in his isolating cock. That led him to say that it was quite possible the train pipe was charged from his own reservoir, and the brakes were released as soon as the disc was turned back again.

WAS THE ISOLATING COCK OPEN?

If Dolman released the brake, would he not have to open the isolating cock?

It is possible.

What gave you the idea about the isolating cock having anything to do with the sudden release of the brakes at Sunshine?

Because the brake appeared to be holding and then came away; and I believe that is just what would happen if the isolating cock were cut in.

In order to try and clear Dolman of all suspicion, Counsel put the matter to Milburn this way:—

If Dolman had his handle in running position, would that be a natural position?

He would need to have it in charging position—that lets the air through the train.

If the isolating cock on Dolman's engine were cut in from Kyneton by mistake, and he had his handle in release position, would not that mean that all the way down you could not have applied your brakes?

No, not in an application of short duration.

Well, now, if Dolman had his handle in release position, would he not be charging air into the train pipe with a high pressure behind his reservoir?

Yes.

And supposing you made a service reduction, taking out 5 to 10 pounds of air out of the train pipe, would not Dolman be charging the train pipe as fast as you took it out, and prevent the application of the brakes?

The brakes would hold for a few seconds; in a short application the pressure of air in the second engine would not affect the brake.

Will you say the isolating cock was alright up to Macedon?

Yes. I cannot say whether it was altered at Macedon or Sunbury, at both of which places I asked for "more air."

And if the isolating cock was cut in, and Dolman had his handle in release position, from Macedon to Sunbury, would you not have noticed something peculiar when you went to apply the brakes?

If I wanted to keep the brakes on I would notice it, but it was only applied for a few seconds between the two stations, while from Sunbury to Sydenham the brakes were not applied at all.

Did you make an abnormally big reduction coming on to the distant signal at Sunshine?

I let out sufficient air to reduce the speed, and after passing the distant signal I made a further reduction, and the brakes were apparently holding. There was nothing to lead me to suspect that the isolating cock was cut in up to that time.

When you asked Dolman to give you more air at Macedon and Sunbury, was he under any obligation to obey you and give you more air?

I should say "Yes."

Milburn was cross-examined in regard to his statement of the various speeds at which he was running approaching the distant signal and to which the train was checked between the distant and the home.

He admitted that the train checked much more rapidly at a low speed than a high, and said he was well satisfied with the way the brakes were holding for 300 yards beyond the distant.

This raised the question why in the first 300 yards, running at 50 miles an hour, the speed was reduced by 10 miles, while in the next 300 yards, with a speed of 40 miles an hour, it was only reduced by 8 miles? But no explanation was forthcoming.

Milburn was also asked the reason why he mentioned in his report of the disaster the fact that the starter at Sunshine was off; to which he replied that it was such an unusual thing to see a starter off with the home and distant signals at danger that he could not refrain from noting it. That was his sole reason.

When did you first see the tail lights of the Ballarat train?
About 100 yards away.

Did you expect that the home signal would come off as you approached it?
No; but I wondered why it was against me. I knew I was bound to stop at the home signal.

Milburn's Evidence Summarised.

The foregoing is the gist of Milburn's evidence, and analysing it carefully, the following points seem to have been emphasised:—

1. That the fact of him receiving the 3.1 signal instead of the 1.5 signal (which the stationmaster at Sunshine should have given) had nothing whatever to do with the collision, although he admits he entered the section a little faster than he would otherwise have done, had he received the 1.5 signal.
2. That the fact of the starter at Sunshine being off for the Ballarat train did not mislead him in any way. Though he saw the green light of the starter 800 yards before either the distant or home, he also

noticed the distant and home signals at danger in ample time to control the train at the distant and to pull up at the home if necessary.

3. That he found it difficult to dismiss the idea that had early come into his mind—that the isolating cock was in some way responsible for the failure of the brake. He was ready, however to accept the statement of Dolman, that the isolating cock was cut out (as it should have been) at the time of the accident, and would try to withdraw that theory as untenable.
4. That he actually had the brakes applied and holding at the distant signal; that a further reduction was made after passing the distant, sufficient to pull up inside the home signal; that the speed was decreased gradually till within 200 to 300 yards of the home signal, when the brake power failed, the train seemed to shoot away, and, although an emergency application was immediately made, the hand brake brought into action, and the engines reversed and given full steam, the collision could not be averted.
5. That, leaving out of account the isolating cock theory, the only theories that he could advance as probably having some bearing on the sudden failure of the brakes were—defective brake cylinders, sticky triple valves or leaks in the train pipe.
6. That had the brake acted at Sunshine as it did all the rest of the way down from Bendigo the calamity could never have happened. Under the circumstances Milburn said: "Had my own children been at the point of impact, I could not have done anything else to prevent the catastrophe."

DRIVER DOLMAN'S TESTIMONY.

DRIVER DOLMAN'S evidence in regard to what happened immediately before the disaster, having an important bearing on the phase of the enquiry specially dealt with in this book, will be better understood if read in conjunction with Milburn's evidence.

Dolman said he had thoroughly tested his engine brake before leaving the Melbourne shed on the morning of the 20th

of April, for Kyneton, where he was to take up duty as a "stand-by," that is, to be ready at a moment's notice to take up the running in case of a breakdown, or some other special call. He was certain his brake was in first-class order; he tested it again at Kyneton, and it held the wheels tight for the two or three minutes that he took to examine the piston-nuts, etc. The engine was not required all that day, and when the Bendigo train arrived at Kyneton he was coupled on behind Milburn's engine. Immediately afterwards Dolman cut out the isolating cock, and he was absolutely certain that it was not touched up to the time of the collision. Anyhow, Milburn asked him if it was cut out before they left Kyneton that night, and he told him it was.

On the way down from Kyneton to Sunbury the train was pulled up a couple of times, and once he thought the brake seemed a bit sluggish in acting.

After leaving Sunbury the pace was increased to about 55 miles an hour, and a few miles from Sunshine he noticed that there was a train line pressure of about 70 lbs. and a main reservoir pressure of 90 lbs.

Soon after passing St. Albans Milburn shut off steam, and was travelling about 50 miles an hour 500 to 600 yards from the distant signal at Sunshine. Dolman did not see the distant signal until within 200 or 300 yards, when he noticed it at danger, and simultaneously felt the first application of the brake. The speed, so far as he could judge, was reduced to 40 miles at the distant, and he entirely disagreed with the guard, who put the speed at the distant down at 50 miles an hour. After running well past the distant with the brakes on and gradually slowing down, the train seemed to jump away as if the back part of the train were running into them. He did not know if Milburn released the brakes just before the train shot away—they seemed to be continuously on up to that point, and should certainly have remained hard on till the train was pulled up at the home signal.

What Dolman did to pull up the Train.

The moment the train jumped away Dolman pushed his handle into emergency position, and was dismayed to find the air exhausted from the train pipe and the train rushing on to the home signal at danger. He immediately reversed his engine, while the fireman put the hand brake hard on—all of which was accomplished by the time the engines reached

the home signal. An appreciable slowing down was at once noticed, and if the brakes were applied throughout the train prior to this, they certainly had very little power. If they had held at all, Dolman felt satisfied that with both engines reversed and both hand brakes applied, the train would have been pulled up between the home signal and the Ballarat train. He did not believe that the brake blocks were on the wheels of the train from the time it jumped away till the collision occurred. Any slowing down was due to the use of the hand brakes and the reversing of the engines.

Dolman said that his idea was that Milburn should have made an emergency application 200 yards from the home signal to pull up at the signal, seeing he had come down from the distant under a service application. Of course, if the brakes were holding well, he might have released the brakes and filled the train pipe again, but he thought what Milburn did was the right thing to do under the circumstances.

But if the air was all exhausted, should not the brakes have been on harder than ever?

Yes, I suppose they should.

And is it not a remarkable thing that whatever took the brakes off and made the train jump forward also made them absolutely useless afterwards?

Yes; I cannot explain it.

Dolman and the Isolating Cock.

Dolman was asked if he had touched the isolating cock after the collision, and he said that about an hour afterwards he had cut it in so as to enable him to pump air into the train pipe and have some brake power available, as he wanted to back the Bendigo train from the point of the collision, in order to make the work of the rescuers easier.

This answer led on to a series of sharp questions as to why, if, as Dolman had just told them, the brake was absolutely useless up to the moment of the collision, he still had sufficient faith in the Westinghouse brake to want to use it again? He was also pointedly asked if he did not fill the train pipe in order to release the brakes rather than to make use of them? But Dolman answered decidedly that, seeing the air was all exhausted when the disaster occurred, it would be absurd to say that an hour afterwards he pumped the engine in order to release the brakes. Even if they were on at the

point of impact, ten minutes afterwards they would all leak off again.

Were you mislead at all with the signals?

No; although I was not expecting to stop at Sunshine, I was on the alert for the signals, and noticed that they were at danger; I was certain that Milburn would easily pull up at the home signal till I felt the train bolt away.

And so your whole case is that the brakes failed to act?

Yes.

FIREMEN IN AGREEMENT WITH DRIVERS.

Both firemen corroborated the evidence of their respective drivers, and there was such a definite pronouncement on the failure of the brake by those more immediately concerned, and such a unanimity of assertion in regard to distances, speeds, places of application, and failure, that a feeling of unrest took possession of the public mind, which it seemed at the time would be difficult to allay.

PASSENGERS VERSUS DRIVERS AND FIREMEN.

However, it was thought that the opinions of passengers by the Bendigo train, as to where the brakes were first applied, would be valuable in testing the accuracy of the drivers and firemen; and consequently a number were closely questioned on this point. How far their testimony agrees with that of the drivers and firemen of the Bendigo train the following summary of their evidence will show:—

The first passenger who gave evidence said that after having Macedon the train travelled at a very rapid rate—he thought considerably over 50 miles an hour, judging by the way their game of cards was interfered with. He remembered hearing a whistle blow very loud and long on approaching Sunshine, and then followed two or three very sharp, shrill whistles. Immediately after that there was a crashing sound. He positively felt the brakes applied a very few seconds before the crash, and thought they were travelling at about 15 miles an hour when the collision occurred. Before the crash he noticed a smell of burnt oil or grease, but could not say how long—it was some minutes before. The smell he noticed was a sort of metallic smell, which he considered would be caused by friction.

Another passenger also testified to the fast rate at which the Bendigo train travelled after leaving Macedon. Coming into Sunshine he noticed one long and several short whistles, and immediately there followed a very strong smell, as of something burning; then the train immediately reduced in speed—it was a gradual reduction, and the impact occurred directly afterwards.

A third passenger, who boarded the train at Macedon, said that the train travelled very fast after leaving Sunbury. "Everybody was rocking to and fro, and a terrible row was kicked up." Approaching Sunshine, he felt a slight slackening of speed. Then the train appeared to be pulling up very fast —that was a few seconds before they struck the Ballarat train. He did not feel any grinding of the brake on the wheels of the carriage.

A fourth passenger reckoned the speed of the train after leaving Macedon at between 50 and 60 miles. He felt the brakes being applied prior to running into Sunbury, but did not notice any application of the brake on approaching Sunshine, although it occurred to him that the train had slowed down before it collided with the Ballarat train.

Another passenger testified that immediately before the disaster he felt the train slacken up very sharply; he did not feel the brakes go on, but heard a clinking row as if they were going on. He thought that the train was slackening for, perhaps, a couple of seconds before the collision. He was positive the brakes were not applied with any force at the distant signal.

The sixth passenger who gave evidence testified to the easy manner in which the train pulled up at Macedon, but did not remember it stopping at Sunbury. He remembered the brakes being applied at Sunshine. The train was going at a very fast pace; he also noticed a very long whistle, immediately after which the train gradually slowed down, as though it were going to make an ordinary stop. Then followed a peculiar grinding, gripping noise, and a hard, sudden stop. He could hear the brakes being put on, but could not say if a heavy application had been made. He thought that the brakes were applied somewhere between the distant and the home signals, but nearer to the home.

The seventh passenger who gave evidence (a clerk in the employ of the Railway Commissioners) said that there was nothing alarming in the speed at which the train travelled

THE BENDIGO TEST TRAIN AT SUNSHINE STATION. PREPARING FOR THE RUNNING TESTS.

W. O. BAGLEY,

the Brake Expert who had the honour of driving the leading Engine in the last nine Tests that were made at the instance of the Coroner and Jury.

after leaving Macedon. He would say that at Macedon and Sunbury the brakes operated promptly and effectively. On approaching Sunshine (somewhere near the distant signal) he heard what he considered to be a warning whistle, and then felt an application of the brakes, with a checking of the speed. He thought the train rolled right into Sunshine. He had a faint recollection of hearing the alarm whistle a moment before the impact. The nearest description he could give of the collision was the sudden application of the brakes, being accompanied by a grinding noise. He would say that from the time the train was checked for a few seconds near the distant signal the brakes were not again applied until almost on the point of impact. In his opinion, the speed of the train when the collision occurred was between 20 and 30 miles an hour.

The eighth witness had ridden from Sunbury in the guard's van. He noticed that the train travelled very fast from Sunbury. When nearing Sunshine he felt the train slowing down gradually. Then came the collision. He considered the guard was keeping a sharp lookout. Before the "bump" the train seemed to be pulled up in the usual manner—just a gradual slowing down for half a minute. "I did not feel any application of the brakes," said this witness to the Coroner, "in the usual way. I felt the train gradually stopping, but did not feel the grip. The brakes were not put on suddenly."

The last witness from among the passengers (who also rode in the guard's van) gave similar evidence to the previous witness. He was positive the guard was doing his duty, and on approaching Sunshine kept a sharp watch by going from one window to the other. When the collision occurred, he considered the speed of the train "had been reduced about one-fourth of what she was travelling at previously." He did not feel the brakes being applied, and about half a minute elapsed from the time he felt the train slowing down until the collision occurred.

THE RUNNING TESTS.

EVERYBODY interested in the searching enquiry made into the causes of the Sunshine disaster thought that the running tests would provide evidence of an incontrovertible kind in support of one or other of the parties engaged in the strenuous conflict to make good their arguments and statements. On the one hand, the men's hopes were centred on the possibility of the brake's tricking those conducting the tests as Milburn said they had tricked him on the night of the tragedy; and the reports of at least two of the experts certainly gave them grounds on which to base their hopes. Had not Professor Kernot reported that the brakes of the Bendigo train were "feeble"? And did not Mr. W. O. Bagley, a brake expert, provide some theoretical causes for condemning the brake as inadequate in power to effectively control the train? On the other hand, the Commissioners held unwaveringly to the opinion that the tests would only confirm the evidence that had been or would be tendered to the effect that the brakes were thoroughly effective for controlling the train and pulling it up in a reasonable distance; and with this Mr. F. Selley (representing the Westinghouse Company) concurred. Had not the brakes operated well at every stop from Bendigo to Sunshine? Had not the standing tests at Sunshine soon after the collision failed to reveal any fault detrimental to the working of the brake?

And so every one interested anxiously awaited the results of the running tests, the like of which had never been held in Victoria before—if, indeed, they had ever been conducted in any part of Australia.

The composition of the Bendigo train was the same as on the night of the collision—engines, carriages, etc.—except that 40 tons of ballast were loaded on to the train to represent the passengers and luggage estimated to be on board on the night of the "smash."

The train had been practically under lock and key, and, beyond one or two minor repairs to the leading engine, the train was in exactly the same condition as when it returned from Sunshine after the collision.

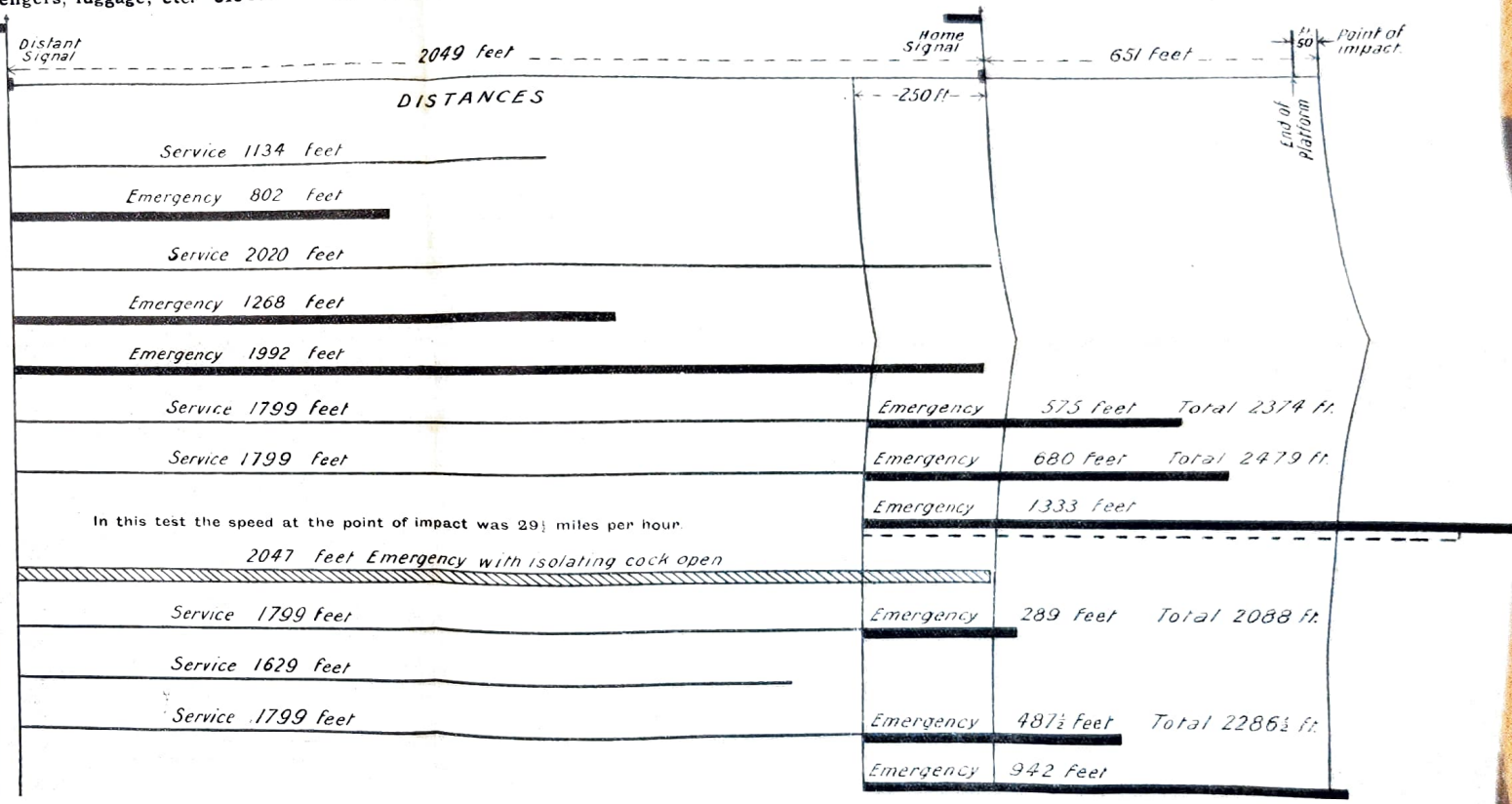
Collision between Bendigo and Ballarat Trains at Sunshine on Monday, 20th April, 1908.

Statement showing the Results of the Tests of the Westinghouse Brake, etc., on the Bendigo train on the 28th April, 27th and 28th May, and 2nd June, 1908.

Gross weight of train—including allowance for passengers, luggage, etc.—319 tons 1 cwt. 2 qrs. 0 lbs.

No. of Test.	Date.	Speed in Miles Per Hour	Train Pipe Pressure.	Nature of Application.	Time taken in Seconds
1	April 28th	At distant 38	70	10 to 15 lbs.	40
2	do.	At distant 40	70	Full	24
3	do.	At distant 49½	70	10 to 15 lbs.	46
4	do.	At distant 48	70	Full	32
5	do.	At distant 59	70	Full	41
*6	May 27th	At distant 49½	75	8 lbs.	51
7	May 28th	At distant 45½	75	7 lbs.	52
8	do.	250 ft. from home 49½	75	Full	33
9	do.	At distant 49	70	Full	46
10	June 2nd	At distant 44	84	9 lbs.	45
11	do.	At distant 43½	74	(?) 10 lbs.	44
12	do	At distant 45½	75	(?) 5 lbs.	41
13	do.	250 ft. from home 50½	77	Full	23

*Sand escaped from boxes and spoiled this test.



An extra test was conducted by order of the Coroner. Speed at distant signal 60½ miles per hour. Steam shut off, and engines allowed to run free to point of impact. Speed at point of collision 57 miles. Distance Travelled, 2,700 feet.

Scale, 300 ft. to 1 inch.

The accompanying diagram shows the result of 13 running tests made at Sunshine—9 with the train in its original condition—that is, with brake defects, etc., discovered at the standing tests made after the collision—and 4 with the piston travels taken up to the maximum laid down by the Westinghouse Company, and also with all leaky joints, cylinders, valves, etc., thoroughly overhauled and put into first-class condition. The following "notes" may be helpful to those interested:—

1. The distance between the distant and home signal is 683 yards, and between the home signal and point of collision 217 yards, or a total of 900 yds. from the distant signal to the point of impact.

2. In not a single instance where the brake was applied at the distant signal, either in service or emergency, did the train fail to pull up before reaching the Sunshine platform.

3. In an extra test, where a speed of 60½ miles was reached at the distant signal, and the train allowed to run free without steam to the point where the collision occurred, it will be noticed that the speed was only reduced by 3½ miles in a distance of 2,700 feet on a road having a gradient of 1 in 240.

4. Tests Nos. 2, 4 and 5 will make an interesting comparison. In all three cases the train line pressure was 70 lbs., and an emergency application was made at the distant signal. In No. 2 test the speed at the distant was 40 miles an hour; in No. 4, 48 miles per hour, and in No. 5, 59 miles per hour. At 40 miles an hour the train was pulled up in 802 feet; at 48 miles an hour in 1,268 feet; and at 59 miles an hour in 1992 feet.

5. No. 6 test is of very little value beyond showing that sand gives the wheels a splendid grip of the rails. Owing to a slight mechanical defect, when running this test the valves from the sand-box were automatically opened, with the result that the rails were "sanded." The train was reduced from 50½ miles to 33 miles, with an 8 lbs. reduction, in 1799 feet, and was brought to a stop in an additional 575 feet. In test No. 7, without the aid of sand, and with a

7 lbs. reduction, with the train travelling at the much slower rate of 45½ miles, the train was reduced by only 7 miles in the same distance (1799 feet), and it took an additional 680 feet to stop the train.

6. Test No. 11 was not carried out as ordered, owing to a combination of circumstances. Expert Bagley was conducting the test, and was driving the leading engine. In addition to watching the speed, pressures and signals, he had also to signal the driver of the second engine to shut off steam at the precise moment the service application had to be made. A number of interested persons were travelling on the engine, and in the excitement of the moment the 7 lbs. reduction arranged for was exceeded—one says by 1 lb., another by 2 lbs., while a third held out for a 10 lb. reduction. Anyhow, to the surprise of all, the train never reached the detonator, the point at which an emergency application was to have been made, but pulled up from a speed of 43½ miles per hour in 1629 feet—certainly an excellent stop with, say, an 8 or 9 lbs. reduction.

7. Test No. 9 was made with a view to proving whether, if the isolating cock of the second engine were cut in, when the leading driver upened his valve, it would have the effect which Milburn believed it would, of retarding the operation of the brakes or in making them less effective. The test ordered required an emergency application to be made, and the result showed that Milburn's discarded theory was based on a very sound foundation, for, from a speed of forty-nine miles an hour, and a train line pressure of 70 lbs., it took 2047 ft. to pull up the train from the point where the driver's valve was opened to make the emergency application. Instead of dropping to zero, however, the pressure gauge in the guard's van dropped to 50 lbs., remained stationary for 5 seconds, then gradually lowered to 25 lbs., when the train had pulled up.

8. No. 8 test was made to determine what the effect would be if a train approached the home signal at the high rate of 49½ miles per hour, and when within 250 feet of the home an emergency application was

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made. This test showed that the speed was reduced by 20½ miles at the point of the collision, and also that, while it took 901 feet, with an emergency, to reduce the speed of the train from 49½ miles to 29 miles per hour, another 432 feet was sufficient in which to bring the train to a standstill.

9. In test No. 7 the speed at the distant was 45½ miles an hour, the train pipe pressure 75 lbs., and a service reduction of 7 lbs. was made at the distant till within 250 feet of the home, when a full application was made. At the point where the emergency was made the speed had only been reduced to 38½ miles per hour, yet the train was pulled up 221 feet before reaching the point where the collision occurred.

10. In test No. 3, where the speed was 49½ miles per hour at the distant signal, and a 10 to 15 lbs. reduction was made, the train pulled up 29 feet inside of the home signal.

11. Tests Nos. 6 and 7 are informative as showing the effect of an extra pound reduction in service application. In the one, with the train travelling at 49½ miles an hour, an 8 lbs. service reduced the speed to about 33 miles in 2049 feet; while in the other, with the train travelling at 45½ miles an hour, but with a 7 lbs. reduction, the speed is reduced by only 6 miles in the same distance.

12. Comparing Tests No. 8 and 13, it will be seen that when the piston travels were taken up and the brake overhauled an appreciable difference in the stops was noticed. With the moderately braked train, at a speed of 49½ miles and a train line pressure of 75 lbs., an emergency application pulled it up in 1333 feet, while with the brakes in first-class order, with a train line pressure of 77 lbs. and a speed of 50½ miles, an emergency application brought the train to a standstill in 942 feet.

13. The remarkable point about a test not shown on the diagram (which was said to exactly reproduce the conditions prevailing on the night of the collision from the distant signal until the Ballarat train was struck) is that the train, with engines reversed and hand-brakes hard on at the home signal (and with no

obstruction on the track) only went 83 feet past the point of collision, while the same train, with Milburn in charge, on the night of the disaster, with the same speeds up to the point where the engines were reversed and the hand brakes put hard on, ploughed through the Ballarat train for 190 feet before pulling up—a difference of 107 feet, plus the resistance of the Ballarat train.

When questioned about this, Milburn said: "You would have your engines blowing off hard; my engine was not blowing off by any means. We do not carry a full amount of steam coming down a place like that. My engine would be considerably reduced in the pressure when I was pulling compared with when I was rolling."

Can you explain (Milburn was asked), even allowing that point, how there was such a difference in the distance you travelled after striking the Ballarat train (190 ft.) and the distance we travelled in making the tests (only 83 ft.) without an obstruction?

"No," replied Milburn, "I cannot explain it."

What do the Running Tests Show?

What do the tests show? What could be said about the brake in face of the first nine? Only this: that a brake which is non-effective in theory may be very effective in practice. Mr. Bagley was compelled to abandon the position he had taken up that it was one of the worst-braked trains he had ever seen in his 20 years' experience; and although he proved his contention in the concluding tests—that the brake's effectiveness is greatly increased by having the piston travels well inside the maximum (however the leverages are applied) laid down by the designers of the brake—and although he still held to the positive declaration he had previously made, that he would not have allowed the Bendigo train to leave the yards with the brakes unattended to, yet he readily admitted that, judged by the tests made prior to overhauling and repairing the brakes and brake gear, the brake power of the Bendigo train on the night of the collision was sufficient to enable Milburn to effectively control his train, as, indeed, he admitted he did up to the time he approached Sunshine.

THE EXPERTS IN THE WITNESS BOX.

KEEPING in mind the object of this book—to place on record the most interesting and informative parts of the evidence relating to the brake—the author is compelled to omit many items of general interest dealing with engine drivers' experiences and difficulties.

We now turn to the evidence of the three experts (Professor Kernot, Messrs. F. Selley and W. O. Bagley). The way in which they fought to uphold their convictions spoke well for their earnestness and sincerity in defending the positions that exhaustive examination and trials conducted by themselves, and the knowledge that had been gained by others' experiments and experience had forced them to take up. Notwithstanding that each of the experts had furnished the Coroner with an independent report, the gist of which had already appeared in the press, it was hoped that between them the experts would throw enough additional light to settle the question of whether the Westinghouse brake could be regarded as absolutely reliable; to set at rest the fears that had been created by the press reports, experts' reports, and the reports of the crew of the Bendigo train.

PROFESSOR KERNOT'S EVIDENCE.

William Charles Kernot, Professor of Engineering at the Melbourne University, was indisposed during the greater part of the enquiry, and his evidence was not taken until near its close. He had examined the train soon after the collision, and his report added weight to the testimony of those who reported unfavourably regarding the appearance of the brake and the apparently poor brake power which the standing tests revealed. His interesting evidence may be summarised as follows, Mr. McArthur doing most of the questioning:—

WAS THE TRAIN EFFICIENTLY BRAKED?

In your opinion was the brake on the Bendigo train efficient to safely control and stop the train?—I think it was sufficient for the safe working of the train. I compared the result of our tests with some of the early brake tests in England, and

some very recent ones in America, and I found that the effect of our brake was on the average just about two-thirds of these English and American trials, where, presumably, everything was in perfect order. I reckon the brake was about two-thirds of a brake in absolutely ideal order.

You mean to say that about 33⅓ per cent. would have to be taken off?—Yes. For example, the time taken in stopping with these recent American tests was generally just about two-thirds of the time we took, and the distance run was the same percentage.

You give it as your opinion that a brake which is two-thirds of the efficiency of an ideal brake was a safe-working brake?—I think so, always presuming that the man knew that it wasn't an ideal brake.

Would you, then, still describe the whole of that brake as a feeble brake?—Yes, I think so. Of course, it is a vague, indefinite word. Perhaps it conveys more to others than I meant to put into it. I merely meant to say that my personal impressions bore out the results of the trials.

Have you studied the leverages on this particular train?—No; I have not measured the leverages.

You know that in nearly every case, except one of the engine tenders, the piston travel was over 10 inches?—Yes.

Is Blackall Reliable?

Judging by Blackall (an acknowledged authority), with a 10 inch piston travel and a 7 lbs. reduction, he shows that the piston would not be entirely out: there would really be no pressure at all. Do you agree with that?—I think there would be a very considerable pressure. It is purely a matter of the relative volume of the brake cylinder and the carriage accumulator. As well as I can remember, from looking at them, I cannot agree with such a statement as that.

Well, this is in the 1903 edition of Blackall: "With a 5 inch travel there would be 23 lbs. pressure, 6 inch 17½ lbs., 7 inch 13 lbs., 8 inch 10½ lbs., 9 inch 8 lbs., 10 and 11 inch and all over, piston not entirely out."—I don't know what that means.

I suppose it means that the piston is not moved sufficiently forward to move the reverse spring?—Oh, I forgot that spring. That table is new to me. I would not say it was wrong without going into the matter very carefully.

On this question of leverage, does excessive leverage tend to excessive piston travel?—I should say so.

And excessive piston travel tends to feeble application of the brakes, particularly on service applications?—Yes.

Are there any fixed rules as to what leverage should be used?—You must adapt it to the weight of the carriage.

I have read that it is inadvisable to use a leverage of greater proportion than about 10 to 1: would you agree with that?—Probably that is right, but I could not say positively.

With the car 8AV we found that, owing to the leverage there, even when you took the piston travel up, it could not be reduced to less than 8⅛.—It was over 10 inches the night of the collision and the tests.

Do you agree with Blackall that on a passenger car weighing 50,000 lbs. the cylinder should be 12 inch, not 10?—I cannot say one thing or the other. A 50,000 lbs. car would be large, and it would probably have a large cylinder.

In your opinion, would it not be better to have a larger cylinder and less leverage than a small cylinder and excessive leverage?—I don't see that it makes much difference.

Supposing that the table of Blackall is correct, and that with a 7 lbs. service reduction and 10 inch piston travel the piston is not out. That would mean that, owing to the compression of the spring there is no force working on to the levering rods, so that no matter what leverage you've got—because 1000 times nothing is nothing—if you have a large cylinder, it tends to smaller piston travels, does it not?—Yes.

On the standing tests in 8AB the piston travel was 10 inches. If Blackall's table is correct, the result of that would be no pressure on the lever rods?—Yes.

And it would not matter what leverage you had after that, on a service application of 7 lbs., there would be no pressure on the brake blocks?—No; on the whole, I think it would be a wise thing to have fairly large cylinders, because, for one thing, the stroke would not increase so rapidly with the wear of the brake blocks and other parts as with excessive leverage.

You refer to slippery rails in your report. Do you think they make much material difference in the stopping of a train?—I should think it would make a good deal.

Can you give me any idea of the percentage of stop?—I should imagine that on slippery and greasy rails it might make from 30 to 40 per cent. I know how they make the engine slip.

With regard to your report, you say the brakes were feeble. Counsel says that was your sensation in sitting on the engine and tender. I suppose it was your general sensation of how the train threw out in stopping, not the tender only?—It was largely the train as a whole. I expected from my recollection of old brake trials to be thrown forward, but I was not thrown forward to anything like the extent that I expected.

Am I to take it that, so far as the standing tests are concerned, if you had not been at any of the running tests, you would consider the brake was in good order?—No, certainly not in good order. I think I might go so far as to say it was in bad order, when some of the blocks were not applied to the wheels at all as they should have been.

Some Knotty Points.

At one test on the first day the train ran past the distant at 60 miles per hour, and immediately steam was shut off; it was found that that train ran through Sunshine at 56½ miles per hour. What would that indicate to you? What would it show in regard to the grade, which, I understand, is 1 in 240 there?—It would show the grade was assisting the train.

To what extent?—If it had been a level run the train would have been considerably below 56 miles per hour—perhaps 50 or 45 miles. The grade would assist the train.

But, as a matter of fact, the speed would diminish instead of increase?—Yes, it would diminish, and without the application of the brakes the train would have been brought to a stop somewhere beyond Sunshine station.

The grade would not be sufficient to accelerate the speed very much?—Not if the speed was high. I should say that a railway vehicle left on that grade would probably creep down slowly, but it would not gain much speed.

If a train is said to roll down, that means that steam was shut off; would the speed tend to diminish?—Yes, considerably.

Assuming we had a pressure of 75 lbs. in the train pipe and in the auxiliary reservoir, on a service application the triple

valves might stick, and when the driver put his handle back into the neutral position the air would escape from the auxiliary reservoir of the carriage in which the brake did not apply into the train pipe instead of through the triple valve, and that consequently it would release the brakes on the rest of the train?—It seems to me that the quantity of air in one auxiliary reservoir would be very small to produce such an effect.

You think that the brakes could not be released in that way?—I hardly think so; certainly not on the whole train.

Do you think, with your knowledge of the triple valve, that there is a possibility of it sticking with a service application of, say, 5 lbs?—It seems extremely unlikely, but it is possible.

In regard to the day these experiments were made, would you expect to get exactly the same result with the second experiment as the first, if it were conducted on as nearly as possible the same lines?—The second would be slightly inferior, as the brake blocks would be wearing all the time. The wheels might be warm, or their surfaces would be more polished the second time. Friction is very variable and uncertain.

In regard to test No. 5, where you have an emergency stop of 1992 feet, in a repetition, what would be a reasonable variation?—Well, anything within 100 feet.

Is it possible to thoroughly investigate the braking force of this train without taking into account the question of piston travel and leverage?—You cannot make any calculation without taking those two things into account.

You said that the co-efficient of friction varied. Supposing a train had come down from Bendigo and stopped at only a few stations on the road down. You would expect the wheels to be warm, would you not?—Yes.

And much warmer than the wheels of the train on the day we had the tests, coming only from St. Albans?—I don't think there would be a great deal of difference, because after the wheels warmed up a little the rapid motion through the air would have a great cooling effect. I have never observed the temperature of railway wheels, but motor car wheels get tremendously hot. In any warming up, I don't think you get much more after three or four miles.

MR. F. SELLEY

was the next expert called, and on him devolved the duty of explaining the brake, by means of charts, to Coroner, Counsel and Jury. Being the representative of the Westinghouse Company in Australia, he was able to unhesitatingly give all the information desired in a clear, concise, and comprehensive manner.

After describing the brake gear, and its various operations in application and release, he was questioned as to the difference in actual working between the plain automatic brake (with which the Bendigo train was fitted) and the quick-acting triple valve. He said that when a quick action takes place the brake is applied first from the train line pressure, and the passages leading through the triple valve to the brake cylinders are much larger than when you have an ordinary service application. The quick-acting brake is only adapted for long goods trains, and is designed to apply the brakes on the rear vehicles of a long train at the same time as it is applied on the front vehicles, in order to prevent them crowding into the front of the train. No advantage would be gained in fitting the quick-acting brakes on to trains of ten or twelve vehicles.

The Isolating Cock and the Brake.

Mr. Selley was questioned closely on the effect that would be produced if the isolating cock of the second engine had not been cut out (as it should have been). He said that if the driver of the second engine did not shut off the isolating cock it would not interfere with the driver of the leading engine operating the brakes: the question was, How long would they remain on with the isolating cock open? If the isolating cock of the second engine were open, and the driver of that engine had his handle on the "lap" position, he cut off the supply of air from the reservoir to the train pipe, but in doing that he would really be helping the driver of the first engine to pull up, by exhausting the air from the train pipe into the atmosphere.

Supposing he had the brake valve handle at the running position, and the driver of the first engine tried to put the brakes on, and released the air from the train pipe—would the fact that the isolating cock was open and the brake handle

in running position help or hinder the first engine driver putting on the brakes?

That would depend on his main reservoir pressure. If that pressure was above what his feed-valve would allow to pass, the main reservoir pressure would start to pass through the feed-valves into the train pipe, and thereby possibly increase the pressure in the train pipe sufficiently to push the triple valves forward into the release position. It might take the brakes off all the vehicles. If the driver of the second engine had his isolating cock open, with his handle in running position, it would not have any effect on the brake at all. The small amount of air that would pass the feed-valve would filter into the train pipe, and out at the cavity at the brake valve on the leading engine.

Mr. Selley was asked: If the driver of the second engine had opened the isolating cock, and set himself deliberately to hamper the driver of the first engine by throwing his handle over and filling the train pipe with air from his reservoir at the moment that the leading driver made an emergency application, what effect would that have?

His reply was: It would retard the application of the brake for one or two seconds by the sudden rush of a large volume of air, at a high pressure, into the train pipe close to where the opening had just been made from the train pipe to the atmosphere on the leading driver's brake valve; it would tend to crowd the air up on that end of the train, and it would take a couple of seconds to free itself before the brake worked. He had not tested his theory, but he was confident that, under these conditions, the brake would not be retarded for longer than two or three seconds. He was positive it could not prevent the application of the brakes. But in this case it has to be assumed that the two acts are done by the two drivers at the same time.

Now (Counsel asked Mr. Selley), supposing the driver on the second engine threw his brake valve handle into the release position, and let the air into the train pipe before the driver of the first engine makes the emergency application, what would happen?

It all depends (was the reply) upon the length of time between the two acts. If it was a matter of 10 to 15 seconds, the extra amount of air the second man allowed to pass would equalise the air in the reservoir, and he would get the same amount of pressure; if it is done at the same time, the

air has not time to get into the reservoir. Put in another way: If the driver of the second engine put his handle into release position a reasonable time before the driver of the first engine made his emergency application, it would have the effect of putting an extra charge into the auxiliary reservoir.

Supposing, again, the second engine driver placed his valve handle into the release position *after* the first driver made his emergency, what would the effect be on the brakes?

It would have no effect unless the driver was working at "a ridiculously low" pressure. With the driver of the leading engine carrying a 60 to 70 lbs. pressure it could not affect the brakes, but if lowered to 40 lbs. it might have the effect of reversing the triple valves for a second or so, but the brakes would immediately re-apply.

To sum up this phase of the enquiry relative to the position of the isolating cock, Mr. Selley affirmed that unless the two acts are done simultaneously (with the isolating cock of the second engine open) it would have no effect whatever on the braking of the train.

Will the Wheels Lock and Slide with an Emergency Application at 40 Miles an Hour?

Turning to another matter of general interest, Mr. Selley was asked whether in an emergency application, and a speed of 40 miles an hour, the wheels of the Bendigo train would lock and slide. He said that it depended on what pressure the driver carried. If it was higher than the regulation lays down, it was quite possible; if lower, then there was a sufficient margin left between the brake force applied and the weight of the car to prevent skidding. If they skidded sometimes, with a certain pressure on the brake blocks at a low rate of speed, that was positive proof that there was too much brake power on. Take a car weighing twelve tons, and assuming a pressure of 50 lbs. to square inch in the brake cylinders: the Westinghouse Company would put 75 per cent. of brake force on—that would mean nine tons. That is, twenty-five per cent. of the weight of that vehicle was running unbraked. If, with that pressure, the brake was fully applied, how could it pick up the wheels on a dry rail? It was possible on a wet or greasy rail.

This statement immediately brought forth the query: Granting your theory is correct, why do you provide for the

reduction in pressure as the train is slowing down with the high-speed brake?

The exact reply given was this: With the high-speed brake we run with a train pipe pressure of 110 lbs., which equals 125 per cent. of the weight of the vehicle—that is, 25 per cent. more than the actual weight of the vehicle. That is done in order to increase the co-efficient of friction at a high rate of speed. As the speed of the train decreases the pressure in the brake cylinder decreases to 80 or 85 per cent., and the train runs on until it comes to rest, but it does not pick the wheels up. To apply a high-speed brake at a low rate of speed it would pick the wheels up. That is why it is only applied to fast trains, and it is then only supposed to be applied in cases of emergency when running at high speed.

If in the case of the high-speed brake you find it necessary to reduce the pressure on the brake blocks as the speed diminishes, to avoid the wheels skidding, does not the same natural law hold when running with the low-speed brakes at more moderate velocity?

Not so long as your brake power does not exceed the weight of your train; it should not skid the wheels, even at a very low speed.

What, then, is the object of the instruction issued to release the brake before the train stops, if it is not to prevent skidding the wheels?

It is only to do away with the rebound and recoil of the train when it comes to rest. That instruction only applies to the driver who rushes into a station at a high speed, and finds it necessary to make nearly a full application of the brakes to save himself over-shooting the platform. If he keeps that application on till the train comes to rest, there is a terrible rebound, which causes great discomfort to passengers. That is why the regulation has been framed by the Westinghouse Company that a driver should put his handle into release position on the last half-turn of the wheel, so that by the time the train has pulled up the greater portion of the air that entered the cylinder to apply the brake has passed into the atmosphere, leaving the brake just lightly applied—just sufficient to hold the train in position. The regulation has nothing whatever to do with the skidding of the wheels.

The Effect of Piston Travel on the Brakes.

Mr. Selley was next questioned regarding the piston travel and their relation to the effective application of the brake. He said the Westinghouse Company recommended a minimum travel of 4 inches, with a maximum of 8 inches (that is, the piston should travel from 4 to 8 inches before the brake blocks touch the wheels). When the compressed air gets into the cylinder, it drives the piston forward, and then, by means of the lever, the brake is applied. It was possible to gear up a brake so that it would be applied before the piston had travelled up to 4 inches. Supposing it was reduced to 2 inches, it would materially interfere with the graduating of the brake. With a shorter travel than 4 inches it would not be possible to make a light application; with a reduction of from 7 to 10 lbs. it would practically apply the brake as effectively as in emergency with a 4 in. travel; and, likewise, with a greater travel than 8 inches, the power of the brake becomes appreciably affected. The further the head of the piston gets forward, the bigger space there is for the air to fill, and the more the power is reduced.

Mr. Selley was asked about the loss in braking power when the piston travel exceeded the maximum (which was the case with every vehicle except the two tenders), and his evidence on this point is very interesting.

He was asked whether the brake would act if the piston travel was 10 inches, and in responding in the affirmative admitted that there would be a loss of power.

On the bogie car 91AA the brake applied effectively with the 10 lbs. reduction, you say; but has not that brake an excessive piston travel?—It is 9¼ in., that is 1¼ in. above the maximum.

If it was only 7 lbs. reduction of air that brake would not have applied at all?—Yes it would.

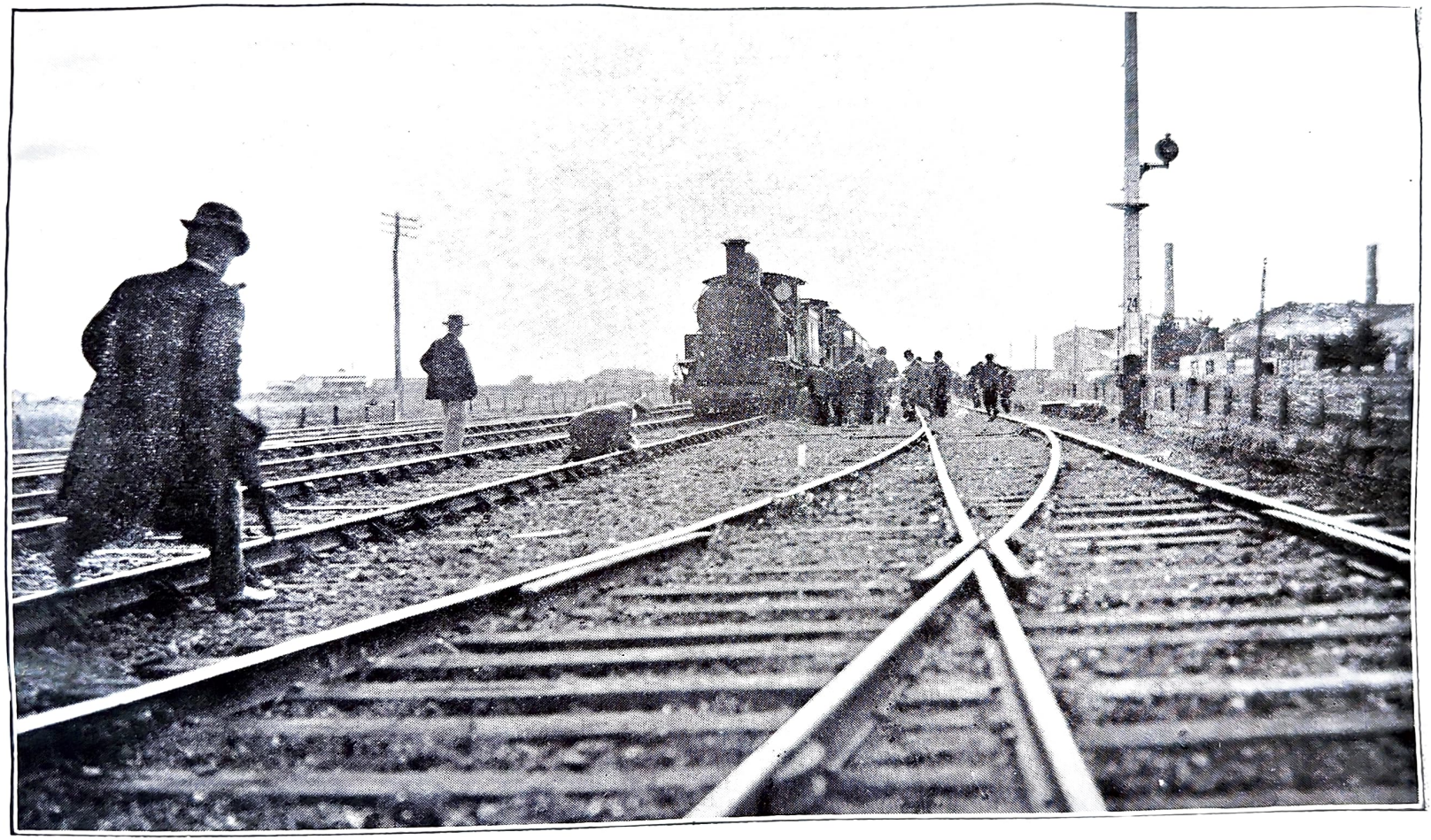
Judging by the Blackall trials, with a 7 lb. reduction at 9¼ in. would it apply?—Yes; there would be some 6 or 7 lbs. to the square inch; 7 lbs. gives you 8lbs. to the square inch on a piston head.

On the next three bogie cars the brakes applied effectively right through, but those three cars had excessive piston travel also?—Yes.

And though you put "applied effectively," you mean the brakes went on and remained on, but you do not say they had

THE BENDIGO TRAIN.

Exactly as composed on the night of the disaster, showing the broken buffer of the leading 90-ton engine, which was caused by the collision.



COMPARING NOTES AT THE CONCLUSION OF A TEST.

An official is seen to be making measurements, while the figure hurrying towards the train, which was pulled up at the home signal, is a newspaper reporter—who for once was late on the scene.

any power?—They were not applied for power in the service application; they were applied to see whether they would remain on with the service application and were effective under service conditions.

Inasmuch as they went on and did not come off?—That is right.

But the amount of pressure they exerted on the wheels can only be ascertained by looking at the piston travel of the table?—Yes; the brakes were apparently effective.

What is the meaning of the word maximum?—That is the limit.

Consistent with effectiveness: is that what you mean?—It does not follow because of the piston travel the effectiveness has decreased to any great extent. We work our leverages out, assuming 50 lbs. in the brake cylinder; we say the piston should not be allowed to travel more than 8 in.

That is the longest distance it should be allowed to travel consistent with effectiveness: is not that what you mean by maximum?—No, not necessarily.

Then what does it mean?—With an 8 inch travel you get the amount of power that we consider is necessary.

With a 4 inch travel you get the power necessary, but you say you can let it go out to 4 in., 5 in., 6 in., and 7 in., but you must not let it go out to more than 8 in.—is not that what you mean?—No; certainly not. We must have a minimum and a maximum; if we laid down a hard and fast rule for those pistons to travel 6 inches—no more and no less—the brakes would require continual adjustment.

Does not Blackall lay it down?—Yes; they base their calculations on the 50 lbs. pressure in the brake cylinder, with a 70 lbs. auxiliary reservoir pressure, and you can get that power when the piston travels 8 inches; if you go beyond that you are losing power.

It means you cannot go beyond 8 inches, does it not?—Not necessarily. Suppose you lose three or four per cent. because the piston travels an inch beyond the 8 inches, that does not decrease effectiveness to any great extent.

You found the piston travel in a number of those vehicles excessive on standing tests; supposing the train is running, does not it still more decrease the effectiveness?—Very slightly I should say.

In answer to further questioning, Mr. Selley said that with an 8 inch travel and 70 lbs. pressure in the auxiliary you

get 50 lbs. pressure in the brake cylinder, and with a 10 inch travel, 47 lb. An increase of 2 inches makes a difference of 3 lbs. to the square inch—that is, with a full application. That is equal to 5.5 per cent. between the 8 and the 10 inch, but 17.7 per cent. between a 4 inch travel and the 10 inch. He considered that the average piston travel in excess of the maximum was equivalent to 4.6 per cent. loss of brake power.

Should All the Vehicles be Braked?

As an expert, what do you say, cutting out the two vehicles which were unbraked and remembering the condition of the other vehicles, as to whether or not that train on the night of the collision was efficiently braked for the purpose of the efficient working of the brakes?—I should say it was safe to run, but safer under an emergency application than a service. What I mean is this—that on a service application the brake on the second engine was useless; but in the case of an emergency or a full application of the brake it operated and remained on for two minutes, when it leaped off, but at what rate it diminished could not be ascertained. It is certain that the brake was effective to a certain extent during the emergency application, but with a service application the brake did not apply at all.

Mr. Selley said that, guided by the running tests, he would say that the train was braked well enough to effectively and safely work the Bendigo train; but if he had inspected the train before it left Bendigo, he would have said No. He considered the train would have been more effectively controlled had the second engine brake been in better order.

As showing the difference in distance in which a train perfectly braked could be pulled up and that actually taken by the Bendigo train in the tests, the following is exceedingly interesting:—

Taking the Bendigo train, and reckoning on the engines, tenders and other vehicles (except the horse box, which was only piped) being braked up to their maximum of effectiveness, an emergency application while travelling at 40 miles an hour should pull it up in 511 feet, whereas the test made with the brakes untouched since the collision showed that 802 feet were travelled before the train pulled up—a difference of nearly 300 feet.

At 48 miles an hour, with a train line pressure of 70 lbs., an emergency application of the brake of the Bendigo train perfectly braked should pull it up in 736 feet, as against 1268 feet taken in the test. At 59 miles an hour it would have pulled up in 1112 feet, as against 1992 feet in the test.

The Expert Solving a Problem.

By way of diversion, Mr. Selley was given an opportunity to defend the Westinghouse brake against a suggestion of unreliability made by Counsel when referring to the case of a train which broke in two, and the rear portion ran back three miles before it was stopped. Mr. Selley was asked: Was that not against the principle of the brake?—No!

Should not the brake hold at both ends?—Yes!

Why did it not do so?—I was not there to see. I am quite satisfied that the brakes applied.

But they leaked off?—I suppose so.

Through faulty upkeep?—You cannot guard against some foreign substance getting into the train line and getting under the check valves and preventing them seating. That may cause some brakes to leak off; and that may have happened in the case under notice.

Is it possible for a foreign substance to get into the connections and prevent the valves seating?—It all depends on which valve you speak of. I am referring to the check valve and the quick-acting, but there were none of them on the Bendigo train.

Have you known of a piece of coal?—I have never known of a case. I could understand if it was a vacuum brake;—it would suck it in—but not a pressure brake.

If I can bring drivers to say they took an engine out and could not get any air at all, and when they examined it they found a piece of coal in the hose pipe coupling and the thing would not work, what would you say?—I would be surprised, but I would have no reason to doubt them.

Then a foreign substance may get in?—A little piece of coal could not stop it. If that were possible, the Westinghouse brake would have been knocked out years ago.

Supposing I put three men in the box who will swear absolutely that they could get their engine from Oakleigh to Melbourne, but not from Melbourne to Oakleigh with any brakes on—is it possible for the brakes to act going one way and not the other?—I have never known of a case of that kind.

Then the drivers find those things out themselves?—A driver might perhaps say the brakes will not act; he does not say they fail altogether; they might be slow in action, due to the core curling up inside, but that would not entirely block the passage of the air.

But if those three men say they could not get the brakes on?—I do not think it would be possible for the interior of the pipe to be blocked absolutely by the curling up of the core.

Then if these men are brought here, including the train examiner, it will show that it is possible that things occur in the brake that you do not hear of?—Possibly, and a lot that I do hear of.

Is it possible for a brake to go on at one application, and then at a subsequent application of the same sort not to go on?—The only case that did come under my observation was one on the Bendigo train.

Brake Power Calculations.

What amount of brake power should there be on any passenger train; what is the percentage to the total weight of the train?—With a train similar to the Bendigo train, if you have 45 to 50 per cent. of the total weight of the train it should be sufficient.

I am told there should be 90 per cent. of the empty weight of the train as brake power?—That applies to very fast trains.

You have said that owing to certain defects in the braking power of this train it had minimised it by about 40 per cent.: did you take into consideration the unbraked vehicles?—That would be the condition under which the train is running now.

In the comparisons you gave us, the train under perfect conditions at certain rates of speed seems to have travelled nearly twice as far on two or three occasions. Does not that mean that there is a loss of about 50 per cent. of braking power on that train?—It does not work out at that. We made a stoppage of 802 feet with the brakes in the condition they are now. We know there are certain defects existing.

In a proper test where would you have stopped?—511 feet.

That is about 60 per cent.; does not that mean that these defects meant a loss of about 40 per cent. of brake power?—Theory very often upsets practice.

Would it be proper working of the train coming up to the distant signal to make a 7 lbs. reduction at first?—No; on a train running at the speed of the Bendigo train I would not reduce less than 10 lbs.

Have you had any experience of running with the Westinghouse brakes?—I have had eighteen years' experience in the States.

Have you ever driven an engine?—Yes, I have.

You have been in the railway service?—Yes, a long while ago, but not out here.

Have you ever driven a train fitted with a Westinghouse brake?—No, but I have been in charge of the brake with men who were in charge of the train. I was there to teach the men what should be done.

In answer to Counsel, Mr. Selley said the weight of the Bendigo train (including passengers) was 319 tons 1 cwt. 2 qrs. Without the passengers it was 288 tons 19 cwt., and the passengers' luggage was estimated at 30 tons 2 cwt. 2 qrs.

The weight of the unbraked carriages was:—18F, 7 tons 4 cwt. 1 qr.; 258BH, 7 tons 3 cwt.; and that of the two carriages with partly inefficient brakes, 30BB, 10 tons 12 cwt.; 20E, 8 tons 13 cwt. 2 qrs. That is, unbraked or insufficiently braked, about 33 tons out of 319 tons.

Mr. Selley was asked: Assuming they were unbraked, and compared with the total weight of the train, was not that within the limits which practice allows?—Yes, certainly it was.

Having got the total weight of the train as 319 tons, will you give me some percentage of 319 tons which you would consider to be a perfectly safe brake power on that train?—Well, 58 per cent. You could also with safety reach 50 per cent. 50 per cent. is considered a fair safe working per centage; 58 per cent. is almost a standard of perfection; there is a margin of safety at 50 per cent.

Piston Travels and Leverage.

In calculating the brake power on this train, have you considered the question of leverage?—No.

Is not that very important?—Yes.

It would operate, would it not, in this way—that even if the piston loss were greater than the recognised limits, and if the leverage was greater than ordinarily, the loss in pressure in the cylinder would be made up by the greater leverage?—It would certainly compensate.

You gave us to understand that the adjustment of travel was a perfectly simple and easy matter?—Yes.

Has that adjustment to be frequently made?—It depends upon the service of the car. The brakes on the suburban train, where the brakes are continually at work, would need to be adjusted more often than a through train.

Would a train leaving Bendigo in correct adjustment, say, not exceeding an 8 inch travel on these brake blocks, need re-adjustment on arrival at Melbourne?—It might do in some cases. Some brakes will wear away more quickly than others.

One of the piston travels taken at Sunshine prior to the first set of tests being conducted showed 9¼ inches. Could the difference between 8 and 9¼ inches be possibly due to wear of brake blocks between Bendigo and Melbourne?—Only if the blocks on that particular car were soft.

It is possible, then, for that particular brake block with the travel not exceeding 8 inches on leaving Bendigo to show a travel of 9¼ inches at the other end?—Yes.

Take the next one (Car 3BB) that showed a travel of 10¾ inches. Is it possible that the piston travel at Bendigo did not exceed 8 inches?—No; you would not get that amount of extra travel in one trip, I am certain.

This concluded Mr. Selley's evidence.

AN INDEPENDENT EXPERT IN THE BOX.

One of the most difficult of all positions to fill with any satisfaction is that of "independent" expert. Occupying such a position, one speedily finds out the tremendous difficulties that arise to challenge the maintenance of that independence. Mr. W. O. Bagley, whom the Coroner had appointed as an "independent" expert to help, to the limit of his ability, in throwing light on the causes which may have led up to the lamentable tragedy at Sunshine, soon realised that the man who was engaged as a "partisan" had by far the most comfortable position. On the one hand, there were the railway men, with whom for 29 years he had had the happiest association prior to leaving the service in order to devote the whole of his time to the work of preparing students for examination, most of whom looked to him to uphold the strong opinion they had already formed—that, whatever else was

the cause of the disaster, no blame should be attached to the crew of the Bendigo train; on the other hand, some were anxious to see him determinedly "plump" for the Commissioners, in spite of what any investigations he made would reveal. The alternative was to try and act the part of "independent" expert, to smother up all bias (so far as it was possible to do that), to face the duty imposed upon him with an open mind, and to speak out fearlessly, at the proper time, the convictions which exhaustive and conscientious examinations and honestly-conducted tests would produce. This latter course Mr. Bagley set himself to follow. How far he succeeded, others are entitled to judge.

As was only to be expected, he was subjected to close examination and cross-questioning by the representatives of the interested parties.

What is a Service Application?

The first point was in regard to a service application of the brake. In his report of the standing tests he had spoken of a 15 lbs. service reduction being made; Mr. McArthur asked him whether that was about an average service application. "No," said Mr. Bagley emphatically, "a 15 lbs. reduction in any train with the brakes in good order is altogether too much; 8 to 10 lbs. should pull a well-braked train up. In testing the brakes, however, a reduction of 15 lbs. is proper, because by that means the pistons will be forced to their extreme travel, and a proper examination can be made."

How Piston Travel Affects the Application of the Brake.

Questioned in regard to a table forwarded with his report (which is printed on page 24), Mr. Bagley gave the following explanation:—

1. With a 7 lbs. reduction and an 8 inch travel you get 10½ lbs. pressure per square inch on the piston head; with 9 inch 8 lbs.; with 10 and 11 inch you get no pressure at all.
2. With a 10 lbs. reduction and a 6 inch travel you get 34 lbs.; with 8 inch, 23½ lbs.; with 9 inch, 19½ lbs.; with 10 inch, 17 lbs.

3. With a 4 inch travel and a 7 lbs. reduction you get 25 lbs. pressure; to get substantially the same pressure with an 11 inch travel you have to reduce the train pipe pressure by 16 lbs. With a 10 inch travel and a 7 lbs. reduction you do not get sufficient pressure to force the piston out.

   Put in another way: With a 4 inch piston travel you get 25 lbs. pressure with a reduction of 7 lbs.; to get 25 lbs. pressure with an 11 inch travel the reduction must be increased to 16 lbs.

4. You can get a greater pressure than 50 lbs. in the brake cylinder with a train line pressure of 70 lbs. If with a 4 inch piston travel you allow 13 lbs. of air to escape, a pressure of 57 lbs. will be secured; but this only applies to a 4 inch piston travel. With an 8 inch travel and a 70 lbs. train line pressure you cannot get more than 50 lbs. pressure in the brake cylinder, whatever reduction is made.

5. Taking three brakes, with 6, 8 and 10 inch piston travel respectively, and making a 7 lbs. reduction, there would be a striking difference in the power exerted by each. The 6 inch would develop a pressure of 17½ lbs. per square inch; the 8 inch, 10½ lbs.; while the pressure in the cylinder having the 10 inch travel would not be sufficient to drive the piston out to the full stroke, and therefore not sufficient to apply the brake.

6. If you make an emergency application with an 11 inch travel you will get a pressure of 45 lbs.; with an 8 inch travel you will get a pressure of 50 lbs.

Mr. Bagley was asked his opinion about the brake of the Bendigo train, and said he had never seen (as far as appearances went) a passenger train so defective in brake power. He would not say that the train could not be properly controlled with the brakes in the condition in which he found them on examination, but the percentage of brake power was very low compared with what it would have been in a properly equipped train. In order to effectively control the Bendigo train he would say that the driver would have to apply his brakes a longer distance away and make a greater reduction that was usually the case with fast main line passenger trains.

A Poor Brake and a Good Brake.

Mr. Bagley was asked whether a driver, with the brakes in the same condition as he had seen them, would, by exercising ordinary care and caution, be able to control his train as he wished; to which he replied: "I should say he would. The difference between a poorly braked train and one that is well equipped with brake power is that in the one case a driver can enter a station or run up to a signal at a higher rate of speed, and be able to pull up; if he has an inferior brake he must apply it at a greater distance from the stopping-point—that is the chief difference. Milburn said he made a 12 lbs. reduction: if the brake was in good order there would be no necessity for that reduction. Of course the inferiority of the brake would be apparent to a driver on making the first stop. And he had no hesitation in saying that if the brake was in any way defective on leaving Bendigo, Milburn would have discovered it and provided against it long before he reached Sunshine.

In Mr. Bagley's opinion (which had been altered as a result of the running tests made), there was no reason why the brakes should not have applied effectively enough to pull up the Bendigo train between the home and distant signals on the night of the collision, unless some extraordinary occurrence had taken place to prevent the brakes operating at the moment they were needed to pull up the train, as, for example, an unravelling in the hose, or a scale from the pipe or some other substance, which may have entered the rotary valve and blocked up the passage of air for even 30 seconds, thus preventing the brakes applying. It was only a suggestion, but it was a possible cause of the brakes not acting. The rotary valve of the driver's equalising discharge valve is very small, and any scale or other substance passing along the train pipe might block the passage of air from the pipe to the atmosphere, and check the application of the brakes. The smallest aperture through which the air has to pass was $\frac{5}{8}$ x $\frac{3}{4}$ inch, but with a 70 lbs. pressure behind it, it would take a good-sized foreign body to block it up. But instances had occurred in Victoria when, on account of the unravelling of a hose coupling, the passage of air was completely blocked, and while the brake was applied at one part of the trip, it could not be applied at a later stage. Then, again, a tap may accidentally close on a vehicle and block the passage of air.

If such a thing happened, and the leakage in the train pipe was greater than the feed grooves could supply from the auxiliary reservoir back into the train pipe the brakes would apply, but if the leakage was not great enough, they would not apply—the air from the train pipe and auxiliary would exhaust itself without applying the brakes. Mr. Bagley had known a tap to close on a goods train, but not on a passenger train. He did not think that a closed tap had in any way interfered with the operation of the brakes in the Bendigo train.

With regard to the theory of the unravelled canvas inside the hose, Mr. Bagley was forced to admit that the theory was hardly consistent with the number of tests that had already been made, but he was not willing to finally relinquish it until he had an opportunity of cutting open a hose coupling which appeared to have some blockage. This was done at a subsequent date, when he reported that the theory of the unravelling was no longer tenable.

After giving a recital of the manner in which the brakes were tested after coupling on to a train, the following dialogue took place:—

Would an engine driver know, after he had coupled up, if there was a block between his tender and, say, the next carriage?—Yes; but the farther away the block was from the engine the more difficulty there would be in discovering it. If it were between the last and second last carriages of a fairly long passenger train he would not detect it. Even if a driver failed to notice such a block before starting his trip, he would find it out when he came to apply his brake.

If a block occurred between the tender and the next carriage, would the engine driver have control over any part of his train?—He would have complete control over the engine and tender, but not any control over the rest of the train.

Could the guard operate the brakes on the rest of the train?—Yes.

The Scale Theory.

With regard to your theory—assuming a chip has found its way to the rotary valve, if there is a complete stoppage there the driver cannot operate on any brake, even his engine brake?—If he places his handle over into the emergency position, and a scale passed up and choked the rotary, it would prevent the brakes applying at all; he cannot make the brake

operate upon any part of the train. The guard at the other end could then make the brakes operate upon every part of the train, including the engine and tender. Of course, that scale may not be a scale that would completely block the passage. In that case the engine driver could operate the brakes, but not so quickly. In either case the guard could operate them completely.

Suppose the blockage is in the pipe in the middle of the train—a complete blockage—even the engine driver can operate on all the brakes forward of that blockage, can he not?—Yes; the brakes would apply on the portions wherever the air was allowed to escape. It does not matter where it is blocked, the engine driver can operate on the part of the train forward of the block, and the guard can operate on all the train behind the block.

What Caused the Sparks?

In regard to the sparks seen along the train just prior to the collision, Mr. Bagley gave it as his decided opinion that they were caused by the application of the brakes. The friction brought about by the brake blocks pressing hard on the wheels would account for that. He had seen the same thing occur scores of times. It would be apparent along the full length of the train if it were running at a high speed and the brakes were applied in emergency. Sparks would not be due to a reversed engine with the brakes off, because the power of the reversed engine would not be great enough to cause the wheels to revolve in the opposite direction at a high speed. Even if the reversing of the engine could cause sparks to fly, they would only show on the engine wheels, and not on any other part of the train. But if the brakes were applied on the train, and the engines were reversed, the wheels would lock and slide, and the friction thus set up would produce sparks, but not so bright as when the brakes are applied in emergency at high speed. You would not get any sparks from the carriages unless the brakes were applied.

Mr. Bagley was asked his opinion of the Westinghouse brake—was the principle a good one? was it the best continuous brake available? He gave emphasis to an affirmative answer to both questions. Like all other machinery, it was necessary that it should be kept in perfect order. The fact of air being used as a force made the up-keep of the Westinghouse brake a matter of particular importance. In order to

have the brake in proper order, it was necessary to keep the hose couplings on all the vehicles in first-class order, to have the packing leathers in the brake cylinders tight-fitting and well greased; to frequently and thoroughly examine the triple valves, packing rings, the gear which regulates the piston travel, and all the various other parts which combine to render it the most effective continuous air brake in the world.

What is a Service Application?

What amount of air should be released on a service application?—There is no fixed rule that can be laid down for the application of the brake. In the service application you must consider the length of the train, the speed, the condition of the rails, and the condition of the brake. With a short train about 6 or 7 lbs. reduction is a fair amount, in the first place, to let out of the train pipe, and the driver has to decrease the pressure as required. On a long train you must allow a greater reduction than on a short train.

It is good working, then, to release 7 lbs. of air, and then, if you find that it is not checking the train sufficiently, to release a few lbs. more, and then to go right on to 15 or 25 lbs.?—Yes.

So when you said 15 lbs. is the ordinary service reduction it is not quite correct, is it?—I would like you to understand, with reference to an application or reduction, if you apply the brake and allow a 7 lbs. reduction, then place the handle in a neutral position, and then another 5 lbs. and place the handle in neutral position, and then another 5 lbs. and place the handle in a neutral position, and then release the brake, that is termed an application as from the time you apply the brake to the time when you release.

In ordinary working, if you wanted to check a train at the distant signal, you might only release 5 or 7 lbs., and put the handle in a neutral position?—That depends entirely on the condition of the train. If it has an inferior brake, he would have to make a reduction of from 10 to 12 lbs. If a man has to allow 12 lbs. to start with, it shows that the piston travel is too great to have much effect on the train.

Do you think that if a 7 lbs. reduction was made on the Bendigo train at 60 miles an hour, and considering the excessive piston travel, it would have much effect on the train?—It would have no effect at all.

And if there had not been excessive piston travel, would it have had any effect under the same condition?—Yes, 25 lbs. per square inch in each 10-inch brake cylinder.

As a matter of fact, the 25 lbs. means that you would have 100 per cent. greater pressure on your brake blocks?—Yes.

Piston Travels—Their Relation to Effective Braking Power.

At frequent intervals throughout the enquiry, the question of piston travel came up, and Mr. Bagley was subjected to a close examination in regard to this matter some nine or ten times during the Enquiry. It is amusing to notice how it was introduced on one occasion, as the following dialogue between Mr. Corr and Mr. Bagley will show:—

You were asked by Mr. McArthur at some length with regard to the possible means of the brakes not acting—is it not possible that the cause of the brakes not acting very often arises at a station?—Decidedly.

And, therefore, though the brake may have acted at Bendigo, Kyneton and Castlemaine, the cause may have arisen at Sunshine?—It is quite possible.

He might create an obstruction possibly at the very time the accident happened?—Yes.

Mr. McArthur also asked as to certain obstructions—where the engine driver could attempt to apply the brake, and yet not apply it—is not a question of seconds most important?—Yes; that is, in operating the brake.

It is quite possible for a man to get a brake on if he has time?—In an application the brake is put on some distance away from where he expects to pull up; if a driver is making a service application, and finds the brakes are not holding to his satisfaction, he would place the handle to the extreme right, but some seconds would elapse before he would discover that the brake was not properly controlling the train. If the piston travels were short he can feel the brakes gripping almost at once.

If the piston travel is long it takes him more time to find out whether he has the train under control?—Certainly; and he has then to reduce till he feels he has the train thoroughly checked.

Supposing that a man was coming to the distant signal at Sunshine, and coming at a fast rate of speed, as on the night

of the collision, with excessive piston travel, how far, with a 7 lbs. reduction, do you think he would go before he found the train showing a diminishing speed so as to stop at the home signal?—When he made the 7 lbs. reduction he would find it was not checking at all, because that would not give him any power, except on his engine.

The combined weight of the unbraked power behind him would keep shoving him?—The speed might be a little checked perhaps, but he would go a fair distance before he really put his handle over to the extreme.

If such a thing did happen, with the vehicles not sufficiently braked, he might get half way between the distant and the home signal before the train answered?—It depends on the judgment of the man in handling the train. If a driver finds it is not holding, he will allow a reduction to take place so that it will hold. If he allows 7 or 8 lbs. to start with, he will make a further reduction to cause the brakes to act. He will not let the train cover a great distance without applying the power, but of course the speed of the train will soon advance you.

In working out the excessive piston travel that he showed by his table, Mr. Bagley said that a driver would reasonably expect that he would not have more than an 8 inch travel; and therefore he would naturally, first of all, make a reduction of 7 lbs. That would give him 10½ lb. pressure to the square inch on the blocks with an 8 inch travel. If the travel was 10 inches, he would get no power at all. With a 10 lbs. reduction and an 8 inch travel, there would be 23½ lbs. pressure; but if the travel is 10 inches he gets 17 lbs. pressure.

In answer to questions, Mr. Bagley said that looking at the figures, the deficiency from 23½ to 17½ lbs. pressure did not seem much, but in percentage of braking power it made a great difference.

Driver Milburn's Record.

Milburn's record, dealing with offences against the Railway Department's regulations, was allowed to be placed before the Jury, notwithsanding a vigorous protest from Mr. Corr, and it appeared, in some respects, to be a rather bad one. Milburn, however, made such an able defence of his action in regard to the most serious items on the sheet, that opinions were speedily changed. Mr. Bagley was asked for his judgment on Milburn and his record.

You have been a driver for many years, and you know driver Milburn?—Yes, I know him well.

You have acted as fireman for him?—Yes.

In your experience of him, have you found that he was a careful and a good driver?—Yes.

With thirty years' service is that record a bad one?—Any driver who is at North Melbourne for a number of years and who can show a better record than Driver Milburn is a lucky man.

It favourably compares with the others?—Yes.

Breaking draw-bars cannot be avoided?—Drivers the world over break draw-bars. It is impossible to avoid it.

I suppose you have broken one or two?—Oh, yes; I should like to meet the man who has not.

The subject of piston travel was again introduced, when some pointed questioning was made in regard to possible causes of the brake being in the poor condition in which the experts found it on examination after the collision.

Do you think the collision itself might have had any detrimental effect on the brakes?—No; the cylinders are in a vertical position, and I do not know how they could be affected.

Coming to the carriages: if everything was done, and the train examiners and others responsible for examining the train did their duty, the train should have been right on the day of the disaster. Can you suggest a reason for the excessive piston travel, such as was observed ten days later? Could the collision itself have caused it—strained the connecting rods, loosened the pins, and so forth?—I do not think it had the slightest effect.

What reason would you suggest?—Well, I suppose the piston travel had never been taken up.

Suppose it was right on leaving Bendigo, can you suggest any reason how that excessive travel occurred?—There was a certain amount of wear on the blocks coming down from Bendigo and in the five tests made at Sunshine.

Is there any other cause you can suggest?—No, I do not know of any other.

You said this, that you have never known a fast passenger train so deficient in brake power in Victoria as the Bendigo train?—That is, judged by a standing test.

Were you surprised at the running tests?—Yes; I would not have thought it possible for the train to have pulled up

in the distances. Like Professor Kernot; I found the theory different from the practice. The train was pulled up in a much shorter distance than I expected to find.

No driver can complain of it, but he might get a better test?—If I am a driver, and if I am running on the Bendigo line, and accustomed to handling first-class trains with the brake in first-class order, and then should I have to handle a train with the brake power at not much more than half of the percentage to which I am accustomed, I am very likely to be deceived. I may be approaching a station, forgetting for the moment that it is a different train from what I have been accustomed to handle, and so get myself into serious trouble.

Piston Travel Again Discussed.

Mr. Starke next took a hand in discussing the vexed question of piston travels and to what extent they affect the brake power of the train.

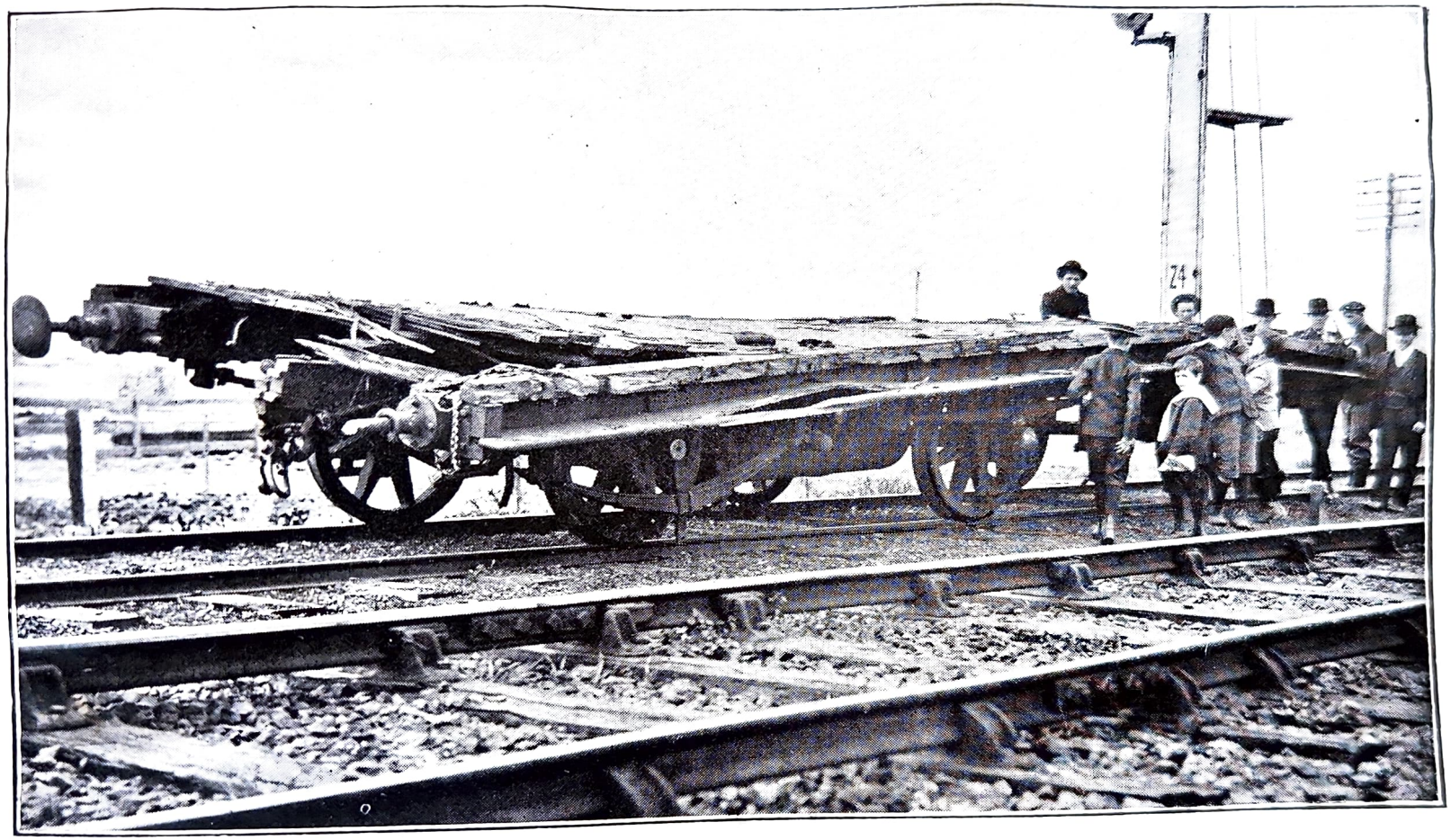
Now, as to piston travels. You tell us that the range is from about 4 to 8 inches; and, of course, within those limits a larger range gives you a great control of your brake?—The shorter the piston travel the greater power you have.

But the more difficult (said Mr. Starke) to graduate your stops, when you apply your brake heavily straight away?—With a long piston travel you must allow a heavier reduction to take place to steady the train up than with a short travel. If you have a train with a a 10 inch piston travel it is necessary to make a 10 lb. reduction.

I am assuming 4 inches and 8 inches as the service limits. As a matter of practical work, is not the longer travel of the piston up to 8 inches beneficial, as it gives you a better range, which enables you to more gradually apply your brakes?—Oh, no; the longer the piston travel the poorer the brake power.

In a service application you would have it rather 8 inches than 4?—No, certainly not. The piston travel of a train decides its brake power. If you have an average travel of 4 to 6 inches the brake power is far superior to a piston travel of 8 inches.

If you have a 4 inch travel, and you open your valve, with very little pressure you get the whole of the emergency power of the brake applied, do you not?—If you allow 13 lbs. of air to escape out of the train pipe the pressure from the auxiliary reservoir to the brake cylinder equalises at 57 lb.



ALL THAT WAS LEFT OF ONE OF THE SMASHED FOUR-WHEELED CARRIAGES OF THE BALLARAT TRAIN.

The remarkable feature about the wrecked carriage of this illustration is that, although the body was splintered into matchwood, and the undercarriage badly damaged, the roof remained intact (as will be seen) as though it had been carefully lifted off.

What I mean is this: Suppose you reduce the train pressure 5 or 6 lb., would not that, with a 4 inch piston travel, practically give you the whole emergency force of the brake power?—No; you would have to make a reduction of 13 lbs.; that would give you the full emergency power with a 4 inch travel. With an 8 inch travel you would have to allow a reduction of 25 lbs. to get the emergency power of the brake.

You work your brake more gradually within the limits of 4 and 8 inches than if you say the piston shall never travel more than 4 inches, do you not? Is it not better to apply gradually than make one sudden application?—It is better to handle the train with the piston travel short.

The piston travels in the Bendigo train were pretty regular—between 9 and 10 inches—that was more advantageous than if some were 8, some 10, and some 6?—No, certainly not.

Why?—The one that had a 6 inch travel would have a greater power on that particular vehicle than on one with 8 inches.

But it would be a tremendous strain on the vehicles in front?—They would apply instantaneously throughout the train.

With a uniform piston travel the brakes all go on together on every vehicle to which they are applied?—So they do with a long travel. They apply at the same time, but the pressure is not so powerful on one piston as on the other.

If you had 75 lbs. in your train pipe, and you had a short travel of 4 inches in one, and in another 6 inches, and in another 8 inches, and in another 10 inches, the possibility is that some of those wheels with the short piston travel will skid?—Of course; there is a tendency to do that. But for very high speed trains, with 4 inch travels and carrying 70 to 80 lbs., it is supposed that the power is not sufficiently great to skid the wheels.

If you have piston travels of varying lengths, I suppose the brake power is not so evenly or so well applied as it would be if you have vehicles with brakes having a uniform piston travel?—The uniform travel is certainly preferable.

I may take it that you prefer a train with a 10 inch uniform travel to a train with 4, 6, 8 and 10 inch travel?—No fear, I would not!

Is the Quick-acting Triple Valve Desirable?

Mr. Bagley was asked his opinion of the quick-acting triple valve—whether it was desirable on trains such as the Bendigo train, or whether it was superior to the ordinary Westinghouse brake? He said that there was nothing to be gained by equipping ordinary passenger trains, such as the Bendigo and Ballarat trains with the quick-acting triple valve. The ordinary triple valve had been proved to be effective for a great many years. It was only when larger engines were built and heavier and longer trains were hauled that the ordinary triple valve was found to be unsuitable for this particular class of traffic. If the hose burst in the front portion of the train, or if it was necessary at any time for the driver to apply his brakes in emergency, those in the front part of the train would apply sooner than the brakes in the rear, with the result that the rear of the train would crowd into the front portion and do a great deal of damage to the loading and draw-gear. To overcome that difficulty the quick-acting triple valve was invented, not to give greater power, but to give an instantaneous action of the brakes throughout a long train. According to tests, the brake can, with the quick-acting triple valve, be applied on every vehicle in about two seconds. To show that it was not for power it was wanted, we are supposed to carry only 50 to 60 lbs. of air on a goods train. The Sydney express is fitted up with a quick triple valve, but they are cut out for ordinary purposes, and practically it is a plain triple valve. With the plain triple valve in use on that express, we carry 70 to 80 lbs. pressure, and at the speed run at the present time, should the driver apply his brake in emergency, it would almost lock and slide the wheels, so it is not necessary to have greater power. With the quick-acting brake, if the driver applied his brake in an emergency, he would lock and slide the wheels every time, because he has the extra power to pass from the train pipe into the brake cylinder. The ordinary triple valve Westinghouse apparatus is the proper and the best to use on our main line fast passenger trains.

The Speed at the Distant Signal—What should it be?

In his evidence, Mr. Bagley said that his practice as a driver was to have his train under control at the distant signal if it was at danger. He would reduce the speed to 20 or 25 miles an hour, and then roll on to the home signal.

Supposing you see the distant signal and the home signal against you, and you have got a perfectly braked train—what is the proper thing to do?—To get your train under control so as to be able to stop at the distant signal: that is the regulation of the Department.

So that if there is any obstruction between the distant and the home signal you may pull up altogether?—Yes, so as to be able to stop at the distant signal, but should you see the way clear between the distant and home signal, you draw the train cautionsly to the home signal and remain there until the signal is off—that is the case under all conditions.

With a perfectly braked train, then, you would apply the brakes at about 500 or 600 yards from the distant signal?—It would depend on the speed of the train. As far as distance is concerned, the driver uses his judgment.

Supposing you had been on this train with an imperfect brake, that took longer to stop the train, would you have run past that distance signal at all without being sure there was no obstruction in front?—Yes. I would have had the train under control so as to be able to stop. If I have a Westinghouse brake, I consider if I check the train to a speed of about 20 miles an hour I would have it under control, so as to be able to stop at the home signal.

Supposing you had brought it to 15 or 20 miles an hour before you got to the distant—that is, with this train, with this brake, which takes a little longer to pull up—would you then have been able to stop, if you had suddenly seen an obstruction between the distant and home signals?—Easily; if you pass the distant at a speed of 20 miles an hour, you could stop even with the hand brakes on the engines before you got to the home signal.

Even with the brake in perfect order, would it not have been a very rash and improper thing to have come almost up to the distant signal or right up to it at a rate of 50 miles an hour?—Yes, there is nothing to gain in rushing up to signals at that speed.

Would it not have been a most dangerous and improper thing to do?—Most decidedly, when the signal is against you.

Pointed Questions and Answers.

As to the effect of the collision upon the brakes of the Bendigo train, would the collision have any effect upon the piston travel?—No; I say the brake was applied on the Bendigo

train, for this reason: I have examined that train carefully, the framing, lever, rods, and buffer beams, and I believe the train was rigid when it passed the home signal and ran into the standing train. If the train came without the brakes being applied, as soon as it struck the Ballarat train it would have taken the old horse-box next to the heavy carriages and the two engines and smashed it up into splinters. The back end of the train would have crashed into the front portion and done considerable damage. There is a casing with a spring between the buffers. It takes very little to bring the buffers together and break the casing, but the buffers of the carriages, which I closely examined, had not been driven home, which seems to show that the train was held rigid. If that train had come in without the brakes being applied, I maintain that it would have caused great damage, and the back part of the train would have been derailed.

You think that practically the Bendigo train came in and struck the other train in a rigid condition, and so there was no appreciable effect upon, say, the piston travel or any other material part of the brake?—It had no effect, in my opinion, on the brakes. Whatever the state of affairs was before the collision, Mr. Bagley had no doubt the brakes were on and holding the train rigid when the collision occurred. That was his conviction.

Supposing you got the hand brake on the train and you also got the Westinghouse plain automatic brake on the train, could you leave your hand brake and the automatic brake on and still reverse?—If you did that you would lock and slide the wheels every time.

Suppose they are both ineffective to pull the train up quickly enough, could you reverse your engine and add to your power of pulling up? No, decidedly not; it will lock and slide your wheels just the same, and you would not stop as soon as you would without reversing the engine.

Supposing the Westinghouse brake did not act at all—he would have to throw off the brake in order to get the full effect of the reversing?—No! Directly the driver shuts off and reverses the engine it has a tendency to work the engines back, but the power of momentum prevents it. He has to shut off, stop, and then apply it again.

He could do that though the Westinghouse brake was on, but not suffiicently for his purpose?—Yes. Even with the automatic brake lightly applied to the wheels, it has been found in

practice that by reversing the engine you lock and slide the wheels. The extra power of the pistons and brake blocks on the wheels will cause the wheels to slide.

You would have expected that result to have obtained here, supposing these conditions were the same, viz., that you have the Westinghouse brake on as far as it will go in emergency and have reversed your engine?—Yes.

Milburn said: "On coming up to the home signal I applied the brake to stop." You understand by that he applied the Westinghouse brake?—Yes.

"And when I made this application the brake took no effect." You understand the brake did not act at all?—Yes.

"And I reversed the engine and gave full steam to stop at the home signal"?—Yes.

Then you think the Westinghouse brake was not acting at all?—I say the Westinghouse brake was on that train when it struck the Ballarat train.

Then if his statement is correct—and we have no right to suppose it is not—he would lock and slide his wheels, and do harm rather than good?—Yes.

ANOTHER ASPECT OF THE CASE.

Ex-driver Harcombe, a pensioner of the Victorian Railway Department, and a driver of 24 years' experience, gave evidence, first, in regard to the signals (about which, it must be remembered, Milburn made no complaint), many of which, he declared, could not be seen at a proper distance for a fast-running train. He said that outside of that court he had a grievance against the Department. He boastingly asserted that he had run up to the distant signal at 40, 45 and even 50 miles an hour, and said he relied on the brake to pull him up at the home signal.

He was asked: If you had a train running at 43½ miles an hour, and with a train pressure of 74 lbs., and you made a train reduction of 10 lbs. in the pressure, within what distance ought that train to pull up?—Inside of 1000 feet.

Do you know that a train in perfect order could only pull up in 1629 feet?—That depends upon who uses the brake.

I believe the regulation is that no driver must run through the station at more than 40 miles an hour, so we must assume Milburn had got his train down to 40 miles an hour?—Yes, if the brakes had not failed.

The tests show the brakes did not fail?—I have something to say about the tests.

The tests were severe?—Yes; no driver would think of being so severe as to put emergency on.

Suppose you put on a service application, driving at 40 miles an hour past the distant signal at danger, it shows that Milburn could have stopped in a little over 1134 feet, or a little more than half-way between the distant and the home?—Yes, but the question arises, Why did he not stop? He tried.

The test proved it?—Yes, but it did not prove it in Milburn's case.

Take another—50 miles an hour at the distant; it shows the service test in that case stopped the train inside the home?—It shows on the night of the accident there was a partial failure of the brake.

Supposing you saw the distant signal against you and the home signal against you, and the starter off, and you could see no tail lights of a train at Sunshine station, and you got the 1.5 signal, at what rate would you pass the distant?—At any rate I pleased, because I would expect to stop at the home signal.

Would you pass the home at danger?—No, certainly not.

Suppose you saw no tail light in the station, and you found the home against you, would you pass it?—No.

The mere presence of a tail light in the station would make no difference; you would not pass the home signal?—Not with the 1.5.

Assuming the same conditions, and you got the 3.1 signal, at what rate would you pass the distant signal?—I would try my brake before I came to that, but I would pass it at 50 or 55 miles an hour!

A Partial Failure of the Westinghouse.

Mr. Harcombe said he had found partial failures of the Westinghouse brake. Counsel asked him what he meant by "partial" failures, to which he replied: That is, triple valves never moved. For instance, if a triple valve does not move on a service application of the brake, the driver, who had 70 lbs. pressure when he started to apply the brake, would probably bring it down to 63 lbs. We thus have 63 lbs. from the train pipe—63 in the auxiliaries—but there is one triple valve that has not moved, and that would be 69 lbs. We thus have 5 or 6 lbs. extra feeding into the train line.

On the night in question Driver Milburn reports that he made an application of the brake, but the brake was said to fail. What was the cause of the failure?—The failure is because one triple never dropped, never moved (on E20). The excess pressure in the auxiliary of that one fed into the train line pressure and released the brakes; consequently Milburn had a partial failure of the brake or release; and when he made his second application he started from 63 lbs. pressure, and as we are told 25 lbs. pressure is the maximum to get the full force of brake power, he had only 18 lbs. left to get a good action. Consequently he had lost 7 lbs. of power through the partial release of those brakes, and that helped to let the train run farther than under ordinary conditions. The same may be said of water under the triple valve. It has been said that water has no effect. I have had a different experience. In the triple valve water remains down in the cavity, and when the driver goes to make an application of the brake, if there is water there it is inclined to follow the rush of air. As soon as the driver puts his handle on lap the rush of air is stopped, and the water is raised up, comes against the triple valve, and kicks that brake off. Water is not compressible, and air is. The air acting on the sea disturbs it, and water will always throw the brake off, because the water is disturbed by the sudden rush of air or stoppage of air. I have had experience, with vans and engines, of the brake when put on lap releasing so that you could hear it. When the plug is taken out and drained of water, the brake never released itself. That is the explanation of water in there. The other explanation of the mail van failing is that the driver made a 7 lbs. reduction and that triple valve never moved. If the piston is tight or there is dirt the valve will not drop at service application, but it would drop at 15 or 20 lbs. or at emergency. In this case, if the valve is not dropped, the extra pressure on the top feeds into the train line and reduces the brakes. The question of a tight train line might be decided. On the night of the accident he had a tight train line, and the proof of that is found in the fact that the brakes were tested on the morning of the accident by letting out 25 lbs. of air, when certain brakes leaked off. If it had not been a tight train line those brakes could not have come off. It was a serious thing having a tight train line on the night of the accident.

Have you had personal experience of a failure of the Westinghouse brake in the manner such as you have described?—Yes; 14 or 15 years ago—none of the drivers could stop with ease at Flemington Bridge. After a series of tests with an A.A. car on the train, it was found that the triple valve did not move with a 5 or 10 lbs. reduction—only with a 15 lbs. I told the examiner to clean the triple valve, and there was no more trouble. Frequently it happens that when a brake is applied it holds, and for some reason or other it comes off, and the train runs away; the explanation is that the triple valves drop.

You have experienced other failures of the brake?—Yes; on the North-Eastern line, some years ago, I found that there were triple valves that did not drop, and the only way I could use the brake was to continuously let the air out. But if you put your handle on lap, the excess air from the top comes off and releases the brakes.

How many failures do you know of from your own personal knowledge?—I have had 20 or 30.

Did you report them?—I merely reported to the train examiner that there were certain triple valves not doing their work, and they were to be cleaned when opportunity offered.

The Coroner brought Mr. Harcombe's evidence to a conclusion by asking him a few direct questions in regard to where Milburn applied the brake on the night of the collision.

Where do you think Driver Milburn put on the brake?—At the distant signal or thereabouts.

Did the brake remain on?—My opinion is that it came off.

When were the brakes put on again?—Immediately afterwards.

Immediately after passing the distant signal?—When he found the train did not answer.

Where do you think the emergency application of the brakes took place?—300 or 400 feet before he got to the home signal.

You put it higher than 250 feet?—It would be before that he would make it. He would not let it go that close. He would make a service, and also make a continuous service.

If he found it had failed, would he keep on applying the brake?—Yes.

Bagley on Harcombe's Sticky Triple Valve Theory.

Mr. Bagley was asked what he thought of Mr. Harcombe's suggestion that sticky triple valves were responsible for the alleged failure of the brakes on the night of the collision. He (Mr. Bagley) said there was nothing in it; he had carefully examined every triple valve except that of the leading engine, and they were all in good order—he found no indication of any of them being sticky.

With a sticky valve, although the brake might not apply with a small reduction, it would with a greater reduction?—Certainly. An emergency reduction would be sure to apply it.

Your own opinion is that it would not affect them?—No.

Well, as you found the triple valves in good order when you examined them, could they have been sticky on the night of the accident?—No, certainly not; if anything, they would deteriorate. A sticky triple valve occasionally gives trouble by not applying in a service reduction, but there was nothing of that kind in the Bendigo train. The triple valves were in good order, and there was no appearance of any gummy substance to hold them fast when a reduction was made.

One theory Mr. Harcombe suggested I did not quite follow—it was in regard to the water. What was it?—I have heard a lot about the water (was Mr. Bagley's reply), but the Westinghouse brake is not a hydraulic brake, and the water does not get along in the valve. I examined every brake, and there wasn't one drop of water in any of the auxiliary reservoirs. A few of the drip cups were about half full, but most of them were free of water.

The drip cup is where the water ought to be?—Yes.

Mr. Harcombe suggested that water might be found in the chamber at the triple valve?—There is nothing at all in the theory.

I suppose a service reduction is anything over 4 lbs.?—Anything from 5 to 25 lbs.

Any further reduction over 25 lbs. is waste of air?—That is right. 25 lbs. could be scheduled as an emergency application.

I suppose in ordinary braking the driver very often does use, for the purpose of checking or pulling up the train, a 6 or 7 lb. reduction?—That is so.

Is it more correct to use a 6 or 7 lb. than a 15 lb. reduction?—It just depends upon the brake, the train, the speed, and other conditions.

Was any of the standing tests of the brakes made with a 6 or 7 lb. reduction?—No, it was a 10 to 15 lb. reduction.

It is quite possible, then, even at the standing test, that the brakes might have applied on a 10 to 15 lb. reduction and not on a 6 or 7 lb.?—Yes, it is quite possible for one brake not to apply.

The Expert Trapped.

Mr. Corr prepared a trap for Mr. Bagley, into which he unwittingly fell. The following will show the wily ways of lawyers to secure the downfall of the unwary:—

Assuming that there were three sticky triple valves on that train and you had 70 lbs. pressure of air, and then you made a 7 lbs. reduction, what would be the pressure in the pipe?—63 lbs.; 7 lbs. less; it would pass from the auxiliary reservoir into the brake cylinder.

Supposing one of the triple valves stuck, what would be the pressure in the auxiliary reservoir under that vehicle?—There would be no air in there. The air would pass from the auxiliary reservoir back into the train pipe; 7 lbs. of air would gradually work back from the auxiliary into the train pipe, so as to equalise it. There would not be 70 lbs. in the reservoir.

If, under these circumstances, there were three of these not acting in that manner, that would mean 21 lbs. of air—three times 7?—Yes; it would be working back into the train pipe, but for such a short period before the further reduction would take place, it would not have sufficient time to do anything.

Mr. Outhwaite (appearing on behalf of the Westinghouse Company) gave Mr. Bagley the opportunity to correct himself by saying: In one answer that you gave Mr. Corr, he suggested that three of these valves were not contributing air to the train pipe through being stuck. You got 21 lbs extra pressure in the train pipe. Mr. Bagley responded: That is not correct. It would only be 7 lbs.

The Scale Theory Demolished.

From all you have seen and heard, can you assign any cause of the disaster from the position of the brakes?—No. When I heard Milburn's fireman express himself with refer-

ence to the air passing out like a cork out of a bottle, it appeared as though there was a chock there and it was blown out.

But the brakes should have acted at once when that came out?—Yes.

Supposing Milburn has told the truth, and that he made a service application 200 yards from the distant signal, the brakes went on alright and held well, and there was evidently no scale affecting the rotary valve then. He made another application some little distance inside the distant—a further reduction without releasing his brake—and the brakes still jammed and held well, reducing the speed. Suddenly—200 yards from the home—the brakes appeared to jump off: could that possibly be due to scale blocking the rotary valve?—No.

The only reason why the brake should suddenly jump off would be that somehow air was forced into the train pipe?—The only possibility would be air passing from the main reservoir by means of the driver's brake operated on the second engine. That would cause the train to jump forward.

The only way, 200 yards before you get to the home, that the brakes could be released would be that in some way or other air was forced into the train pipe?—Yes.

Whereas the blocking of the rotary valve by a scale means that air is prevented from being let out into the atmosphere?—Yes.

And therefore it is impossible that any blockage in the rotary valve could account for the brakes jumping off?—There is no chance of them jumping off.

Milburn says that the brakes jumped off: you say it is impossible to attribute that to scale?—It was not due to scale.

Another Possible Theory.

Is it possible that in some way or another the handle of his brake was pushed over into the running or release position, and that charged the train pipe with air and thus released the brakes?—It is easy for a driver to do that. He may not have noticed it, because the handle is very close to the reversing gear, and when a driver leans over to look out of the window he might easily touch it with his arm or elbow, and thus bring the handle slightly forward towards the running position and allow the air from the main reservoir to enter the train pipe.

But does not Milburn deny that?—Well, then, the only other possibility of charging the train pipe with air and re-

leasing the brakes at that point would be through the isolating cock being open and the driver of the second engine having his handle in the release position.

You have no doubt that this block in the rotary valve cannot account for the brakes suddenly coming off as Milburn described?—No; if the handle was in the emergency position, and should anything keep it there, it would only block the remaining air from passing out. It would not take the brakes off.

Of course, any pressure in the train pipe through a leakage back from the main reservoir, would release the brakes all round, would it not?—Yes; a leaky rotary valve would cause the brakes to release when once a driver made a reduction and he placed his handle at neutral. I thought such might have been the case on Milburn's engine, but on examination the rotary valve was found to be perfectly tight.

Suppose Milburn had applied 15 lbs. of air, and by some means the brakes had come off, and he then made an emergency application, how would the power of that emergency application compare with the power of an emergency made with a pressure of 70 lbs. in the train pipe?—It would weaken his auxiliary reservoir pressure so much that when he came to make the emergency application he would have very little power to stop his train.

The Duty of the Driver of the Second Engine.

You say that if the second driver sees the driver of the first engine is likely to pass the home signal he ought to apply his brake?—Yes. It must be left to the judgment of the driver of the second engine when the train has got so near to the home signal as to be likely to pass it.

Suppose the second engine driver finds he is getting dangerously near to the home signal, and the driver of the first engine has not applied the brakes, what should he do?—He should apply the brakes in that case, but the driver of the first engine would give a distress whistle when he finds his brakes not acting. In a case like that the second driver should do everything possible to stop the train.

With the second driver doing his duty, if anything was wrong with the first driver's brake, should not the train be pulled up?—Yes; but it would have been past the home signal; it would not have reached the point of impact.

Speaking of this train with the brakes it had on the night of the disaster, do you thing that train ought to have been pulled up before it got into danger?—Yes; it should have been pulled up before it reached the home signal if nothing unforeseen happened. If anything went wrong as the driver approached that signal, and something blocked the passage of the air, and the train was likely to over-shoot the signal, the second driver should have applied his brake and done everything possible (as he said he did) to pull up the train.

But even if he had passed the home, should not the second driver have been able to pull up before he got to the point of collision?—It depends upon what power he had to use.

With two men on the train, both with a perfect braking power, ample to control the train, and with each of them able to control it, what puzzles me is, supposing anything goes wrong with the first engine, why cannot the second engine driver be able to stop the train?—Decidedly he could stop it, but in cases of emergency of that kind it is a matter of seconds before anything can be done by the second driver, and all the time the train is rushing on to the danger ahead.

Assuming that the second driver knew the driver of the first engine had made an application of the brake about the distant signal, as a point of practice he would not interfere with the brake until the first driver came somewhere near the home signal?—That is what I say. Knowing the danger of interfering at all, he would wait until it was absolutely necessary before doing anything. Drivers have confidence in one another in applying the brake. Milburn was an experienced man, and was expert in handling the brake. If I were on the second engine I would not think of applying it unless I saw he was likely to pass the signal. It is very risky for the second driver to interfere with the brakes at all.

If through any chance the driver of the first engine had no air, you could do nothing on the second engine?—Certainly not. If there was no air the brakes would be on.

A Slight Diversion.

A much-debated question was that of the speed at which a driver should pass a distant signal at danger. Even among the experienced drivers there seemed to be little unanimity. The maximum speed was placed at from 20 to 25 miles an hour by Mr. Bagley, but he found very few drivers willing to support him. The following dialogue between Counsel and Mr.

Bagley throws an interesting sidelight on the much-discussed question:—

Do you consider Mr. Milburn an experienced driver?—Yes.

Assuming he was in charge of the first engine on the Bendigo train, and you were in charge of the second. Suppose you come down to the distant signal at danger at a speed of 50 miles an hour, and there was no sign of the brake being applied, as the driver of the second engine, what would you have done?—Only a fool would attempt to pass the distant signal at that speed.

What would you do if it did happen?—If there was no sign of the first driver applying the brake, I would certainly apply it myself.

You have had long experience of these drivers on the railways—it is suggested that it is common practice for them to come past distant signals at danger at fairly high rates of speed, say 40 miles an hour; is that true?—Not in my experience; I have always been careful in approaching distant signals myself, and the drivers that I have fired for were the same. Any man approaching the distant signal at 40 miles an hour is running a great risk. After I gave my evidence last week, I went to the locomotive running shed, and I had a number of drivers telling me they ran past the distant at danger at 40 miles an hour. I said, "If the home signal is at danger, what gain is it?" I have never seen it in my experience, but it is a common thing for men to inform me of that since I have given my evidence. I say a man is a fool to attempt such a thing.

Did good drivers tell you that?—I asked them, "Are you willing to go into the box and swear you passed the signal at 40 miles an hour?" They are afraid to do that. I have never seen it done, but other drivers say it is necessary to do it in order to keep on time. If the home signal is also at danger, however, there is nothing to be gained by passing the distant at 40 miles an hour, and there may be a great deal to lose. I do not believe in the practice, schedule or no schedule.

These men said they would not swear it?—I said they were at liberty to come into the box if they disagreed with what I said, and swear that they passed signals at danger at 40 miles an hour.

If they gave that evidence, would they not be exposed to some danger?—I should say they would!

At a later stage the question was again brought up in this manner:—

Several railway officers of high standing have said that a driver is entitled to pass the distant signal at danger at from 25 to 30 miles an hour; do you agree with that?—I should say from 20 to 25.

Is there a speed indicator on the engine?—No.

Well, how is a man to judge the speed?—It is wonderful how a man with experience can judge speed.

If he is late, and wants to make up time, having been given "line clear," would he not be entitled to pass the distant at, say, from 40 to 50 miles an hour?—Decidedly not. There is no gain if the home signal is at danger for him to pass the distant at a high rate. If the home signal was off and the distant signal happened to be against him, it is different.

Supposing he gets the "line clear," and supposing he is thoroughly in control of his train, as he has reason to believe, you say he is not entitled to come past that distant signal at 50 miles an hour?—I say decidedly, No. No man should pass it at that speed with the home against him.

You know from the tests that you can pass the distant signal at 50 miles an hour, and yet pull up before you come to the home signal?—Yes, it can be done, but you never know when the unexpected will occur, and it is right to have a margin to work on.

You think that a driver should not rely on his brakes under the circumstances which I have described so as to pass a distant signal at the rate of 50 miles an hour?—The Westinghouse brake is very reliable, and you certainly can stop in a very short distance, but a driver cannot tell what might unexpectedly happen.

None of us can tell what may happen within the next few minutes. In this case you have been told that you are perfectly safe 400 yards from the home signal. You have been given line clear. That is the assumption in this case, and yet these signals are against you although you have been given that assumption. What is the effect of having been given that "line clear"?—It is no guarantee that the home signals would be off at the next station.

Certainly not, and they are not off?—Well, in that case a driver should have his train under control so as to be able to stop at those signals.

But it is under control?—If he had it under control, he should then proceed up to the home signal.

We had tests at Sunshine on the 30th April, and one day a train came down past the distant signal at 49½ miles per hour. The brake, with a 15 lbs. reduction, was applied at the distant signal, and it stopped before reaching the home signal, so the train was practically under control passing the distant signal at 50 miles an hour. Would you then say that it was a wrong thing for a driver to pass a distant at 50 miles an hour?—I say most decidedly, Yes. A driver is running too great a risk in approaching a distant at that rate—in case of brake failure—if the home is also at danger.

Is the Westinghouse Brake Reliable?

You believe in the Westinghouse brake?—Yes.

Every one of the drivers you have spoken to is a believer in the efficiency of the Westinghouse brake?—It is a wonderful brake, and the more experienced a man becomes the more reliance he places upon the brake. It is a great power placed in his hands with which to control his train.

I suppose a driver is expected to always run to time?—Yes. The Department is anxious for them to keep to their schedule if possible, and the public are, too. Drivers are pleased when they arrive at the terminus on time, and they strain a point to do that.

When a driver is anxious to make up time, and having a brake that he thoroughly believes in, would not that entitle him to pass the distant signal at a fair rate?—It does not entitle any man to pass a distant signal at a high speed.

Take the Bendigo line. You have said that drivers have to flog their engines. Do you think a driver can run to time if he went past this distant at under 50 miles?—He would gain no time, because the home is also at danger, and in any case he will probably have to pull up.

Cannot he reasonably expect that these signals would be pulled off?—A man runs grave risks in expecting signals to be pulled off.

A driver knows that this station has one man on it, and if he sees the green light burning brightly, showing that the starter is on, would he not be justified in such a case in approaching the home at a high rate of speed?—No, he would not be justified. All the same, it would lead him to expect the home signal to be pulled off.

Where did Milburn Apply the Brake?

What is your opinion as to when the emergency application was first applied on the night of the disaster, taking the tests we have made as a guide? At what point did Milburn apply his emergency pressure?—According to the tests we made, they seemed to strike up to it very close.

We want your opinion on where he applied the brake in emergency.—I should think that if Milburn applied the brake after passing the distant signal, he would reduce the pressure first by a service reduction, and finding that the brakes were not hard enough on to pull him up at the home, he would place the handle right over, so that he could stop there.

Yes; but he didn't stop there. He struck another train. The jury want to know when, in your opinion, he applied that emergency, if he did apply it, or when he ought to have applied it.—That is a very difficult matter for me to say.

Of course it is, but we want your opinion from the information you have gathered during the course of the inquiry?—Well, Mr. Milburn has had a good practical experience, and is a man of good judgment; no doubt he would apply the brake in an emergency so as to stop at the home. I am at a loss to know how he came to pass the home signal.

You told us the train was rigid when it struck the other train. He must have applied the brake at some part?—Yes.

After seeing all the tests and trial runs, where do you think he applied it?—It would appear to be about 250 feet the other side of the home signal.

FROM THE LAWYERS' POINT OF VIEW.

As soon as the evidence was completed, the Counsel entered on the heavy task of presenting to the jury the points which appeared to be favourable to the particular interests they represented. The addresses were all earnest and pointed, and showed that the evidence had been most carefully sifted, and the outstanding features were presented in a manner that was possible only to the well-trained legal mind.

MR. OUTHWAITE

represented the Westinghouse Company, and delivered the first address to the Jury. He said that the issue was one of some moment to the Company, because it had been alleged that the cause of the grave disaster at Sunshine was due to the failure of the brakes to act. The Company had been concerned over whether the men in charge of the Bendigo train were going to attack the principle of the brake—whether they would say that the accident was caused through some defect (not due to any deficiency in its upkeep) which would tend to make the brake unreliable at any critical period such as that which had been faced at Sunshine prior to the collision.

Of course, for neglect of upkeep of the brake the Westinghouse Company could in no way be held responsible, because when the brake was handed over to the Railway Commissioners they exercised no further supervision over it. But, for all that, he would not have the Jury believe that it was liable to fail or get out of order, or require any more than ordinary attention. They had seen it for themselves, and would know that, when understood, the principle of operation was a comparatively simple one. The parts were not very complicated nor of delicate construction, and each vehicle having its own complete set of apparatus for operating the brake independently of every other vehicle, so long as the train pipe is open right through the train, it would be an extraordinary and most improbable thing that anything could happen to affect every brake (each working independently of the other) at the same moment.

The Public's Confidence in the Brake.

It would not be exaggeration (Mr. Outhwaite told the Jury) to say that millions of people staked their personal safety on this particular brake, and no facts had been given to show that confidence had once been misplaced. Not one witness had brought forth a morsel of evidence to show that the brake was not absolutely reliable if kept in ordinary repair. Many witnesses had been asked whether in their experience they had known of a total failure of the brake which could not readily be attributed to some local cause, and every one had answered "No." Even those who had advanced theories as to what they called partial failure explained away their own position

when they said that these failures could be easily forestalled when the brakes were examined.

In the present case no evidence (Mr. Outhwaite thought) had been given to show that the brake was not operating properly at the time. Those most deeply concerned admitted that it had acted admirably all the day prior to the collision, and the exhaustive tests conducted showed that it had worked splendidly since then, and had proved itself quite capable of efficiently controlling and pulling up the Bendigo train. That being so, Mr. Outhwaite respectfully submitted to the Jury the conviction that, whatever conclusion their deliberations led them to, or whatever their finding, they would be bound to say that there was absolutely nothing in the suggestion that the Westinghouse brake, as a brake, apart from any question of upkeep, failed in a crisis.

MR. STARKE

represented the Railway Commissioners, and strove hard to impress the Jury that his clients had done everything within reason to provide an efficient and ample staff at Sunshine, and to make every provision against the possibility of such an awful disaster as occurred on that Easter Monday evening, except as the result of the grossest negligence on the part of their responsible servants.

Turning to the evidence relative to the brake, Mr. Starke said that the Westinghouse brake had commended itself to almost every railway company in the civilised world. And that installed on the Bendigo train on the night of the disaster was a type of brake perfectly adapted to controlling and pulling up the train. The tests made were a proof of that. Then the brakes are frequently and thoroughly overhauled. Every time carriages are put on a train the train examiners have to test and see that the brakes apply and release evenly. They must also test the brakes when they are applied after the train is coupled up, and also when a train comes into an examining station, and if there is anything wrong, the examiners are bound to report.

Mr. Starke admitted that the railways are bound to keep their trains in a safe working condition. He said:—You may have the best trains in the world, and the most powerfully braked trains in the world, but if they are not in a safe condition they are useless to anybody. We are not bound to

have our trains in some fanciful condition, but within the bounds of reasonable safety; and any person whose duty it is to attend to any of the appliances, and see that they are kept within that condition, and neglects them, and they are the direct cause of death, he is responsible; and that is the only way in which the safety of the public can be maintained. That liability is existent right throughout the people who have the management and control of trains. In this case, what was the position? Take the locomotives. I would point out that they were locomotives in a reasonably safe braked condition on the night of the accident. No. 564A was the first one, and Milburn is apparently responsible for that condition. He says, practically: "My engine was perfectly safe; I looked at her before I went out; I looked at her at Bendigo." So that the engine was satisfactory for all braking purposes. Then take the second engine, No. 544. Dolman is the man mainly responsible for that. On the night of the accident was not that engine braked up to practically its full limit? Since the accident, you will remember there has been a piston leather found to be dry, and it is said it leaked; but take the night of the accident—do you believe the leather leaked then? If you do, Dolman knew that perfectly well, and he should have prevented it. He was not dissatisfied with the condition. He said: "The engine was perfectly safe."

Was the Bendigo Train Properly Examined?

Mr. Starke said the duty of examining the carriages fell upon the train examiners. The Department had appointed a number of people as examiners of brakes, and curiously enough the Bendigo train was examined by no less than six people on the day of the disaster. It was easy enough to say the piston travels are too long and are all wrong. Supposing they are. "I think that piston travel has loomed into a far more important position in this case than there is any need for, so far as train examining is concerned, and, as Mr. Burgess said, the way they often examine the brakes is, they look at the rods, and they can see within a couple of inches pretty well whether it is within reasonable limit or not. But what they really do is to go up to the wheel as they walk along, and when the brake grips they put their foot on it to see if it is loose or if there is any reason why they should take it up a turn. And there seems to be no reasonable doubt that this is the way that every practical man would try and test it. Prac-

tical men and mechanics who are used to judging distances have only got to touch the shoulder of the cylinder to tell whether the piston travel is excessive or not. It seems to me that the piston travel has assumed dimensions out of all proportion in this case, and the real test is—Do you believe that these six men examined that train on the day of the disaster? It may be that the train examiners allowed some of those piston rods to travel a little over the limit. But as I shall show you hereafter, it is a matter of comparative unimportance in this train, when we are looking at the substantial facts. The thing I want you to consider is, Do you think these six men who examined the train—do you think each one of them was so grossly negligent that he did not pay any attention whatever to the train, and let it go without any regard whatever? Do you believe it? All they have got to do is to go and turn up a little screw at the back, to take the rod back a bit, and put a pin through the hole. There was no difficulty in pulling the blocks back. I ask you to say that you accept that as satisfactory and as substantially establishing that the train on the night of the accident was in a reasonable working condition, and a condition with which practical men, and men used to working particular trains, were properly and completely satisfied.

The Men's Own Testimony.

"I am coming to the next important position which I am convinced will satisfy you that this train was in a perfectly safe condition on the night of the accident, and that is the unanimous testimony of the Bendigo train crew—Milburn, Dolman, Tomlinson, Deveney, and Guard Darcy. These were the men whose lives depended upon the safety of that train, their own lives as well as anybody else's. These were the men who had to take the responsibility of bringing their passengers safe and risk their service and also their liberty if they did not. These men tell you that if that train had acted at the time of the collision as she acted at every other stage of the journey from Melbourne to Bendigo and Bendigo to Melbourne, she was perfectly safe and satisfactory. They admit that they were perfectly safe, and that the train pulled them up exactly where they wanted to and when they wanted to. Is there any more convincing testimony? Then take the tests that were run with the train on the 28th April and those run on the 27th May. This fact is perfectly plain—that if these

drivers came up to the distant signal even at 60 miles an hour the train could have been pulled up before they got to the home signal. So far as it went on the 28th April, the test conclusively proves that. All the other tests show that, even on a service application, if they ran on to the home signal at 20 miles an hour, the train could be pulled up on a reduction of about 10 lbs.

The Commissioners' Liability.

"There is no reason I think why anyone should require a train braked up to some ideal standard for that purpose. If you do that, the men who drive get too confident, and instead of saying we are going up to this signal at the rate the Department expects us; they say it doesn't matter if we run it over a bit—we have got such a good brake, we can get right in nearer and stop in time; so that the more brake power you get the more confidence you put in the driver, and the more possibility there is of danger. They will run up to the last point and put their brakes on, and suddenly some day a mistake will be made when they are too close in to stop. The Railway Department have had the distant and home signals placed there, and if you get the train within those two signals, and the whole brake breaks down, they have got hand brakes and reversing gear with which they can stop the train. It is difficult for me to say how it can be seriously contended that the train was not amply and sufficiently braked on the night of the accident. Once you take to over-running signals and disregarding rules there is no safety. The safety is in observing signals and having ample power, if the signals are observed, to pull the train up within proper distance with safety to the passengers.

Mr. Starke and the Witnesses.

"The next matter of importance are the opinions of the experts in connection with this train. I shall take Mr. Bagley first. I think it does no little credit to the service of the Victorian Railways that a man who had been in their service, and who went out of it owing to the strike, should be willing to come here and hold the scales with fairness between his fellow-drivers and the Department to which he formerly belonged. Mr. Bagley, I venture to think, when he told you that the train was, in his opinion, perfectly safe for working conditions even as he found it on that night in May, made a

statement that must have impressed you. When he looked at the tests on the earlier conditions, he said, 'No, I won't say anything about it—they surprise me after what I saw of the piston travels; but I do not like to say the brake was in perfect condition. I would sooner handle her myself; I am a practical driver.' Then you gave him an opportunity of handling the train for you, and he says the train is in perfectly safe working condition. Can you doubt it? Then when he took her at the end of May and ran her at the trials, can you believe there was anything wrong with the train for practical purposes?

The next witness is Professor Kernot, and as an engineer I suppose he is one of the most distinguished we have in Victoria. His opinion is this. He says that for practical working purposes—safe working purposes—the train was sufficiently braked. He said you can have her more powerfully braked. He said you can have her braked up to a retardation percentage of 10 per cent.—those are English competitive tests. He said, I would cut off first of all 25 per cent., and he then made it 20 per cent., for working conditions. Well, if you cut off one-fifth of the 10 per cent. retardation, you get down the retardation percentage which Professor Kernot would think ample for working purposes—that would be 8 per cent. —and he considers that the tests showed that the train was amply controlled, but she could have been better.

"The next witness is Mr. Selley. He is certainly interested in the Westinghouse brake. It is certainly his business to make the best effort to show that his claim that it is THE brake is justified, but there are matters by which you can check Mr. Selley. There is, first of all, the book which the Westinghouse Company sends to the world as to the conditions which it recommends as the safe working conditions for their brake, and in addition to that it would not hurt Selley a little bit to say, 'You have not used our brake in a proper manner: you have not kept it up to proper condition. The brake is alright, but the Victorian Railway Department has not looked after it as it should have.' That did not hurt Selley, but it hurt the Railway Department. Selley says: 'We have published a book, in which we say 62.8 of the loaded weight of a train is our ideal recommendation to the world for braking purposes. Take the whole weight of the train, and take 62.8 of this weight as the brake force—that is our idea of what you should do." If you will look at the book, it is palpable that

when you get 62.89 you are at the top of the tree, so far as the Westinghouse Company is concerned, and there is not a company in the world except the Victorian Railway Department that uses it. He says: 'I think 58 per cent. is about the best they put on." Fifty per cent. of the loaded weight of the train is ample, and even that leaves a safe margin. There is Mr. Selley's 58 per cent., and I have taken the standard set in the book of the Westinghouse Company, and we say, compared with that standard, the Victorian train was sufficiently braked.

The Theories and the Lawyer.

"We have felt that it was necessary for the Railway Department to put forth their best efforts to convince you that their maintenance was perfectly reasonable, and that their methods were perfectly good. That brings me to a branch of the case—to call your attention to a theory that has been presented. It is said by the enginemen that they cannot account for this disaster in any way, and the theory seems to be that there must have been some unavoidable accident which nobody can put their fingers on and nobody can explain. If that be the case, it is a very dangerous condition of affairs for the Westinghouse brake to represent. It has not been the history of that brake in any other country in the world or in this country up to this date. Several theories have been dealt with—that of the cinders, wheat in the train pipe, and scale in the rotary valve—but in the long run each one has been overthrown. Then you got the theory of the unravelling of the hose pipe, which theory also is exploded. The only other theory that has been put forward is that Milburn thought the isolating cock of the second engine had something to do with it. At present there is no evidence, I think, that the isolating cock was open. You may think, gentlemen, that the condition suggested it, but on actual testimony there is no evidence of it. The matter, I think it only right to say, that I felt the most difficulty about, and the one that I have most anxiously considered with the responsible officers of the Department, has been absolutely shattered by the crew of the train themselves. I think if there had been some slight reduction of the train pressure at the time of coming up to the distant signal, and that getting back into the pipes the pressure that had been lost running past the distant signal, and then suddenly applying your brake again without having re-

charged the pipes, I think it might have been possible for some slighter power of the brakes to be present—that instead of 75 lbs. it might have taken away 10 or 15 lbs., and you would get only 60 lbs., which would reduce your pressure very considerably. That is a theory, but there is no evidence to support it. The evidence is absolutely convincing that such a thing never happened. Milburn himself says so, and his fireman agrees with him. He says: 'I put the brake on, and never took it off.' There could be no reduction in the pressure by releasing the brake and then in charging the pipe again and putting them on again. If it were so, it would have been a most extraordinary act of neglect for any driver to have done, and I think an experienced driver like Milburn would be the last to do it.

"It is your duty, gentlemen, to say if Milburn's account of the accident is true—that there was undoubtedly some unavoidable and unexplainable accident. If the other evidence be true, there is an account which would convince you as to the cause of the accident, or which might convince you, and you should make it perfectly plain. That it seems to me is a matter not for me to suggest to you, and I propose, therefore, to leave it. In arriving at a verdict, it should be your own independent opinion, put down in plain language, and not answers to questions in language which lawyers may quibble over, as happens very frequently. I would ask you to avoid that if it be possible, and it will be a relief not only to yourself, but the whole public of the State, if you can state in short, concise and definite language, what you believe to be the cause of the accident on that night, and who are the persons that you consider to be culpably responsible for it."

MR. CHOMLEY

appeared for Guard Darcy and Stationmaster Kendall, but as this book is concerned only with the phase of the inquiry relative to the brake, we summarise only that portion of Mr. Chomley's able address which has special reference to the brake.

In dealing with Guard Darcy's case (said Mr. Chomley) I understand that an intimation was given during the hearing of the case that you do not intend to attach any criminal responsibility to Darcy, but I want to draw your attention to a number of facts in connection with his relation to the train

and the accident, which I think are important, because Darcy is a man who has been suspended.

The Guard in Charge of the Train.

The guard of the train is nominally in charge of the train. It is practically in his hands, and he can give orders to the engine driver as to the running, but his duties on the track are dealt with in two regulations—one, when starting from or approaching stations or fixed signals, he is to keep a good look-out, and if he has reason to apprehend danger, he must use his best endeavours to give notice to the engine driver. The other rule which affects him is a rule in the Westinghouse Brake Working Rules—that he must not use the continuous brake except in cases of emergency, but that if he sees any risk or anything likely to cause danger to the train, he must apply it. There is no doubt that the guard did keep a good look-out, for four or five witnesses, all passengers in the van, men who didn't know Darcy before, voluntarily came forward to say that they had observed that he was taking particular notice. Then Darcy tells you that as he was keeping watch from the canopy window, his view being much obstructed by smoke, he did get a glimpse of both signals—the home and the distant—at Sunshine, a distance of somewhere near a mile away. He kept his look-out from the window, and lost sight altogether of the home signal, owing to smoke, but while running down to the distant he got an occasional patchy view of the distant, which was at danger. When he was close to the distant—in fact, when the engine was past it—he felt the application of the brakes. That was sufficient indication, I think you will agree, to the guard that the men at the other end of the train—there were four of them in this case—that they were looking at the signals, and could, if necessary, put on the brakes. That application of the brakes which he felt at the distant signal told him those men in front had seen it. He knew they had seen it, and up to that point everything was right. He still could not see the home signal. He says he got one glimpse just before reaching the distant signal, and that was the last until he was passing it. On the short run from the distant to the home signal he found his view was blotted out altogether. He got down, and went to the left-hand window, on which side the semaphore posts were placed, and tried to see. Everything was apparently in order, and he thought the train was going to pull up at the home

signal unless the signal went off. He could not see anything, and the train ran on, and he says that at a point, which he could not fix at the time, but did afterwards, he felt an application of the brakes. It went on, and in his opinion it did not strike him as an emergency application. It was like a service application. There was nothing to suggest to him that there was any danger occurring or going to occur. The train was running between two semaphores, and there was a brake application to stop at the home, and he felt it go on.

What Could the Guard Have Done?

Supposing at that point (continued Mr. Chomley) he had known that the engine had run past that signal when it was at danger, and supposing that the Ballarat train was at the platform, there was nothing in fact that he could have done. The evidence is conclusive that at the time Darcy's van passed the home signal the brakes were on. He could not put them on any harder, and there was nothing else left for him to do. Before, and on the run from Sydenham to Sunshine, Darcy was doing his duty so far as he could. He never saw any occasion to put on the brakes, and therefore refrained from doing so. You must not forget that it is a very serious and dangerous practice for an emergency application to be made by the guard from his end of the train. Mr. Bagley's evidence tells us that if the brake were put on at the guard's van, and the engine should by chance be steaming ahead, there is a very great risk of breaking couplings and pulling out drawbars, and severing the train, so that it is not a thing a guard should do simply because he does not know whether the train is running past the signal or not, but only when there is some really serious cause for him to interfere.

You will remember his evidence was that the application he felt as he was approaching the home signal was very like an ordinary application. Well, I think that evidence is in accordance with that of the rest of the train crew to this extent—that a considerable amount of air had been used, and there is little doubt that the emergency application at the post put on by the enginemen did not amount to what an ordinary service application might be. Darcy was standing in the centre of a loaded van, not over the bogies, when the emergency application was made, but this would probably only feel like the ordinary application, and naturally it would not have suggested danger. If he had known that it was an emer-

gency application, it would still have been useless for him to put one on. All that was indicated to him was that the train was pulling up at the home until he found that it was not pulling up; then there was nothing to indicate that he had not rightly passed the home. For these reasons I ask you to find that this man did his duty from start to finish, and that there is no blame or responsibility attached to him in any way in connection with this accident.

MR. CORR

next essayed to convince the jury that his clients (Milburn and Dolman) were not guilty of criminal negligence in connection with the appalling tragedy. He had a difficult task to perform, but set to work, in an earnest and splendidly delivered address, to influence the minds of the Jury in the direction of giving a favourable verdict when the question of their culpability came to be considered.

It may here be remarked (as an interesting aside) that Milburn and Dolman were very fortunate to belong to an Association which was willing to provide (at no expense to either driver) such an able man as Mr. Corr to defend them. That he did his best to make out a favourable case for the two men with the shadow hanging over them, the following summary of his clever speech will abundantly testify:—

Why make Milburn the Scapegoat?

He said that during the whole of the enquiry one man had been mentioned. It had been Milburn, Milburn, Milburn every time. "I cannot help but feel rather indignant that this is so when I consider the number and combination of causes that possibly may have led to this accident. I object to the whole blame being thrown on Milburn. When you consider the question of reckless negligence, and whether his conduct was grossly or recklessly negligent, I do not honestly think that this man was guilty of manslaughter, because any man would have relied upon the protection of the home signal. On the other hand, if Milburn's conduct was reckless, you have to consider the whole question, and not wipe all the others out, and only consider one man. The remark was made by Mr. Chomley that it is not contemplated that a man will run past the home signal. Why do they put 400 yards past

the home signal in the regulations? Who contemplated that? The railway people themselves contemplated it, and the contemplation is proved by accident after accident.

Mr. Chomley: I said it did not occur except in a case of brake failure.

WHO WAS GUILTY OF NEGLIGENCE?

Mr. Corr: It does occur in such cases where through some mistake the train gets past the home signal, and the authorities recognise that that is a common fact, and they put that 400 yards provision in. I have, however, every confidence in this, that the Jury will be bound down purely and simply, whether they deal with Kendall, or with Milburn or with Dolman or any other person—not to deal with them only: Were they guilty of negligence? Were they guilty of reckless negligence? Were they guilty of gross negligence? That is not the question. If Kendall, if Milburn, or anybody else in the train was guilty, it must be asked, Were the persons in authority guilty? Were the train examiners guilty of negligence? I am going to make the most of this point—Were the persons in authority who placed that station at an important junction in such a position guilty of reckless carelessness. It is a junction that one train constantly ran through at 40 miles an hour, and the question is, Were the responsible authorities guilty of carelessness? I do not know who they are: it is not my duty to find out: but if they contributed they are all as guilty of manslaughter as anyone here. I will put that most particularly when I come to deal with the position of that station and the position of the Ballarat train as it stood across those lines, giving this man coming down behind not the reasonable protection in the shape of three full van lights that he should have had. The position of the station is an important item to consider, and also the length of the trains, and the question whether these things contributed to the accident.

The Ballarat train was allowed to come in to that station—a short platform station—and this long train was put in such a position that the men behind could not see. I say that directly contributed to the accident. Does not it mean that it has caused a breach of the right of the driver to see in front of him three red lights--and it is just as bad as causing a signal to be put there when it ought not to be there. I do not mince my words. I believe that the people that caused

that train to be run as a double-headed train—that caused that Ballarat train to be 24 minutes' late—that caused that station to be such a size that in that particular place the lights of that van showed up the Ballarat line instead of up the other line—I will qualify my words, and say that one light did show up the down line—it never showed on the line we travelled on—were guilty of negligence.

An Engine Driver's Hard Life.

In considering whether Milburn or Dolman was negligent, I want you to particularly consider the nature and responsibility of an engine driver's life. He has great responsibility, and that makes him careful. He has arduous duties at all times, and in all sorts of weather. He is bound to turn up for his duty; he is risking his life, as it were, for the benefit of the public, and time after time men have died in the execution of their duty, owing to some unexplainable cause. We have had an instance just recently, and a board of enquiry decided that a driver and fireman who were hurled to death over an embankment at Moranding would have to take the blame to themselves, as they could not find out the cause of the accident. These men are one of the admirable sets of men in the community. You have seen the drivers and firemen in the box, and you have seen what an admirable class of men they are. As they go on, so arduous is their life, and so great is the strain, that very few of them can keep on the footplate until advanced years, and upon these men is the responsibility of hundreds of lives. We find that the strain upon them becomes so great that they are compelled to retire. Then they are worried over making up time, and bothered with preparing reports if they do lose time; and, in addition, you must remember that they have a big mechanical contrivance to deal with, and they must be expert in the handling of that contrivance; in a moment something may go wrong and they may be hurled into eternity. Further than this, they have to be men of strong precision, and to be able to make up their mind to a course of action in seconds. If an accident happens, these men are brought to book as the persons primarily responsible, and all the time they are being forced to decide in a moment questions which involve the lives of many. All the time they appear to be suffering numerous pinpricks, and the position is forced upon them that they have to do their duty under tremendous disadvantages; so that, in

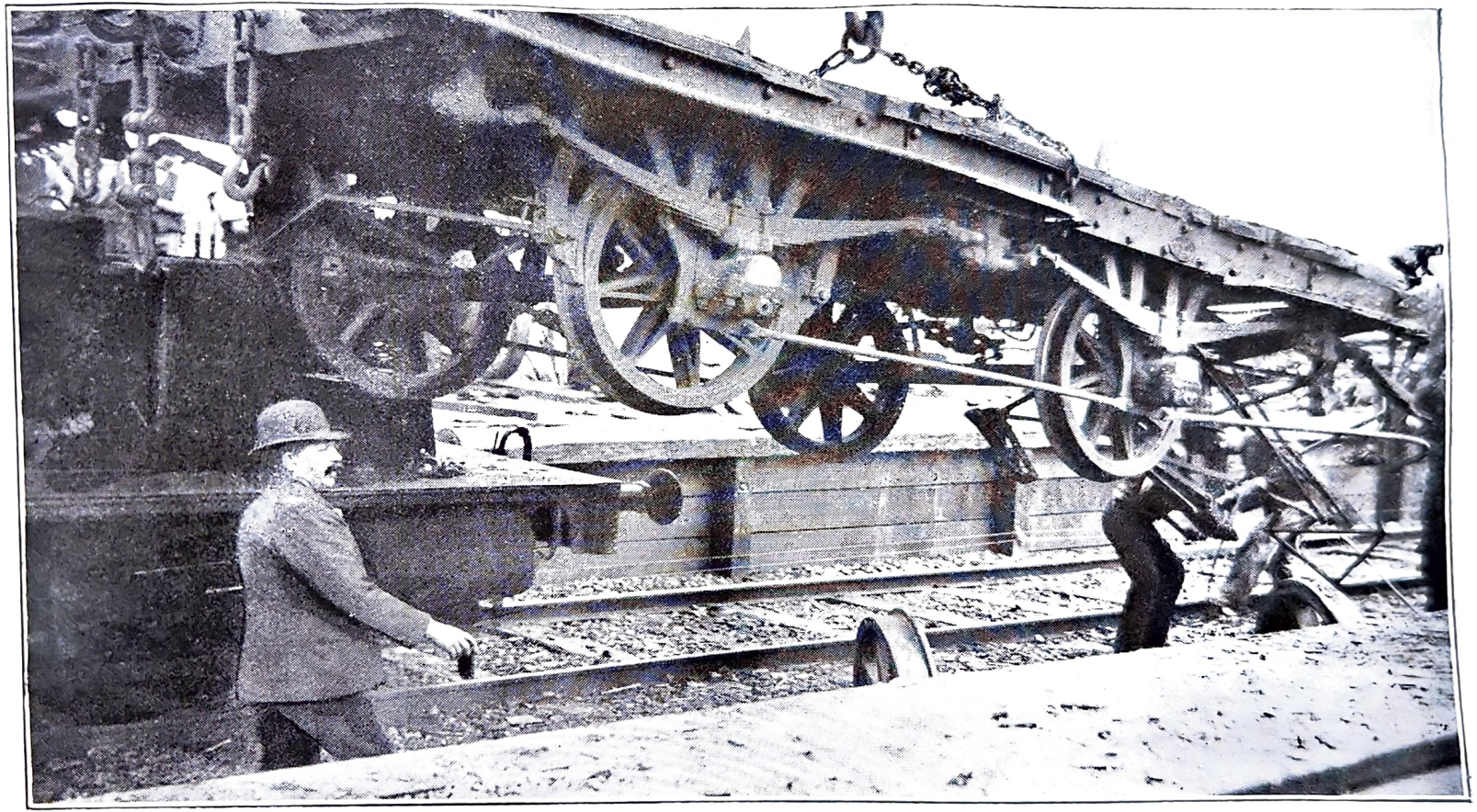
considering this question of recklessness, you must consider the position these men are in. A man's brain is not too active after a long run in wet, wintry weather at one time, and in summer heat at another. He may make mistakes—I do not say he has done so in this case—but owing to the exigencies of the service, whatever that may be, they get heavy runs. These men work 9 hours on an average per day—well, you have only to take the instance of one man, when he went on at 4.35 a.m., and if he had reached town safely at 11 he would not have signed off till an hour later—a fairly long time, and a fairly long strain. Certainly for some hours he was doing nothing, but a man gets just as tired walking about as working, when he cannot leave his engine. The position these men are put into sometimes makes you careful as to how you should deal with them. A man like Milburn gets on to his engine at 12.15 p.m., and if all had gone well he would not have got home till twelve hours later. He would have had a day off, but that is not compensation to a man when his brain is tired after excessive work. If he had it every day he would go mad. So you must consider the strain. It sometimes seems to me that it is no offence to break a regulation when accidents do not occur, but it is a grave offence if they do, because up comes the regulation and hits you in the face. If you implicitly obeyed the regulations we could not run our service. Take the regulation in regard to not using the 1.5 signal in foggy weather. It must be used for fast passenger trains not timed to stop, or express trains. Three or four gentlemen say that Departmentally the train running from Kyneton, although it was run at 60 miles an hour (virtually express), was not an express train because it did not get preference. It ought to have got preference; and for men to get up, in their office, and say that this thing is possible—that the regulations do not apply to our train—is simply hauling men over the coals for a piece of nonsense that would never appeal to a sensible body of men. Take another regulation: "When an engine driver finds a distant signal at danger, he must immediately reduce the speed of his train, so as to be able in case of need to stop at such signal. If he sees that the way is clear, he must proceed slowly and cautiously within the distant signal, having such control over his train, so as to be able to stop short of any obstruction that may exist between such signal and the home." Supposing drivers and firemen carried out those regulations, what time would it take

to come from Bendigo to Melbourne, with all the distant signals at danger: it virtually means that you must next door to pull up at the distant signal, and then crawl down to the home signal. But the practice, as admitted by high officials in the Department, show that these regulations mean one thing in words and something else in practice. One official admits that thirty miles an hour past the distant is alright if you see nothing in front. If you did that, how could you pull up short of any obstruction? With a good brake or a bad brake you could not do it. How could you? We know what it means in practice: it means that the man must reduce his speed, and if he sees his way clear, pull up at the home. It has been said that an obstruction means a train obstruction —how can a train obstruction get between the home and the distant? A man has had a signal given, nothing ought to be there. How can a train obstruction get there? Many of these regulations harass a driver, and though he is not brought up, as a matter of fact he never really obeys the letter of the law.

What are Safety Conditions?

Mr. Corr went on to ask: Are brakes put on trains for working conditions, simply to pull up the train at a station and allow you to go faster between stations? Are they not rather put on primarily for safety conditions, and bother working conditions? Safety conditions are the primary conditions of the brakes. Those are the questions to be considered—not was this brake good enough for working conditions. Did it comply with safety conditions? We find that as the world goes on there is a greater tendency to rush and speed through life, and that rush and speed has been communicated to trains. Trains of to-day go at greater speeds than they ever did go, and the tendency is to increase speeds; and as we do that we must increase the power of the brake in order to make those high speeds safe. That is what I mean by safety conditions. A brake means something to brake the train—to reduce the speed of the train, and not reduce it so as to simply carry on the traffic, but in such a manner that if any accident were likely to happen the train will be pulled up in the shortest time possible. I am ready to admit in ordinary working that the perfection brake cannot be always kept up to perfection, but it does not follow in the slightest that it should not be kept as near perfection as possible, or

THE BIG CRANE FROM THE NEWPORT WORKSHOPS,
which lifted the leading 90-ton Engine of the Bendigo Train on to the rails, dragged the telescoped carriages apart, and hoisted the undercarriages on to the trucks.



CLEARING THE LINE.

The big Crane at work lifting an undercarriage bodily off the track.

that you should not have the perfection or ideal brake. You should have the ideal brake if you can get it, and that is most clearly exemplified by the history of the Westinghouse brake itself. Some years ago George Westinghouse invented his brake, about 1873. As time went on, he found that the plain automatic brake—the brake we have here—did not altogether conform to the conditions of life as they existed, and they say in their book:—"For many years the ordinary Westinghouse brake has rendered valuable service, but time and progress in the art of railway operation has developed new conditions and requirements, which are fully met by the introduction of the quick-acting Westinghouse brake." I have not gone into it at any length, but it has occurred to me that it was another possible factor in this enquiry that the brakes on this Bendigo train were not up to date. Mr. Bagley and others said that the plain automatic brake in this country was quite good enough, and it was quite as good as the quick-acting brake, but unfortunately others do not agree with him. Why are brakes used? For safety conditions. Then, if the quick-acting Westinghouse brake pulls up a train in shorter distance and quicker time than any other brake, why not use the quick-acting? Mr. Alexander himself says that the necessity of the brake is for safety conditions, and I want to lay stress upon this, because the jury had tests in which the train was pulled up in certain distances. That is all very well. It is not a bad performance, but it could have been a long way better for safety conditions. When you come to consider what was the cause of the fatal result, you must also consider whether the men have all done that which they ought to have done. If my client has not done what he should have done, and acted recklessly, he may be at fault. The train has not been braked up as it ought to have been, though, of course, it would pull up with the hand brakes or very poor brakes some time. These points should be considered when you consider whether this brake was properly efficient on the night of the accident. I also want to draw your attention to Mr. Alexander's evidence, which shows that the safety of the people is the best thing. It appears that the Railway Department in this country have themselves adopted the standard of 90 per cent. of braking power as far as their passenger carriages are concerned. Now they try to throw mud in the Jury's eyes by saying this train was very close up to 75 per cent. The standard for safety of passenger

carriages is 90 per cent. Why isn't it 90 per cent., if they have adopted it? It was working conditions when they adopted it. That is the standard with which you must compare the brakes on the night in question. And considering the question from that standpoint, how far did the Bendigo train on the night of 28th April compare with the standard?

Implicating the Train Examiners.

In the first place, we have the examination at Bendigo, and the evidence of Burge and Fraser and others. All I can say for those gentlemen is that if they think they are going to make any set of men believe that when that train left Bendigo on the night of 20th April at 6.50 or 6.55 it had a uniform piston travel, and within the regulation as they swore, and when it was examined seven days later after one trip, the piston travel, with the exception of about two vehicles, exceeded the regulation by over 2 inches, or nearly up to 2 inches, then I think they must take us for more nonsensical men than we propose to consider ourselves.

These men examined the train as far as they were able. No doubt they kicked the wheels, and walked on the next minute. That is no way of doing it. They might kick the wheels, and I don't suppose they would wait a second or two to see whether the brake leaked off again. They walked along, and if the brake blocks would not go on the wheel it is quite likely he would cut it out. One man did that because he felt the air blowing out.

How could the men have examined the train. One man examined some of the vehicles when it came from Melbourne, and another man when the engine got into the platform went along part of the way from the engine, and then the man who had previously examined the train an hour or so earlier came up from the guard's van. He came up the other way at night with a lantern, and you know that some of the brake cylinders are on the platform side. I had a good look at them myself, and it is impossible for the piston travel to be examined on the platform side without getting under the train. They cannot see, as there is the auxiliary reservoir, which obscures the view, and the only examination of the train made was when it was drawn up to the platform for a few minutes. That was the examination made of the train, and if these gentlemen told the truth, then they must have had some very strong brake blocks on that train, or the leverage must have

induced a most excessive piston travel during the journey from Bendigo to Sunshine. It was 10 inches when it got down to Sunshine. The leverages must have been unduly excessive to cause excessive loss of travel, or the brake blocks were so soft that they should never have been on the train; thus, as my friend Mr. Chomley says, they can have it whichever way they like. Either the examiners did not examine the train properly at Bendigo, or the soft brake blocks induced excessive piston travel or excessive leverage.

Mr. Starke: Why didn't they find that out?

Mr. Corr: My clients would not find that out because they have nothing to do with anything but the engine: it is quite likely, however, they found it out at Sunshine. Could Milburn have found it at Woodend? No, because it was an upgrade and a fairly sharp application, and he would not notice it to any extent. At Macedon he could not tell in what distance he was pulled up, and at Sunbury the second driver controlled him, and they were the only three stops he had on the way down. He puts his handle over, and if she is not holding he puts it over a little bit more. He checks her, but he has plenty of room on the various distances between stations, and he does not know whether he has got a long piston travel. The only thing is he would probably find, when he came to places like Sunshine and went to check his train, that his reductions of air would be very much larger, and if he made an emergency application he would not get as much air as he ought to have. That is one of the faults of excessive piston travel. In referring to the piston travels tabulated by Mr. Selley, and corroborated by Mr. Bagley in the table on page 23, Mr. Corr said that on every vehicle, with one exception, the piston travel was greatly above the maximum. I asked Mr. Selley the meaning of the word maximum, and it must mean something as I suggested—the biggest travel that ought to exist consistent with effectiveness. If it is not the biggest travel allowable, it should be something between the two; but here we have had it going 2 inches and more over the maximum, and one or two inches is a great thing in this matter. Those excessive piston travels really mean this, that when you come to work your brake under service conditions, and under service or ordinary applications, you may have nothing like or near the power that you otherwise would have. I do not suppose the excessive piston travel would make so much difference in emergency applications. But emergency

applications are not made by drivers under ordinary working conditions. You must give them a train braked in such a manner that they will be able to use it under service conditions, and such conditions that they will not be likely to miscalculate. We can assume that was the position as far as piston travel is concerned on the night of the accident. In looking at the table put in by an engineer of the Westinghouse Brake Company, you will see that in many cases the leverage exceeds the leverage allowed by the Westinghouse Company. If the Department wants to judge this brake by the Westinghouse standard, it can; but they must give all the conditions, if they want to take 75 per cent. of brake power for passenger carriages, instead of 90 (as is their practice), and as laid down by Blackall, and as used on every American train. I cannot imagine why an American train should have 90 per cent. of brake power and an English train only 75 per cent. If the Department wants to give the figures of the Westinghouse standard reference book they should give us all the conditions, and in taking 75 per cent. the Westinghouse reference book says in a note, which is purposely put on one side, that all the wheels on that train must be braked. If you get the brakes acting and working on them all, with no momentum produced by unbraked wheels, then in the English practice they say 75 per cent. might be sufficient. On the Bendigo train all the wheels were not braked; in fact, there was a marvellous number of them unbraked. There was the horse box with no brakes on its wheels, and there was the six-wheeled carriage with brakes on only four of the six wheels.

Some Apparent Inconsistencies.

I now want to go carefully through another comparison in order to show what a peculiar thing this Westinghouse brake must be, and what an unreliable thing it is, if it is to be judged by the light of the standing tests made on the night of the disaster. On the bogie car 91AA, out of five tests as to whether the brake would apply or not, four only were effective. Out of the next three cars, 8AV, 3BV, and 29BB, the brakes were reliable every time. The four-wheeled car, 258BH was cut out. The six-wheeled car, 30BH, was off on one end for a time. The four-wheeled postal van, 20E, was absolutely useless; the brake never went on at all. The six-wheeled waggon, 568U, was on every time; while on the van, 013, it was on once and never went on again. If the mechanism

is intended to work in the same order every time, and there is no imperfection, they should work every time in the same way, but the result of this analysis that we have made shows that out of 10 vehicles only four brakes applied every time, and each of those four had excessive piston travel. That is, that though they applied, they may have applied without much force, and was quite insufficient to hold the train as it ought to be held. I claim, on behalf of this man, that if you find that this mechanism is unreliable, you can only make one decision. You must give that man the benefit of the decision that if in any vehicle on this train the brakes did not apply every time, it is quite likely that on the night of the accident every one of them did not apply, though they applied at the different tests. Mr. Alexander has given, or attempted to give, an explanation of why some of those brakes went on at one time and went off at another. But his explanation must fail, for this reason, that if you take the bogie car, 91AA, which went off the first time—that is to say, it did not go on the first time, but went on every other time—he would ascribe the reason of that to the fact of a piece of husk or wheat or a cinder getting into the hose pipe and interfering with the valve—I think it is the graduating valve—and by that means keeping the triple valve tight. That is a good enough explanation for 91AA, because on the next application it is quite likely the air would come along and blow that piece of wheat out, and on the next four applications of the brake it would go on. But how can that theory be made to fit in with the action of the brake on the van, O13? On that occasion, if there was a piece of wheat there, how was it that the brake went on the first time, and in the second test it went off? On this we have only to assume that the mechanism of the triple valves was in such a state that they were totally unreliable, and you could not tell what they were going to do. Mr. Starke said the Westinghouse brake was always reliable. In emergency applications I believe it has proved reliable, but in service applications the history of the Westinghouse brake goes to show that it is unreliable. It was unreliable on the night of the disaster. What it is as a rule can clearly be seen, and what it can be made to be is shown by the Jury's tests on June 2, when, without anything being done to it except attending to one or two triple valves and taking up the brake gear, it stopped in a very much shorter distance than it did

on the previous occasion. It shows how important the upkeep of this brake is.

I propose to argue from all I have said that, so far as the standing tests are concerned, the brakes were in a ridiculously poor condition. Mr. Bagley would not have allowed it to go out of the yard; and Mr. Selley, while he does not altogether agree with Mr. Bagley, acts fairly, and says that when he did see the running tests he was surprised. And no wonder, because on all the theoretical tests it failed miserably as a brake.

Mr. Corr on the Running Tests.

Coming, now, to the running tests, I would like, first of all, to say that a number of the tests would be made on so many lbs. of pressure put on in a certain way, where the men were trained and ready and eager to apply the handle at a particular spot. The consequence is, that a lot of the stops made on service or in emergency would have a different result in practice from what was secured under test conditions. The other comment I have to make is that in every case there is an important question arises as to the stop on emergency applications in any of the tests. In his evidence, Milburn shows that he had only 70 lbs. pressure, whereas in the tsets the reductions were made with a 75 lbs. pressure. I think that extra 5 lbs. pressure would have made a tremendous difference to the actual result of the stop. Nothing would exemplify my point better in that respect than the test made by the Jury. Taking Nos. 10 and 11 tests (see diagram facing page 51), which show the service application, you will see that in No. 10 the speed was 44 miles an hour as compared with No. 11, where it was 43½ miles an hour. The train pipe pressure in No. 10 was 84 lbs., in No. 11 74 lbs. But that did not make the slightest difference, because it was a service application. But in No. 10 it was 9 lbs. and in No. 11 it was 10 lbs. The second time the speed was 45 miles an hour instead of 44, and there was a difference of only 1 lb. there. In regard to No. 11 test there are some who say that the reduction was only 8 lbs. It is hard to say what air a man does let out. But in regard to No. 10 and No. 11 tests, in the former the train ran 2088 ft., when the emergency was applied, and the train was pulled up in an additional 240 ft. With 1 lb. more and half a mile less speed, in No. 11 test the train was

pulled up in 1629 feet—a remarkable difference. The whole difference seems to be made up in the half-mile less speed.

I take it, on the standard of the American railway service, that 90 per cent. of brake power should be on the passenger cars; and I take it, on the standard of the Victorian Railway service, that there should be the same percentage for passenger cars, 90 per cent. of brake power. Mr. Alexander's computations have been put forward on the best possible basis that they could be for the department, and even then, taking three tests—in test No. 2 it should have stopped at 623 ft., and it stopped in 802 ft. In test No. 4, 1268 ft., and it should have stopped at 964 ft.; and in test No. 5 it was 1992 ft., instead of 1958. So that it is shown clearly to the Jury that this brake has not had for a safety appliance two-thirds of its value.

Referring to Mr. Selley's opinion, that 50 or 58 per cent. of brake power was sufficient, Mr. Corr said:—Surely in a case like this we want all the brake power on a 60-miles-an-hour-train we can possibly get—surely we want all the power we can reasonably get. 50 or 58 per cent.—Nonsense! Who is the man that stands in that box and says 50 or 58 per cent. is sufficient, when in other cases our own experts say with regard to passenger carriages 90 per cent. of light weight is sufficient!

I think I have shown you that in that train there was not sufficient brake power, that that train was not a properly braked train on the night of the disaster, which both the standing and running tests have proved. The whole of the tests have shown that as a brake it had not even two-thirds of its efficiency under working conditions.

Did Milburn Watch the Signals?

The next position I want you to consider is in regard to the stops made on the run down from Bendigo to Sunshine. Milburn was first of all stopped at Carlsruhe, and this is an important matter in considering what sort of a man Milburn is. He was pulled up with the home signal there. Does that look like the act of a man who runs through? Even at Carlsruhe—remember that when he left Kyneton he was told that, and I think you believe him, he was going to run express through to Melbourne. The man fully believed he was going right on, but stops at the signal when he wants to stop, and when he has the power behind him to stop. Then he gets to Woodend. He says the Woodend stop couldn't give a man

a very good knowledge of how his brake was going because it was on an up-grade. Then we come to Macedon, where the train was pulled up by somebody else, and Milburn could not judge the brakes by that stop. The Sunbury stop is in the same position. We are told that on the way from Sunbury Milburn never applied his brakes at all. But at Sydenham, what is the first thing he does? I am now particularly going on to this question as to whether this man on this night, running his train at the speed he did—I am not going to say it was excessive—was recklessly negligent, or whether he went on, not regarding really what would happen, or whether he ran over anybody or not. That is the effect of the positions I have placed before you, and on them you have to consider this man's every act. It is all very well to say no man should make assumptions—why, the very time he looks at a signal he has a thought and an assumption! When he looked at the signals at Sydenham, what did he find—3.1! And the assumption that naturally arises at once is that there is nothing at the station at Sunshine, and that nothing will be allowed to be there. He has a perfect right to that assumption. It does not follow that he must run past signals, but he takes the assumption along with him in his mind. Then he comes to the distant signal, and according to Milburn's story, as he approaches it, the first thing he sees is the starter showing a green light; and that starter being off plays an important part in deciding the question of whether this man was recklessly negligent, because when he saw the starter off first of all it meant for him a passage through Sunshine. That was the first thought before he saw the other signals. You will have to consider hereafter the question whether Milburn drove at an excessive speed, when he saw his starter, in running up to 60 miles an hour. Seeing the starter off, Milburn would naturally, and properly and rightly in every way, come along at a fast speed—he had a perfect right to do this. Half a mile away Milburn said he saw the distant signal, and it was at danger. Of course, that would alter the judgment he had formed. When you consider his recklessness you must also consider the state of his mind. After he got within 200 or 300 yards of the distant he reduced the speed of his train down to 40 miles an hour, and still the starter was off—shining to him there, and luring him on like a will o' the wisp to safety and another section. It would induce that man to go to the distant signal at 40 miles an hour when he saw the starter off,

and I say he did not break the regulation in doing so. We have had evidence that it is by no means an improper thing to pass the distant signal at 40 miles an hour when you see your way particularly clear. And wasn't the way clear in this instance? And I want the Jury to keep this in mind.

WAS THE EVIDENCE OF DRIVERS AND FIREMEN CORROBORATED?

Milburn has told you the story, and he says that the brake was applied 200 or 300 yards on the Bendigo side of the distant signal. How far is he corroborated by any other person? The only other persons who corroborate him to the letter are his fireman, and the driver and fireman of the second engine. It is important to consider that you cannot place too much reliance on the passengers' evidence as to where the brake was applied, unless something definitely fixes it in their mind. It may be said here that the only men who speak positively is the train crew. Why should they not speak positively? Why should Milburn, Tomlinson, Dolman and Deveney come up and tell you a deliberate lie—why should the two firemen tell you lies? They are perfectly honest as far as I can see. Theirs was a reasonable and not a reckless method of controlling the train on that night. I say particularly reasonable, when you come to consider that the starter was off at that particular time, and any man might reasonably assume that it would be for him. Darcy says the train was gradually being reduced the whole time. He distinctly felt the brakes released, and then coming inside the distant he felt another check. That corroborates up to a measure what Milburn says, except that he says he never released the brakes.

Mr. Corr here subjected the evidence of the passengers who testified to the manner of the application and the place where the brakes were applied between the distant signal and the point of collision to an analytical examination, endeavouring to show that their evidence could not be relied on to any great extent, and even if it could, it would, when properly understood, tend to corroborate the story told by the crew of the Bendigo train.

Mr. Corr also drew the Jury's attention to the expression of Milburn immediately after the collision: "If my own children had been standing at the home signal I could not have pulled her up;" and also to that of Tomlinson: "My God! what has gone wrong with the brakes?" Surely at that moment (he remarked), after those men had been straining

their nerves to stop their train—surely the expressions at that moment one to the other was important as showing what was actually in their minds—the brakes had failed! I may be under a wrong impression in saying they entirely failed. I have not the slightest doubt in my own mind that from before the time he felt this sudden jump he had no doubt the brakes were on his train. Then in the time of excitement—at such a time when a man was liable to speak the truth—he said one thing, and one thing only—the brakes failed him! I want you to particularly consider what the men said and did on the day of the accident, and at the moment of the collision. What they said was, The brakes have failed. What they did was to go straight from one engine to another to see if there was any explanation of why their train did not stop. They did not get the explanation, but they went to seek it, but, fortunately or unfortunately, it was not there.

Did Milburn Drive at Excessive Speed?

The question might arise as to whether Milburn was negligent in coming up to the distant signal at 40 miles an hour. When you consider the question of negligence you have to consider that he had got the 3.1 signal, and saw the starter in the distance apparently in his favour. No jury could convict a man for going at excessive speed who has received the "line clear" signal and is going at 40 miles an hour under the impression that the line was clear before him and that he had a powerful and effective brake behind him.

I wish to refer to the question of Milburn's record. The only entries that troubled me at all were the questions of running past the signals, but I think he has explained those by showing that he has not run past them deliberately.

Why Did the Brakes Fail?

I next desire to submit that the whole of the train crew's evidence shows that the brakes failed to act, and the first thing that would suggest itself is, Why did they fail? I must very candidly confess that to a great extent I cannot give a reason. But things unexplainable to-day may in the future be explained, and in years to come reasons will be shown perhaps as to faults in regard to the Westinghouse brake that are unknown to-day. I think it is one of the things that are unexplainable. It is possible, as suggested by Mr. Bagley, that a piece of scale did get into the valve. Of course it would

not have stayed there, but assuming that the scale should carry some weight on looking for a cause of the brake's failure, it would undoubtedly be an important thing in regard to the application of the brake between the distant and home signals. It would prevent the air coming out, with the result that the train would get closer to the home signal and approach it at a faster rate than he otherwise would do. He would not get the benefit of the service application that he expected to get. Mr. Alexander gave us another clue, that is the theory as to the husks and cinders getting into the graduating valve. It might happen that the valve may be stuck. If it caused one triple valve to stick, why should it not cause two or three to stick? Then we have other evidence to show that bits of waste may get into the hose couplings and interfere. But, in spite of all these suggestions, I can only say that I cannot suggest any cause at all that is known at present, but I have not the slightest doubt that the brakes did come off. The only sensible cause I can give you in detail is that Milburn may have accidentally brushed his arm against the handle of the brake and caused the brakes to release. But I feel positively sure that the Jury will feel the same way as I do, that this man (Milburn), from his demeanour, and Dolman are telling exactly what occurred on the night of the accident.

Dolman and the Isolating Cock.

Comment has been made upon the fact that I have also been acting for Dolman, but at the time we got their confidence it was impossible to see that one man conflicted with another: the result is I have only a few words to say about Dolman. I think you will all agree that, as far as the isolating cock is concerned, and so far as any negligence on Dolman's part in having the isolating cock cut in instead of cut out, there is not a tittle of evidence to support that theory. Dolman could never be convicted of having the isolating cock cut in instead of cut out, but I am just as positive that poor Milburn, searching vainly for a theory, searching in his own mind under the intense strain and worry of the whole case, has some idea that that is the only reasonable account he could give for the accident, but it cannot be proved. There is another piece of evidence I have to refer to in connection with Dolman. It might be argued that if the train were going at an excessive speed he should have taken control of the train and applied the brakes, but that is not a reasonable

argument. You have only to read Mr. Bagley's evidence, and you will see that no second driver and no guard would take the responsibility of applying the continuous brake until it became a question of absolute need. I think if such an affair took place as the men said took place on the night of the accident it would have been a most dangerous thing for Dolman to touch the handle. He did do it—he swears that immediately he saw the danger ahead he tried to operate the brake, but Milburn had evidently used what air there was, and there was none for him. The only other case of negligence against Dolman is that he might have observed the signals. He has explained that he saw the distant signal now and again, but his view was greatly obstructed by the tender of the leading engine being very wide, also that the smoke from the leading engine interfered with his view of the distant until he got inside it—then he relied on Milburn, and thought, judging from Milburn's experience as a driver, that at the pace they were travelling they would pull up quietly and safely at the home signal, if it was at danger, but he could not see it himself. You are bound to believe him: you cannot jeopardise Dolman's position in any way. Peculiarly enough, so far as the speed of the train is concerned, I have the corroboration of Darcy. An experienced guard, and a man evidently of a careful nature, his evidence went to show that at the distant signal he saw nothing unusual in the speed of the train; he felt that Milburn would pull up at the home signal, so the idea of excesive speed is quite cast away by the evidence of the train crew, by the evidence of the passengers, and the conduct and evidence of the guard. I do not think you can say for one moment that Dolman was guilty of any gross negligence under the circumstances of the case.

Why Milburn should be Believed.

I have touched, I think, upon nearly every point it is possible for me to touch upon in the interests of Milburn, but I want to ask you this: Do you believe his story? Do you believe the story of the crew of his train? And in order to judge whether you ought to believe it, I would ask you to take into consideration the demeanour of Milburn as he stood in the box. Was not he an honest man? Did not he convey the impression in his answers of being a truthful man? Do you believe him? Do you believe his story from his statements at the time of the accident, and seeing he has made no attempt

to vary them. What he said at the beginning he says now. I want to ask you one other question: Supposing you do not believe Milburn's story—supposing you do not believe Dolman's story—supposing you think for one moment, and assuming you think that Milburn came up to the home signal at an excessive rate of speed and then put on his brake and found he could not stop in time owing to the excessive speed—supposing you assume that—can you say, even then, that he is guilty of gross negligence or reckless negligence? When you take all the matters into consideration, was he, even assuming the worst against him, and that he did do that, though there is any amount of evidence to show that he did not—but assuming that he came to the 250 feet detonator, and then at the last moment put on his brake—cannot you find an excuse? He does not admit it himself—but would it not likely happen that a man not having received the 1.5 signal, and coming along and seeing the starter off, that he would keep up his speed? And would he be grossly negligent if he did that? Seeing the starter showing the green light, he might say, "That starter is for me," and thinking that, he would be lured on at a rapid rate to the home signal. You would not blame him, even though you do not believe his own story. I do not believe that was what happened, but if it did happen I say he is not a man who would come along disregarding all consequences, because he has been proved to be a careful, reliable man. The whole origin of this accident seems to have been a continuous number of causes all tending at the same moment to an immense accident. Are you going to make Milburn suffer? Are you going to make Dolman suffer? Are you going to say to these men, who have done everything that was reasonable and prudent under all the circumstances of the case, that they are to blame? You are bound, gentlemen, to consider the whole of the circumstances of the case, and to see the position of these men; and I want to draw your attention again to the duty that is cast upon you to say, not whether a man has made a mistake, but has he been recklessly negligent? It is for you to decide on the whole question, and I want to impress upon you fully what I said at the beginning, Do not deal with this case as if you were justices of the peace dealing with an indictable offence. Your duty is to say "guilty" or "not guilty." Do not shirk your duty. But the people of this country do not for one moment think that there would be any possibility of a jury of twelve men in

another court being a better Jury than the nine gentlemen here. Say "guilty" or "not guilty."

MR. McARTHUR,

who represented the public, delivered a forcible and telling address to the Jury. The ability demonstrated in his questioning and cross-questioning of witnesses was further emphasised in his endeavour to place before the Jury a plain, pointed, yet unbiassed statement regarding the evidence that had been submitted for their consideration. Undoubtedly his words carried great weight and made a deep impression.

QUESTIONS FOR THE JURY TO CONSIDER.

The following questions and explanations, submitted to the Jury, show how the case appealed to the legal mind, and they are so exceedingly interesting that we are making room for them in this book:—

Was or were any person or persons guilty of culpable negligence?

Was the collision due to any one or more of the following causes:—

1. Milburn's negligence (a) in driving at an excessive speed when approaching and passing the distant signal at danger, and when approaching the home signal at danger; and in neglecting to apply his Westinghouse brakes until he was close to the home signal, and it was too late to prevent the train from passing the home signal and running into the Ballarat train; or (b) (assuming that the Westinghouse brakes did come off, as alleged by Milburn) in approaching the home signal at danger at such a high rate of speed that the train could not be pulled up by the hand-brakes before running into the Ballarat train.

2. Dolman's negligence in neglecting to apply the brakes when he knew, or ought to have known, that Milburn was approaching the home signal (at danger) at an excessive speed, and had not made any, or any sufficient, application of the Westinghouse brakes.

3. The defective condition of the brakes, due to—Dolman's negligence (as to engine 544), train-examiner's negligence (as to train).

4. "Dolman's negligence in opening, or keeping open, the isolating cock on his engine, No. 544 (subject to the question

of law whether there is any evidence whatever of this to go to the Jury).

5. Milburn's and Dolman's negligence (either with or without cause No. 3)—i.e., Milburn's negligence in driving at an excessive speed when approaching and passing the distant signal at danger, and when approaching the home signal at danger; Dolman's negligence in opening or keeping open the isolating cock on his engine, No. 544 (subject to the question of law mentioned before). So that, though the brakes held for some time on a service application, they came off somewhere near the home signal, owing to the isolating cock being open; and when the emergency application was made, the pressure in the auxiliary reservoir having been reduced by the service application, the power exerted by the brakes was less than it ought to have been (this would be accentuated by the excessive piston travel and other defects in the brake), with the result that the train, which was travelling at an excessive rate of speed, could not be stopped in time.

Or was the collision due to some cause which the Jury have been unable to ascertain?

The goal you are aiming at is, Was anyone guilty of culpable negligence? and it is quite obvious to me that before you find him guilty of culpable negligence you have to find him guilty of negligence. As a separate matter, each question is, Was there anybody guilty of negligence? Approach all these questions as if they were a separate matter. That is the fairest way. Were any of the people guilty of negligence?—that is, the negligence which the plaintiff's counsel says the servants were guilty of?

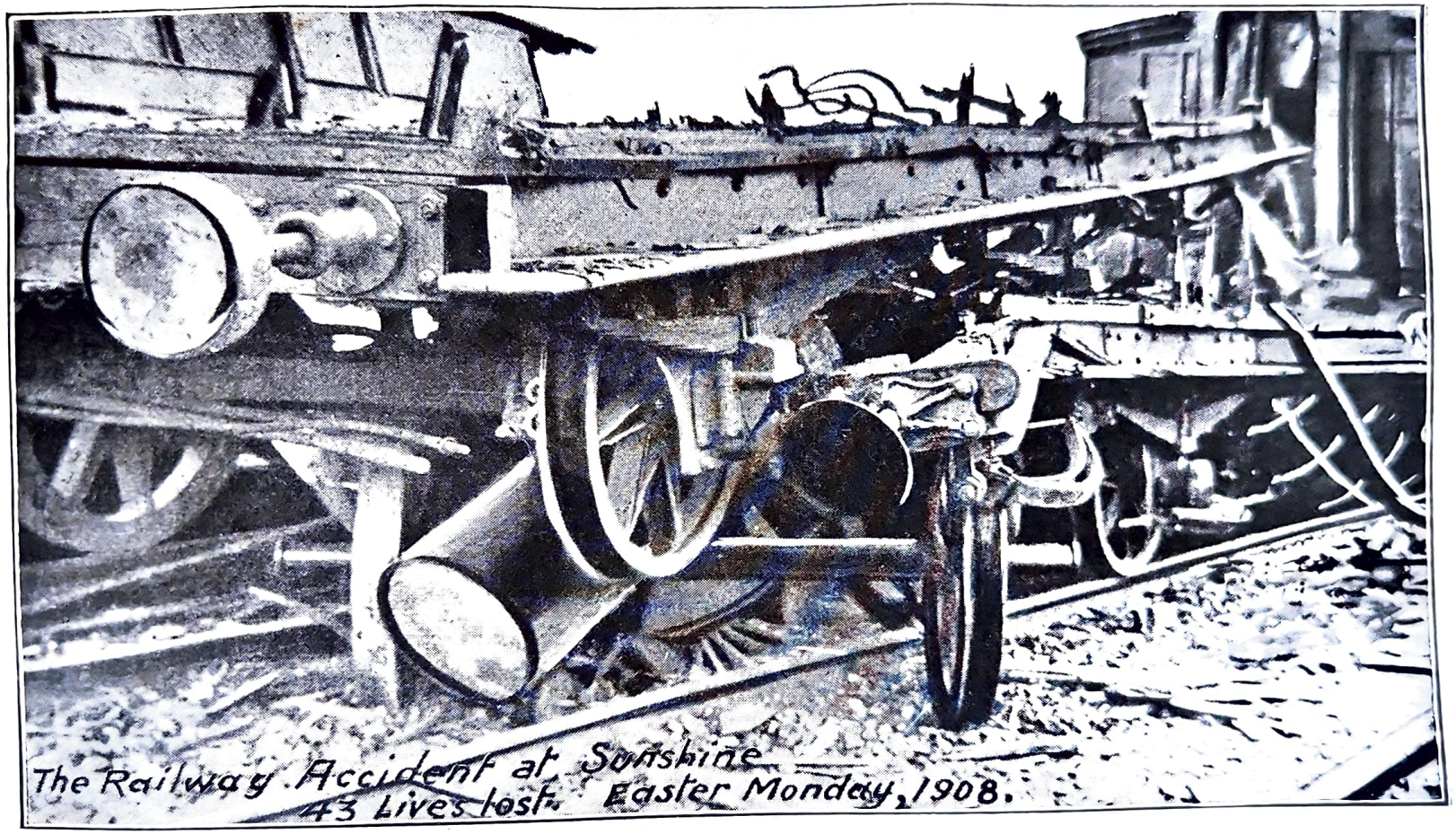
Who is to be Believed?

In regard to question No. 1, clause (a), Mr. McArthur said it put the question in as short a way as possible. Put it in a different way (said Mr. McArthur) if you like. That question (a) is based on the supposition that you will accept as the truth of the matter, as to how the occurrence took place, substantially the version of the guard and the civilians. That is, as if the principal view were that Milburn had driven at far too rapid a pace, ran past the distant, never put on his brakes until he was close to the home, and that was substantially the cause of the accident.

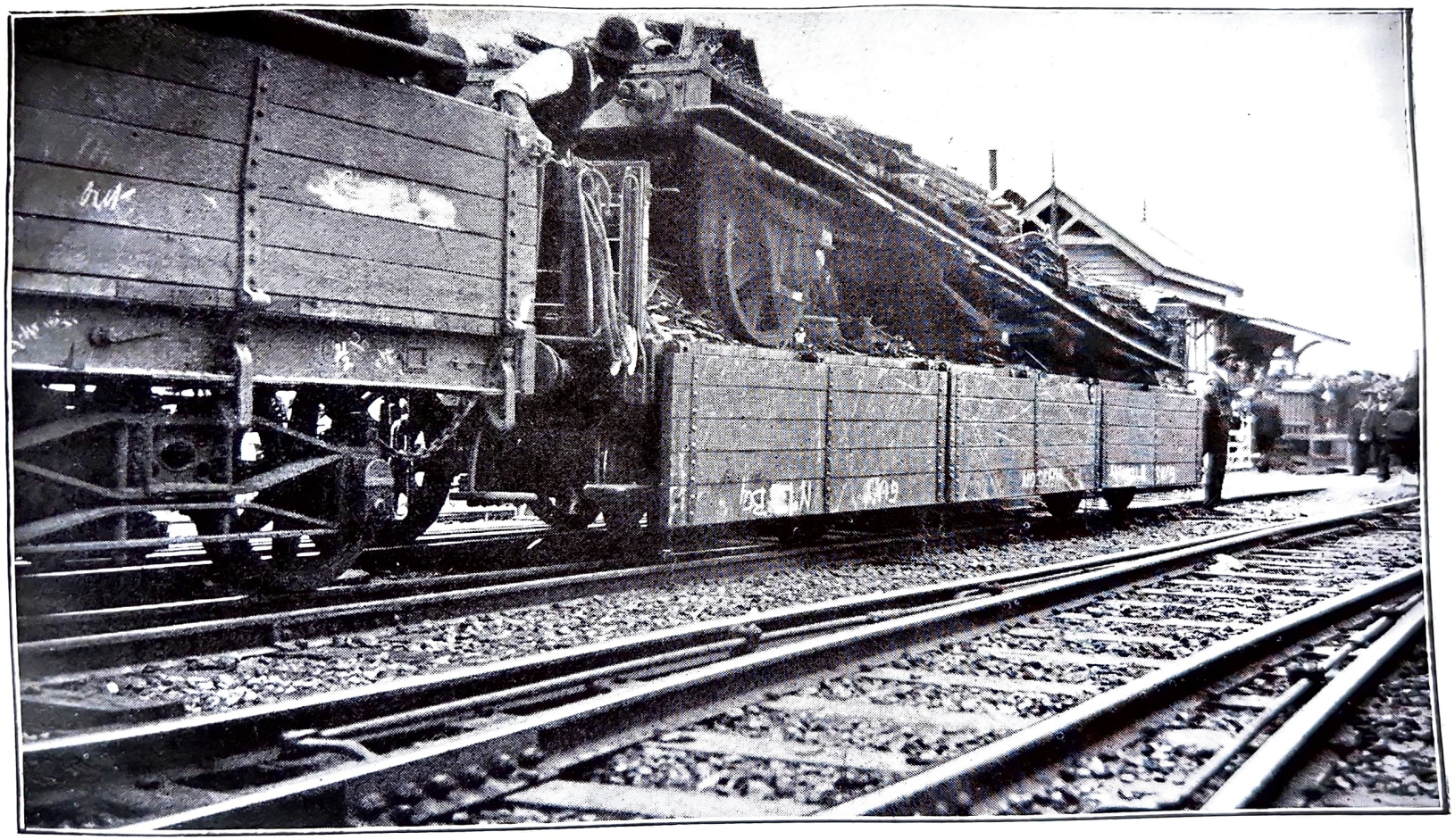
Question No. 1 clause (b) is propounded on the assumption that Milburn's version is correct. However, it is possible that you may still say that, even if the brakes did come off from some cause which you may think is explainable or unexplainable, he was guilty of negligence in approaching the home signal at danger at such a high rate that the train could not be pulled up by the hand brake. You may say: "No; we believe Milburn's evidence, that the brakes did come off as he described, and we do not find him guilty of negligence."

In considering question No. 2, if you accept the view of the guard and civilians, you may say that Dolman was also guilty of negligence when he recognised that Milburn had not put on his brakes, and had passed the distant signal at a rapid rate, and approached the home and still had no brakes on. You may say Dolman is guilty of negligence, and that is why the question is put, and the words, "any sufficient" is meant to apply to this idea. Again, supposing you say that Milburn's evidence is true, and that the brakes did come off—I have already referred to that in No. 1—I say even if he drove to the home too rapidly, you might also involve Dolman there. You might say that both these men are to blame for driving to the home at such a rate that when something did go wrong with the brakes they had such a big pace on that they were unable to avoid any accident, although they had 200 yards plus 631 feet to go.

Question No. 5 is still on the assumption that the isolating cock is the cause of the trouble. You might say it was due to Milburn's and Dolman's neglect, and, indeed, it may be, together with the defect in the brake, and that is why I put that in clause No. 5—"Milburn's neglect in driving at excessive speed." The important thing is neglect in approaching the home signal at danger, coupled with Dolman's possible neglect in keeping open the isolating cock on his engine. Then on this question—that though the brakes held for some time on a service application—if Milburn's evidence is true about the brakes coming off—they came off about the home signal; then the emergency application was made; but the pressure in the auxiliary reservoir having been reduced, the power of the brakes was less than it ought to have been, and this, coupled with the excessive piston travel, caused the train to travel at an excessive speed, and so it could not be pulled up in time.



ONE OF THE WRECKED CARRIAGES, SHOWING THE TERRIBLE FORCE OF THE IMPACT.



READY FOR REMOVAL.

This almost unrecognisable mass is the remains of a second-class carriage of the Ballarat Train. It has been hoisted on to a truck ready for removal to Newport.

MILBURN THE RIGHT MAN TO BE "ASSAILED."

You will notice the very first question is in regard to Milburn's neglect. I don't want it to be thought that I wanted to draw any unfavourable inference against Milburn because his question happens to be first. Mr. Corr has said that the man who has been assailed (I do not think that is quite the right word) here all through has been Milburn. Mr. Corr is not far wrong. But it obviously must be so, because there is no doubt that the very direct and immediate cause of the accident was the driving of the train past the danger signals and against the Ballarat train, and therefore the first question that crops up in anyone's mind will be *prima facie* the man who drove past the signals and into the Ballarat train is the man we have got to look at. I think you will agree that it is the proper thing to do, and therefore we find that Milburn says: "Yes, it is true; I did drive past the danger signals, or, rather, the train I was driving went past, and collided with the tail of the Ballarat train;" but he says: "I can give an explanation of that—I say that it arose from circumstances over which I had no control, and therefore I am not to blame." I think the man it is necessary to assail is the man in charge of the train which ran past the signals and into the Ballarat train. Answering this inquiry involves a very keen and very close questioning of that man and the man who was beside him—Dolman—as to why he went past the signals and drove into the train. If you say he is in no way to blame, I think you will agree that I would not be doing my duty if I did not very closely press those men to find out why they did go past the danger signals and into the standing train.

In order to determine whether any person is guilty of carelessness, I have no doubt in my own mind that the best thing of all for you to do is to make up your mind what actually happened that night. Until you do that you cannot tell who is guilty of negligence or who is responsible. What did actually happen that night? That is the great question. There are two versions. There is Milburn's version, and there is what I may call, for shortness, the guard's and civilians' version. Milburn's version is the version supported by the other driver and firemen on the train. The guard's version is the version supported by the civilians. Milburn's version is a definite, clear-cut version, you understand, because the men

who support it are men who know exactly what did happen on the engine, and therefore they have given a definite, clear account of what actually did happen. The version of the other people—the guard and civilians—is not so definite and clear-cut, because you have got rather to infer what the facts are.

Milburn's Own Testimony in Regard to the Brakes.

Let us look at Milburn's version—and I will put beside it what may be said to be the real facts according to the proper inferences to be drawn from what the other men say. His case is a clear-cut case, I think. He says: "The brakes were alright. I could not have wished for better brakes. They acted very well down to Bendigo and returning from Bendigo. Before seeing the distant signal I got 'line clear,' but that did not deceive me Make no mistake about that." Mr. Corr is quite right to blame everything he can lay his hands on. But do not forget Milburn's own story. "The line clear did not in any way deceive me; I knew perfectly well, when I saw the distant and home signals, what my duties were. It is true I did not see the home quite as soon as I ought to have seen it, but I saw it, and knew it was against me, and that had nothing to do with the accident." He said also, "I saw the starter off, but that had nothing to do with the accident; I thought it might have been off for me, but I soon knew it was not off for me." He then says: "As I approached the distant signal I applied my brakes with a service application. They held well. I had no cause to complain about them up to that point. So far as I know, they were holding just as I should expect them to hold on a service application. I reduced my speed from 50 to 40 miles an hour. I made another application of the brakes after passing the distant. They appeared to respond well again. I noticed nothing wrong with them. They appeared to be alright 200 yards from home. Then off went the brakes, and I was helpless." That is Milburn's story. "The brakes jumped off," to use his expression. "To the best of my belief they all came off: they were all of them not operating. We did the best we could to stop our train with the hand brake—we could not do it, and the collision occurred. I cannot absolutely from my own knowledge say whether they were on when the impact actually took place, for when I am confronted with Bagley's evidence I think it probable that some of them were on." He goes

further than that, and says, "Although the brakes jumped off, I cannot explain what on earth made them come off." That is Milburn's story.

The other case is this. I cannot put it so definite, for the reasons I have already given, but I think the strongest inference may be drawn against Milburn and the drivers of the train on the version of the guard and civilians. It may be fairly put that, having got "line clear" instead of 1.5, Milburn came down to the distant signal at a very much greater pace than he ought to have come down at, that he drove past the distant signal at 50 miles an hour, that he saw the home was against him, but the starter off, and that he came to the conclusion it would be alright to drive past the distant at 50 miles an hour. He could approach the home at some slight reduction of 50 miles an hour, but he always hoped the home would be pulled off. There was the story that he was alright —the home would be pulled off before he got to it. Then when he got very close to the home he found the signal would not go off, or he saw the tail of the Ballarat train in front of him, and then, when it was too late, he jumped the brakes down, and they could not stop him before he ran into the Ballarat train. That is the other side of the picture, and I say that to put that side of the picture as fair as I can it is strongly against Milburn. If you take his own story exactly as he tells it, having reduced the train down to 32 miles an hour, at the time the brakes suddenly went off, you might very well say, "I do not think it is his fault at all." Which of these stories is the correct one? That is the point you have to determine.

A Test of Credibility.

Taking Milburn's story first, you will remember it was sworn to by the other three men on board the train. Do you believe them? Of course, you have, in this case as in every other case, to look at the witnesses. You have to consider their demeanour, what their interest is, and a great many things, in order to determine whether they are telling the truth or not. Now, so far as Milburn is concerned, I was very much impressed by the way he gave his evidence. I may say that I had a very unpleasant time when I was closely questioning Milburn in order to sheet home criminal liability to him. It is not a pleasant business, but it had to be done; and I may say I was impressed with Milburn in the way he gave his evi-

dence. I was especially impressed by Milburn when he was cross-examined by Mr. Fowler (one of the Jurymen). Mr. Fowler examined Milburn with regard to several things which —had Milburn been a cuter man, a cleverer man, or a less honest man—he might have jumped at as a way out of the difficulty. He said to Milburn, "Supposing you had accidentally knocked your elbow against that, and thrown the handle into the release position or the running position, might not that have taken the brakes off?" Milburn said in reply: "That would not happen." Then he was asked: "Supposing that handle were in the lap position, in its extreme position towards the running position, do not you think the air might have leaked owing to a leaky valve?" Milburn replied: "There was no leak in the valve." All that impressed me a good deal with regard to the man's honesty. If he had accidentally put the handle into release and taken the brakes off, it would have gone a long way towards getting him out of trouble.

But I must say this—that these men—Milburn, Dolman, Tomlinson and Deveney—may have made up their minds to tell an untruth with regard to the main part of the case. I was not so struck by Dolman as I was with Milburn, although when I cross-examined Dolman about the isolating cock later I was more impressed with him then. All these men are fighting for their lives, and you have got to be careful. You are entitled to believe them, but you have to remember that they are greatly interested.

A Remarkable Agreement in Facts and Figures.

My first observation with regard to their evidence is this: It is extraordinarily alike—almost identical. That is a perfectly fair comment for me to make, because I do think if you look at it, and if you remember how they gave it, it is extraordinary how identical it is. I say, without much hesitation, that these four men put their heads together, and determined to tell the same story to this extent—they shall agree with each other as to distances and rates of speed. Compare the distances; they are all the same: "200 or 300 yards from the distant;" "half way between the distant and the home;" "30 or 32 miles an hour;" "40 miles an hour past the distant." You have got to remember that although there is this remarkable similarity, yet their story may be true. I can quite understand the four men saying: "In substance

we agree—the brakes held for a time, and then suddenly went off. We may as well agree in detail, so that we will not have one contradicting the other." If that were done, I think it was a mistake to do it, quite apart from whether it is proper. If you come to that conclusion, you would still be suspicious as to the bulk of their evidence. With regard to that, I must make this comment, because I do not think it would be right if I did not. In regard to the isolating cock some questions were asked. I suggested that it was undesirable for Mr. Corr to appear for both Dolman and Milburn. I think as events have turned out, from the point of view of getting the men off, it may have been a very good thing. It seems abundantly clear that these four men went to Mr. Corr's office, perhaps well advised, and they recognised that it was very desirable that they should all present a solid defence. "Let us have one story, and stick to that: it is far better than fighting over the isolating cock. We will agree not to blame the isolating cock." Why should they agree? Why should Milburn agree not to blame the isolating cock if he thought it was responsible? The only reason would be some consideration given to the other side. "I will give up the isolating cock theory if you will throw in with me, and we will all tell one solid, consistent story, and we will stand or fall together. I do think that it is unsatisfactory from the point of view of investigating this thing and getting to bed-rock. It comes to a question of believing them. If they are going to get the benefit of this course they have followed, they must get the onus of it. If they make up their minds that they shall present one solid story, they get the benefit of it, but they must be open to the onus of having it unfavourably commented upon by any Jury before whom they appear.

I agree with Mr. Corr that it is a very important thing to see exactly what these men did or said immediately after the accident, and I also agree with him in the comments that he has made in favour of his own client. The very first thing that Milburn's fireman did after the accident was to go back and examine the isolating cock of the second engine. That shows very strongly that Milburn and Tomlinson thought something was the matter with the brakes. Tomlinson went back because he believed the brake was not acting, and I think it is a strong bit of evidence in his favour; but I say that I cannot help feeling that, even if the other story is true —that he was going at a very fast rate until close down to

the home signal—I can understand, under those dreadful circumstances, his feeling that the brake was not pulling up the train as it ought to have done. It may be that Milburn, having put his brake on before the home signal, and probably travelling a bit faster than he thought he was travelling, said to himself, "Is this train never going to pull up?" as he saw the Ballarat train in front of him. I can understand him saying, "Why on earth doesn't this brake pull up better?" I freely agree that that act on Milburn's or his fireman's part was the act of a man who thought something had gone wrong with his brakes.

What Milburn Said After the Disaster.

Coming, now, to the conversations, I will first of all refer you to Kendall's statement as to what Milburn said:—"I cannot say the time he came into the station, but I asked him how it happened that he passed the signals, and he stated that the brakes would not act. He said he saw both semaphores at danger, but the brakes failed." I quite agree that Milburn should say from the beginning that the brakes failed. Of course, that may indicate that the story he is now telling is perfectly true. On the other hand, supposing he was entirely to blame, and that the other side of the picture is the true side! He has got to give some reason, and it may very well be that the only reason he could give was that the brakes failed. My idea about these conversations is that they didn't say one word about the train jumping away, with the exception of Dolman. To say the brakes failed is one thing, but to say the brakes were perfect up to a certain point, and then suddenly jumped off, is a very different thing; and I must say it seems to me most alarming, if Milburn's story is true—it was a most extraordinary and unheard-of and alarming experience. It was not a case of putting the brakes on and finding they failed. The thing was, that the brakes did act perfectly well up to a certain point, and then suddenly jumped off. I think it is very peculiar that in all these conversations, with the exception of Dolman, you will find that none of them referred to this most extraordinary thing—that the brakes jumped off.

A second conversation was with Mr. Shannon, who asked Milburn how it occurred; he said he could not say. All he knew was that he was carrying good brake pressure, from 65 to 70 lbs.; that he made the application at or approaching the

distant and checked the train, and made another application between the distant and the home, and he found it was not taking the effect he wanted; he then put his handle right over into emergency without effect; then he reversed the engine, but too late to avert the collision. It may be very well said that that is not very unlike the guard's story. I would draw your attention to this conversation, and point out that it is somewhat peculiar that three of them did not say anything about this most extraordinary jumping away.

Another conversation was with Mr. Abel:—"I said, 'This is an awful affair.' He said, 'Yes.' I asked him how it happened, and he said the brakes failed. He said no one was to blame but himself. 'The signals were against me, and I cannot attach any blame to anyone but myself.' I said, 'You must have been coming down at a pretty good pace: you could not have had your train under control.' He said it would not have happened only for the late running of either the Ballarat or Bendigo train." There he again says the brakes failed. Milburn contradicts the statement that he said no one was to blame but himself; but I do say it is a curious thing that there is not a word about jumping away—only that the brakes failed.

The other conversation was with the guard:—"He said, 'You felt me check it up above?' I said, 'Yes.' He then said he reversed the engine, and he pointed to it as being reversed. It was reversed when I saw it. He said something about the brakes not acting." Not a word in that about the brakes jumping away.

Now see what Tomlinson (Milburn's fireman) did. His evidence reads:—"Directly the accident happened I had a few words with Milburn—he was like a madman. I said, 'What on earth is the matter with the brake?' and Milburn said, 'If my children stood at that stick, I could not do more than I did, and I do not know what happened.' Then I got off the engine and picked my way along the platform to Dolman's engine. I stood on the side, and put my hand over him by the lever, and felt the isolating cock."

Why was not the Jumping Away of the Brakes Mentioned Directly After the Disaster.

I am referring to this to show you it is a peculiar thing that so far none of the witnesses say a word about the train behav-

ing in this extraordinary way in regard to jumping away. It is quite true, however, that the conversations do indicate that the men really thought something had gone wrong with the brake. This may be reconcilable with the fact that they were driving faster than they thought, and that the brakes were put on, but it did not appear to them, in view of the great stress of the position, to be holding, although they may have been holding.

It is curious that you will find the only man who suggested the jumping away of the train after the brakes were applied was Dolman. When you find Milburn talking to somebody outside—Kendall, Shannon, Abel, Darcy or Tomlinson—you will find he says nothing about jumping away. You will see in the evidence that, according to Milburn, it was Dolman's suggestion that the train jumped away, and not Milburn's at all; and that is consistent with the rest of the evidence. Dolman suggested it. You will see that Milburn's account is much more likely to be the true one, because the only member of the crew who suggested jumping away shortly after the accident was Dolman himself. I do not know the reason Dolman originated the jumping away story, but it looks as if he suggested it. And now we find every one of them swearing to the jumping away except Deveney. Deveney says it eased off. It is open to criticism that Dolman was the man who first suggested the jumping away; it is probably likely to have happened when the men were making up their defence. You can imagine it being said: "I will give up the isolating cock theory, and I will adopt the jumping away theory."

The only other conversations I desire to refer to are the conversations with Locke, Shannon and Burgess. Mr. Locke says:—"I asked Dolman how the accident happened, and he said he did not know. He said the smoke of the first engine interfered with his view of the distant signal, and that when he was passing the distant signal he saw it was at danger. At the same time he felt the brake being applied, and he then considered driver Milburn had the train under control. On nearing the home signal he felt it could not be pulled up; Dolman then reversed his engine after giving a few puffs with his whistle." It is peculiar that in his conversation with Locke Dolman does not say anything about the train jumping away.

Mr. Shannon says:—"I asked Dolman if he felt the application at the distant, as stated by Milburn. He said he felt

the train checked there. He also said he felt another application between the distant and the home; then he told me the train appeared to jump forward, and seeing that Milburn was going to pass the home at danger, he put his handle over, and afterwards reversed his engine. He said they were carrying good pressure (60 to 70 lbs.). He said he thought they hit the Ballarat train at 10 to 12 miles an hour." There is no doubt, therefore, that Dolman is the only one of these men who gave anything like the same account then as he has given in the witness box.

A Suggestion from Driver Dolman.

In regard to the conversation Mr. Burgess had with Dolman, Dolman said that he thought that Milburn had mistaken starter for the home. This is what Mr. Burgess says about his conversation with Dolman:—"I then said, 'Milburn not getting the 1.5 signal, or being kept back, concluded that the line was clear through the station, and seeing the starting signal off, and not seeing the Ballarat train, took the risk, concluding that the home signal would be pulled off for him. He did not apply his brake until it was too late.' Dolman said: 'My own belief is that Milburn mistook the home for the distant.' I said, 'Did you not see the signal?' and he said, No; the smoke obscured my view. You know, Mr. Burgess, you would have relied or trusted Milburn anywhere, as he was always on the look-out; Milburn says he is quite sure he did not mistake the signal." If Dolman's idea was that Milburn had mistaken the home for the distant, it is utterly and absolutely inconsistent with Dolman's statement in the witness box. If he mistook the home for the distant, and did not see the distant, that would account for his driving at a very fast pace up to the home, which the civilians and the guard say he did.

Referring to Milburn's record, Mr. McArthur said:—It is right that you should thoroughly understand how that record came to be put in. The moment the accused man's counsel asked any questions tending to show that the accused is a man of unblemished character, it is not only the privilege, but the duty of the Crown Prosecutor to show that the prisoner has not an unblemished character. The moment Mr. Corr asked a witness in the box whether Milburn was a man of unblemished record, that is, whether he was not a man who was a very careful driver, and did not pass danger signals,

then my attention was drawn to Milburn's record—otherwise it would appear to you as if Milburn were really and truly a man of unblemished record, whereas he was not. The rule of evidence is that no reference whatever is to be made to his record, but if the counsel for the accused try to make him appear a man of unblemished record, the counsel on the other side may say, "I will show that that is not so." Even if Mr. Corr had not asked the question in regard to Milburn's unblemished record, it was admissible evidence to show whether the Comissioners were justified in having such a man on an engine at all. But I think you ought to put it out of your mind, because it comes to this, that what you have to determine is what happened on that night, and not what happened at other times.

One other observation I wish to make is this: It is a peculiar thing that no other person was called who felt this train being held by the brakes and then jumping away. It is remarkable that no persons have been called who experienced that curious sensation. I do not think I am wrong in saying that it is a sensation that should be experienced over the whole of the train. The story the four men who handled the engines of the train tell may be true; but can it be accounted for? We cannot account for it, and I say it makes it all the more grave a question for you to determine.

The Theories Advanced.

The first theory was a sort of general defect of the brakes. There was a general attack made upon the brake—it was defective; the piston travel was too long; they were leaking off, etc. My view is—which may be quite wrong—that, whatever the defects in the brakes were, they would not have thrown the brakes off in the way that has been described.

Another two causes were scale and unravelling of the hose. You thoroughly understand them, and I think you will say that neither scale nor unravelling would have jumped the brakes off in the manner described. They were theories invented by Mr. Bagley. I want to pay a tribute to the manner in which Bagley gave his evidence. We had one or two pretty sharp brushes, but I will say that I have never come across a witness in all my experience who appeared to be so anxious to do what was just and right and fair between the parties most deeply concerned in this enquiry. I should think that Bagley's whole interest and inclinations—his instincts—

in this case would be to favour his old comrades who are in trouble, and I cannot help thinking that he did have an inclination in that direction. Yet he kept himself absolutely in check to prevent himself doing anything that might be unfair to the Department. You may disagree with his opinion—that is another matter—but I am perfectly confident that he believes to be the truth everything he has sworn to. Bagley invented scale and unravelling, and when he found it would not account for the accident he had to abandon it.

I must refer you to the sticky triple valve theory. You have heard both Bagley's evidence and Professor Kernot's evidence about that, and it seems that the question has been settled. I might remind you that Bagley examined the triple valves carefully, and found no dirt or anything likely to interfere with their working. The mere fact that the valves were not found to be sticky is not an absolute guarantee that the valves did not stick. The question for you to answer is, "Did that valve have anything to do with the failure of the brakes?"

Then with regard to the accidental moving of the brake handle—Milburn was cross-examined with a view to finding out whether he threw his handle over to the running or release position, or whether it was moved by vibration. I do not think that you will be justified in thinking that that was so, or could possibly be so. Milburn absolutely swears that that could not be possibly so, and Bagley says the same.

Another theory was the leaking rotary valve. Bagley says that it is alright, and Milburn says: "That would not account for it; my valve was alright." The rotary valve means a very good get-out for them, but Milburn says it is alright.

Was the Isolating Cock Closed?

We now come to the isolating cock. When it was first raised Mr. Corr got up and said that he admitted the isolating cock was closed. The train crew were called with regard to it, and they all swore about it. I commenced to feel very anxious about the isolating cock. After all, I thought, we may be doing a grave injustice to Milburn, because if you get the isolating cock open and in the running position, that would account for a great deal. It would nearly account for the story told by Milburn. It would account for the pressure being 70 and 90 lbs. It would account for the brakes holding for a certain length of time and then jumping off. It would

not account for the brakes being altogether off. If Milburn placed the handle in emergency position, and if we regard an empty train pipe instead of the isolating cock being open, the brakes would go on, but much more feebly, because of a certain amount of pressure being gone out of the auxiliary reservoir. Therefore, it would account for there being a great loss of power when the emergency application was made, but it would not account for the brakes being off at the time of the collision. I felt that after all we might be doing a grave injustice to Milburn, and in spite of the fact that his counsel admitted it was closed it was my duty to see whether or not his counsel had not admitted something too strong against him. I thought: "I do not care what his counsel admits against him, I am going to satisfy my mind about this isolating cock before I ask the Jury to say whether the isolating cock was closed alright," and so I had the witnesses brought back, and I took a whole day over cross-examining them. I was satisfied after that evidence, and my mind has been put to rest. I had pictured to myself those brakes suddenly going off. It haunted me for two or three days; then I thought —"My word, that isolating cock might have been open after all;" but after the searching cross-examination I felt that I had been unnecessarily worrying myself, and that when Mr. Corr admitted that the isolating cock was closed he was probably doing the best thing he could do for his client, because that brought him in with the other men to tell the one solid story.

I went carefully through the evidence of Deveney, and I was struck with it, inasmuch as he didn't know too much about the isolating cock, and that is a very good test. If Deveney had said: I saw the isolating cock before we got to Macedon, and before we got to Sunbury, and before we got to St. Albans, and just before the accident at Sunshine—I was always looking at it and it was always closed"—I should have had my doubts, but when I examined his evidence, I find he tells a story which looks very much like the story of a truthful man on this point, because he says: "Well, I cannot say I actually saw the isolating cock after Kyneton, but I did see it alright at Kyneton, and I am quite certain it was not open at Macedon"—and he gives his reasons, and those reasons are borne out by Dolman. Deveney says, "I am quite sure it could not have been opened by Dolman at Sunbury," and he gives his reasons why. If he was going to lie about it,

he would say it was a question of it being impossible for Dolman to do it, and say, "I saw it closed at Sunbury." But he doesn't say that. It is like the evidence of a truthful man. It is so easy, if he wanted to lie to say: "I saw it, and it was closed. But he won't say that; what he does say is, "I saw Tomlinson go up and feel the isolating cock after the accident." Deveney is the man who said: "I know Milburn a great deal better than I know Dolman, and if I wanted to help anybody it would be Milburn. I have never driven with Dolman before, and there was no reason for me to get Milburn into trouble and to get Dolman out, because my interests rather were to get poor Milburn out—the man I have known for so long—and make the Jury believe the isolating cock was wrong. "Yet," he says, "all I can say is, I am perfectly certain it was closed."

Then I put Tomlinson into the box, and re-cross-examined him on it. He is the man who is very much interested in saying that the isolating cock might have been open, because it might be that Tomlinson is liable to have a verdict against him. Yet he gets off the engine, and finds the isolating cock closed, and when I put the question to him straight he says: "No, I am quite certain it was closed alright." And so the whole of the evidence goes to prove that the isolating cock was closed.

Were the Brakes on when the Collision Occurred?

Take the next point. What do you say about the question whether the brakes were on or off at the time of the collision? Are you satisfied they were on? Mr. Bagley has given his very strong opinion that they were on, an opinion founded upon reason which may commend itself to you. It does not require a skilled expert to appreciate the basis of his reason. Bagley says: "I think the brakes were undoubtedly on at the time of the collision, because, if they had not been on, the Bendigo train would have been knocked about very badly. Some of the carriages would have been broken into matchwood." How did the brakes get on? That is what I want to know if Milburn's story is true. You see, they jumped off, and the crew of the Bendigo train say they believe they were all off, and remained off. How did they get on?

Which is the Probable Story?

There are two other things I want to refer you to on this question of the probability of these men's story; and I will first refer you to one of those tests—No. 1. According to their evidence, before they came to the distant signal, they were travelling at about 50 miles an hour; they applied the brake when it was only 200 or 300 yards away from the distant signal—they made a service application—which reduced the pace of the train to about 40 miles an hour—curiously enough just about the pace the train was being driven at on No. 1 test held on 28th April. When it was reduced in that 200 or 300 yards the brake was acting very well. Between the distant and the home signal, somewhere between the distant and a couple of hundred yards short of the home, a further reduction was made, and yet the train was only reduced to 32 miles an hour. That is very curious. I don't quite understand how it is that in 200 or 300 yards they reduced her down from 50 to 40, and in the next 480 yards—it is 680 yards from the distant to the home—they only reduced it by 8 miles and hour, and brought her down to 32, or I will say 30, when the brakes were probably better than they were acting at the test. It seems to me a matter of common sense that as the train is getting slower she is pulled up quicker, so that if you make a service application of the brake with the train going at 50 miles an hour, for the first 300 yards it will not be pulled up at the same rate as in the next 300 yards, unless the brakes are getting weaker preliminary to jumping off. I think the answer to that is, first of all, according to the witnesses' evidence, they were not getting weaker preliminary to jumping off, and it is a very good thing to get a suggestion like that, because it enables you to examine all the more closely what the brakes would tend to do. To put that more clearly, the witnesses state that the first application gripped well and held well, and on the second reduction they still gripped well and held well—the brakes were holding well all the time in their judgment, and they suddenly went off. It seems to me that that either shows that their story is untrue altogether, or it shows that they must have been going at the distant signal a very great deal faster than 40 miles an hour. On that test the train stopped in 1134 feet—that is, roughly, 400 yards, at a service reduction of 10 to 15 lbs.

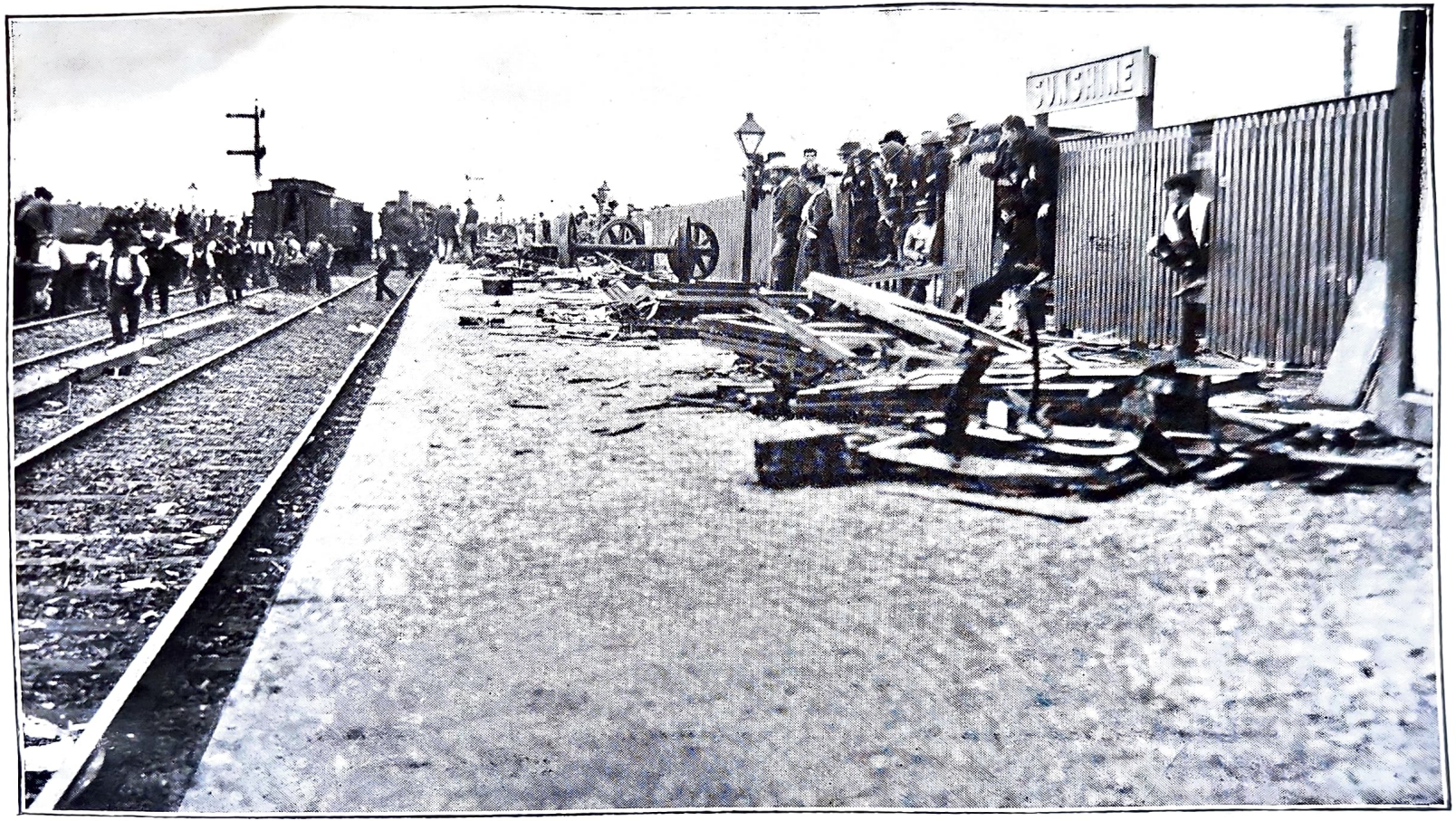
The next thing I want to draw your attention to is the test which was required by the Coroner:—"Both engines to be reversed at the home signal, steam regulators open, and tender hand brakes put hard on when passing the home." You must remember that they got ready 100 yards before the home, so that the brakes could be jammed on at once at the home, and the reversing gear, too, I think. You may take it for granted that in this test they manipulated both brakes and reversing gear so that they would take effect at the home as near as they could get it. Remembering that, you find that they stopped in 734 ft. from the home signal. That is exactly 83 ft. beyond the point of impact. It is a curious fact that in the test the train pulled up in 83 ft. beyond the point of impact, while on the night of the collision the Bendigo train travelled about 190 ft. after striking the Ballarat train. That is a thing that is very well worthy of your notice, because that test turned out to be an excellent test, because the rate of speed—29 miles an hour—is so remarkably near the rate of speed which those men on the engine say their train was at, at or near the home signal—32 miles an hour some 200 yards from it. If you will compare that 29 miles an hour with what actually happened, it is certainly one of those things you ought to look to to make up your minds whether the story is true or not. It is wonderful how closely this test corresponds with what they say actually happened on that night. Why was it, then, if their story is true, that the train, instead of being pulled up in 743 ft., 83 ft. beyond the point of impact, it was not pulled up till nearly 200 feet beyond, and, in addition to that, with all the resistance of the Ballarat train to overcome.

Another and a Different Story.

I am now going to take you to the other story—the story told by the guards and civilians. The guard says: "There was a check just before the distant signal, and then the brakes were released; then they came on again before reaching the home." He said just before the home, and in another part of his evidence he said "a train or two lengths" before the home. I think it is a very important question for you to determine whether the brakes which the guard says he felt were the Westinghouse brakes or the hand-brakes, which the men admit they put on at the home, and which all the men say commenced to come into operation just about the home, or

a little before the home—somewhere within 50 yards of the home. It may be said that the brakes the guard described as having felt at or about the home signal were the hand brakes, and not the Westinghouse brakes at all. He says: "After passing the distant signal I was looking out. I could not see the home signal because of the smoke. Half-way between the distant and the home signal I went to the window to try and get a better view of the home signal, but I could not see it. When the engine was not far from the home I felt the application of the brake again. I could not say how far it was away; the momentum of the train was not in any way rough, but the speed was reduced. From the time I felt the brakes being applied the second time near the home signal the train went on smoothly, but at a slower pace. It appeared to be continuously going at a slower pace. I did not feel as if the train was first of all slowed and then jumped away again. I was standing in the centre of the van, and you do not feel the effect so much as if you are over the wheels. I felt no jumping away. . . . I am not able to say whether the application of the brake was an emergency application or not. I did not at any time see the tail lights of the Ballarat train. I would think the brakes were on at the time of the collision." He also says: "Approaching the distant signal at Sunshine I felt a check. It was some distance behind the distant signal—a train-length distance behind. . . . I felt the application of the brakes going on in a gentle form, nothing extraordinarily harsh about it. . . . I could not tell whether the application was an emergency or not unless I was looking at the gauge. . . . I have a recollection of the brakes being on the wheels." "When I felt the check at the distant signal it was momentarily; I felt the application of the brake on and off again. I do not know that it checked the speed of the train very much; I did not notice much difference. Shortly before we got to the home signal I felt the brakes go on again." Then, in answer to a question, the guard says: "When I felt the first application at the distant signal it was an indication to me that the drivers had seen the signals and were obeying them." "I did not notice any difference between the application of the brake on the night of the tests and the application of the brake on the night of the accident."

Then you have the evidence of a long list of civilians. Does their evidence lead you to the conclusion that the real truth of the matter is that these men approached the home



THE SUNSHINE PLATFORM STREWN WITH PORTIONS OF THE WRECKED CARRIAGES.

A grim testimony to the dreadful collision which had occurred a few hours previously.

DETECTIVE BURVETT (who worked so hard to collect the reports and arrange for evidence for the Coroner's enquiry) making enquiries from Mr. Gwenneth, C.E., and Mr. Selley *re* the disaster.

and distant signals at a great deal too high a speed, and that they approached the home signal at a high speed, hoping that the home would be taken off, and finding at the last moment that it was not taken off? There is a story told by the guard and various civilians, and with its various probabilities, and there is the story as told by the crew; and it is for you to say which is the true one.

Counsel and the Tests.

I now want to draw your attention to test No. 4—and there is no mistake that the tests do throw a lot of light on this question. Take No. 4, and recollect for a moment that the suggestion is that this train was being driven up to within 250 feet of the home signal to begin with. If you take 250 feet as a basis, with the suggestion that the train was going about 50 miles an hour at the distant, at which point the brakes were "felt," according to the guard, and if the brakes are applied in emergency 250 feet from the home, the train has got to travel 250 plus 651, which brings you to the point of impact. Then you must add to that the 199 feet which the train travelled beyond the point of impact, which will give you a total distance of 1100 feet. So that, in fact, and on the assumption that on the night of the disaster the brakes were applied 250 feet before the home signal, the train was pulled up in 1100 feet. She then had the Ballarat train assisting to stop her by its resistance. At the test you will find—No. 4 test—at 48 miles an hour, she is pulled up in 1268 feet. There is a remarkable coincidence between these two.

The Quick-acting Brake Not Necessary.

In regard to the quick-acting brakes, I was asked to make enquiries about it from the various witnesses, although I never was of opinion that the Railway Commissioners could be convicted of negligence because they did not have the quick-acting brake, even if it was better than the plain automatic. Well, all the experts apparently say that the quick-acting brake for all practical purposes, in a train of the length of the Bendigo train, is no better than the plain automatic. In view of this and all the evidence given I must say I think it was ill-advised of Mr. Corr to cling to the fact that the quick-acting brake not being used is one of the causes for which the railways or their officers should be held responsible, and

as a reason why his client should not be held responsible. I think it is only right to refer to the quick-acting brake, because I do not think that not having the quick-acting brake had anything to do with this accident.

With regard to the question of whether this brake was reasonably fit for the purpose for which it was required. Right up to the accident all the practical men—the drivers—agree that it was a good, useful brake—not a brake that would stop the train in the quickest time on record, but one that, when people get into that train they can be driven safely—the train can be controlled going down grades, and can be stopped safely at stations. You don't require an ideal brake. I feel sure that the men are not entitled to say: "Oh, well, it is perfectly true we drove up to that distant signal at 50 miles an hour: it is perfectly true we didn't put on the brakes until we were 250 feet from the home signal, but if we had only had a brake right up to the standard of the Westinghouse—in fact, higher than that—we could have stopped the train in time." Neither does the law entitle them to say: "You Railway Commissioners ought to put a brake in my hand, that when I grossly break all the regulations, and pay no heed to distant and danger signals, and get myself into a fearful mess, I can pull up before I do any damage."

It does strike me that the way to put the whole matter is this:—If Milburn's story is true that the brakes flew off, it is a defence which has nothing to do with anything but the flying off of the brakes. If the guard's and civilians' version is true, defective brakes do not come into the question, because it was undoubtedly their negligence in driving at a great and excessive speed that was the real and substantial cause of the accident.

Mr. Starke desires me to call your attention to test No. 9, of the isolating cock—that is, where the isolating cock is open all the time, and a full application is made. If the isolating cock was open at all, it was open all the way from Sunbury. Even when it was open the train stopped in 2047 feet with the emergency application. It seems to me that it is important to show that the isolating cock was not open. If the isolating cock was open, and 200 yards from the home it did throw off the brakes, the moment he put his handle to the emergency he gets some considerable power on the wheel, and with the addition of the hand brakes and the reversal of

the engine it seems to me that the train must have stopped long before it did. In that view, it seems to me very unlikely that that would cause the accident. I can understand that it would kick the brakes off, and that when the emergency is put on he would not have the same power, because he has not time to get the power up again, but still he does get some power, and when you add to that the pressure of the hand brakes and the reversed engines, I do not understand how the train did not stop.

An Appeal to the Jury.

After referring at some length to Kendall's responsibility in the matter of causing the collision, Mr. McArthur concluded:—"I would remind you that your duty is simply to determine this case on the evidence, and on nothing else. If you are doubtful about any particular point, you must ask yourselves what is the evidence about it, and what is more, I advise you to harden your hearts, so to speak—that is to say, do not allow yourselves to be swayed by sympathy. I do not think you ought to allow yourselves to be influenced in favour of Milburn by any of that very natural feeling of sympathy that you must have—as we all have—for him, any more than you should allow yourselves to be influenced with the relatives of those people who have been killed. In other words, I would advise you not to allow yourselves to be influenced by sympathy one way or the other, nor by the fact that this has been a very grave disaster, which has attracted the attention not only of this community, but of people all over the world. I would advise you strongly to regard this simply as a case in which only one individual has been killed. Keep sympathy out of the question—keep public opinion out of the question; and decide as you think right on the evidence.

DR. COLE,

the Coroner, placed the facts of the case before the Jury in a splendid speech, which was listened to with deep interest. Though undemonstrative in his manner, Dr. Cole has an impressive style of speech, and the way in which he gave the charge to the Jury, and the able manner in which he pointed out the law in relation to the salient features of the evidence given at the enquiry, showed him to be a master hand at

analysis and deductive reasoning, and must have considerably lightened the task of the Jury in arriving at a verdict.

A Record Enquiry.

Dr. Cole said:—This enquiry has, I think, established for itself a record in this State of Victoria as being the lengthiest inquest that we have ever had. You were summoned as jurors early in May, and we have now sat on till the beginning of July, and during that time the evidence taken in the case has grown, until it has made quite a bulky volume. I, as Coroner, summoned you in order that you might find out the cause of the death of one of the persons who was killed in a railway accident at the Sunshine railway station. I used my judgment as to those whom I would call, and from my experience of you, gained during this lengthy hearing, I think that you have not only exceeded the opinion which I formed of you from the start, but have gone very far beyond it; and your assistance in this enquiry has lightened my labours considerably. I know you have not only attended to the evidence, but have noted the evidence carefully when it was supplied to you on the day after its being taken by the shorthand writers. I know you have gone carefully into it, and considered it, and I think I might safely say that you know more about the evidence than we do—speaking for myself and those learned Counsel engaged in the enquiry.

I think the evidence we have gone into is quite sufficient for you to form an independent view, apart from any other consideration. I think the evidence will entitle you to say, not only that this railway accident was caused directly by certain things, but entitles you to go into indirect causes as far as the evidence goes. The scope of this enquiry goes beyond what Mr. McArthur, as Counsel assisting me here, has pointed out, and goes beyond the mere direct cause of death. I think it entitles you to say whether, in your opinion, there were any matters that led up to the accident at Sunshine station—matters that may not, of course, involve any person, but that may direct the attention of those in authority to possible things that have escaped their purview.

The Jury Restricted to the Evidence.

I would like to warn you not to go beyond the evidence. You have not been restricted in any way. You have mixed with people, and heard their opinions freely expressed in

the street, and during your daily concerns, and especially upon a subject upon which everybody in this community of ours has been thinking for weeks. You have read in the press accounts of the matter, and you have, no doubt, seen opinions in the press and heard opinions expressed by different people. I warn you distinctly not to be guided in any way by those opinions you have heard outside. You must not be guided in any way by the opinion of the Coroner himself, but decide the matter according to the evidence, and to the best of your skill and knowledge, and you must not go beyond that in your determination.

Some of you gentlemen may have formed your opinion before you were summoned as Jurors. I would ask you as far as possible to dismiss that opinion from your minds, and come to the consideration of your verdict with a mind unfettered by any preconceived notion whatever.

Some of you may have feelings possibly that may tend to bias your minds in some respect, but I would ask you not to allow your feelings or your ideas on the subject to be in any way swayed in that direction. I would ask you to look at the evidence, and on nothing but the evidence you should come to consider your verdict.

I would like to say that I have had great assistance from persons who have taken an interest in this enquiry. The assistance in many cases I have used—that is to say, letters suggesting certain views, and especially from railway and ex-railway men. Those letters, taking them altogether, have assisted me, and I wish to thank those who wrote them for the suggestions offered. There is no doubt an intelligent co-operation in a matter of this sort helps one very greatly. I also wish to state that the press in this matter have given me cordial assistance, and very cordial help to you and me in endeavouring to get out all the evidence required in this enquiry.

The Coroner's Opinion of the Railways.

And now a few words as to the railways of this State. At the beginning of the enquiry the Secretary of Railways (Mr. L. McClelland) wrote me a letter, promising that the Railways would give me every assistance possible. You are the best judges as to whether the promise in that letter has been carried out. I think I can say that the Railways have given us every assistance. Of course, you can understand that an accident of this sort has not only shocked the public, but

it has shocked the Railway Department itself, and it has had the effect, I should think, of stirring up that Department, from the Commissioners down to the lowest paid employe in the Railway service.

We have examined a good number of railway men in this enquiry, and from them all I think we have had the most cordial co-operation and assistance that could be given by any body of men.

You will understand that the Railways are a great business. The Railway Department is practically the largest Department of State we have, and you will understand, as men of business, that the Railway Department do not want outsiders continually prying into their methods, and disturbing their business by interfering with those methods, and it is a policy of reticence which is incidental to all big businesses. You would have an inclination to prevent enquiries which didn't seem to help in any way, but I do not think the Railway Department has not displayed to any great extent any reticence in helping us in this enquiry. They have had tests, which we attended. They had tests at my instance before you were summoned, and afterwards also, and they have put their whole organisation at our service in an endeavour to clear up this matter.

It has come out in the enquiry what a splendid organisation our railways are. You have seen men and officers who have given evidence in this case, and they have proved to you that the railway men are as fine a body of men as the State can have in its service. There is a solidity about them, and they seem to know their business thoroughly well, and the discipline seems to be splendid. They all seem to have the railway service at heart. You have had engine drivers before you, and other railway officers, and you have seen that they are all men in whim I think we can say that the trust of the railways is not badly placed.

Incidentally during the case we have had mention of the Railway strike. Well, I don't think that the fact of there having been a strike comes into this case at all. There is nothing to show any of the latter effects in the evidence given before you. I do not think there is anything that would show disloyalty on the part of drivers who have gone back to their work, and you can safely come to the conclusion that the effect of the strike need not be considered at all.

COMMENDING THE ENGINE DRIVERS.

And now a word as to the engine drivers. You have had before you several—some ten I think—giving evidence in the witness box, and you have seen what stamp of men they are; and you can say that they are men who understand their work, and are thoroughly aware of its dangerous condition. The responsibility of engine driving is very great indeed, and the drivers are the pilots upon whom the public depend for steering their trains from one part of the State to another. They must have nerve and judgment, and it will be a question for you to consider whether in this case the particular engine drivers who may be concerned in this case lost their nerve and judgment.

As to the witnesses—the chief witnesses were Railway men. That is inseparable from enquiries of this sort. You must have those men brought before you, and the railway men are the persons concerned; but there were other witnesses—civil witnesses—and their evidence has been commented upon by counsel as being unreliable, by reason of the fact that they were not skilled in railway matters. I think myself in this case that you will be able to place great reliance upon the civil and other witnesses.

Then there were the expert witnesses—Professor Kernot, who unfortunately delayed the enquiry by illness; Mr. Selley, Westinghouse brake expert, and Mr. Bagley. I would like to say as to them, that they were men who gave us great assistance, and were not in any way biassed or influenced by their positions. Mr. Bagley, for instance, might be said to have been a witness who could give evidence on both sides. He had been an engineman himself, and later on became a brake expert, and knew not only the conditions under which the brake ought to have been worked, but he had the practical experience himself of the working of the brake. On his evidence I think you can place a great deal of reliance, because he struck me as being a man who was intensely eager to do justice to both sides—that is the men whose conduct was in question and the Railway Department—and was also keenly alive to seeing that the public, through the Coroner, should get to the root of the matter.

The Safety of the Public of Paramount Importance.

And now, as to the conditions of railway travelling in Victoria. The first condition—and we have it in the rules—enjoined on all railway servants is the safety of the public. "The safety of the public shall be the first and most important duty of every employe." That is the regulation, and it means that the railways have got to be eternally vigilant so as to conserve the public safety. They have to take care that the public are not injured in any way. Then there is another condition of railway travelling, and that is efficiency, and it will be for you to consider as to whether this train was an efficient train—that is, was it a train proper for the purpose for which it was employed.

Of course, the question of the railways running to time will come in, and as to that, I think it will be a matter for you to consider whether in this particular case either of the men primarily concerned—that is either Kendall or Milburn—was not endeavouring to save time at the expense of a certain amount of risk. The regulation as to time is the one which enjoins upon engine drivers to run to time. It was more in respect to one of the conditions of railway travelling that I was mentioning it, because learned counsel mentioned that the time-table was only for the convenience of the public. But there has been produced in evidence time-tables for the running of goods trains, and they were certainly issued for the convenience and for the guidance of the officers of the Department. But it becomes a material fact, this question of time, when considering safety and efficiency and the rights of the general public. You know of your own knowledge that frequent complaints are from time to time made about the running of trains. That has been referred to in the evidence of Mr. Burgess and Mr. Mathieson, and someone else. As to the trains running to time, you must remember that engine drivers are enjoined by this rule to run to time. I might mention just here that there is evidence given by a witness who saw the Bendigo train coming into Sunshine, that that particular train did not usually stop at Sunshine. It would appear that if a train were late that injunction would operate accordingly upon the engine driver's mind.

Public Outcry for Fast Trains.

There is another question comes in here—the speed of trains. No one who is travelling, unless it be possibly an

undertaker, likes to have his speed reduced to a minimum, and no one who travels in a railway train likes to run at a slow rate. On the contrary, the public are always crying out for fast trains, and on the Bendigo line especially the question of fast trains has been urged from time to time, and a strain has therefore been put upon the Department in order to run to time. You have Mr. Bagley's evidence that engine drivers have to "flog" their engines coming down from Bendigo. That, taken in conjunction with this particular case, with holiday traffic, and the delay at stations, would cause the engine driver more than ever to flog his train coming down that line. That is a question you will have to deal with in considering the mind of the engine driver or drivers on this particular train. These three questions—speed, efficiency and safety—are questions I think you are entitled to consider.

We have heard advocated from time to time other accidents on railways. I was directed by an old railway servant to an accident which occurred on the North-Eastern Railway in the county of Durham. I have been handed accounts of an accident at Sunnyside, in Scotland. We cannot rely on these accidents at all. We cannot get the circumstances the same. There is always some difference which makes all the difference, and therefore I would ask you to put out of your mind, when considering your verdict, all the instances you have heard.

The Coroner went on to say:—Not alone is the question of the place, but the time must also be considered—a holiday, for instance. If a man drives a railway train—a crowded railway train—on a holiday on a line that approaches the junction of another line, the question will be whether that should not be an element in considering whether he had not driven carelessly, wickedly carelessly, or not. The driver of a carriage is not bound to keep on the proper side of the road, but if he do not do so he is bound to use more care and keep a better look-out. That question, too, comes in here in considering the question of negligence. If a driver intended to do a certain thing that was unlawful, that is contrary to the practice and to what he is enjoined to do, he does it with a greater amount of risk, and therefore in this aspect you would consider the fast driving of a railway train up to a certain point. Is he entitled to do it at a fast rate, and does not that savour to some extent of want of caution? Sir John Jarvis puts it this way:—"And generally if any person upon whom

the law imposes any duty or who has by contract or otherwise taken upon himself any duty tending to the preservation of life and who neglects to perform that duty and thereby causes death of another is guilty at least of manslaughter." What amount of negligence is necessary to complete the offence must depend on the circumstances of each particular case.

What is Culpable Negligence?

While on the subject of engine drivers, I will point out that the first thing you have to do is to find out what is the duty, and next how that duty was performed—culpably negligently or not. For instance, in a case cited by Mr. Chomley, if the engine driver acted through error of judgment—supposing he was suddenly called upon to decide, "Will I pass that home signal at danger, because I am late, and it is of more value to me to make up time, than it is to obey the rule which enjoins on me to stop at the home signal?"—if that is done in a moment—he has to decide that—you must consider the question whether it was a mere error of judgment or something more than that. The evidence in this case, with very slight exceptions, points to the fact that a man may not pass the home at danger, but then you will have to consider all the surroundings, whether to some extent—I do not say entirely—he was not, so to speak, bustled out of the due observance of the regulations as to the home signals, and called upon suddenly to make a decision in his mind, "Will that signal come off? It will come off." You will remember that one of the engine drivers said, "I have often known the home signal to come off," meaning that on certain occasions the home might suddenly come off, and so allow a man to obey the rule enjoining him to save time for the public convenience. The breach of a regulation, if it causes the death of a person, may, if it be a wilful breach, amount to manslaughter. The cases cited do not say, "It will," but "It may," therefore in that aspect you will have to consider it. If it be merely an error of judgment, or if a man's mind be in such a condition that when he is suddenly called upon to decide a question he decides wrongfully, but does not act with wilful mischief, then I think it will be a matter for you to decide whether he is guilty of culpable negligence in such a case.

I ask you to find the duty, and whether it was broken, and was the breach of it culpable. If you find all these things in the affirmative, then you will have no difficulty in finding manslaughter, but if you find any of them in the negative, then you will find, not manslaughter, but misadventure in the case of that particular individual.

THE LETTER OF THE RULES NOT OBEYED.

There is another question in regard to the two engine drivers—that is, how far the rule as to signals is to be obeyed. Rule 55 states that when a man finds a distant at danger he must immediately reduce the speed of his train so as to be able, in case of need, to stop at such signal, but if he sees that the way in front of him is clear, he must proceed cautiously within the distant signal, having such control of his train as to be able to stop it short of any obstruction that may exist between the distant and the home, and must bring his train to a stand as near the home signal as the circumstances will allow. This rule seems to point to the fact that the distant and home signals stop a train, and if they are both at danger the engine driver must stop at the home signal. All the evidence points to the fact that the home is taken as a block. But the question you have to decide is whether it is a block, or when at danger it is only a block in this aspect, that he must stop at the station. There is another rule, 58B, "When a train has been stopped or brought nearly to a stand at the home." That would seem to mean that the train is running down, or possibly is still in motion at the home, and it is necessary to bring it within the home before the section ahead is clear. "The signalman must, where a starter is provided, and that signal is at danger, lower the home for the train to draw ahead." You will have to consider whether in this particular case the train was at such a speed when coming down to the home that this rule could not have applied, because according to the evidence the starter was off, and that starter being off might have induced the engine driver to have considered whether the line was not clear ahead, because Rule 55 refers to line clear ahead, and the question you will have to consider is whether this man was not entitled to consider that the line was clear, the starter being off, and whether he could not say, "The starter being off, I may reasonably expect the home to come off when I get to it."

FROM BENDIGO TO SUNSHINE ON THE NIGHT OF THE DISASTER.

I would like you to attend to the history of this train, because if we follow this train carefully it will give us some light on the subject of the enquiry. This train left Bendigo 5 minutes late; it was one of three trains into which the ordinary 6.50 had been split by reason of the increased holiday traffic; this train arrived at Kyneton 26 minutes late. If we follow the story of the train on the run down it will throw light on the driver's conduct on the road down, and also show us how far he is influenced by the loss of time that he was incurring. The train arrived at Kyneton 26 minutes late—it was 5 minutes late in starting, and had lost 21 minutes on the trip. The guard says in his evidence: "We stopped at Kyneton 11 minutes; before we left the stationmaster said we were to run to North Melbourne without stopping." The stationmaster also said that, owing to the train being nearly full, he had said to run the train right through to North Melbourne without stopping, and that he did that for the convenience of the passengers. It was intended, evidently, that the amount of time lost on the trip might be made up. Up to reaching Kyneton the driver had not run at excessive speed. You will find that he ran at the rate of 20 miles an hour, which is not excessive, even though the grade from Bendigo to Kyneton is an up-grade. That is important, because it shows that up to that point the speed was not excessive. There seems to be some doubt as to whether Milburn received the instruction to run through to North Melbourne without stopping. It is material in the matter, because there has been a question before the Jury as to whether this was or was not a fast train. There is no doubt it was actually a fast train so far as the public are concerned and the speed attained. In fact, the Bendigo line is the line in this State upon which the fastest trains are run. But there are what are called in the Department "fast" trains run on that line, and according to the officers of the Department this train, which was allowed to set down at certain stations, was not a fast train. That is material for you to consider, because a fast train is run under very different conditions to an ordinary train. A fast train is given precedence, and it has also certain signals of its own. This train, the Department says, was not a fast or express train, and although it had in some respects the incidence of a fast

train it was not to be regarded as one. This is a material point when you come to consider the driver's conduct. It may be considered by you, because, if the driver had in mind that it was a fast train, the question as to how far his conduct was governed by that is one you will carefully consider.

MILBURN ON THE LOOK-OUT FOR SIGNALS.

Another point is that at Carlsruhe—the station between Kyneton and Woodend—the driver is pulled up. That shows that he has gone at a great speed, but he obeys the signals, and loses a minute. Later on he goes on to Woodend, where there is a longer delay—6 minutes were lost. Continuing, he leaves Woodend 6 minutes late, and is running through Macedon at a speed somewhere about 50 miles an hour, and is pulled up by Stationmaster McDonald, who was a passenger by the train, pulling the communication cord slightly. That announced the matter to the guard, and he also pulled his communication cord slightly—but the guard took no part in the pulling up of the train. It was pulled up by Milburn. That fact shows that at that period he was not acting in defiance of instructions, but he was governed by the rule that, if the guard lowers the pressure in the train-pipe ever so slightly, it is a signal for him to pull up, which he did. If he were going at 50 miles an hour through Macedon station, which is a down grade, he must have pulled up pretty rapidly.

I am going down the line in this fashion in order to help you to get at the mind of this man—to show whether he was or was not on that journey down wickedly negligent in his driving of the train. You may think he suddenly became wickedly negligent when he was getting close to home, and that otherwise he had driven the train with care all the way down until he arrived at Sunshine.

Well, the train was backed to Macedon, and there was a delay. That was piling up the delay that had already occurred. They were now 26 minutes late, and the train was getting later and later owing to numbers of holiday excursionists endeavouring to get in. They arrvied at Sunbury 30 minutes late. You will remember that, according to the train records, the train came down from Macedon to Sunbury at a great speed. According to the train records it was 80 miles an hour; according to the guard's train book it was about 67 miles an hour. Evidently they had made up some

time at Sunbury, and there the train was pulled up, curiously enough by Dolman, the driver of the second engine, because something had gone wrong—one of his piston-rods had become heated. You will remember a significant expression of Milburn's when the train was pulled up. He said, "Hang it all! Here is another stop—what's the matter now?" That may or may not indicate to your mind that what was in his mind was this loss of time—it was influencing him, and he was thinking more of the time than anything else. That was the one governing principle, it appears to me, which actuated him right through. He wanted to gain time, and here he was losing it. The stop at Sunbury must have come rather as a shock to him, because the signals were off. He came down that steep bank into Sunbury, and the whole train was pulled up. You have been told in the witness box that it is a dangerous thing for the second engine driver to handle the brake, but there was evidently no danger on this particular night.

There is a point in Guard Darcy's evidence that is worth noticing. He said he got a good view of the home at danger. Now, he was in the end of the train—in the van—so that there could be no doubt that if he saw the home at danger the men in the front of the train must have seen the home at danger, and yet it does not appear that the driver of the second engine took any particular notice of the home until he was passing it.

The Speed at the Distant Signal.

There is a good deal of evidence as to the speed at which the train passed the distant, and also as to what the speed should have been when the train passed the distant, it being at danger. Driver Harcombe stated that with the distant signal at danger he would come down at 35 to 40 miles an hour. Guard Darcy states he felt a check. If he were going down at 50 miles an hour, it may have been a reduction of 5 or 10 miles, and it might have brought it within Harcombe's rule, but the significance of this check is that the driver had his brake in hand, and that he was on the alert for all that might happen—it was not as if he had let his train go regardless of signals. Guard Darcy said the brake was applied and released—that is to say, the driver had checked his train, and was then letting it roll or putting on steam, but there is no evidence that he was putting on steam, and Milburn's own evidence is that he was letting her roll, which I understand

is the custom at that point. Steam is shut off, and her own momentum brings her down to the home signal.

Darcy fixes the speed immediately before the check at 50 miles an hour. You gentlemen would know that that is a great speed, and at that particular point, if you were in a second class dog-box, as one of the witnesses described it, it would cause a good deal of discomfort. I would ask you to notice very particularly when you come to the evidence of the lay witnesses, if I may so term them, that they speak from their own sensations, and have no criterion of speed except their own feelings.

The guard states that he felt the brakes applied again, and from that point he felt a continuous slowing down. He states he did not see the light of the home signal again, but he saw the post, and the arm was at danger—that is to say, he looked out, and as the window came past the post he noticed it. He says also that he felt the grip of the brakes. Now I would ask you to pay particular attention to his evidence on this point, because it is the evidence of a man who knows what he is talking about; he has been in that train several times before, and with that driver. He would be put in a position as regards his sensations, and in the translation of those sensations into facts he would be practically a skilled witness. He says he felt the grip of the brakes, and there is no doubt when the train passed that home signal the brakes were gripping, and there was a continuous slowing down. But you will have to determine the matter of the speed of the train. If the train was rushing down after the first check it will be for you to say what speed she was checked down to. I had a test to prove the speed at which the train would come down there, or, rather, the amount of speed she would lose, supposing she was coming at a certain speed, and the steam was shut off. At 60 miles an hour past the distant she would lose a speed of something between 4 and 5 miles when coming into Sunshine station—she would not gain speed—and if she were checked down from 50 to 40 miles she would not have any more speed at the time the brakes were applied. According to Milburn's evidence, he applied the brake the second time. It is for you to say whether that is so. If he applied the brake a second time that would still further reduce the train speed, and then it will be for you to say at what speed the train passed the home signal.

Evidence Greatly at Variance.

At that point in the journey we come to a great discrepancy in the evidence, and in this connection I would like to say a few words to you concerning the evidence given by the engine drivers and the two firemen, because they are companions in misfortune. They are the four persons who were concerned mainly, with the Stationmaster, Kendall, in this sad and grave occurrence at Sunshine. You will remember that these four men were not interviewed by any of the officials of the railway upon the subject for some time after the collision. You will also understand that they are, as Mr. Corr put it, fighting for their lives. They are the persons whose conduct may be culpably negligent in this case, and therefore they have a grave stake in the matter. Two at least of the other men are their companions in arms, and you must understand that their position entitled them, or, rather, it induces them to put the facts in the light most favourable to themselves. One of the Counsel said something about self-preservation being the first law of nature. That is so, and in that aspect you will criticise their evidence, and even if you disbelieve their evidence there is some reason why I think they should be excused if they put the facts in such a way as to relieve themselves, as far as they could, of the grave responsibility cast upon them. In their evidence some of them stated that the train jumped away. That is to say, the brakes no longer gripped. We will assume that steam was shut off—in fact, I think you may almost say it is clear that steam at that point would be shut off, and that the train was rolling down when it jumped away. In order to believe it occurred you will have to disbelieve the evidence of Guard Darcy and disbelieve the evidence of all the other witnesss (civilians) who said they did not feel any jump away. They have all spoken of the gradual slowing down that the guard mentioned.

There is another point. No person on the train, I take it, is more alert for a whistle than the guard. It may be that he hears whistles so frequently that he does not take any notice of them; but if he is on the train it is the one communication that the engine driver has with him, and the first thing the engine driver will do if he is in trouble is to give an alarm whistle to call the guard's attention; Darcy states distinctly he heard no alarm whistle. We are told by an eye-

Reading from left to right: Mr. SELLY, Representative Westinghouse Co.; Mr. ALEXANDER, Asst. Manager Newport Workshops; Inspector SHANNON, Railway Dept.; Mr. SMITH, Workshops Manager; Mr. WOODRUFFE, C.M.E.

THE DAY AFTER THE DISASTER AT SUNSHINE.

The crowd watching the efforts made to clear the line of the wrecked carriages of the Ballarat Train.

witness that there was one continuous whistle. That is, I take it, to denote that the train was approaching a station.

Is Milburn's Evidence Credible?

It would appear that these witnesses contradict the engine driver. There are other points that show the engine driver's story is not so credible—I will put it that way—of course, it is for you to say, but it does not appear to be so credible. The credibility of a story is not the sole test by which you estimate it. You must apply every test you can, because a man may tell a plausible story, and it may be a terrible untruth. In this aspect I would ask you to look particularly at the evidence of the driver of the second engine, because it appears to me, according to his own evidence, that he had very little information of what was going on until the home signal was passed. Dolman says in his evidence, "I knew I was behind a good driver." He says that distinctly, and in reply to me he stated he had been up since 4 o'clock that morning. You will also remember that when he yoked on to that train at Kyneton he did so because he preferred to come down with a train in charge of another driver than to come down light—that is to say, with the engine without any train at all. That is a significant point—whether he did not think: "It will be much easier for me to come down behind an experienced man like Milburn, and so relieve myself of responsibility altogether." He says in his evidence in another place that he did not apply the emergency until after the home was passed. I would ask you carefully to look into the evidence here also, because it is only on a little point like this that you can really estimate the value of evidence when it comes to direct contradiction such as we have got here. If Dolman did not apply the emergency until after he had passed the home signal, and he was coming at a speed estimated at 25 miles an hour when the collision took place, what occasion would he have to apply any emergency?

Mr. Chomley: He applied it at 50 or 60 miles.

The Coroner: He says in another place he did not. He thought the home would be pulled off, and he therefore did not do anything until he passed the home signal.

Theories Advanced of No Value in This Case.

Turning, now, to the theories put forward by the experts bearing on the possible failure of the brake, I may say that

we have eliminated, as far as we are able, both scale and rust, and we have searched in every direction to find the cause, and if the train did jump away owing to a failure of the brakes, there is an end to the matter so far as the drivers are concerned, and so far as the responsibility of anybody is concerned, unless it be the Westinghouse people, who provide an instrument that may, on an occasion like this, play such a trick as will kill two score of people.

The question of the isolating cock has come in, but I think that the isolating cock mystery is no mystery at all, and that in this train the isolating cock was cut out in the second engine, and that it was not cut in again until there was an attempt made to move the train wreckage away from the unfortunate beings who had been injured, when the engines were uncoupled at the platform.

There is another point to be considered, and that is the condition of the rails on that night. It has to be considered in respect of the brakes and their effectiveness. Most of our time has been spent on the brakes; I do not think it has been spent wrongly or unprofitably, and it has been interesting. If the rails are damp, the effectiveness of the brake is certainly diminished. There is very little doubt that, and it must be remembered, there was a dew on the night of the disaster.

I will now refer you to Driver Milburn. I had spoken of it incidentally to show his state of mind; how he stopped the train at Carlsruhe in consequence of the signals, and again at Woodend, and how at Macedon he stopped after passing the station. I want you to look at Darcy's evidence carefully. Darcy was on the spot, and after the smash he takes a statement from Milburn at once. Milburn evidently volunteered the statement. He said: "You heard me check her up there." What did he mean? He meant, "I had the brake ready. I was relying on the brake." He does not say, "You felt it," but "You heard it." A witness says he goes by the blow; he hears whether the air goes out with good force or not. Milburn said: "You heard me," that is to say, "I was ready with my brake." Later on he says: "I had no air; I reversed hard, and there she is." It is a funny thing to say he applied pressure but had no air. If he has the pressure in his reservoir he has no air—the brakes are on tight. How did it come out? That is a question. Not by accident, seeing there is plenty of air in the second engine.

The man wanted to point out that he had, so to speak, his hand on what Mr. Bagley describes as "the pulse of the train."

The Point at which the Brakes Were Applied.

One of the witnesses—a very intelligent man (a solicitor)—said he felt the grip of the brakes. He was travelling in the guard's van, and the guard said that probably this witness would feel them better than he did on account of his position over the wheel—it is there you can feel the brakes best. Then two witnesses who saw the fire on the wheels placed the point at which it occurred, and from that you can assume the brakes were on at 250 feet from the home signal. The guard states that the brakes were on when passing the home—perhaps a train length or more before that. Those distances for all practical purposes correspond. It is for you to say, however, whether those brakes were on strongly at passing the home signal.

Another question comes in, and that is the question of the effectiveness of the brakes. It may be thought by you that if the brakes had been properly effective on that night the train would have stopped before the accident happened, even though the speed was great before they were put on and the time was short in which they had to operate.

The Guard's Responsibility.

There are two points I would like to mention for your consideration when dealing with Guard Darcy's responsibility in this case. The first is in regard to his duty in regard to the pulling up of the train. It might be thought that it was his duty to pull up this train when approaching Sunshine. If you look at Rule 200 you will find there is a regulation stating that guards must apply their brakes when a train is approaching a station at which it is timed to stop at too great a speed. You have heard what the guard said, that they did not expect to stop. I think you might infer from that that the guard had not, as far as he could tell, any duty enjoined on him to stop that train approaching the home signal or the Sunshine station.

The Isolating Cock Finally Discarded.

I understand there is some difficulty still in the minds of the Jury with regard to the isolating cock of the second

engine. Some members of the Jury, I understand, seem to think that the question comes in. As regards that, it can only come in as affecting the conduct of the two drivers. It was the duty of a driver of the second engine to see that the isolating cock was cut out. If it happened to be cut in then there would be a clear breach of duty on his part; and I think you might take this as being a duty specially enjoined on him, and it would be for him to see that he was not guilty of any neglect in the matter. I would ask you to put this matter out of your minds, because if those men have made up their minds to tell a story which is not true, I would not give the driver the benefit of the falsehood. If that isolating cock was really in the cut in position, and Milburn really thought it was in that position, he should have relied upon that fact in order to clear his character before the Jury and the Court. And there is another aspect of the matter—that, having agreed to leave the isolating cock theory out, he practically agrees, at his own expense, to exculpate the other driver; so that I think you might dismiss the subject from your minds.

Railway Regulations Bearing on the Case.

I would like now to direct your attention to some of the regulations applying to this case. There is the main regulation which you have to consider—a regulation enjoining upon engine drivers the necessity to observe all signals. There is no doubt that the signalling part of railway business is one of the most important branches of it; and there is a necessity to obey signals. Signals do not mean necessarily blocks to a train, but they may mean something more. They may be directory in the case of an engine driver to check speed merely. They may mean, as in the case of the home signal, to stop him altogether; but the question comes in whether it means stopping before they reach the home signal, or where, as in this case, the engine has got "line clear," whether it tells him that he has 400 yards ahead of the home in which to stop. Rule 55 deals with the distant signal, and says: "When an engine driver finds a distant signal at danger, he must immediately reduce the speed of his train so as to be able, in case of need, to stop at such signal." It says: "In case of need to stop at such signal." You will have to consider whether that case arose here. He found the distant at danger, as has been proved, but you go further,

and say whether that rule has to be followed. I think you will find that there was no necessity for him to stop at the distant signal in this case. This rule goes on to say: "But if he sees that the way in front of him is clear, he must proceed slowly and cautiously within the distant signal, having such control of his train as to be able to stop it short of any obstruction that may exist between such signal and the home signal." In this case you will consider this part of the regulation in relation to the "clear signal" Milburn received.

Then there is Rule No. 170: "The engine driver and fireman must pay immediate attention to and obey all signals, whether the cause of the signal being shown is known to them or not. The engine driver must not, however, trust entirely to signals, but must be vigilant and cautious. He must also promptly obey the instructions of the station-masters." This rule tells him not to trust entirely to signals. If he were to trust entirely to signals, then it might be, if there were no other rules pressing upon him, he would be compelled to stop in any case.

Another matter comes in, and that is, whether Milburn used reasonable discretion on the other side of the home signal—whether, in endeavouring to make up time, he has gone as close to the speed limits as possible, and has come to the home signal with the idea of keeping to time, he being late, and finding the home signal against him, he comes down hoping it will be pulled off; and he finds it is not, and close to the home signal he applies the brake, but the speed of the train carries it beyond the home signal, and so causes the accident.

Then there is rule No. 171: (a) "The engine driver must keep a good look-out all the time the engine is in motion, and the fireman must also do so, when he is not necessarily otherwise engaged." (b) "As far as practicable, the engine driver must have his fireman disengaged when approaching or passing a signal box, so that he also may keep a good look-out for signals." Then there is the rule applying to approaching junctions: (c) "When approaching a junction the engine driver must give the required notice by whistles if the signals are at danger." There is evidence from a witness that he heard one continuous whistle, and he was in such a position, that he could not make a mistake, because he was standing, watching. That shows that Milburn noticed the signal at danger.

I will next draw your attention to rule No. 174(a): "When two engines are employed drawing a train, the engine driver and fireman of the leading engine are responsible for the observance of signals." He is practically in charge—the man who drives the first engine of a double-headed train and the working of the continuous brake. He is to apply the brake, which is entirely in his hands—it is cut out from the second engine. The rule proceeds: "The engine driver of the second engine must watch for and take his signals from the engine driver of the leading engine, but the driver of the second engine is not relieved from the due observance of all signals regulating the safe working of the line. And in case of need, he must apply the continuous brake."

Is the Westinghouse Brake Reliable?

I would like now to refer you to the Westinghouse brake, because much of our evidence was given in regard to this. I take it that all the evidence you have heard in regard to the Westinghouse brake will have had its effect upon your mind, and you will probably have come to a conclusion. First of all, in considering the Westinghouse brake, remember it is not a perfect machine. No machine is perfect, but we who have travelled in trains all our lives, and are continually coming into contact with the Westinghouse brake in that respect, know how near perfection it is. From the standpoint of a brake being fallible we have judged this case, and we have entered into every question as regards the efficiency of the brake, and a doubt was suggested early in the case by the evidence of Mr. Bagley. He said that it was a very inferior brake for a fast main line passenger train. Our first test was taken in order to show, amongst other things, whether it was up to the work it had to do, and Mr. Selley and Professor Kernot arranged to have certain tests made at Sunshine as nearly as possible under similar conditions and with a similar train and similar weight as on the night of the accident. Mr. Bagley's evidence in this case has been of great and material use to every one of us; it is evidence given by a man whose position is somewhat peculiar, and yet it entitles him to give us the clearest view of the facts of the case, because he has been an engine driver himself and had a long experience, and he has also made a special study of the Westinghouse brake, that study culminating in his becoming

a teacher of engine-drivers and the author of a work upon the Westinghouse brake. When Mr. Bagley made his statement about the inferiority of the brake at the outset of his evidence, I said we should consider it carefully, but later on —when he came to consider and eliminate all the details he gave to you of the brake—he came to the conclusion it was a good working brake.

The Brake and the Tests.

As regards the brake and the tests, I have the report of Professor Kernot, and you will remember his report in the light of his further evidence. He stated that the brake, in his opinion, acted feebly on the night of the tests. You are not to take it that that is the same brake. You know the piston leathers dry. A brake, like everything else, is not always up to the highest standard pitch, and the brake may have deteriorated during the eight days' interval between the accident and the first series of tests.

As far as the brake is concerned, we eliminated everything that might interfere with it, as far as our knowledge would go. Mr. Bagley cut up the hose pipes for unravelling. He got a scale out of the iron pipes; that scale is inseparable where you get dampness in any pipe. That was eliminated as a cause of the brakes failing to operate, or being a cause that might have rendered the brakes more ineffective. The only question you have to consider is whether the brake was of sufficient power or not on that particular night to have done its work reasonably well.

On the subject of the brake, you will find the evidence of Mr. Bagley, who is a brake expert, and looks at the matter from what I might call the inside point of view, the point of view of the engine drivers. Then as to Professor Kernot, whose unfortunate illness interfered to a degree with the completeness of his evidence. He spoke of the brake being about two-thirds of its efficiency from a high standard, but said that it was reasonably efficient. Then Mr. Selley gave us a demonstration on the subject of the brake. He is also a brake expert—the Westinghouse Company's representative —and he would not do anything to injure the interests of the brake; but I think he gave us evidence that is of great importance in this case; it showed you that he understood exactly what he was talking about.

Then the evidence of Mr. Alexander, a railway officer, was to the effect that the standard of this particular train was very close to the standard required by the Westinghouse Company. Had the engine driver, Milburn, in this particular case any right to expect a brake more highly efficient than the one he had got? Milburn was perfectly satisfied with his train, and, according to Mr. Burgess, another railway officer, he was a man who relied greatly upon his brake. He was careful about his brake also, according to the evidence. It may be that he placed too great a reliance upon his brake at Sunshine. Yet, according to Milburn, the brake was alright. Both drivers stated clearly that they were perfectly satisfied with it.

MILBURN'S IMPRESSIVE DEMEANOUR IN THE WITNESS-BOX.

I would like to say a few words about the position of Milburn and Dolman. First of all, there is Milburn's record. It has been described by a railway officer as a very fair record, and the offences, according to the Railway Department, on which he was brought up were very trifling. He is a sober man, and you saw him in the witness box for yourselves, and no doubt you were impressed with his demeanour Although he was "fighting for his life," fighting for what a man holds dearest—his reputation—he still was careful and concise, and clear in his answers to you, and he stood in the witness-box there as a man capable of being judged by his fellows, and judged clearly and without favour. He did not ask for any pity, although the man was under a strain several times during his examination; and I think you could fairly say of Milburn that he bore out his record in the evidence he gave you in the witness-box. I am not speaking to you now about the story of what happened at Sunshine. It may be, of course, that he has felt the weight of public opinion. It may be that the influence of the engine drivers has overborne him in this case, and the man might have in his mind certain ideas he had been compelled to give up. There is no evidence of Milburn having been careless anywhere until he arrived at Sunshine, and then the question is for you to decide. He checked the train passing the distant signal, so that, as far as the distant signal, he had his train under his command—his hand was on the brake. If any of you have had the privilege of riding on an engine, you will see driver's hand is always close to his brake. He keeps a

look-out on the left-hand side of the engine for signals, and his right hand is on the brake. There is no doubt that Milburn had his eye on his brake. He denied that he was a two-application man. Mr. Burgess stated it was his opinion Milburn was a two-application man. Mr. Burgess no doubt meant that he was a man who relied upon his brake—more especially did he rely upon it in cases of emergency to have it applied quickly. He would apply his brakes, say, and then that would be taken as being sufficient, and until the stop came he would apply it again and stop the train. He seemed to take the remark of Mr. Burgess as implying something that was wrong, but I think Mr. Burgess rather meant to compliment him when he called him a two-application man.

DOLMAN'S RESPONSIBILITY SECONDARY TO THAT OF MILBURN.

Then you had Dolman before you. As far as the evidence against him is concerned, I think his position is a secondary one as far as responsibility for the accident is concerned. In the first place, the man was in the condition that he had been up all day since 4 o'clock. That may or may not have affected him, but we are all human, and we are all liable to be affected by want of sleep; and this man might have been in a sleepy condition. You remember, I asked him if he was sleepy, and he said he was not. Then he was perfectly safe behind Milburn, and he relied upon the home signal to come off. He said in his evidence that it flashed through his mind that the home might come off. I do not think the evidence is strong enough in Dolman's case to warrant you in saying he was guilty of culpable negligence in not checking his train so as to bring it to a stand at the home signal, because, supposing the home signal had been suddenly pulled off, and Dolman at that particular time had put on his brake, and the other man had put on a little steam to get speed up again, you would have had the train drawn asunder. Then the question would be, Was not he guilty of negligence there, and I think it might possibly be said that Dolman would be guilty of negligence in not relying a little more on the driver ahead of him.

In concluding, Dr. Cole said the Jury had an option—they could say whether there was sufficient evidence to warrant the person accused standing for trial; and they could go further, and say whether in their opinion the evidence

was sufficient to warrant them in accusing any person or persons, so that they may be committed to take their trial. The question of negligence (continued Dr. Cole) is in every case dependent upon the particular facts of the case; and it is a question of whether, in your minds, that negligence is of so wicked a character as to be culpable or gross, or whatever you may apply to it. You are not warranted in accusing a person of any crime unless you are sure of this fact—that the negligence you accuse him of is of a gross character. You have all the evidence before you, and I think now that I can end my address to you.

Coroner's Advice to the Jury.

Mr. McArthur has put the drivers' case before you fairly, I think, and in every respect as I should have put it had I been addressing you without his assistance. I think you may recognise that he, and the other members of the bar who have appeared here, have been of very great assistance indeed, and I want especially to say that they have helped us greatly in endeavouring to get at the real truth in regard to the cause of the accident. This has been a case of wide public interest, and has caused the public to attach great importance to it, as shown in the interest they have taken in it. That cannot have failed to impress itself upon you. It is a matter of concern, not only to this particular State, but to the whole world, and especially to the whole railway world. There is another matter which arises in connection with an enquiry of this sort, where the consequences were so grave and the calamity was so great that it forced its attention on us more than it possible would have had only one or two persons been killed. In this calamity so many were killed that the whole world is looking on. I leave the matter in your hands, and merely instance those facts to show you the grave responsibility that is thrown upon you—as grave a responsibility as any man could have thrown upon him; and it behoves you not to come to your verdict hurriedly or hastily, and to avoid all prejudice, preconceived notions, or opinions that you may think of weight that you have heard outside of this court, or the fact that the public may have made up its mind in a particular direction, or that one person may be made the scapegoat to bear the sins of others. Because, in a case of this sort, it may be there is a tendency to blame someone else, and not to give attention to anything else. I ask you to put

away all these sources of information, and base your verdict upon your own unbiassed judgment—to put away, as far as you can, everything apart from the evidence, and I trust that in arriving at your verdict, the spirit of justice will animate you all.

THE JURY'S VERDICT.

The Coroner submitted a number of questions to the Jury, in which they were asked to deliver judgment in regard to the indirect causes that may have led up to the disaster—but the Jury waived them aside, and without adding a rider they adjudged Milburn, Dolman and Kendall guilty of manslaughter—a melancholy ending to a remarkable and lengthy enquiry.

DRIVERS MILBURN AND DOLMAN ON TRIAL.

Towards the end of September Drivers Milburn and Dolman were placed on trial on the charge of manslaughter preferred against them by the Jury at the Coroner's Enquiry into the disaster at Sunshine. The Chief Justice (Sir John Madden) presided, and a Jury of twelve were empannelled to hear the evidence and arrive at a verdict on that evidence.

Mr. McArthur and Mr. Mann (instructed by the Crown Solicitor) appeared for the prosecution, and Mr. Maxwell, with Mr. Ian Macfarlane (instructed by Messrs. Corr and Corr) for the accused.

The evidence affecting the two men concerned which was submitted at the Coroner's Enquiry was reiterated in the Criminal Court, nothing fresh being brought to light which could be calculated to affect the issue to be decided. No evidence was submitted in defence of Milburn or Dolman.

The Jury's Responsibility and Duty.

In addressing the Jury, Mr. McArthur said they could ask themselves three questions: (1) How it was that the brake came off? (2) Why did not the brakes go on when the emergency application was made? (3) What on earth put the

brakes on at the time of the collision? On Milburn's showing, he put the brakes on in plenty of time. If they believed he drove up to the home at 50 miles an hour, the train would never have been pulled up, even had the piston travel been alright. If the Jury accepted the story of Guard Darcy, Milburn would have to admit that he absolutely disregarded the distant and home signals, and then jammed on the brake. An accused person was not at liberty to say, "I admit that I was grossly careless up to a certain point, and then shoved the handle over to the emergency position. Now, to get out of the consequences of my gross carelessness, I want to say that if I had had a better instrument I could have saved myself." From the evidence of Mr. Bagley and other experts it looked extremely probable that on one vehicle only (20E) was the brake ineffective on the night of the accident. Even if some others were out of order, would they have the sensation which the men described, of all the brakes coming off? Milburn said that all the way from Bendigo he would not have wanted a better brake. The engine tests spoke for themselves, and were of grave significance. Immediately after the accident both Milburn and Dolman attributed it to the failure of the brakes. That counted in their favour, but, looking about for a cause, it was a most obvious thing to say. Dolman was the first to introduce anything about the train jumping forward. Accused met at Mr. Corr's office, and agreed to give up the theory of the isolating cock being open. There must have been a *quid pro quo*. Passengers on the Bendigo train substantially bore out the evidence of eye-witnesses as to where the brakes were applied. Was not the story most probable that Milburn, seeing the home signal against him and the starter off, concluded that the starter was off for him, and that, after realising there was a train ahead, he did all he could to pull up? The driver of the first engine was in charge; but ought not Dolman to have checked the train when she passed the distant signal at such a high rate of speed?

A Plea for the Acquittal of the Accused Men.

Mr. Maxwell, speaking on behalf of Milburn and Dolman, said that the manslaughter charged was the manslaughter as the result of negligence—in the words of Mr. McArthur, "negligence with an adjective in front of it." Before a man was worthy of being stamped as a criminal, the Jury must

be certain that the accused had a wicked disregard of the consequences of the act he was about to commit, or of the omission of which he was about to be guilty. The cases of Milburn and Dolman were absolutely apart. Mr. McArthur had not seemed to take the care he ought to have taken to keep the cases of the two men separate. It was easy to be wise after the event, and to sit down, with a book of rules and regulations, and judge the case of a man. The Jury had to judge the men who acted under the excitement and hurry of the moment. A man's act should not properly be looked at from the consequences backward, but before the commission. What was done that night might have been done a thousand times in succession without disastrous result. There was a combination of circumstances. Another man had still to stand his trial for something he was said to have done that he ought not to have done, which contributed to the accident.

As to the case of Dolman, Mr. Maxwell said his Honour had stated that he could not think of any definition of criminal negligence that would include Dolman. Even the Crown witnesses said that the leading driver checked the speed of the train at the distant signal. According to Mr. Bagley, Dolman would not have been guilty of even simple negligence. There was no regulation as to what speed a driver should pass the distant signal at danger—it was a matter of discretion. It was deposed to that Milburn took a grip of the train between the distant and the home. Milburn, right from the distant to within a short distance of the home, was taking care to reduce the speed of his train. The most that could be charged against Milburn was that he was a second or two late in putting the brake hard on. The brake of the Bendigo train was "sick unto death." No word Dolman had said about the accident was evidence against Milburn. The depositions of Milburn were those of an honest, truthful man. Where was there anything to satisfy the Jury that Milburn was lying when he said that the brakes lifted on that night? The Jury were the sole judges of whether Milburn was guilty of criminal negligence. He asked them to say that they could not put the brand of criminal on Milburn, but, by returning a verdict of "not guilty," bring back into the homes of the accused sunshine that had long been absent, and dissipate the cloud which had been resting over them for a long time.

THE CHIEF JUSTICE SUMS UP.

Sir John Madden, in summing up, said that the duty of the Jury was to judge the facts. He was sure their earnest desire was to perform their duty according to law. Questions of law were determined by the presiding judge. It would be difficult, if not impossible, to present any one definition of manslaughter, as the law understood it. Every homicide was presumed to be murder until it was shown to be less. Murder was to kill another, of malice prepense, unless it were justifiable or accidental, as killing sometimes was. If it were none of these things it fell within the possible area of manslaughter, which must arise out of some form of negligence. It was further insisted that the negligence must be culpable. If a man deliberately did any act which it was his express duty not to do, or omitted any precaution it was his express duty to take, having reason to believe that someone would be killed, and someone was, in fact, killed, as the direct consequence of his act, he was guilty of manslaughter. The negligence of others was no excuse for him. The Crown case was that Milburn, for some reason, deliberately ran past the distant signal at far too great a pace; that, still travelling at a fast pace, and expecting a clear line through the station, he suddenly found the home signal not pulled off, and the Ballarat train in the section. He then put the brakes on, but it was too late. That proposition involved that when Milburn saw the danger signal against him it was his unmistakable duty to act upon it. The definition of manslaughter he had given fitted in with this story if it were the true one. It was said that Milburn disregarded the warning of the danger signal. If that were true, the definition was one which would make his act unquestionably one of manslaughter. Happily, in this case, not one word of aspersion on a man's character had been suggested. Even if Kendall were as negligent as possible in sending the 3.1 signal, at all events his duty was done in keeping the signals on the Bendigo line at danger. The question of the signal given was unimportant, as Milburn said it had nothing to do with the disaster. The result of all the evidence as to signalling came to this, that, whatever momentary meaning the signals at Sydenham conveyed to Milburn, he was under strict obligation to see the distant and home signals at Sunshine, and to act upon them, and them only. As to the condition of the brakes, Milburn said they

were in good order previous to leaving Melbourne. They were acting perfectly at the last point of stopping—Sunbury. Dolman spoke of his brake being in good condition. The train examiners at Kyneton said in effect that the train left Kyneton thoroughly braked. In considering the evidence on different points, he impressed upon the Jury that that could only take the statements of each accused into consideration in his own case. Dealing with the speed of the train at and after passing the distant signal, he pointed out that Milburn said he put the brake on, and brought the speed down to 40 miles an hour at that signal, and that 200 yards from the home signal it was 32 miles an hour. The Jury must determine if that was a proper and prudent pace. At the subsequent trials of the train, under as nearly as possible the same conditions, it was stopped, showing that the brake was capable of doing the work at a high speed. It might be said that the accused might therefore have expected the train would stop on the night of the accident. But if a man broke his duty with safety once, that would be no excuse when he failed on another occasion. The whole vital principle in this case turned on the disregard of duty. Milburn said he passed the signal at 40 miles an hour; others put the speed at 50 miles an hour. The expert said either speed was imprudent, because sometimes the train might not come under control. It appeared the brakes were applied a little before the distant signal. The differences of evidence as to the use of the brakes between that point and where, at 200 yards from the home signal, Milburn said the brakes jumped off, were pointed to. The Jury must decide whether the brakes were put on before they were put hard on. The evidence with regard to the action of the brakes was very important, and he therefore read all the evidence on the point. Evidence of officers, that the speed at which the train should have entered the section should not have been more than 25 or 30 miles an hour, and of the engine driver who said it was safe to pass the distant signal at 50 miles an hour, was also quoted. If the Jury thought 50 miles an hour a reasonable rate, then the charge of negligence must go, though not altogether, because the train should have been pulled up outside the home signal. If it was said that drivers took the chance of coming in at 50 miles an hour, that could not possibly be an excuse, otherwise an habitual offender would get off where a man who had only offended once would be punished.

Milburn's Position must be Decided by the Law.

In respect to the case of Milburn, it must be first admitted that the two signals were against him, and he went into the section knowing what they meant at a speed, he said, of 40 miles an hour, and by other witnesses 50 miles an hour, though officers said the speed should not have exceeded 25 or 30 miles an hour. He was a capable, experienced man, in whose hands rested the lives and limbs of those on the train. If he went on under circumstances he could not afterwards control he must stand by the result. That was the reasonable principle of law. The Crown in effect said that the brakes were alright, and that Milburn, relying on the "line clear" signal, went on, and when he found the Ballarat train where he did not expect it, he dashed into it, because he could do nothing else. If that was so, he was guilty of manslaughter. Then there was the defence that, if true, ought to entitle him to acquittal, because, whether he entered the section imprudently fast or not, if it was done in circumstances under which he could with care have handled the train, and the cause of the trouble was that the brakes broke down, then it was only an accident—only a misfortune. The expert evidence was that the failure was not physically possible under the circumstances. Either a physical law must be broken or there must be a leak. No leak was found, and the jury would take it, he presumed, that that which nature commanded could not have been disobeyed. If Milburn let the air enter the train pipe deliberately he was guilty, and if accidentally not less guilty, because a man in such a position must not do these things. Milburn, with true manliness, had rejected the supposition that he had moved the handle by mistake. There was nothing in the isolating cock question. There was no evidence that it was not in its proper position. Scale in the pipes or sticky triple valves had nothing to do with the accident.

Justice Before Sympathy.

It was important in such a case to remind one another of the true principles of justice. There was a tendency of people maddened with anger to take into their hands the remedy against the supposed causers of their trouble. The court of justice sat to remedy that sort of thing. It must see justice administered, not hesitating to do right—on the one hand, seeing that no man was made a sacrifice to the unreasonable,

if justifiable, sorrow; and, on the other hand, that, if wrong was caused through negligence, justice was calmly done. They must not be too pitiful. The consideration of a man's character was excellent, if punishment had to be considered; but when they had to decide on guilt or otherwise, it only served to destroy judgment.

After deliberating for four hours and a half, the Jury returned to the Court with a unanimous verdict of

"NOT GUILTY."

THE PRESS ON THE VERDICT.

MELBOURNE "AGE."

No one will venture to dispute the verdict which the Jury gave in acquitting Milburn and Dolman, the engine drivers concerned in the Sunshine railway disaster. They were on the post of supreme responsibility, with others, at a time when a frightful calamity hurled great numbers of their fellow citizens into eternity, maiming and mutilating many others. They stood their trial for manslaughter. All the facts have been carefully sifted, and a Jury has declared they are not guilty of culpable negligence in anything which they did or left undone. The Jury was helped to its decision by eminent counsel and the direction of a painstaking judge. It was therefore in a position to decide more accurately than can the judgment of any unassisted citizens. And the verdict stands. But considerations arise from it which are of the most disquieting nature. The millions of people who travel every year on our railways have a perfect right to feel that every care should be taken for their safety. And that is most certainly not being now done. All the resources of the Railway Department should be devoted to carry its charges as securely as it can; but the sworn evidence given in this inquiry leaves no doubt at all in the mind that the every-day practice of train drivers is in some respects a violation of this primary duty. And the verdict of the Jury was no doubt based on this recognised fact.

For example, it was shown that when Driver Milburn saw the distant Sunshine signal against him he did not at once put the brakes on his train, which was travelling at 40 miles an hour or so. He kept on, in accordance with a customary habit, trusting to see the near signals in his favour, and relying on the brakes, should they not be so, to enable him to draw up in time. This is admitted to be what happened. When he caught sight of the near signals and found them also against him, he applied the brakes at once, and they failed to act in time; and hence the crash, the catastrophe, the shambles, the sudden horror, and the land long in mourning. His explanation, which the Jury evidently accepted, is that he made no miscalculation as to the efficacy of the brakes, if they had only acted in a normal manner; but for some inexplicable reason they failed. Taking these assertions to be facts, just as they were deposed to and received, one indisputable conclusion arises from them. The Railway Department permits its drivers, as a matter of daily practice, to over-run distant danger signals at full speed, relying on the Westinghouse brake to act effectively at close quarters. In 99 cases out of 100—perhaps in 999 out of 1000—it performs what is expected of it; but in a solitary case here and there it fails, and sometimes with appalling loss of life. The reason why the traffic managers permit this infraction of one of their own rules appears to be in order to keep to the time tables. There is always a certain amount of difficulty, especially in busy periods, about trains arriving to their times, and when one train is late on a busy line it dislocates any number of other trains. This, of course, is clear enough, and anyone can comprehend the disposition to cut things fine and take risks.

It is just here, as it seems, that we get to the very heart of this Sunshine tragedy. The question forces itself at once—If the Railway Department has decided that distant railway signals are a necessity for public safety, as it has, can we conceive of any justification for allowing drivers to pass those signals at full speed, as Milburn did, and did as a part of ordinary procedure? There is in law a practice which is called "extra precaution." Practitioners take these measures for the better security of their clients' property. The railway authorities also have their methods of extra precaution. In addition to choosing men of approved ability and prudence, they surround them with every mechanical means of reinforc-

ing their vigilance. The distant danger signal is one. It is created to make assurance doubly sure, so that if any train be standing in a station, a down-coming train on the same line shall not only run no danger of telescoping it as it stands, but shall not come within a quarter of a mile of it. That is the salutary meaning of the distant signal. Passengers have ridden in a sense of security, because they fondly thought such measures and precautions were in operation for their safety. Now they learn from the sworn testimony given at this trial that they were being lapped in a fool's paradise. The rules were there. The signals were there. The drivers' instructions were there. But they were not being obeyed, except when it was quite convenient to obey them, and when there was no lost time to make up. They were pleasantly regarded as works of supererogation, to be remitted at the discretion of drivers, who had to choose between making bad time and punctiliously performing these practices of extra precaution.

We come, therefore, to this conclusion—that at all times of extra pressure, such as holidays and times of special excursions—just when the greatest strain is put on the machinery of the Department, and when obstructions are of most probable occurrence—that is, when the extra precaution is remitted. If this view of the matter be an accurate one, as would seem to be the case, the care for safety is most exercised when the danger is the least, and the precaution is most remitted when the danger is greatest. We must not forget that what are called "accidents" in life are nearly always the result of a want of due care. Some regulation has been omitted, which, if observed, would have averted the disaster. This Sushine tragedy was one of the preventable kind. Driver Milburn, the Jury says, was not to blame, though he broke one of the rules. This shifts the responsibility on to the shoulders of the Traffic Department at large, and the public will want to know what is to be done in future about this setting aside a salutary observance of the distant danger signals.

MELBOURNE "ARGUS."

The Jury in the "Sunshine Trial," in which the drivers Milburn and Dolman were charged with manslaughter, returned the expected verdict of "not guilty." Dolman was not directly involved in the errors which led to the disaster and loss of life. In the case of Milburn, the driver of the leading

engine on the Bendigo train, the Jury evidently brought itself to consider that his *laches* did not amount to the criminal negligence necessary to justify a verdict of manslaughter. Human sympathy must have played its part. As a matter of cold technical law, the verdict may be open to question. There was near the Sunshine station a "distant" danger signal, which should, in conjunction with the home signal, also at danger, have brought the Bendigo express to a halt, but did not; in consequence, this train, with the brakes too late applied, smashed into the Ballarat train at the platform. The situation which the Jury considered probably contained among its elements a keen appreciation of the suffering which Milburn has undergone since the accident, and a merciful belief that, even if the guilt were his, no good could be done by adding to this natural penalty the heavy punishment of the law. The Crown performed its obvious duty in sending the drivers for trial. The result rested with the Jury; and the verdict which they gave is the verdict which would probably have been given by any twelve ordinary flesh-and-blood "men in the street."

It is certain that the disaster itself will be a graver warning to engine drivers, and a more powerful deterrent to careless men, than any punishment inflicted upon Milburn could have been. Human nature is fallible and inclined to recklessness; in every perilous occupation men familiar with the work soon learn to take with a light heart risks at which novices tremble; but the catastrophe at Sunshine revealed in a piteous manner what may happen when engine drivers "chance it." For many years to come, we should think, no driver on the Victorian railways will venture to pass a danger signal without the strictest obedience to regulations. This point of view is one which suggests itself to everybody, for, after all the available evidence has been considered, the fixed impression is left that Milburn, relying on the clear run which he naturally expected, took chances which should never have been risked. His brakes were applied too late to prevent the collision, and but for their remarkably prompt action, when his train ran down on the Ballarat train "wheels on fire," the disaster would have been ever so much worse. It is regrettable that, in seeking excuses, Milburn and his advisers decided to brand the Westinghouse as unsafe. That suspicion —had the evidence not consistently discountenanced it—would have had a deplorable effect upon the public mind. No rail-

way traveller would have felt safe. But the efficient braking of the Bendigo train was demonstrated by ample evidence and thorough trial. Mr. Bagley's opinion, that but for the immediate action of the brake after its tardy application, both trains would have been wrecked, because of the high speed of the Bendigo express, clinches all the contributory evidence on this matter. This was the case for the brake in a nutshell. Indeed, it is so obvious that the brake must have acted, and with effect, that it was mere counsel of despair to suggest that it did not. Had it been otherwise, there would have been a calamity which cannot even be thought of without a thrill of horror.

In fact, the principal feature of the investigations, both at the Coroner's inquest and in the trial for manslaughter, was the steady narrowing down of the field of responsibility, until it became clear that the fault resided, not in the system nor in the appliances, but in the men on the engines. The negligence, or error, which was the cause of the accident was pretty clearly to be seen even before the inquest opened; the legal inquiries served to confirm what the investigation made by the press had already suggested. Now that both official inquiries are over, the Westinghouse brake has its reputation enhanced rather than diminished. Its application, even at the last desperate moment, saved scores of lives. That it provides, under careful hands, a sure guarantee for the safety of railway travellers, seems now more clear than ever. In fact, its action is so prompt and reliable that it may even tempt drivers to take risks from which they would shrink with an instrument less efficient. They know, when they run faster or further than strict regulations allow, that the Westinghouse will pull them up in case of need. A defect on one car will make little difference; along the rest of the train the brakes will still operate powerfully. The Sunshine calamity has steadied every railway man in Australia with a new sense of responsibility. But it has not shaken confidence in the appliances by which public safety is guarded.

THE LOCOMOTIVE

ENGINE DRIVERS' GUIDE

A HANDBOOK

OF THE

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By

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